DEPARTMENT OF THE AIR FORCE
TECHNOLOGY TRANSFER AND TRANSITION

FY2024
ANNUAL REPORT

AFRL Clearance: #AFRL-2025-2182

Partnering with a Shared Vision

The Department of the Air Force Technology Transfer and Transition (DAFT3) Team takes a creative approach to exploring collaborative possibilities and long-term partnerships.

Contents

Our New TEO

Technology Executive Officer

Brig Gen Jason Bartolomei

In July 2024, Brigadier General Jason Bartolomei assumed command of the Air Force Research Laboratory (AFRL) and became the Department of the Air Force (DAF) Technology Executive Officer (TEO). As the TEO, Brig Gen Bartolomei is responsible for overseeing the DAF's Technology Transfer and Transition (T3) Program.

Brig Gen Bartolomei is focused on aligning AFRL's science and technology development with acquisition to deliver the capabilities Airmen and Guardians need to win the future. Strategic partnerships with academia, industry, and other government agencies are central to Brig Gen Bartolomei's vision to "Bring the Future Faster" by accelerating the transition of cutting-edge technologies from the laboratory to the warfighter. Brig Gen Bartolomei is committed to using his authority to harness the full potential of these partnerships and collaborations to drive innovation.

> **The future of air and space power will be defined by our ability to innovate, adapt, and outpace our adversaries.**

AFRL Commander and DAFT3 TEO Brigadier General Jason Bartolomei shares current AFRL research advances with former AFRL Commanders Major General Scott Cain, Major General (Ret) Heather Pringle at the AFRL technology booth during the 2024 Air, Space and Cyber Conference.

Photo by Air Force Research Laboratory

By working together, we can create a dynamic innovation ecosystem where we leverage our combined expertise to solve complex challenges and maximize our impact.

Previously, Brig Gen Bartolomei served as the Program Executive Officer (PEO) for Weapons and Director of the Armament Directorate, Air Force Life Cycle Management Center (AFLCMC) where he worked closely with AFRL's Munitions Directorate to deliver execution-ready programs of record. Brig Gen Bartolomei's career, marked by notable experience in research, acquisition, and leadership roles, reflects his dedication to serving the nation and making a lasting impact for the Air Force and Space Force.

"We're at a pivotal moment in history," Brig Gen Bartolomei said. "The future of air and space power will be defined by our ability to innovate, adapt, and outpace our adversaries."

Career Highlights

- Program Executive Officer for Weapons and Director of the Armament Directorate, Air Force Life Cycle Management Center, Eglin AFB, FL
- Director, Senior Materiel Leader Upper, Ground Based Strategic Deterrent, Air Force Nuclear Weapons Center, Hill AFB, UT
- Chief of Staff of the Air Force Fellow, John Hopkins University Applied Physics Laboratory, Laurel, MD

Education

- Ph.D. Engineering Systems, MIT, Cambridge, MA, 2007
- M.S. Systems Engineering, Air Force Institute of Technology, Dayton, OH, 2001
- B.S. Mechanical Engineering, Marquette University, Milwaukee, WI, 1997

THE DEPARTMENT OF THE AIR FORCE TECHNOLOGY TRANSFER & TRANSITION PROGRAM OFFICE (DAFT3PO)

Our Director

Mr. Scott Aughenbaugh

The Department of the Air Force Technology Transfer and Transition Program Office (DAFT3PO) directly supports the Department of the Air Force (DAF) Technology Executive Officer (TEO) and is responsible for the Department of the Air Force Technology Transfer and Transition (DAFT3) Annual Report, which highlights DAFT3PO activities. The FY24 report demonstrates how the DAFT3 Office and 38 other DAF organizational activities, both Air Force and Space Force, have been successful in Technology Transfer (T2) activities.

Scott Aughenbaugh was appointed by the DAF TEO as the Program Director of the DAFT3PO effective 24 Feb 23. Scott has served in various roles at the Department of Defense (DoD) National Security Innovation Network (NSIN) and as a Fellow at the Center for Strategic & International Studies, performing strategic futures analysis. With an eye toward the warfighters needs, he brings with him a background in defense innovation which has historically benefitted from Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) projects, venture capital engagement, and customer discovery; along with a number of executed Technology transfer Agreements and Partnership Intermediaries, as described in more detail, later in the this report.

Message from Scott

The FY24 report presents our Annual Review of the DAFT3 Program. Highlighting the work and accomplishments of the past year in facilitating the collaboration between the Department of the Air Force (DAF) and external partners.

In 2024, we had a number of new agreements (see overview on Page 17), including 188 Cooperative Research and Development Agreements (CRADAs), 92 Educational Partnership Agreements (EPAs), and 99 Information Technology Agreements (ITAs) / Commercial Test Agreements (CTAs). These agreements play a crucial role in advancing the DAF's mission by fostering innovation, accelerating the development of cutting-edge technologies, and enhancing national defense capabilities.

Throughout the year, our office has actively engaged with a diverse range of stakeholders—from academic institutions and private industry to federal agencies and research organizations—building a robust ecosystem that supports the transition of scientific discoveries into operational advancements. We were also able to receive an Authorization to Operate (ATO) for our new Defense Technology transfer Information System (DTTIS), modernizing our International agreement process, and ran a full review of our DAF Partnership Intermediary Agreements to measure their return on investment. This report outlines the key agreements established, the progress made, and the outcomes achieved, providing transparency and insight into the ongoing efforts to leverage external expertise and resources in support of the Air Force's evolving needs.

In addition, this document serves as a vital communication tool for Congress, National Institute of Standards and Technology (NIST), Office of the Secretary of Defense (OSD) and DAF leadership, and other partners, detailing how these collaborations contribute to technological innovation, foster economic development, and ensure the continued superiority of U.S. Air Force capabilities. As we look ahead, the ongoing success of these partnerships will remain critical to maintaining a technological edge in an increasingly complex and competitive global environment.

Strategic Partnering Director

Mr. James “Sass” Bieryla

As the Director of the AFRL Strategic Partnering Directorate, I have always believed that partnerships are the lifeblood of innovation and mission success. My experience as a fighter pilot and test pilot in the U.S. Air Force taught me that no mission succeeds alone. Whether it’s coordinating complex flight operations or tackling challenging technological problems, success is always a product of strong teamwork and strategic collaboration. That principle is no less true in the work we do at the Department of the Air Force’s Technology Transfer and Transition (DAFT3) program.

The DAFT3 team plays a critical role in bridging the gap between cutting-edge research and real-world applications, enabling the rapid transition of technologies into operational use. Partnerships are at the heart of this mission. By collaborating with academia, industry, other government agencies, and international allies, we ensure that the U.S. Air Force and the U.S. Space Force can leverage the best ideas, talent, and innovations from across the globe. Our partnerships accelerate technological advancements, reduce duplication of effort, and create pathways for innovation that strengthen national security.

As someone who has spent a career operating in high-risk, high-reward environments, I understand the importance of trust and shared goals. The DAFT3 team, through its diverse network of partnerships, exemplifies these principles by cultivating relationships that are not just transactional, but transformational. We measure our success not only by the number of partnerships but by the quality and impact of these collaborations in delivering critical technologies to our warfighters. These efforts are a testament to the power of partnerships and their role in achieving the mission-critical outcomes that keep our nation at the forefront of technological innovation.

> **“Our partnerships accelerate technological advancements, reduce duplication of effort, and create pathways for innovation that strengthen national security.**

Who We Are

THE DEPARTMENT OF THE AIR FORCE TECHNOLOGY TRANSFER & TRANSITION PROGRAM OFFICE (DAFT3PO)

The Department of the Air Force Technology Transfer and Transition Program Office (DAFT3PO) is responsible for managing and supporting technology transfer activities within the Air Force. The office is organizationally aligned under the Air Force Research Laboratory's Strategic Partnership (AFRL/SP) Directorate and works closely with other departments to process technology transfer agreements, provide training and guidance, and manage intellectual property. The DAFT3PO also oversees Partnership Intermediaries (PIs), updates Air Force instructions, and manages patent royalty disbursements, among other tasks.

(Back Row Left to Right) Shania Horner, Myra Saxon, Rachel Bankowitz, Guz Vu, Trish Randall, Oswaldo Delacruz

(Front Row Left to Right) Elisse Whitney, Scott Aughenbaugh (DAFT3 Director), Pam Kallio

Not Present: Jack Owsley, Sharon Barker, Debbie Davis-Brutchen

Our DAFT3 Team

Scott Aughenbaugh
DAFT3 Director

Jack Owsley
DAF ORTA Task Lead

Sharon Barker
T3 Support Specialist

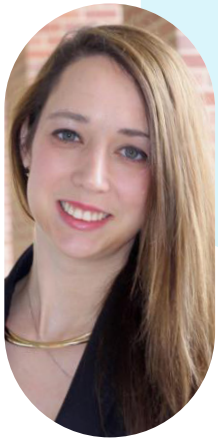
Rachel Bankowitz
T3 Support Specialist

Tricia Randall
PIA Program Manager

Elisse Whitney
PIA Program Manager

Pam Kallio
T3 Support Specialist

Shania Horner
Sr. Graphic Designer



Myra Saxon
PIA Program Manager

Oswaldo Delacruz
Data Engineer

Debbie Davis-Brutchen
PIA Team Support/IP Training POC

2024 Accomplishments

The Department of the Air Force Technology Transfer and Transition Program Office (DAFT3PO) has had many great successes during this past fiscal year. The following stories are a few that we'd like to highlight.

2024 DAFT3 Annual Summit

The 2024 Department of the Air Force Technology Transfer and Transition (DAFT3) Annual Summit, held from 13-15 August 2024 at the Basic Research Innovation Collaboration Center (BRICC), was a pivotal moment for technology transfer professionals across the Department of the Air Force (DAF). The event brought together a diverse array of technology transfer and transition (T3) stakeholders, including Air Force personnel, contractors, and other key figures, to forge a path forward in T3 strategy.

The summit was a success, with attendees applauding the event's engaging agenda and keynote speakers. The interactive game on Day 1 was a particular highlight, with many attendees expressing their enjoyment of the activity. The marketing design and session were also commended, with attendees impressed by the creativity and expertise on display.

The summit attracted a significant number of attendees, with over 90 participants on Day 1, including 15 online attendees. Day 2 saw 55 attendees, with an additional 10 joining online. The final day of the summit, which focused on training, drew 26 attendees. The diversity and engagement of the attendees were a testament to the importance and relevance of the event.

One of the highlights of the summit was the presentation of the DAFT3 Awards, which recognize individuals and organizations that have made significant contributions to the advancement of technology and innovation within the Air Force. Some of the winners of this year's awards included Ms. Teresa Whinnery (USAFA), Ms. Jessika Webb (AFRL/FZAO), Mr. Paul Hausgen (AFGSC/ST), Capt Friedrich Martin (92 ARW/CCE), and the AFMCLO/JAZ Team. These individuals and teams were recognized for their outstanding contributions to the Air Force and the broader technology community, and their achievements serve as an inspiration to others in the field.

The 2024 DAFT3 Summit was widely regarded as the "best summit" by attendees, who appreciated the opportunity to come together and share knowledge, ideas, and best practices. The event provided a valuable platform for T3 stakeholders to network, collaborate, and shape the future of technology transfer and transition within the Department of the Air Force.

As the Department of the Air Force continues to push the boundaries of innovation and technology, events like the DAFT3 Annual Summit play a critical role in facilitating collaboration, driving progress, and recognizing excellence. The success of this year's summit is a testament to the dedication and expertise of the DAFT3 team, and we look forward to next year's event with great anticipation.

Increased Social Media Communication

Fiscal Year 2024 marked a major milestone for the Department of the Air Force's Technology Transfer and Transition (T3) office, as it was the first full year of implementation for the newly established rebrand and social media strategy. The numbers tell a compelling story, with significant increases in engagement, followers, and page traffic, demonstrating a resounding success in amplifying the T3 message and reaching new audiences.

The DAFT3 marketing and communications strategy plays a crucial role in enhancing our visibility and engagement within the community. By focusing on clear and effective messaging, we aim to strengthen our brand and connect with our audience on multiple platforms.

The position of the DAFT3 is a unique one. Due to the services that we provide, we have several different audiences that we aim to communicate with.

Our audiences include:

1. The Internal Department of the Air Force
2. Industry
3. Senior Leadership

Some challenges that DAFT3 has faced include:

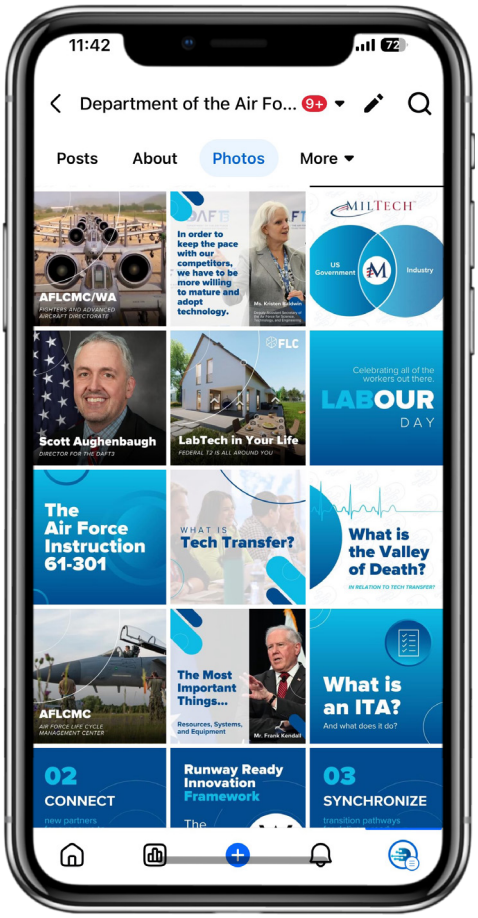
- Technology in the field that is not being patented
- Inventors do not understand technology transfer and transition
- Pre-conceived notions that the government is hard to work with and opposed to outside sources

How does marketing and communication address these challenges? It boils down to one word: Exposure.

Increased exposure can educate our audiences on what technology is available for patent licensing. It can show examples of what technology transfer and transition are utilized for. Most importantly, it can build relationships with our audiences to build trust and explain processes.

FY25 Goals

- Increase LinkedIn followers
- Continue to grow Instagram audience
- Increase website traffic from social media



Social Media Snapshot

NEW Instagram

Launched Aug 31, 2024

Facebook

***Followers:* 1,902**
4.5% Increase from FY23

***Page Impressions:* 23,448**
48% Increase from FY23

***Page Reach:* 18,039**
58.3% Increase from FY23

***Post Engagement:* 4.83%**
7.9% Increase from FY23

LinkedIn

***Followers:* 1,161**
30% Increase from FY23

***Page Impressions:* 40,481**
45.6% Increase from FY23

***Page Reach:* 22,685**
37.8% Increase from FY23

***Post Engagement:* 7.74%**
46.4% Increase from FY23

Website Rebrand

https://www.aft3.af.mil

One of our primary goals in FY24 was to revamp our website to better reflect our brand identity (established in FY23). Our new website includes a fresh, user-friendly design that not only enhances user experience but also ensures that our messaging is consistent and engaging.

This site features several useful tools, including access to the Department of the Air Force Technology Transfer and Transition (DAFT3) Handbook, partnership agreement mechanisms, and the latest news from the technology transfer community. Although the Department of the Air Force's Technology Transfer and Transition (T3) office successfully launched its rebranded website and social media strategy, the rollout occurred mid-fiscal year, which means we don't have a full year's worth of data to compare and assess the impact of the rebrand. As a result, we're eagerly awaiting the completion of the first full fiscal year with the new brand in place, which will provide us with a comprehensive dataset to analyze and evaluate the effectiveness of our rebranding efforts. At that time, we plan to conduct a thorough audit of our website and social media metrics to gauge the success of our strategy, identify areas for improvement, and inform future decisions to further enhance our online presence and outreach efforts.

Laboratory Quality Enhancement Program

DAFT3PO and AFMCLO/JAZ (LOJAZ) continues to participate in Laboratory Quality Enhancement Program (LQEP) Working Groups to improve efforts and initiatives for the T2 Community. Progress in a variety of areas continue. Accomplishments include the release of the a DoD Tech Transfer Strategy PPT that was briefed to LQEP-G; LOJAZ memo to be signed out by OSD leadership on PIAs; the Professional Development Working Group (PDWG) is working standardized training for all OSD and has a list of training modules to be recommended or built; and The Software Working Group (SWWG) is working on a guide for OSD Components.

Defense Technology Transfer Information System

A key project for the office is the development of the Defense Technology Transfer Information System (DTTIS), which aimed to streamline technology transfer activities across the Department of Defense and was deployed 01 October 2024.

Our Success Stories

10 Sep 2024

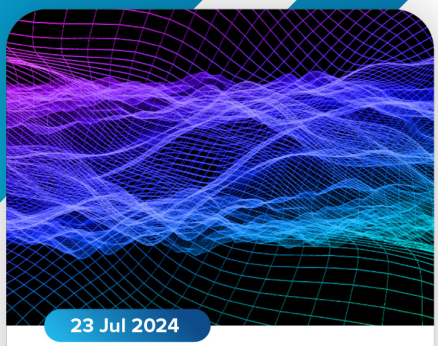
Catching the Wind: Revolutionizing Wind Tunnel Testing

Patent Number(s):
US 11,933,694

6 Aug 2024

Team 'Twists' Their Way to New Patents Detecting Nuclear Weapons & More

Patent Number(s):
US 11,346,017 B1 and US 11,608,568 B1



23 Jul 2024

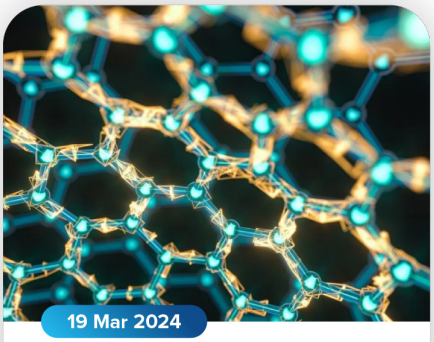
AFRL & the Buckeyes' Transform Sensing Revolution: Phased Array Radar Game-Changer

Patent Number(s):
US 11,796,664 B2

9 Jul 2024

Resilient Timing is Key

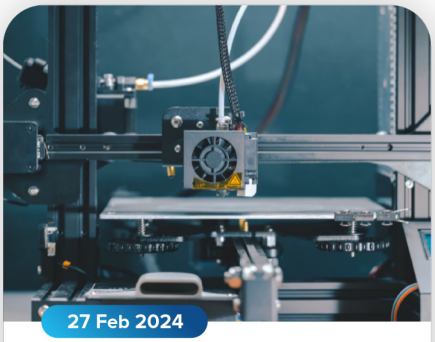
Patent Number(s):
US 11,509,451



19 Mar 2024

Innovative Gold Nanorod Reshaping: A Breakthrough in Plasmonic Material Science

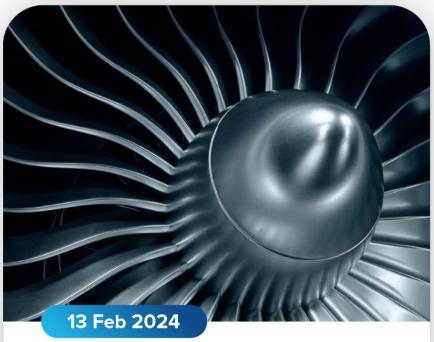
Patent Number(s):
US 11,993,720 B1



27 Feb 2024

Intriguing AFRL Patents Written in 3D Ink

Patent Number(s):
US 11,787,109 B1 and 11,613,077 B1



13 Feb 2024

Team Combines Two Technologies for Cool Jet Engine Concept

Patent Number(s):
US 11,454,171 B1

13 Feb 2024

AFRL Scientists Buck Conventional Wisdom to Save Big Bucks

Patent Number(s):
US 11,292,967 B2

Scan the QR code below or go to https://www.aft3.af.mil/ to read the full stories

More Successes

13 Feb 2024

Shaken, Not Stirred: On-Demand Materials for Harsh Space Environments

Patent Number(s):
US 11,702,390 and US 11,603,357

2 Jan 2024

Physicist's Family of Patents is a Crystal-Clear View Into the Future

Patent Number(s):
US 9,647,156, US 9,777,402, US 11,384,448
US 11,390,963, US 11,434,583, and more.

21 Nov 2023

Airman's 'Small' Idea Makes Monumental Impact for the DAF

Patent Number(s):
US D958,619

21 Nov 2023

AFRL Team Sweats the Details for Bio Patent

Patent Number(s):
US 11,547,326

31 Oct 2023

AFRL Team Holds the Cards, New Patent, in Breaking from Convention

Patent Number(s):
US 11,247,915 B1

24 Oct 2023

AFRL Patented Technology Expands Functionally of Mid-Infrared Filters

Patent Number(s):
US 11,543,571

17 Oct 2023

AFRL Engineers Put New Spin on Old Concept for Patented Breakthrough

Patent Number(s):
US 10,942,313B2, US 11,156,782B2, US 11,204,468B2

Scan the QR code below or go to https://www.aft3.af.mil/ to read the full stories

FY2025 Strategy

Mission

To facilitate the transfer of Air Force and Space Force technologies to industry, academia, and other government agencies while ensuring the protection of intellectual property and the interests of the Air Force.

The Future

The Department of the Air Force Technology Transfer and Transition Program Office (DAFT3PO) mission is growing beyond the traditional objective to facilitate the implementation of Air Force and Space Force innovative technologies in products and services to benefit the warfighter and the public, while supporting Air Force and Space Force research through collaborative partnerships. Our mission will work towards pursuing the value-added engagements to increase our impact and reach. The DAFT3PO encourages the private sector to use their technologies along with Air Force and Space Force technologies through Technology Transfer (T2) mechanisms. The DAF benefits by working with companies having knowledge and expertise in the technological areas of interest. Ensuring our commitment to 15 USC 3710, "It is the responsibility of the Federal Government to ensure the full use of the results of the nation's federal investment in Research and Development (R&D)", DAFT3PO successfully deployed the Defense Technology Transfer Information System (DTTIS). This system aims to streamline technology transfer activities across the Department of Defense, allowing DAF to "Bring the Future Faster." As system capability grows with daily usage by the ORTA community, our repository for agreements, metrics and patent docketing increases. Growing our analytical power for analysis and providing clarity to not only the facilitation of agreements but focusing on the impact of the agreements. The data insight will allow DAF to prioritize portfolios, matching our current and future interests in technology, enabling strategic outreach.

Goals

- Increase the maturity of Air Force and Space Force technologies to enhance their commercial viability and their ability to spin them back in as a defense capability.
- Foster a culture of innovation and collaboration across the Air Force and Space Force with external partners.
- Optimize manpower and resources to support tech transfer activities.
- Leverage Partnership Intermediary Agreements to accelerate tech transfer and commercialization.
- Mitigate risks associated with tech transfer to protect Air Force and Space Force intellectual property and interests.

Key Focus Areas

1. Agreements
2. Delegations
3. Royalties (Licensing)
4. Inventions and Patents
5. DTTIS (Information Management)
6. Training
7. Partnership Intermediaries
8. ORTAs

FY24 Metrics

The following Department of the Air Force Technology Transfer metrics are used to measure progress and evaluate the success of new efforts to encourage technology transfer activities. Metrics include Cooperative Research and Development Agreements (CRADAs), Educational Partnership Agreement (EPAs), Patent License Agreement (PLAs), and more.

Under the Technology Transfer Commercialization Act of 2000 (P.L. 106-404), each Federal agency that operates or directs one or more Federal laboratories, or that conducts activities under 35 USC § 207 and 209, must submit to the Office of Management and Budget, as part of its annual budget submission, an annual performance report addressing the intramural technology transfer activities of its Federal laboratories.

Federal laboratories, through their basic and mission-oriented research and development investments, have historically been at the forefront of scientific discovery and technology innovation. Technology transfer facilitates the practical application of Federal research directly through the transfer of laboratory results and by providing non-federal entities opportunities to partner with Federal laboratories on innovative research of mutual interest. Over the years, new products, services, and the formation of new companies have occurred through technology transfer initiatives.

Technology transfer activities are not spontaneous events. Inventions typically require years of research effort before they are disclosed. A review of a patent application may take several years before the patent is awarded. It may also take years to license a Federal patent or form the collaborative commitment behind a CRADA. To get an understanding of how technology transfer activities are performing over time, it is helpful to view the trends in key metrics. The following Air Force Technology Transfer metrics are used to measure progress and evaluate the success of new efforts to encourage technology transfer activities.

Metrics Dashboard for FY24

Patents Issued

113 total

New Inventions Disclosed

150 total

Income from Licensing

$488K

Estimated CRADA Value (Contributed)

$541M

Federal Collaborative R&D Relationships (CRADAs)

862 total Includes all active agreements in FY24

$2.7M CRADA Revenue

Partnership Intermediary Agreements (PIAs)

15 active

Information Technology Agreements (ITAs) **& Commercial Test Agreements** (CTAs)

727 total Includes all active agreements in FY24

Educational Partnership Agreements (EPAs)

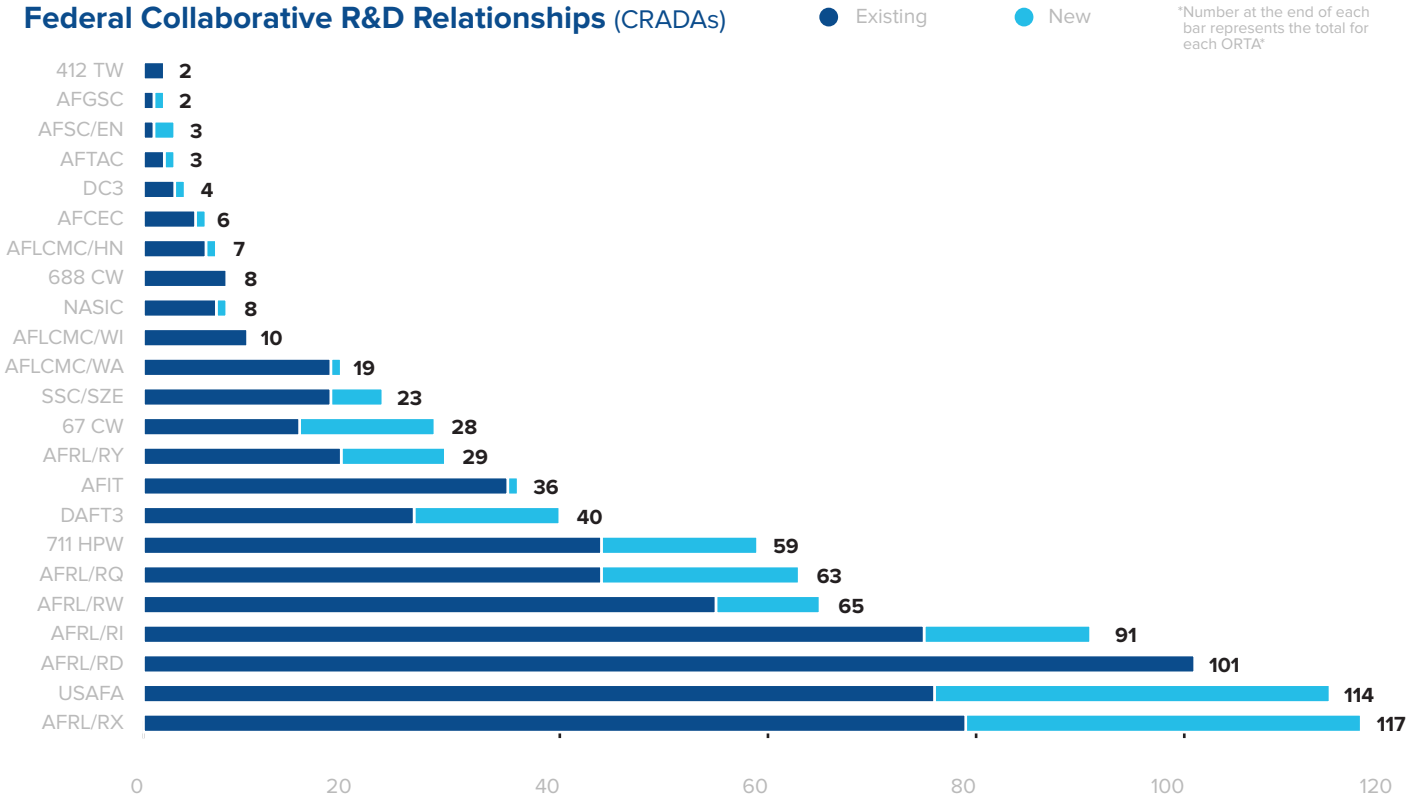
416 total Includes all active agreements in FY24

Software Licensing

28 total Includes all active agreements in FY24

ORTA Metrics

Federal Collaborative R&D Relationships (CRADAs)

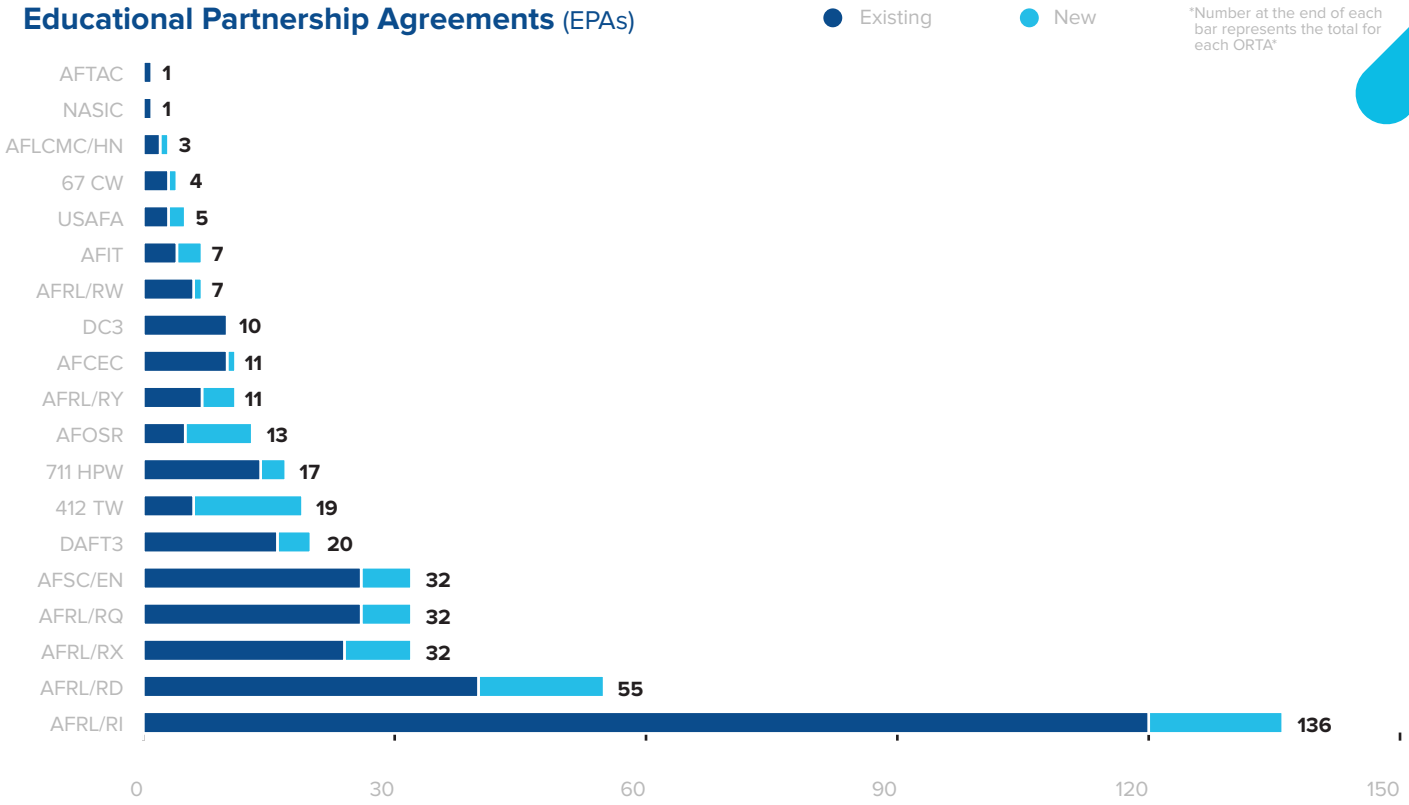


Estimated CRADA Contributed Value

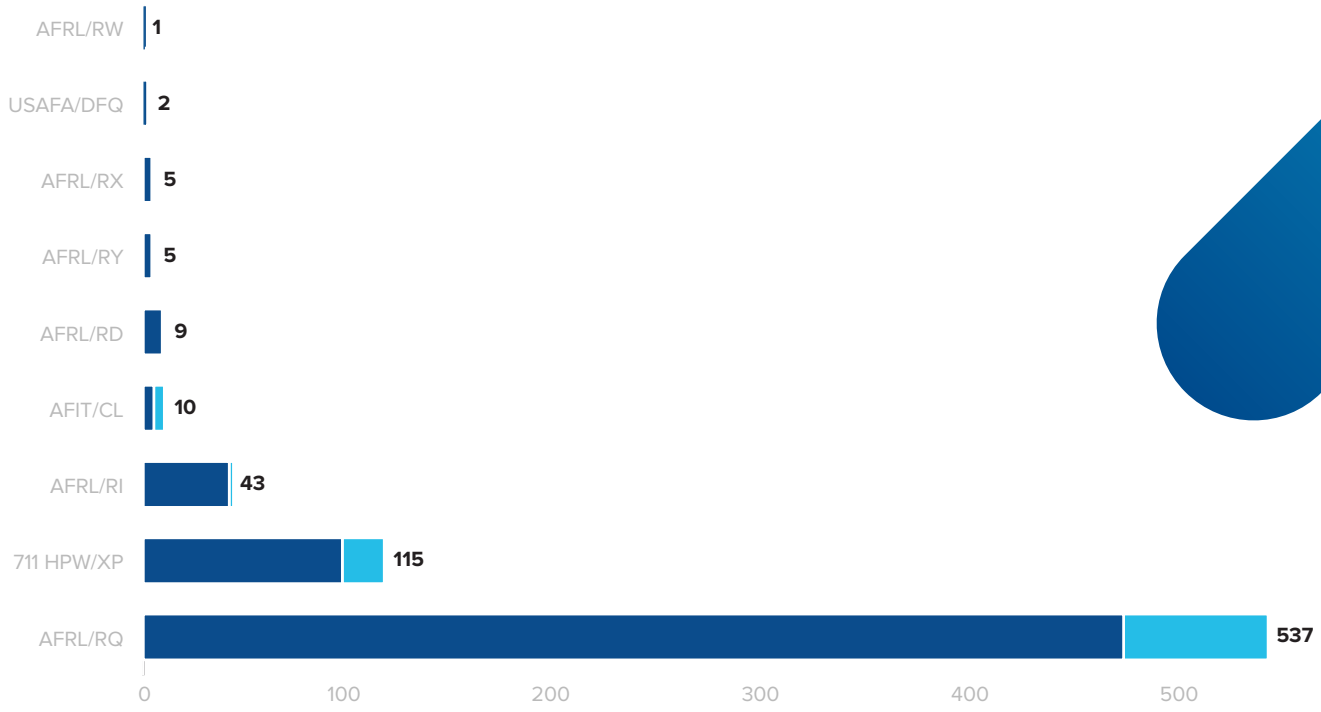
$541M

SSC/SZE	**$200K**
AFTAC	**$220K**
NASIC	**$300K**
AFSC/EN	**$520K**
USAFA	**$617K**
688 CW	**$1.4M**
AFLCMC/HN	**$1.5M**
AFCEC	**$2.5M**
AFIT	**$3.5M**
AFGSC	**$4M**
AFLCMC/WA	**$4.2M**
AFRL/RX	**$4.7M**
67 CW	**$6.9M**
AFRL/RW	**$14M**
AFRL/RD	**$18.6M**
AFRL/RQ	**$101M**
AFRL/RY	**$105M**
DAFT3	**$114.6M**
711 HPW	**$123.5M**
AFRL/RI	**$32.8M**

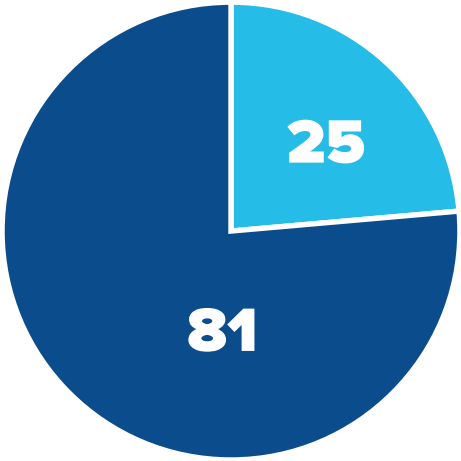
Educational Partnership Agreements (EPAs)



Information Technology Agreements (ITAs) & Commercial Test Agreements (CTAs)

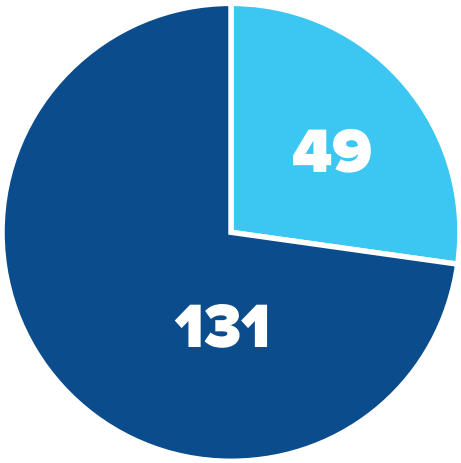


Number of New Inventions Disclosed



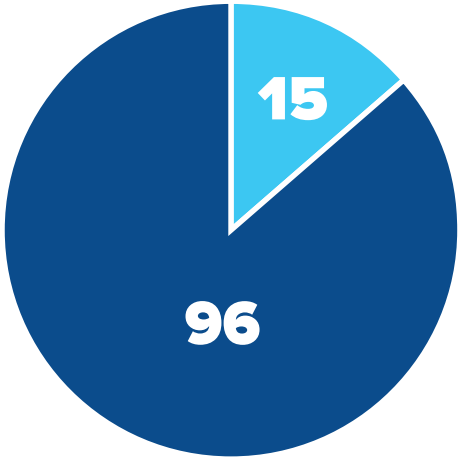
- **AFRL**
  - 2 - AFRL/RW
  - 6 - 711 HPW/XP
  - 8 - AFRL/RD
  - 10 - AFRL/RY
  - 13 - AFRL/RQ
  - 17 - AFRL/RI
  - 25 - AFRL/RX
- **Other**
  - 1 - 412 TW
  - 1 - AFGSC/ST
  - 1 - AFLCMC/HN
  - 1 - AFOSR
  - 1 - AFSC/EN
  - 1 - NASIC/XO
  - 2 - AFCEC/CX
  - 5 - USAFA/DFQ
  - 12 - AFIT/CL

Applications Filed

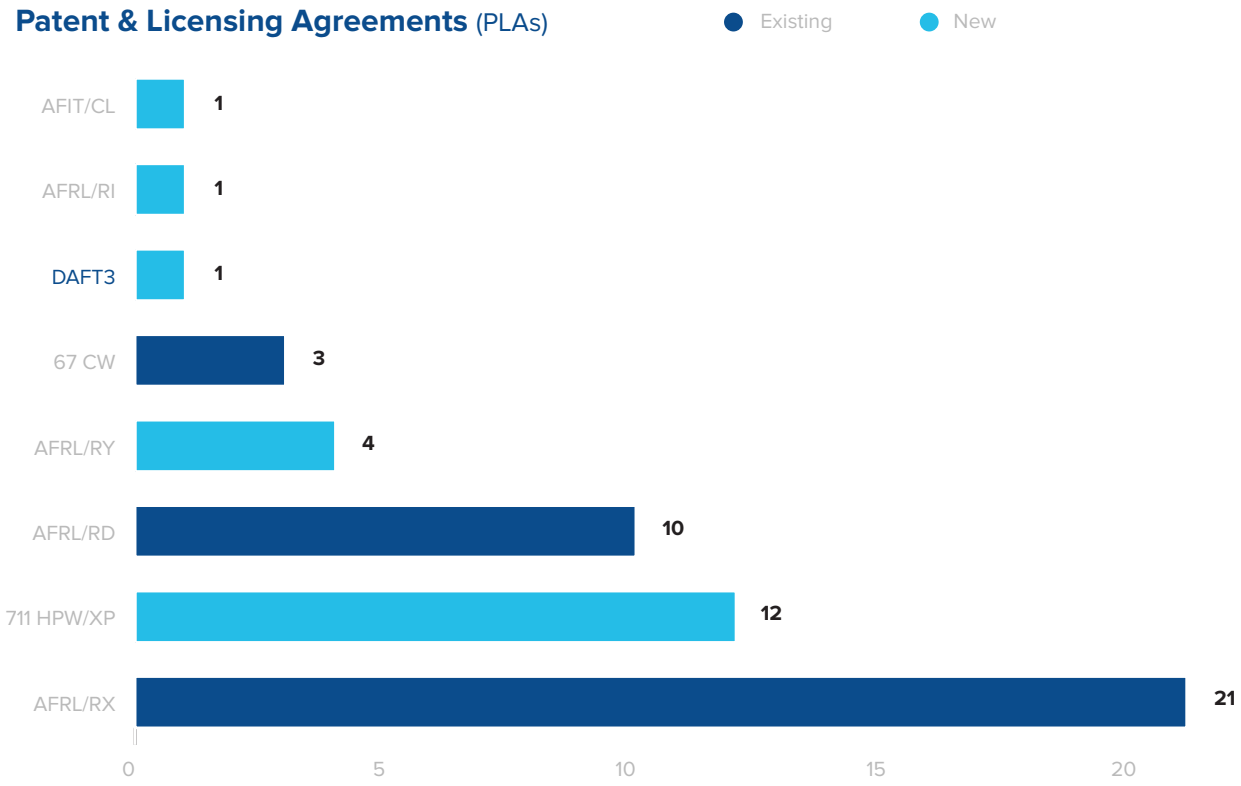


- **AFRL**
  - 7 - AFRL/RI
  - 7 - AFRL/RW
  - 15 - 711 HPW/XP
  - 17 - AFRL/RY
  - 21 - AFRL/RD
  - 25 - AFRL/RQ
  - 39 - AFRL/RX
- **Other**
  - 1 - 412 TW
  - 1 - AFCEC/CX
  - 1 - AFLCMC/HN
  - 4 - AFSC/EN
  - 6 - USAFA/DFQ
  - 26 - AFIT/CL

Patents Issued



- **AFRL**
  - 3 - AFRL/RI
  - 7 - AFRL/RW
  - 10 - AFRL/RD
  - 12 - AFRL/RY
  - 16 - 711 HPW/XP
  - 20 - AFRL/RQ
  - 28 - AFRL/RX
- **Other**
  - 1 - NASIC/XO
  - 1 - AFSC/EN
  - 6 - USAFA/DFQ
  - 7 - AFIT/CL



Royalties

The Department of the Air Force Technology Transfer & Transition Program Office (DAFT3PO) is at the forefront of ensuring that Air Force and Space Force inventors receive the recognition and compensation they rightfully deserve for their groundbreaking contributions to the field.

As part of their wide-ranging responsibilities, the DAFT3PO manages royalty payments for DAF inventors, including contractors and former government employees, who patent inventions made in Air Force and Space Force labs and assign their rights to the subject intellectual property over to the United States Government.

This provides a significant financial incentive for inventors to continue pushing the boundaries of innovation and to contribute to the advancement of the Air Force and Space Force. Eligible inventors will receive the first $2,000 in royalty income from every license every year, and 50% of any additional royalty income. The remaining 50% is allocated to the DAF lab where the intellectual property originated, providing valuable resources for research and development, education, training, and for awards or incentives to lab personnel.

In Fiscal Year 2024, the DAFT3PO received $488K in royalties, highlighting the immense impact of this essential program.

PIA Metrics

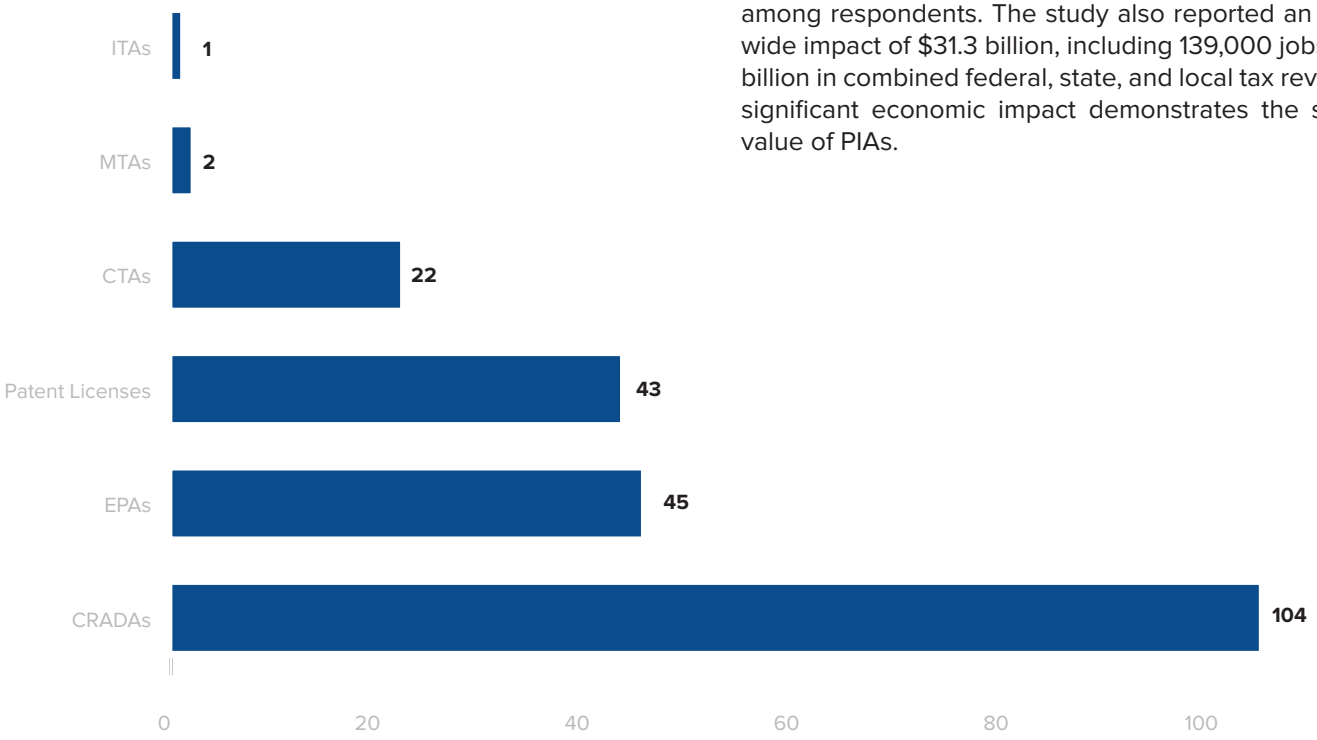
The DAFT3 Program Office has been collecting data on technology transfer activities, including Partnership Intermediary Agreements (PIAs), as part of its overall metrics collection efforts. However, this year marks a significant milestone, as it is the first time that this office has revamped our list of metrics and expanded it by collecting additional metrics from our Partnership Intermediaries (PIs). The data collected is a combination of metrics previously reported by PIs as well as first time metrics designed to meet an Assistant Secretary of the Air Force for Acquisition (SAF/AQ) request for the "Technology Transfer Program Manager to establish procedures within annual reviews of the Technology Transfer Program to identify, track, and report technology advancement and return on investment for PIAs and associated Collaborative Project Orders (CPOs) and funding." Due to the complexity and variability of activities under each PIA, the development of metrics is ongoing, and the team is refining its approach to measuring success.

The FY24 analysis aims to provide an accurate description of the metrics and value that PIs provide to the United States Air Force. We aim to highlight the impact the PIAs have had on success of AF technology transfer and transition activities using T2 Agreements, AF Patent licensing and other activities, and small business/non-traditional engagement.

Future reports will include analysis of transition and economic impact. Currently, the available data does not provide a comprehensive picture of these aspects, since many of these activities have lifecycles that span many years. However, it is expected that FY25 data will include these metrics, as the PIA team gains a better understanding of the necessary data points to accurately assess transition and economic impact.

Agreements

According to collected data, PIs have facilitated or supported various types of T3 agreements, including Cooperative Research and Development Agreements (CRADAs), Patent License Agreements (PLAs), Information Transfer Agreements (ITAs), Material Transfer Agreements (MTAs), Educational Partnership Agreements (EPAs), Commercial Test Agreements (CTAs).



This support, accounting for over half of the total agreements created in FY24, has enabled the Air Force to leverage partnerships with industry, academia, and other government agencies, driving innovation and advancement in numerous fields, while also generating significant economic impact.

A study on Air Force CRADAs conducted through the TechLink PIA found that between 2000 and 2020, AF CRADAs generated over $10 billion in economic impact among respondents. The study also reported an economy-wide impact of $31.3 billion, including 139,000 jobs and $3.4 billion in combined federal, state, and local tax revenue. This significant economic impact demonstrates the substantial value of PIAs.

Appendices

Partnership Intermediaries

Partnership Intermediary Agreements (PIAs) facilitate partnerships between Federal laboratories and industry/academia to increase the likelihood of successful cooperative or joint activities between DoD and those organizations in the technology transfer and transition environment. The DAFT3 PIA Team not only directly manages numerous PIAs, but also contributes to strategic planning, sets performance metrics and objectives, process improvements, delivers PIA training, updates policy and guidance, prepares annual reports, and supports congressional inquiries and engagements.

Ms. Tricia Randall

PIA Team Lead and Program Manager

Manages Techlink and MilTech

Ms. Elisse Whitney

PIA Program Manager and Strategic Plan and Metrics Lead

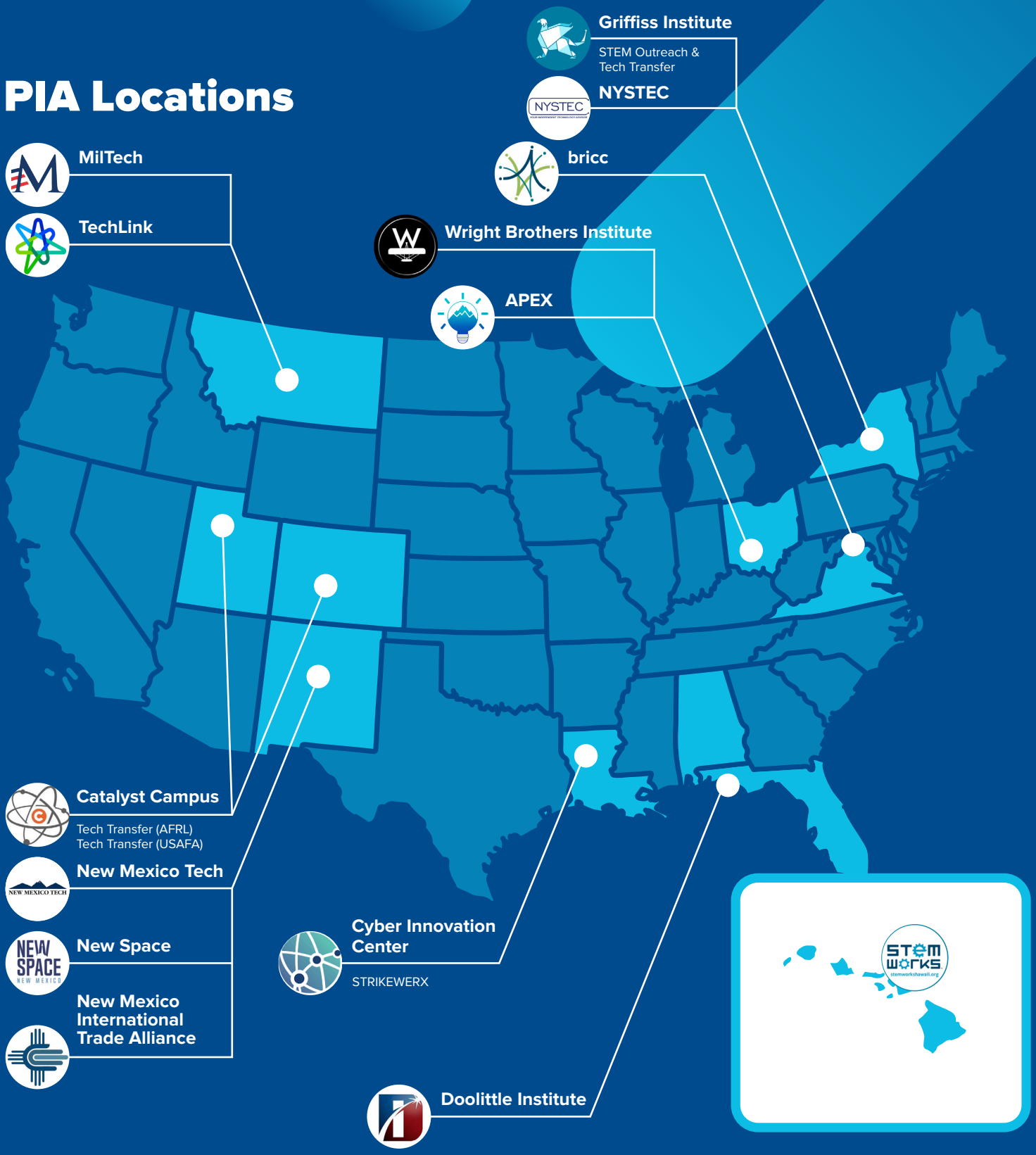
Manages Wright Brother's Institute (WBI)

Ms. Myra Saxon

PIA Program Manager and Legislative Policy Lead

Manages Academic Partnership Engagement Experiment (APEX)

PIA Locations



Academic Partnership Engagement Experiment (APEX)

Dayton, Ohio

https://apex-innovates.org/

Who We Are

APEX was established in 2019 through a partnership intermediary agreement (PIA) between Parallax Advanced Research and the Department of the Air Force to answer the call of the U.S. Air Force Science & Technology 2030 Strategy by forming and deepening partnerships with academia and industry to better leverage knowledge, technology, and talent to benefit of all partners.

APEX's mission is to connect universities, businesses, and the government together; build collaborations between these sectors; identify their transformational operational defense solutions and capabilities; and advance defense technology transition/transfer and reduce risk for the DAF.

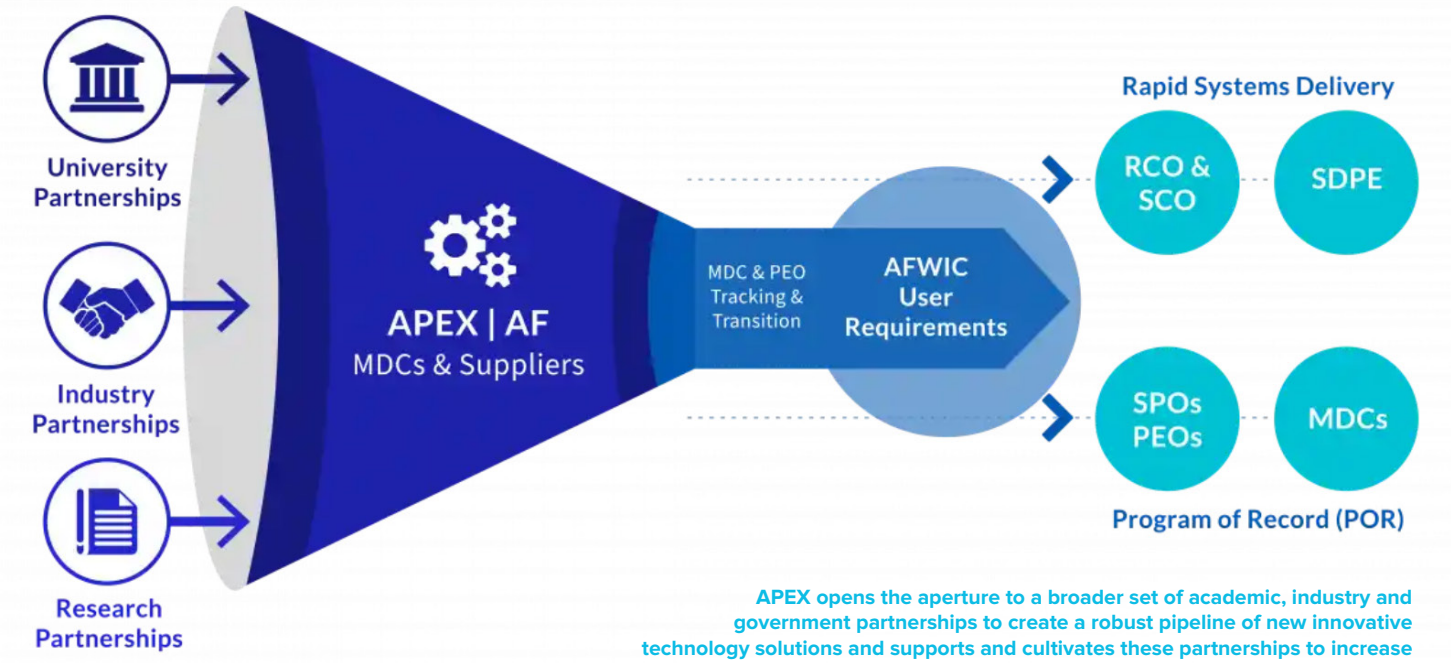
What We Do

IDENTIFY collaborators, innovators and technology opportunities using robust data analytics and active connection programs.

BUILD & CONNECT a nationwide network of innovators and technologists from universities, small businesses and government.

DEVELOP & DEPLOY & DRIVE INNOVATION through targeted education programs providing hands on training to university and small business innovators on how to effectively interface with the DoD.

ACCELERATE & DIVERSIFY the transition pipeline via challenge problems, novel and targeted small business and technology transition opportunities with the DoD and its suppliers.



APEX opens the aperture to a broader set of academic, industry and government partnerships to create a robust pipeline of new innovative technology solutions and supports and cultivates these partnerships to increase technology transition successes and enhance access to top worldwide talent.

Graphic by APEX

Success Story from FY24

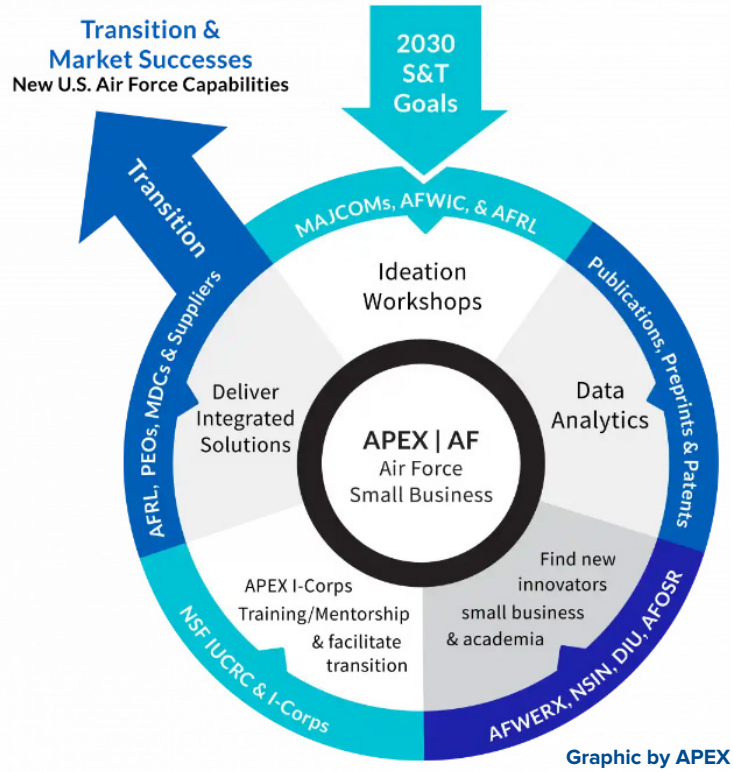
APEX OVERALL SUCCESS

https://www.purdue.edu/newsroom/2024/Q1/quantum-research-sciences-receives-u-s-air-forces-first-quantum-computing-phase-iii-contract/

The Details

Since its inception, APEX has built a network comprised of 33,000-plus academic, small business, and economic development organizations to build university-industry partnerships that advance the Nation's research and development ecosystem.

To date, APEX has assisted 625-plus small business owners and academic researchers to win 350-plus funding awards across 43 states to advance their science and technology innovations, with 16 Phase III/technology transitions.



Graphic by APEX

The Outcomes

- Quantum Research Sciences (QRS) Achieves Milestone with USAF's First Quantum Computing Phase III Contract!
- CEO of FlightProfiler joins the APEX cohort as a new entrant to the DAF in early 2020 to advance their technology for the DoD, specifically the Air Force. He later spins out new company, Quantum Research Sciences.
- APEX assisted QRS through Phase I as a part of our Phase I Cohort. Focus on teaching Customer Discovery and Business Model Canvas. Helped understand teaming requirements with academic partner.
- QRS joined the APEX Phase II navigator community after receiving their Phase II award. APEX continued to assist with strategizing their approach and continuing their customer discovery.

In 2024, Quantum Research Sciences (QRS) secured a $2.5 million, three-year Phase III Small Business Technology Transfer (STTR) contract with the U.S. Air Force. This contract represents the Department of Defense's first operational quantum computing software, developed to optimize inventory forecasting and supply chain management. APEX has supported QRS throughout their journey, providing Process Navigation services and guidance through the SBIR/STTR proposal process, including a pivotal Phase II award. While not directly involved in the Phase III submission, APEX's assistance in earlier phases has helped QRS achieve this monumental success, demonstrating the power of partnerships in advancing quantum technology for defense applications.

Quantum Research Sciences has received a $2.5 million, three-year Phase III Small Business Technology Transfer contract from the U.S. Air Force to deliver the Department of Defense's first operational, production-level quantum computing software. QRS personnel are (left to right) AJ Wildridge, CTO and Purdue University doctoral student; CEO Ethan Krimins; and Andreas Jung, COO and Purdue University associate professor of physics and astronomy.

Photo by Ms. Jennifer Mayberry

Virginia Tech Applied Research Corporation

Basic Research Innovation and Collaboration Center (BRICC)

https://briccpia.org/

Arlington, Virginia

Who We Are

The Basic Research Innovation and Collaboration Center (BRICC) at Virginia Tech-Applied Research Corporation's (VT-ARC) helps AFRL/AFOSR to identify, investigate, and exploit research opportunities that will transform future Department of the Air Force (DAF) and Department of Defense (DoD) capabilities. It provides collaborative environments and data analytic services that support AFRL/AFOSR's mission to discover, shape, and champion basic research that profoundly impacts the future Air & Space Force.

What We Do

The BRICC is designed to help AFRL/AFOSR accelerate technology transition and transfer by providing a combination of collaboration, analysis, and workforce development services. Our goal is to leverage our unique capabilities to enhance and expand AFRL/AFOSR technology objectives as well as those of our partnership network. The BRICC specializes in data-driven approaches to quantitatively assess global Science and Technology (S&T) communities, research and technology trends, and innovation capacity. Our data analytics provide strategies and insights that empower AFRL/AFOSR's collaborative discovery, technology transition and technology transfer (T2), and Scientists and Engineers (S&E) workforce development efforts.

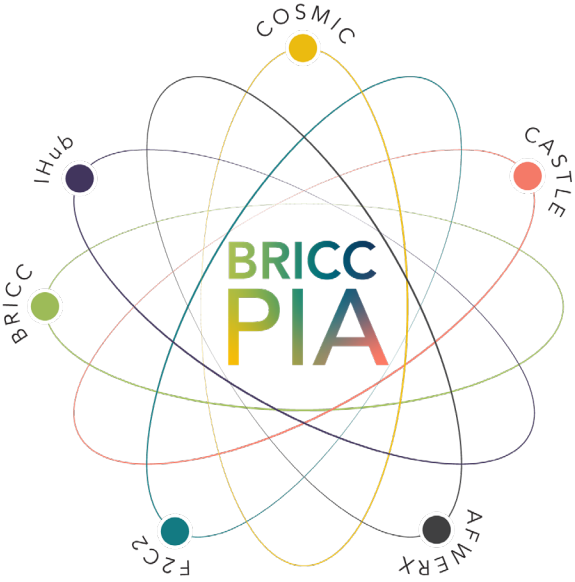
Success Stories from FY24

AIR FORCE OFFICE OF SCIENTIFIC RESEARCH'S (AFOSR) TESTING AND EVAL

The Details

Graphics by BRICC

In April 2024, the Basic Research Innovation and Collaboration Center (BRICC), hosted the Air Force Office of Scientific Research's (AFOSR) Testing and Evaluation of Ethical Artificial Intelligence (AI) Workshop. This groundbreaking event brought together leading scholars, experts, and stakeholders to explore the crucial intersection of artificial intelligence (AI) and ethics within military applications nationally and internationally.



The Outcomes

While advancements in machine learning and algorithms are remarkable, the workshop revealed a disconnect with human-machine interactions, raising concerns about integrating AI into existing Department of Defense (DoD) platforms. Participants underscored the importance of managing risks and errors associated with AI systems. This successful workshop not only fostered valuable dialogue among experts but also set the stage for future research and collaboration in the realm of AI ethics.

YOUR GATEWAY TO SPACE

https://www.linkedin.com/posts/briccdc_webinar-students-activity-7234973518101114880-WRYU

The Details

In August 2024, VT-ARC, in collaboration with Space System Command (SSC) and Inter Astra, hosted "Your Gateway to Space," an initiative aimed to underscore the integration of space technology in various aspects of everyday life, including mapping, aviation, and banking, while promoting STEM initiatives. This virtual event attracted over 200 participants, including students, educators, industry professionals, and space experts, who attended panels and engaged in interactive breakout sessions with experts that shared their experiences in the space workforce. Key discussion points included the necessity of skills in the space industry, the significance of international collaboration, and the evolving landscape of space commercialization and technology.

The Outcomes

VT-ARC, SSC and Inter Astra were able to foster global participation and connect experts directly to students, emerging leaders and mid-career professionals, highlighting potential pathways for involvement and advancement, regardless of participants' educational backgrounds or work experience.

Catalyst Campus for Technology & Innovation

https://catalystcampus.org/

Colorado Springs, Colorado

Who We Are

The Catalyst Campus for Technology & Innovation is a collaborative ecosystem where industry, small business, workforce training, entrepreneurs, startups, and venture capital intersect with the aerospace and defense industry to create community, spark innovation, and stimulate business growth. We serve as a trusted agnostic partner that facilitates connections to initiate, cultivate, and enhance public and private partnerships.

What We Do

Execute the Catalyst Space Accelerator on behalf of AFRL Space Vehicles, a program that scouts for promising technology and capability from the private sector. Through intensive collaboration with the various components of the National Security Space enterprise in Colorado, assists in determining a mission fit for the technologies and capabilities discovered.

The Hyperspace Challenge

https://www.hyperspacechallenge.com/

Hyperspace Challenge, launched in 2018, is a business accelerator fueled by the U.S. Space Force and Air Force Research Lab, in partnership with CNM Ingenuity, to support the Space Vehicles directorate and our U.S. government personnel everywhere.

We forge valuable relationships between the government, industry, and university communities to accelerate innovation for the space domain through educational offerings, special human centered events and an informative webinar series.

Screenshot by the Hyperspace Challenge

Photo by Benchmark Space Systems

Success Story from FY24

BENCHMARK WINS $4.9M AFRL ASCENT AWARD

https://payloadspace.com/benchmark-wins-4-9m-afrl-ascent-award/

The Details

This award is the fourth Benchmark has won in as many years to develop ASCENT-based propulsion systems, bringing the total to $8.4M. ASCENT (Advanced Spacecraft Energetic Non-Toxic) is a monopropellant developed by AFRL that offers users a few key benefits over hydrazine, which is one of the most common chemical propulsion fuels used on spacecraft today.

The Outcomes

According to Benchmark Chief Technology Officer (CTO), Jake Teufert, direct work experience that resulted from Hyperspace helped Benchmark qualify for the ASCENT work.

> **This is one of those unique moments you have in an industry where you have a complete paradigm shift, and you get to shuffle the existing order. So, whoever really masters this and comes out of it with high-quality flight heritage products is going to win the next 30 years of in-space propulsion.**
>
> *Jake Teufert, Benchmark CTO*

Air Force Global Strike Command

Cyber Innovation Center, STRIKEWERX

Bossier City, Louisiana

www.cyberinnovationcenter.org

Who We Are

The Cyber Innovation Center (CIC) is the anchor of the 3,000 acre National Cyber Research Park and serves as the catalyst for the development and expansion of a knowledge-based workforce throughout the region. As a 501(c)(3) not-for-profit corporation, the CIC fosters collaboration among its partners and accelerates technology, research, and development. One of its primary missions is met through a Partnership Intermediary Agreement with Air Force Global Strike Command. This STRIKEWERX partnership serves as the Command's persistent technology transfer & transition, and innovation resource.

What We Do

STRIKEWERX works hand in hand with Air Force Global Strike Command to rapidly create solutions that directly benefit the warfighter and aid in revitalizing the Air Force nuclear enterprise. Our role is to further Air Force Global Strike Command's mission and capabilities by delivering cost-effective, scalable, and agile solutions to the Command's technology challenges through innovation and collaboration with academia, business, industry, and government.

Graphic by Cyber Innovation Center

Success Story from FY24

Photo by Sean Green

STRIKEWERX DELIVERS NUCLEAR WEAPONS EOD TRAINER

https://www.strikewerx.com/global-strike-eod-crews-get-hands-on-with-advanced-training-tech

The Details

STRIKEWERX, the command's innovation hub, delivered a unique minimum viable product training capability using commercial virtual reality technologies. The new platform allows Explosive Ordnance Disposal (EOD) personnel to train as a team on safing a nuclear weapons accident site. Though it is one of 11 joint EOD missions, nuclear weapons EOD has never had a training capability. By partnering with a commercial gaming company STRIKEWERX was able to produce immersive multi-player scenarios for EOD crews to train for real-world scenarios. The Defense Threat Reduction Agency provided an additional $1M funds to enhance the product and provide more hardware to Air Force EOD Airmen.

The Outcomes

- Increased training throughput 300%; no longer have to unpack, clean, dry and repack EOD suits and equipment
- More engaging training; airmen enjoy the experience much more than computer-based training
- Flexible platform, easy to add new weapons, equipment or environments
- Realistic modeling of radiological materials based on environment
- New standard of training for AFGSC

Air Force Research Lab Munitions Directorate (AFRL/RW)

Doolittle Institute

Niceville, Florida

www.doolittleinstitute.org

Who We Are

The Doolittle Institute (DI) was established in 2012 to facilitate the technology transfer objectives and initiatives of the Air Force Research Lab Munitions Directorate (AFRL/RW). DI's success as a PIA spurred the creation of nine other innovation hubs—serving various government and non-government customers—which are located throughout the country and are overseen by our parent company, DEFENSEWERX. DI's state-of-the art, 20,000 square feet facility enables AFRL/RW personnel, academia, industry and other government organizations to participate in innovation and collaboration activities in unique ways.

> **"[Doolittle Institute] serves as a catalyst for innovation by connecting AFRL/RW with relevant partners in industry and academia.**

What We Do

DI serves as a catalyst for innovation by connecting AFRL/RW with relevant partners in industry and academia.

Our key activities are as follows:

Technology transfer/Transition (Spin-In): DI uses a combination of widely marketed events and targeted market research to identify businesses and universities that are developing technology of interest to AFRL/RW. In order to increase the breadth and scope of RW's industry engagements, our priority is to identify non-traditional industry players that have had limited or no prior engagements with AFRL.

Technology transfer (Spin-Out): AFRL/RW has a portfolio of more than 45 patents comprised primarily of "dual use" technology that has military and non-military applications. DI's technology transfer team conducts broad marketing campaigns to raise awareness of RW's patent portfolio and educate industry about licensing agreements and other mechanisms they can use to access these technologies. DI also conducts targeted market research and outreach to identify and engage with businesses that may be interested in licensing AFRL/RW patents.

SBIR/STTR Support: DI provides education and support regarding the AFRL/RW SBIR/STTR programs These initiatives aim to stimulate technological innovation, encourage participation in entrepreneurship among women and disadvantaged individuals, and enhance the commercialization of innovations from Federal research. Additionally, the STTR program fosters collaboration between small businesses and research institutions to promote technology transfer.

Future Workforce Development: DI's STEM team administers a variety of STEM programs at K-12 schools across North Florida. The focus of this programming is to ensure AFRL/RW's future success by developing a pipeline of qualified individuals that can continue to innovate and develop new technologies far into the future.

Success Stories from FY24

CYBER SURVIVABILITY ASSESSMENT EVENT

https://www.youtube.com/watch?v=pZhLgg3vuQo

The Details

In February 2024, DI hosted an Assessment Event aimed at sourcing new technologies in the field of Cyber Survivability/ Resiliency. The event kicked off with a webinar featuring the Cyber Survivability Technical Point of Contact (TPOC) who shared information about the capabilities sought and answered questions posed by businesses and universities. This interactive format proved to be very popular with industry and was also beneficial for AFRL/RW as it resulted in solutions that were more relevant to the TPOCs needs.

The Outcomes

- More than 94 businesses and universities attended the kick-off webinar
- A recording of the webinar, available on the DI YouTube page has more than 196 views to date
- The event page on the DI website was viewed 689 times
- Twenty-eight white paper submissions were received
- Five white paper submissions were down selected by AFRL/RW
- More than $530,000 of funds were disbursed through the Air Delivered Effects Broad Agency Announcement (BAA)

Graphic by the Doolittle Institute

Air Force Research Lab (AFRL)

Explora Science Center & Children's Museum

Albuquerque, New Mexico

https://www.explora.us/

Who We Are

Explora Science Center and Children's Museum of Albuquerque is a hands-on science and learning center that serves as a hub for Science, Technology, Engineering, and Math (STEM) education and community engagement across New Mexico. Through interactive exhibits and dynamic programs, Explora empowers students, educators, and families to explore and connect with scientific concepts. By partnering with organizations like the Air Force Research Laboratory, Explora brings innovative, real-world STEM opportunities to diverse communities.

What We Do

Through a partnership with Air Force Research Laboratory (AFRL), Explora integrates STEM education into classrooms and community programs, aligning with the Next Generation Science Standards (NGSS) to support a rigorous and relevant learning framework. This partnership enhances educational experiences through professional development workshops for teachers, hands-on student internships, and public STEM events, all designed to spark interest and prepare students for future STEM careers. Explora's initiatives emphasize inclusivity and accessibility, ensuring that STEM opportunities reach underserved communities throughout New Mexico.

Success Story from FY24

EXPERIMENTS IN EXTRATERRESTRIAL BOTANY (EEB)

https://bit.ly/3NUaGyE

The Details

In collaboration with NASA and the University of New Mexico (UNM), the Experiments in Extraterrestrial Botany (EEB) program introduced Albuquerque students to real-world scientific inquiry related to space botany. Students ages 11-15 explored NASA's Advanced Plant Habitat on the ISS, fostering their curiosity and critical thinking through hands-on experiments involving plant biology in simulated extraterrestrial conditions. This experience connected students with STEM professionals, helping demystify science and inspire future career paths in space and botany.

The Outcomes

The EEB program successfully engaged 25 diverse students, sparking interest in STEM careers through practical exposure to space science. The sessions achieved high engagement, with students developing an appreciation for STEM applications beyond Earth. The program's impact was amplified by Explora's ongoing partnership with UNM's Frontiers for Young Minds, which provided annual STEM exposure to 45 additional students.

Photo by Explora!

Over the past six years, our programs have witnessed remarkable growth and evolution, significantly impacting STEM education and community engagement across New Mexico. From the inception of our initiatives to the ongoing refinement of our strategies, each year has contributed to shaping a robust and dynamic STEM ecosystem.

Our efforts to provide high-quality professional development, facilitate innovative educational experiences, and foster meaningful community partnerships have led to notable achievements. Programs like the App Contest, the Maker Community of Practice, and the STEM Pathways for Girls Workshop have successfully engaged students and educators, driving interest and participation in STEM fields. The establishment of the STEM in the Burque exhibition and the Career Pathways Initiative (CPI) Internship program further exemplify our commitment to offering hands-on, impactful learning opportunities.

Throughout these years, we have encountered and addressed various challenges, such as adapting to changing educational landscapes and managing fluctuating engagement levels. Our strategic responses, including refining our programs and incorporating feedback, have been instrumental in overcoming these obstacles. The insights gained have informed our approach, underscoring the importance of flexibility, stakeholder involvement, and continuous improvement.

As we reflect on our achievements and lessons learned, we recognize the need to build on this foundation. Moving forward, our focus will be on leveraging these insights to enhance program effectiveness, expand outreach, and continue supporting the development of a thriving STEM community. The dedication and collaboration of all involved have been pivotal to our success, and we are excited to advance our mission with renewed vigor and a commitment to excellence.

The Griffiss Institute

Rome, New York

https://www.griffissinstitute.org

Who We Are

As the premier STEM Talent and Technology Accelerator for the United States Department of Defense, Griffiss Institute (GI) is also comprised of an elite international network of academic, government, and industry partners. Together with our team of expert professionals we bridge the gap bringing these three unique sectors together into one collaborative space known as the Innovare Advancement Center (IAC) in Rome, N.Y. Located in the picturesque Mohawk Valley Region, GI has served the Air Force Research Laboratory Information Directorate (AFRL/RI) and the United States since 2002. GI empowers diverse teams with talent and technology development programs that lead the nation in technical and economic impact.

What We Do

The Griffiss Institute is a nonprofit talent and technology accelerator for the United States Department of Defense (DoD) and an international network of academic, government and industry partners. The Griffiss Institute supports AFRL/RI through a Partnership Intermediary Agreement (PIA). A PIA is an agreement, (contract or memorandum of understanding), between the government and an intermediary organization, (state or local governmental agency or nonprofit entity). As a Partnership Intermediary the GI performs services for the AFRL/RI that increase the likelihood of success in the conduct of cooperative or joint activities with small business firms, institutions of higher education, and industry.

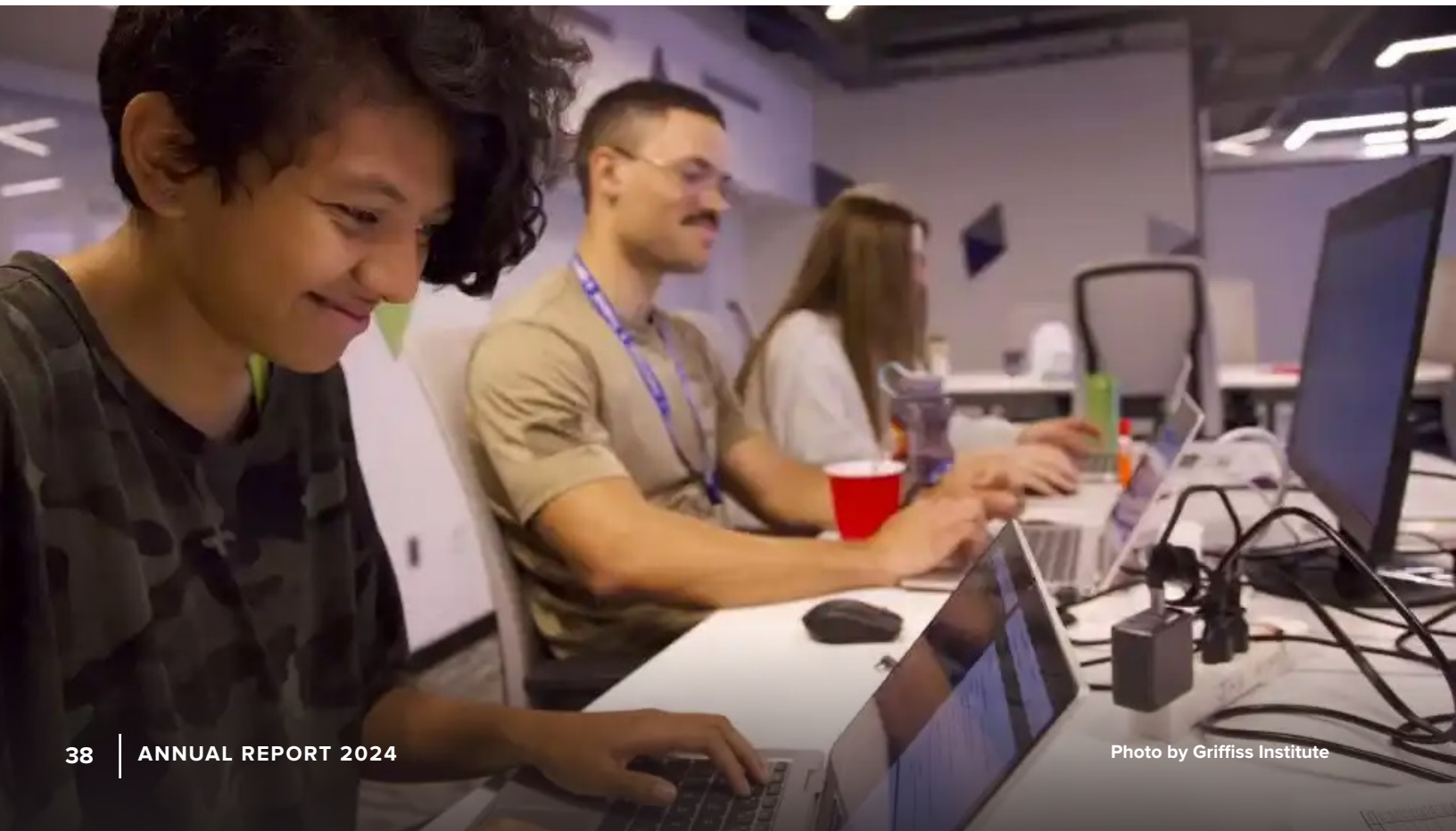


Photo by Griffiss Institute

Success Story from FY24

FULL STACK TECHNOLOGY SCOUTING

The Details

The Griffiss Institute has created a fully scoped Technology Scouting capability which supports AFRL/RI. An internally facing team of scouts, consisting of a licensed Patent Agent and a Technology Transfer professional with over 13 years of experience performing technology transfer activities in higher education, is deployed to proactively engage scientists, engineers and researchers. The scouts support AFRL team members by facilitating the disclosure process and helping them in the patent application process. Working closely with the ORTA office, the scouts help AFRL/RI increase the number of disclosures and patent applications helping both the lab and the individual team members. An externally facing scout, consisting of an Air Force veteran and entrepreneur with 25 years of experience in and around the DoD, proactively seeks out companies, universities and organizations that want to collaborate with the lab. In the specific technology verticals in which AFRL/RI focuses, the scout strategically attends conferences and events to maximize the exposure to AFRL/RI teams.

The Outcomes

In just three months, the internal scouting team has increased the number of patent application packages from low single digits to almost 20. In addition, over a 12-month period, the external scout attended 24 events and established 174 new contacts for the lab.

Our Impact

(Reporting Period 2019 - YTD)

13,581
Unique Guests

700K
STEM Outreach

1,274
Collegiate Interns

344
Visiting Faculty

251
Partnering Universities

32
New Startups

We Elevate TALENT.
We Empower INNOVATION.
We Enable EXPERIENCE.

Montana State University - Office of Research and Economic Development

Miltech

Bozeman, Montana

https://www.miltechcenter.org/

Who We Are

MilTech was established in 2004 as a PIA between Montana State University (MSU) and the Office of the Secretary of Defense (OSD) with an additional PIA established in 2019 under the Department of Homeland Security (DHS).

The mission of MilTech is to accelerate the transition of new technology to the U.S. Government. Since 2004, MilTech has performed over 600 technology acceleration and transition projects for DHS and all DoD Services, OSD, Joint and Special Programs.

MilTech maintains a significant STEM program with MSU students involved in real, hands-on projects for the Army, Navy, Air Force, and Marine Corps. MSU is the only university-based Mentor in the Air Force Mentor/Protégé program with performance recognized as the 2020 winner of the Nunn-Perry award.

MilTech engages, develops relationships, and leverages targeted networks such as the Department of Commerce's (DoC) nationwide Manufacturing Extension Partnership (MEP). MilTech demonstrates unparalleled and proven success in finding small, non-traditional vendors to fill U.S. Government needs and gaps, to identify optimal solutions for U.S. Government customers.

What We Do

MilTech assists with on-time delivery of innovative technology to the U.S. Warfighters through hands-on assistance to integrated product teams and end users. MilTech supports the U.S. Government by:

- Identifying, qualifying and actively engaging industry partners, subject matter experts, and academia
- Assisting with advancing user-initiated innovations, solving problems, and advising the DoD on advancing Technology and Manufacturing Readiness Levels (TRLs/MRLs)
- Assisting government labs with technology transition activities
- Ensuring that end user needs are integrated in new technology development
- Supporting development and delivery of evaluation samples, Field User Evaluations and Human Factor's Exercises

MilTech contributes to enhance efficiency and reduce costs for government partners while actively advancing technology into DoD and DHS programs. Core competencies include:

- Information research and analysis, technology scouting
- Design, design review and evaluation samples
- Manufacturing, process improvement and process management expertise

MilTech delivers improved mission readiness, survivability, and safety.

Photo by Miltech

"MilTech delivers improved mission readiness, survivability, and safety.

Success Story from FY24

STANDARDIZED TEST PLATFORMS FOR CASUALTY CARE DEVICES

The Details

In 2010, the Joint Tourniquet Working Group established the Joint Operation Evaluation of Field Tourniquets studies to assess the effectiveness and suitability of currently fielded and newer generations of tourniquets. MilTech and the Naval Medical Research Unit San Antonio partnered to support Defense Health Agency (DHA) to test and evaluate seven extremity tourniquets, from the Tactical Combat Casualty Care list of approved non-pneumatic extremity tourniquets.

In prior studies, tourniquet effectiveness was tested using human subjects. This can create issues such as variability in anatomy, subject's pain and injury threshold, limited number of cycles per day, etc. The goal with this study was to collect statistically significant data over 25 different use cases, necessitating 5,000-plus samples. Leveraging human subjects would have been prohibitive in both time and resources.

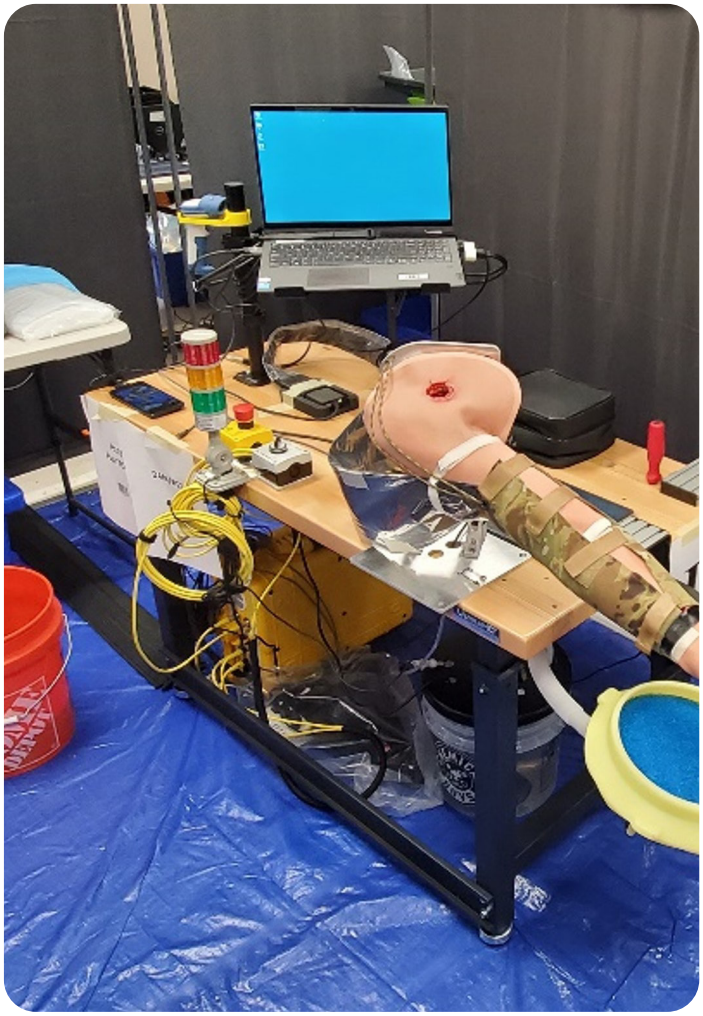


Photo by Miltech

The Outcomes

Standardized test platforms and a process to carry out the tests were developed using feedback from end users and automation where applicable.

There were two sets of test platforms developed, both utilizing upper and lower limb "anatomy". The first set was developed around tourniquet trainers as these are manufactured to anatomical scale, have multiple hemorrhage wounds, and are manufactured to tight specifications. The second set was developed specifically for the environmental testing, which required six tourniquets to be applied for over 60 minutes. Because the environmental set does not simulate hemorrhage and has limited compressibility, a method for applying the tourniquets to an appropriate load matching occlusion pressure had to be developed.

The resulting tourniquet trainers allowed for collecting data across 16 different use cases with 35 different users, consuming 3,000-plus samples, the bulk of which happened over four days. The environmental test platforms allowed for collecting data across nine different environmental effects, with five different users, consuming 1,600-plus samples, over nine days. Across all tests, time to occlusion and tourniquet pressure distribution at occlusion was recorded.

Because the platforms are based on engineered solutions, rather than human subjects, significant numbers of variables are eliminated or mitigated, allowing for direct comparison between the different tourniquet models, use cases and user groups, as well as further models and users or use cases.

AFRL Southwest Regional PIA

New Mexico Tech University

Socorro, New Mexico

https://nmt.edu/

Who We Are

The New Mexico Institute of Mining and Technology, also known as New Mexico (NM) Tech, is one of New Mexico's premiere Technology Institutes and Universities. As a State of New Mexico institution, it serves New Mexico and beyond through exceptional education, research, and service, focused in science, technology, engineering, and mathematics and serves the public through applied research, professional development, and teacher education, benefitting the people of New Mexico. NM Tech also serves New Mexico through innovation to commercialization, benefiting the economy of the state and creating opportunities for success. NM Tech has a strong background in STEM education and has received grants from the State of NM specifically for innovation in STEM education including the Premiere K-12 STEM outreach program operated on behalf of the Air Force Research Lab in New Mexico under the AFRL-NM STEM Academy. NM Tech also facilitates several AFRL Collaboration Centers to serve as spaces where creativity, innovation, and education converge to benefit our workforce, partners, and the broader community. Our vision is to continually optimize these spaces, ensuring they remain at the forefront of transformative progress, propelling the lab toward a future characterized by ingenuity, collaboration, and lifelong learning. With approximately 24,481 square feet under management, these spaces are dynamic, adaptable, and purpose-driven. These spaces include: Q Station (off-base, "front door" space), AFRL STEM Academy (on-base, K-12+ outreach/education center), AFRL Innovation Lab (off-base, seminar/workshop/meeting center), AFRL Maker Hub (on-base, creative project and tech assessment support facility).

Photo by New Mexico Tech University

What We Do

Conduct, facilitate and enable T3 for the Air Force Research Lab Space Vehicles and Directed Energy Directorates. Specifically facilitate and enable technology transfer agreements and tools that contribute to the advancement of the strategy and mission of the lab by enabling effective collaboration, resource sharing, and commercialization of intellectual property.

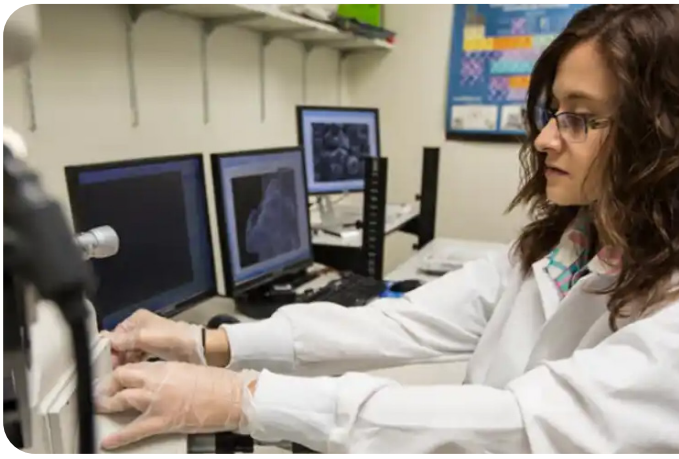
Through various programs, we enable the directorates to collaborate with industry partners, fostering the development and commercialization of lab-originated technologies and ensuring the lab's strategic interests are safeguarded while promoting technological advancements.

Examples include:

- Facilitating Cooperative Research & Development Agreements (CRADAs) that allow the directorates to partner with external entities, accepting funds, personnel, services, and property to advance research and development efforts and fostering collaboration and knowledge exchange, enabling the lab to leverage external expertise and resources to accelerate technological advancements;
- Facilitating Commercial Test Agreements (CTAs) to provide the opportunity for the lab to make its testing facilities and services available to external entities to assess the practical application and validation of the lab's technologies in real-world settings, furthering the mission of the lab;
- Enabling Patent License Agreements (PLAs) that facilitate the commercialization of intellectual property developed by the lab's inventors;
- Facilitating Education Partnership Agreements (EPAs) that allow the directorates to partner with academic institutions, promoting scientific study and engagement at all levels of education.

NM Tech also facilitates both the transfer of AFRL research and expertise into the private sector, and the assessment and transition of technology and capability from the private sector into the Department of the Air Force through sub awards with New Mexico State University, the University of New Mexico, the University of Texas at El Paso, the Albuquerque Hispano Chamber of Commerce, and through Albuquerque Community College, CNM Ingenuity, who executes the Hyperspace Challenge on behalf of AFRL Space Vehicles - a program that scouts for promising technology and capability from the private sector, and through intensive collaboration with the various components of the National Security Space enterprise in New Mexico, assists in determining a mission fit for the technologies and capabilities discovered.

NM Tech also operates the AFRL in New Mexico STEM Academy that reaches over 10,000 students and 150 teachers annually and approximately 3,000 students through our annual Missions that provide in depth STEM explorations that impact approximately 3,000 students annually.



Photos by New Mexico Tech University

Air Force Research Lab (Space Vehicle and Directed Energy)

New Mexico Trade Alliance

Albuquerque, New Mexico

www.qstation.tech

Who We Are

Founded in 2012, the Trade Alliance is an 501(c)(6) economic development organization in the State of New Mexico. The Trade Alliance maintains contracts with county, city, and the state governments, in addition to the work it peforms for the federal government. The Trade Alliance's current PIA began in March 2019 and will expire in February 2026.

The Statement of Work (SOW) under the Trade Alliance PIA can be categorized into three primary functions:

1. **Workforce Development:** Providing direct STEM Outreach Programming and supporting regional workforce development efforts bolstering the space and directed energy industry ecosystems surrounding AFRL's New Mexico assets.
2. **Economic Development:** Regional partnerships leveraging and coordinating AFRL's investments in a way that complements regional economic development strategies that support AFRL's mission.
3. **Technology Engagement:** Including the identification of start-up and small technology companies with innovations of interest to AFRL, programming to decrease the likelihood that promising technology companies will succumb to the technology "Valley of Death," and pursuing industry convergence strategies to find pathways to revenue for promising companies outside of government and in other industry sectors.

What We Do

The Trade Alliance programming includes:

- **Workforce Development:** Super STEM Saturday Science Fair Event, STEM Signing Day, STEMYs Awards for Excellence in STEM, community partnerships including Space Force Days at the universities, job fair hosting, etc.
- **Economic Development:** SpaceValley Regional Branding initiative for New Mexico and Southern Colorado, Q Station Collaboration Hub, technology ecosystem event partnerships, SpaceValley Coalition ecosystem building strategy
- **Technology Engagement:** Q Station Collaboration Hub Co-working facility, Space Tech Cohort Incubator program, Space Regulatory Bootcamp

Graphic by Q Station

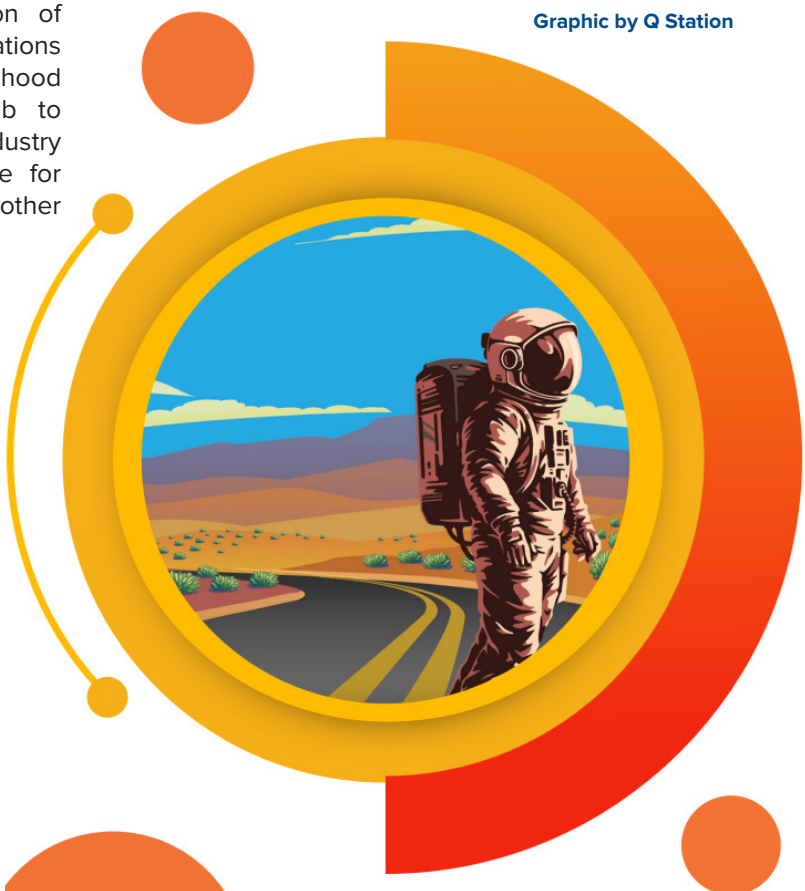


Photo by New Mexico Trade Alliance

Success Story from FY24

MAXIMUM ECOSYSTEM IMPACT - SPACEVALLEY INITIATIVE

https://www.bizjournals.com/albuquerque/inno/stories/news/2024/10/21/spacevalley-foundation-launches-rebrand.html

The Details

In 2022, The Trade Alliance convened several sister PIA partners to consider launching a regional strategy to pursue never-before-seen Covid/Post-Covid regional ecosystem building federal grants. The team named itself the "Space Valley Coalition," pulled together additional partners like local high education partners and government and a proposal was submitted to the Economic Development Administration in pursuit of a Build Back Better Challenge award. With over 500 national submissions, the SpaceValley Coalition placed in the top 60, won a $500K planning grant and was asked by the State of New Mexico to continue with a proposal for the National Science Foundation's Regional Innovation Engines Competition. 177 of the nation's most important ecosystems submitted and the Space Valley Coalition placed top 16, winning an additional $1M to support the initiative. Now, a new non-profit organization, the SpaceValley Foundation has been supported and has rallied the region around one space industry vision and strategy.

The Outcomes

- Ecosystem wide organization to support the development and advancement of the region's space industry.
- $1.5M in additional funding supporting AFRL's mission and ecosystem development
- The emergence of a new space innovation brand to be recognized globally.

NewSpace Nexus

Albuquerque, New Mexico

www.newspacenexus.org

Who We Are

NewSpace Nexus is a 501(c)(3) non-profit entity that is accelerating the pace of space innovation by uniting and igniting the industry. NewSpace Nexus was established to bring together space stakeholders, promote a universal voice for space leadership, and grow the commercial space innovation base for the benefit of the nation. With extensive experience in commercial, civil and military space and product marketing and sales acceleration, NewSpace Nexus uses its knowledge and vast network of stakeholder relationships to bring vetted opportunities and hard-to-find resources to the companies that need them.

For more information, visit: *www.newspacenm.org*

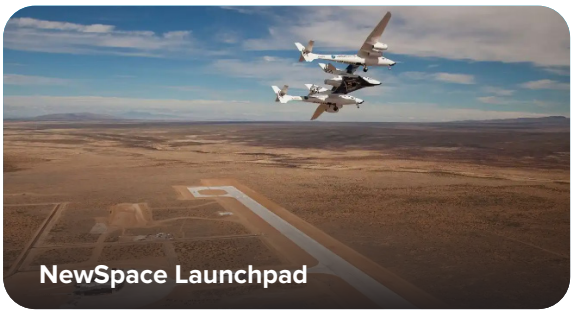
What We Do

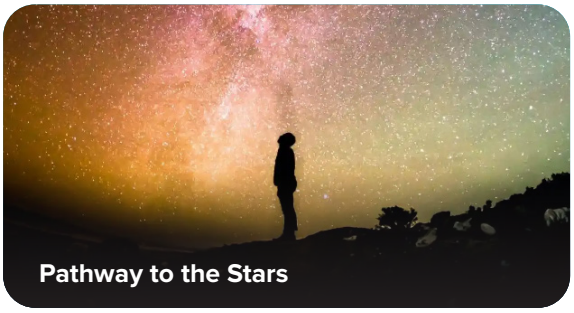
Accelerating the pace of space innovation by uniting and igniting the new space industry! Providing our members with direct and faster access to the right connections, resources, customers and collaborations needed to get their products into space.

NewSpace Nexus brings together resources, programming, and workspaces to advance innovation and support the growth of the industry. Our philosophy is that the space industry will move forward faster and better when we all work together. Our connections across the space ecosystem are vast, and our customers rely on us to bring vetted opportunities and resources to them. Each type of service we offer will save you time and enable you to grow smarter and faster.

- **Community Services:** Access to space ecosystem knowledge, events, and networking opportunities.
- **Navigation Services:** Tailored guidance and advisory services that fast-track finding and advancing the right partnerships, collaborations, and customer opportunities.
- **Co-Innovation Services:** Collaborative workspaces, resources, and programming that accelerate and strengthen product and solution development and business impact.

Our Programs





Screenshots by NewSpace Nexus

Success Story from FY24

NEWSPACE IGNITOR

https://www.newspacenexus.org/newspace-programs/newspace-ignitor/

The Details

NewSpace Ignitor served 44 companies since the fall of 2022, $42 million in funding for companies secured within 18 months: The NewSpace Ignitor is a purpose-built, first-of-its-kind incubator-like program designed to reduce barriers space companies face in moving their concepts beyond R&D. Space companies can apply to join NewSpace Ignitor and move from concept to product to sales faster with services that focus on accelerating product development and customer contracts. Brought to you in partnership with the Air Force Research Laboratory (AFRL).

Ignitor services include:

- Assessing company readiness levels and how to elevate them. Tech-to-market business services include needs/tech
- assessment, TR-Elevator® (Tech Readiness Elevator), market analysis, strategic planning, scaling curriculum and pitch support.
- Providing tailored navigation plans that guide companies to needed resources across the new space ecosystem, including connections to workforce.
- Accelerating product development with access to shared facilities, labs and equipment at co-innovation workspaces and partner locations.
- Showcasing company products to investors and buyers to fast-track funding and sales.
- Access to over 50 space leaders through the NewSpace Expert Network.

The Outcomes

- 44 companies served since Fall 2022.
- $42 million in funding secured for participating companies within 18 months.
- Accelerated product development and customer contracts for space companies.
- **Comprehensive services offered, including:**
  - Tech-to-market assessments: Evaluating company readiness, market analysis, and strategic planning.
  - Tailored navigation plans: Guiding companies to resources across the space ecosystem, including workforce connections.
  - Access to shared facilities, labs, and equipment at co-innovation workspaces.
  - Investor and buyer showcases: Helping companies secure funding and fast-track sales.
  - Access to over 50 space leaders through the NewSpace Expert Network.

Screenshot by NewSpace Nexus

New York State Technology Enterprise Corporation (NYSTEC)

Rome, New York

https://nystec.com/

Who We Are

New York State Technology Enterprise Corporation (NYSTEC) helps federal laboratories, defense agencies, and other government institutions discover and accelerate technology transfer to and from private companies by identifying licensing and commercialization opportunities and fostering collaboration. NYSTEC's IgniteU also supports economic and workforce development through its STEAM and Fellowship programs, small business education and outreach for industry and academia.

Screenshot by NYSTEC

What We Do

Technology Commercialization
Elevate and accelerate the commercial adoption of a new product or production method.

Ecosystem Building
Collaborate across communities to build, grow, support, and nurture your networks.

Government Contract Assistance and APEX Accelerator
Receive free, confidential business counseling and education to help increase the likelihood of securing federal, state, and local government contracts.

Landscape Analyses
Through our various PIAs, engage with NYSTEC to increase the likelihood of success in joint activities between the government and private companies, higher education institutions, and industry.

Small Business and Technology Acceleration
Get access to mentors, investors, and other small-business support to help bring your innovative concepts and products to market.

Event Services
Get tailored event planning and execution support, from initial conceptualization through post-event reporting.

Success Story from FY24

ORION TAK HACK SERIES

ORION TAK HACK

The Details

In conjunction with Open- Architecture Resilitent IOT for Operational Networks (ORION) stakeholders such as Assured Information Security (AIS) and Quanterion Solutions, Inc., AFRL conducted a series of mini events to employ ORION's capabilities and expertise in certain areas of Internet of Things (IoT). This event series provided a testbed for testing and evaluation of IoT-related systems and technologies as well as further the experience and documentation for continued ecosystem development.

The Outcomes

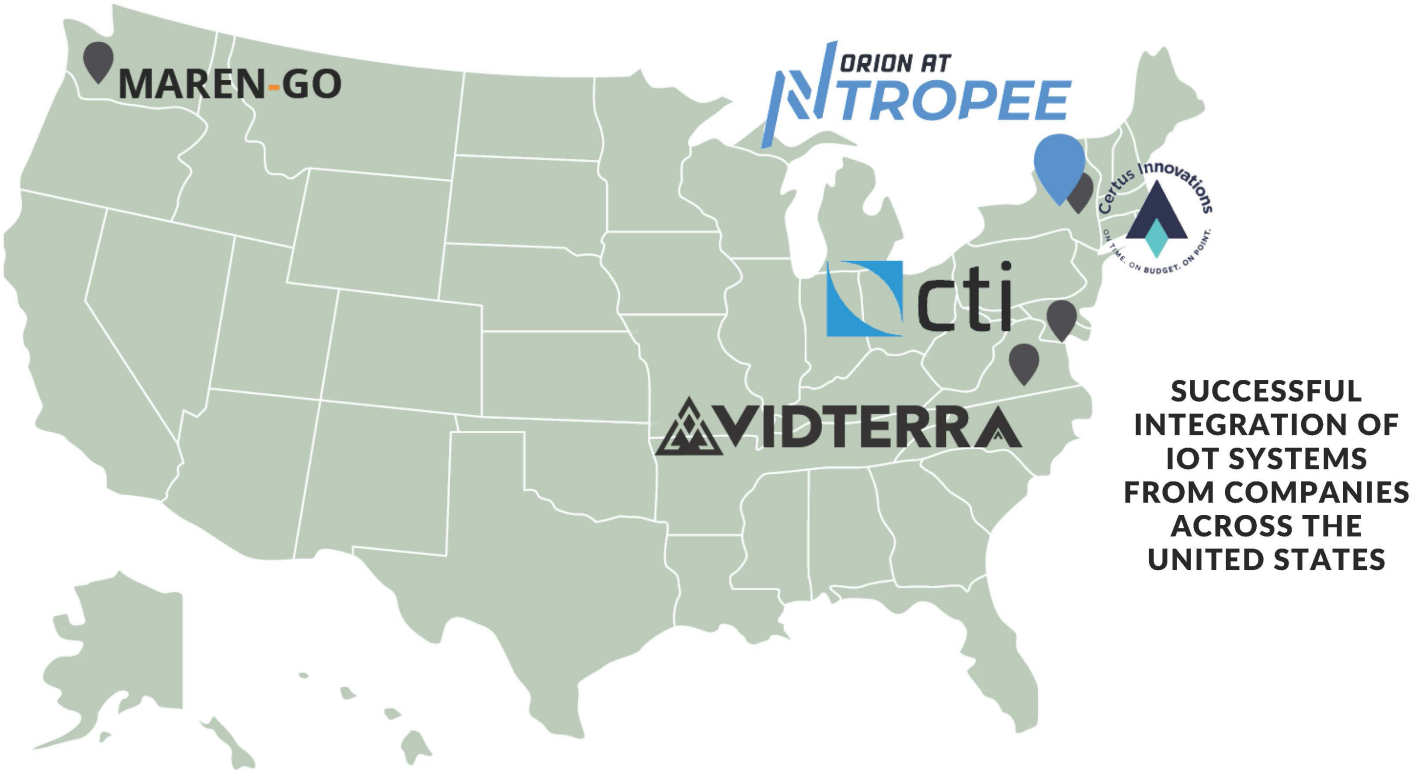
- 60 unique visitors
- 22 hours of testing
- 39 tests performed by five participant groups
- 16 findings

60
UNIQUE VISITORS

22
HOURS OF TESTING

39
TESTS PERFORMED

16
FINDINGS



SUCCESSFUL INTEGRATION OF IOT SYSTEMS FROM COMPANIES ACROSS THE UNITED STATES

Graphic by NYSTEC

Air Force Research Laboratory

TechLink

Bozeman, Montana

www.techlinkcenter.org

Who We Are

TechLink is the U.S. Department of Defense (DoD) program of record for Technology Transfer (T2), facilitating T2 partnerships between DoD labs and U.S. industry since 1999. TechLink's program implements innovative, cost-effective approaches to increase and accelerate transfer of technologies developed in DoD labs to the private sector for commercialization, enabling the transition of dual-use warfighter technologies.

Our record of success in facilitating over 2,000 DoD T2 agreements since 1999 has enabled the conversion of lab inventions into realized products and services that expand and bolster the U.S. Defense Innovation Ecosystem, benefiting the Defense mission and U.S. economy. These activities have generated nearly $10B in total economic impact as of 2022. TechLink's program scope has grown to support each stage of the invention-to-impact lifecycle and includes activities supporting initial research, innovation disclosure and patenting, T2, technology commercialization and transition, mission and economic impact assessment, and return on investment analysis. In addition to these major program efforts, TechLink also provides T2 training for the DoD via TechLink's T2 University (T2U), software engineering and analysis services, and the accomplishment of other important strategic objectives and pilot projects, such as development of a T2 Impact Model for the Office of the Secretary of Defense.

TechLink is the Defense Department's authorized, nationally focused T2 partnership intermediary per 10 USC §4124(f) and 15 USC §3715. TechLink operates as an economic development center at Montana State University under a PIA managed by the Air Force, serving the entire Defense Laboratory Enterprise via Memorandum of Agreement (MOA).

What We Do

TechLink's approach adds value across the entire invention-to-impact lifecycle and has been honed in the 25 years of direct support of the DoD T2 enterprise, and the nearly 30 years supporting federal T2. TechLink's leadership advancing the DoD T2 Enterprise includes collaboration with all DoD designated laboratories, their scientists, legal staff, Office of Research and Technology Applications (ORTAs), chief technology officers, lab executive leaders, and service component headquarters.

TechLink's primary efforts are aligned under the following objectives:

- Facilitate high quality partnerships with industry that enable conversion of lab inventions into products and services that benefit the defense mission and U.S. economy.
- Train and educate DoD T2 professionals and stakeholders so they are empowered with the knowledge, skills, and professional networks they need to be successful and impactful in their roles.
- Conduct statistically rigorous assessments of the economic and Defense mission impacts of DoD T2 partnerships involving CRADAs, license agreements, and other agreements to determine if these agreements have resulted in the final development of new products and services for U.S. military and/or civilian use.

Success Story from FY24

ORTA PORTAL - HELPING DOD LABS SUCCEED IN TECHNOLOGY TRANSFER

https://dodt2.techlinkcenter.org

The Details

TechLink recently opened a new, first of kind, communication portal for the DoD technology transfer community by launching a website dedicated to collaboration; a go-to resource for T2 partnership building.

The website is content rich and readily accessible via direct link. Resources and tools provided are both informative and actionable - and will be updated with new content on a regular basis.

This new site is designed to be a resource for Labs. TechlinkCenter.org remains the front door for industry to discover T2 opportunities with the DoD laboratory system.

The Outcomes

This new information hub offers:

- An at-a-glance overview of TechLink's services.
- Featured resources and tools for marketing, license agreement and CRADA facilitation.
- Tutorials and news.
- Industry and Laboratory success stories, mission impact and much more!

Graphic by Techlink

Wright Brothers Institute

Dayton, Ohio

www.wbi-innovates.com

Who We Are

Founded in the birthplace of aviation, Wright Brothers Institute (WBI) stands as a trusted and unbiased partner to help the U.S. Air Force solve warfighter problems through innovative approaches and facilitation of technology transition. From the early stages of problem exploration, to facilitating transition of final end user applications, WBI is here to provide the needed resources, collaborative spaces, and intelligence to foster breakthrough solutions. As a establish Partnership Intermediary (PI) in the defense and aerospace community for over two decades, we are proud to bring together leaders throughout industry and academia to tackle complex initiatives and ensure that the USAF remains steadfast in their mission to fly, fight, and win.

What We Do

WBI works closely with our commercial and defense partners to facilitate collaboration and discover innovative capabilities, technologies, and solutions for the warfighter. With our 'end-to-end' philosophy, we can provide the experimental environments, education, training, and industry expertise needed to assist with technology transition. Our team does this by uncovering new pathways that can convert concepts into real-life capabilities!

By leveraging our strategic partnerships in both industry and academia, WBI can connect warfighter painpoints with problem-solvers to enable efficient, world-class research and solution development. From small businesses to expansive government agencies, WBI stands as a trusted advisor to facilitate better technology transfer and transition outcomes for all involved.

Photo by Ms. Jennie Hempstead

Success Stories from FY24

WBI AIDS IN ADVANCING CAPABILITIES OF TILE PROPULSION TECH

https://www.wbi-innovates.com/blogs/post/mra

The Details

The Air Force Research Laboratory (AFRL) Materials and Manufacturing Directorate requested WBI to produce a Space Propulsion Market Analysis Study, marking a pivotal step forward in the advancement of space propulsion technology. The study initiated a Manufacturing Readiness Assessment (MRA) on Liquid Electrospray technology, uncovering the current state of the art in TILE (Thrust-Induced Light Electrospray) capabilities.

The collaboration between Wright Brothers Institute and FASTLANE, Dayton's local Manufacturing Extension Partnership (MEP), was integral to the success of this project, showcasing the strength of WBI's future-focused ecosystem. The MRA revealed critical areas for improvement in Revolution Space's TILE manufacturing process. This collaboration aimed to advance this transformational technology in the U.S. market by significantly increasing both production capacity and the operational lifetime of individual TILE systems.

Graphic by Wright Brothers Institute

The Outcomes

The collaborative benefits of this partnership extended beyond just solving immediate technical problems. WBI and FASTLANE were able to integrate their efforts into a broader strategy that aligned with the Air Force's long-term goals.

By working together, they were able to:

- Accelerate Time-to-Market: The combined expertise of WBI and FASTLANE helped Revolution Space quickly overcome manufacturing challenges, accelerating the timeline for bringing TILE technology to market.
- Enhance Production Capacity: Through the MRA, WBI and FASTLANE identified key improvements that allowed Revolution Space to scale up production from 10 TILEs per month to over 200 per month, with a clear path to reaching 1,000 per month by 2025.
- Improve Quality and Reliability: FASTLANE's manufacturing expertise ensured that the improvements made to the TILE production process not only increased output but also enhanced the quality and reliability of the final product, leading to extended operational lifetimes for TILE thrusters.
- Support National Defense Objectives: By aligning their efforts with the needs of the Air Force, WBI and FASTLANE helped ensure that TILE technology would meet the strategic requirements of the U.S. military, providing a critical edge in space operations.

ORTA Information

Offices of Research and Technology Applications (ORTA) are the essential focal point for collaborations between federal labs and the outside world. They promote their lab's technologies, expertise, capabilities, and facilities in order to attract non-federal partners for Research and Development (R&D) and Technology Transfer (T2) partnerships. The ORTA function is multifaceted, requiring these offices to serve as information brokers, liaisons to industry and academia, deal makers, and agreement facilitators. The following pages contain Department of the Air Force (DAF) ORTA locations and reports detailing their successes, best practices, strategies, and metrics. Information contained herein has been submitted by each organization.

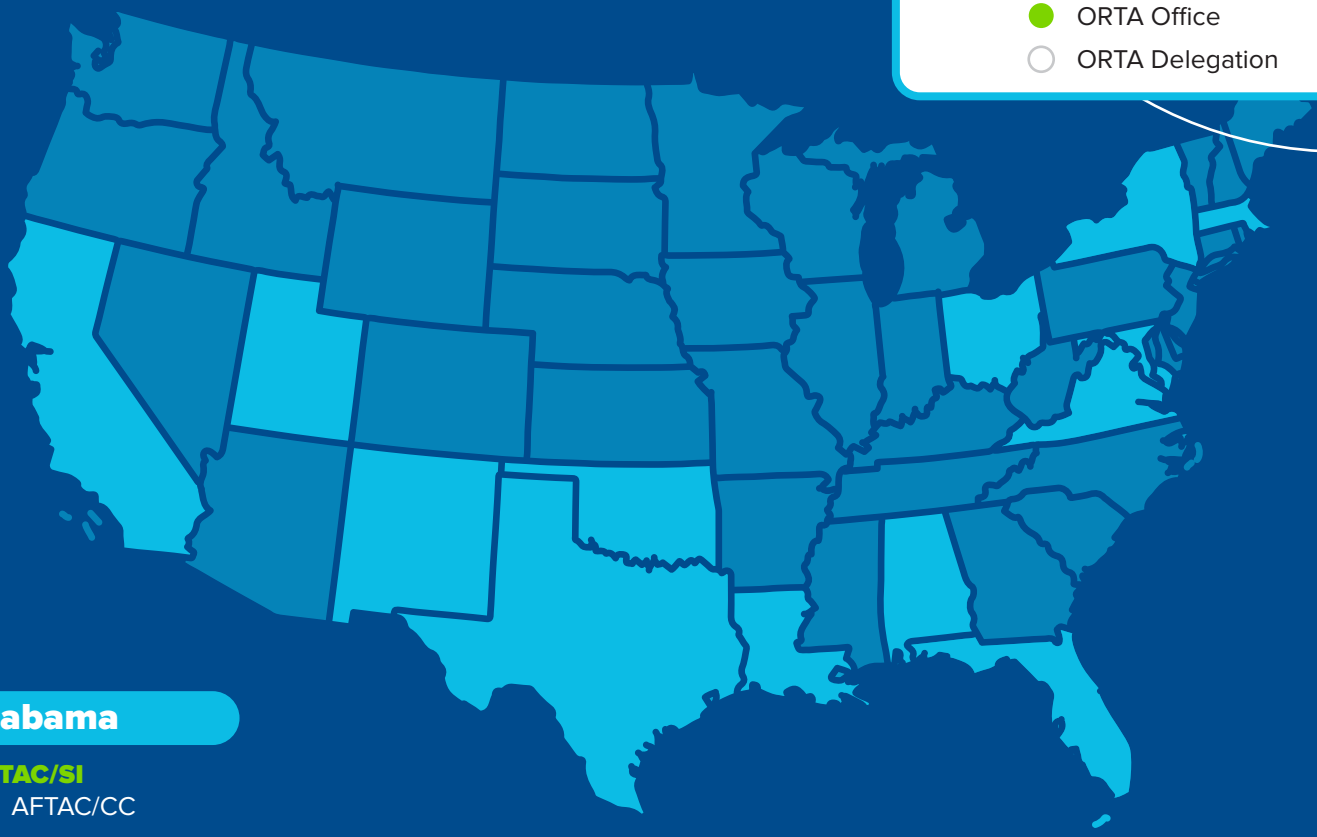
Delegated Authority

The Technology Executive Officer (TEO) for the Department of the Air Force has overall responsibility to manage the Technology Transfer (T2) program, including the designation of Air Force and Space Force laboratories and technical activities for T2 purposes, and for the granting of authority to enter into one or more T2 agreements (CRADAs, CTAs, EPAs, PLAs, SLAs, and ITAs). To obtain Delegated Authority, an organization may submit a request to the Department of the Air Force Technology Transfer and Transition Program Office (DAFT3PO) or the DAFT3PO has identified an organization producing a high number of agreements. The organization is then reviewed if it meets the designation requirement to be deemed a lab for T2 purposes. If deemed to be called a Lab, the organization, the DAFT3PO and Air Force Materiel Command Intellectual Property Legal Office (AFMCLO/JAZ) will discuss who will be designated the Reviewing Official, identify which office will serve as the ORTA and identify which Agreements they may enter into. The next step will be for the organization to receive ORTA training. Once training has been completed, the organization will be required to work with the DAFT3PO and create at least three agreements which will be staffed to the Department of the Air Force Technology Executive Officer (DAF TEO) for signature. When it has been determined that the organization has an understanding of the process, an official memorandum to grant delegated authority will be crafted by the DAFT3PO and sent to the TEO for signature. If the TEO concurs and signs the memo, the organization my begin executing technology transfer agreements as identified. Note: This delegation cannot be delegated down and can be rescinded if not used or not used properly.

The memorandum from the DAF TEO to known "Labs" granting them the authority to enter specific T2 agreements is divided into 10 specific paragraphs:

- **Paragraph 1** sets out the TEO's authority
- **Paragraph 2** explains need for the new delegation letter
- **Paragraph 3** state all previous delegations are rescinded
- **Paragraph 4** provides all new delegations
- **Paragraph 5** states a reorg. will lead to a rescission of any previously held delegated authority
- **Paragraph 6** states delegation cannot be further delegated
- **Paragraph 7** explains ORTA roles and responsibilities
- **Paragraph 8** explains servicing legal counsel roles and responsibilities
- **Paragraph 9** explains how any lab without a delegation can obtain one
- **Paragraph 10** states a delegation or designation can be rescinded if not used or not used properly

2024 ORTA Map



Alabama

AFTAC/SI
- AFTAC/CC

California

412 TW/XP
- 412 TW/CC
- AEDC/CC

SSC/SZE-BCE
- SSC/BC PEO
- SSC/SZ PEO

Florida

AFCEC/CXA
- AFCEC/CX

AFRL/RWSP
- AFRL/RW

Louisiana

AFGSC/ST
- AFGSC/A5/8

Maryland

DC3/XEX
- DC3/CA

Massachusetts

AFLCMC/HN
- 66 ABG/CC
- AFLCMC/HB PEO
- C31&N

New Mexico

AFRL/RDOX
- AFRL/RD
- AFRL/RV

New York

AFRL/RIBA
- AFRL/RI

Virginia

AFOSR/CL
- AFOSR/CL

USAFA/DFQ
- USAFA/DF

Ohio

711 HPW/XP
- 711 HPW/RH
- USAFSAM/CC

AFIT/CZ
- AFIT/CL

AFLCMC/PZP
- AFLCMC/XA

AFLCMC/WA
- AFLCMC/WA SML

AFLCMC/WIN
- AFLCMC/WI PEO

AFRL/RQSP
- AFRL/RQ

AFRL/RXOP
- AFRL/RX

AFRL/RYO
- AFRL/RY

NASIC/XO
- NASIC/CC

Oklahoma

AFSC/ENS
- 72 ABW/CC
- 75 ABW/CC
- 78 ABW/CC
- AFSC/EN
- AFSC/SW
- OC-ALC/CC
- OO-ALC/CC
- WR-ALC/CC

Utah

AFNWC/NXXX
- AFNWC/NX

Texas

67 CW/A5/8
- 67 CW/CC

688 CW/A5/8/9
- 688 CW/CC

412th Test Wing, Air Force Test Center

Edwards Air Force Base, California

https://www.edwards.af.mil/

Overview

Mission: 412 TW tests and evaluates advanced aerospace systems with world-class installation and mission support to accelerate war-winning capabilities to the warfighter.

General Overview: The 412th Test Wing provides independent test and evaluation of avionics, flight sciences, and electronic warfare systems utilizing modeling and simulation, ground test facilities and airborne test ranges for the Air Force, joint military services, and foreign partners. The 412th Test Wing provides the tools, talent, and equipment for the core disciplines of aircraft structures, propulsion, avionics, and electronic warfare evaluation of the latest weapon system technologies. The Air Force Test Pilot School, also part of the Test Wing, is where the Air Force's top pilots, navigators and engineers learn how to conduct flight tests and generate the data needed to carry out test missions.

Operating Location: Established in 1949 as Edwards Air Force Base (EAFB), in honor of Captain Glen Edwards, also the site where Captain Chuck Yeager was hailed as the first human to break the sound barrier in supersonic flight. Located in the Mojave Desert (High Desert) in the Antelope Valley Region of Southern California, considered a remote and isolated installation based on its geographic location, Edwards Air Force Base and the 412 TW are one of three joint service partners (Air Force, Army, Navy) that are conjoined by the largest contiguous restricted airspace (R2508) in the Continental United States (CONUS). The 412 TW is comprised of eight subordinate Groups, an Air Force Plant (Plant 42), and the Air Force Test Pilot School with a workforce population of more than 12,000 uniformed service members, government civilians, and contractors. Edwards Air Force Base is the USAF's largest land share holding installation in CONUS with the mission of "Fueling Air Power: World-Premier Test and Evaluation of Tomorrows Technology-Today." The 412 TW is considered "The Center of the Aerospace Testing Universe." The current 412th mission is nested with the Secretary of the Air Force (SECAF) Operational Imperatives and Re-optimization for the Great Power Competition conducting test and evaluation of the entire capability suite of Air Force Aircraft currently in the inventory including emergent aircraft capabilities and associated avionics systems.

Strategy

The 412th Test Wing at Edwards Air Force Base California established its formal ORTA program in April 2023 IAW Department of the Air Force Technology Executive Officer (TEO)/AFRL/CC, directive Designations as Defense Laboratories, Cooperative Research and Development Agreements (CRADAs), Commercial Test Agreements (CTAs), Education Partnership Agreements (EPAs), Patent License Agreements (PLAs), Software License Agreements (SLAs), and Information Transfer Agreements (ITAs) dated 12 October 2022. Responsibility for the 412 TW ORTA program was assigned to the Wing Plans and Programs Office (XP) for initial implementation and oversight.

Looking Forward: 412 TW ORTA strategy is to indoctrinate and train ORTA focused representatives under the Wing ORTA Office with representation in four of the eight 412 TW Groups to establish T3 functions to support Test and Evaluation requirements.

> **The 412 TW is considered "The Center of the Aerospace Testing Universe.**

The Year in Review

Marketing & Outreach

412 TW continues to work with Northrup Grumman and Boeing out of Operating Plant-42 (Palmdale) on major programs and associated advanced technology development. 412 TW is also working with local community leaders to develop a commercial technology lab that will serve as a centrifuge where new and emerging technologies can be shared in pursuit of engineering and scientific advancements in aerospace capabilities design.

Resources Utilized

The 412 TW ORTA leveraged the Plans and Programs Innovation Office to build an application that tracks the current status of EPAs, CRADAs, CTAs, and IPAs; this application also allows for fiscal accountability of potential revenues generated from future CRADAs, licensing, and other royalty generating agreements.

Lessons Learned

412 TW ORTA is responsible for drafting and pursuing legal sufficiency for EPAs and requires the organizations that initiate the EPAs to pursue educational institution endorsement before final signature of the Wing Commander. Currently, EAFB has six active EPAs with 13 EPAs awaiting educational institution endorsement. EAFB has five EPAs being prepared for submission for legal review including one with the University of Reno, NV.

412 TW ORTA will implement a “closing process” whereby the ORTA will pursue educational institution endorsement after 120 days in stasis.

FY24 Metrics

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	2

Educational Partnership Agreements (EPAs)

Number of total active EPAs	19
Number of newly executed EPAs	13

Inventions

Number of new inventions disclosed	1
Number of U.S. patent applications filed	1

PA CLEARED #67CW241003

67th Cyberspace Wing

Joint Base San Antonio-Lackland
Air Force Base, Texas

67CW.ORTA.T3@us.af.mil

https://usaf.dps.mil/sites/11903/SitePages/Home.aspx

Overview

The 67th Cyberspace Wing (67 CW), headquartered at Joint Base San Antonio-Lackland, Texas, is aligned under the Sixteenth Air Force, Air Combat Command. The wing presents combat cyberspace capabilities to the Air Force, United States Cyber Command, and the Joint Forces. In this capacity, 67 CW acts as the execution arm for Air Forces Cyber for conducting global cyberspace operations. Additionally, the wing provides organic operations training, cyber capability development, operational testing, and range capabilities to drive readiness across the Cyber Mission Force.

67 CW contains four groups: 318th Cyberspace Operations Group (318 COG), 567th Cyberspace Operations Group (567 COG), 67th Cyberspace Operations Group (67 COG), and 867th Cyberspace Operations Group (867 COG). In 2018, 318 COG was designated as a federal laboratory, and in 2020 the laboratory designation was moved to 67 CW in order to encompass all the groups.

Strategy

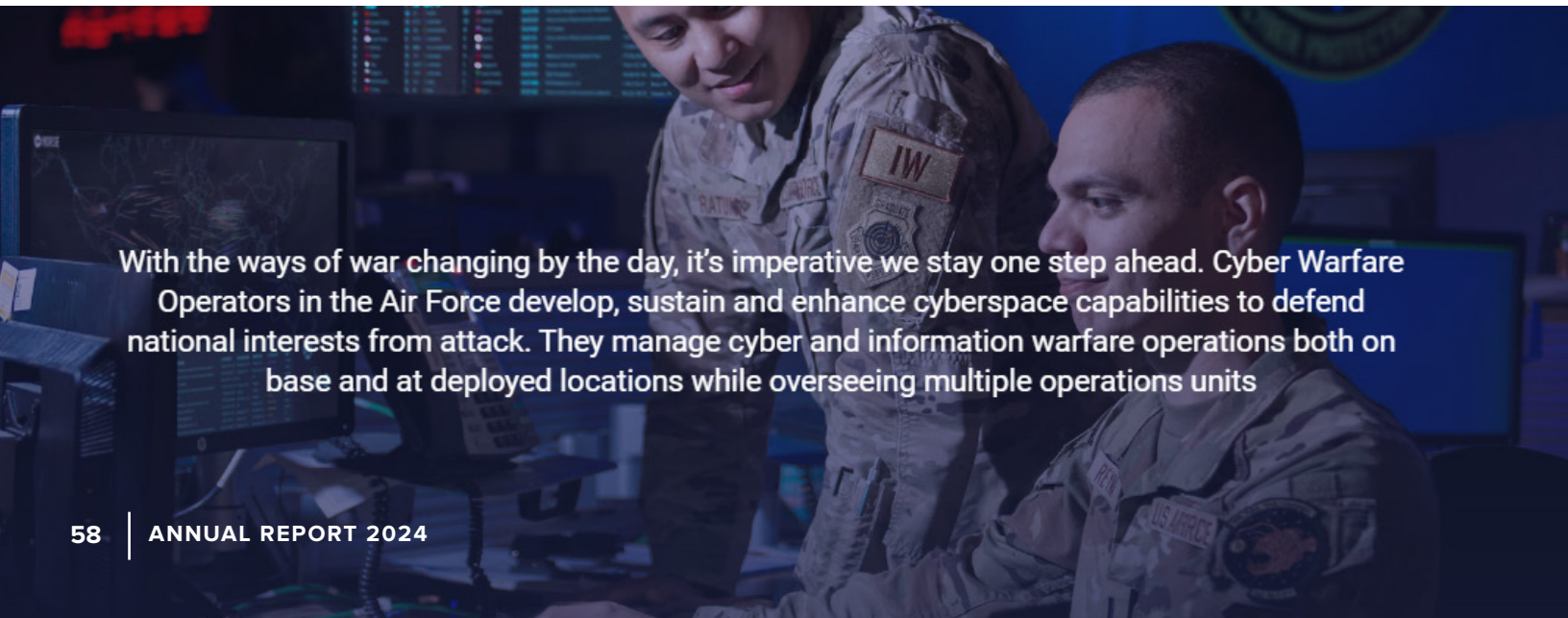
In the past our strategy was primarily focused Cooperative Research and Development Agreements CRADAs and Approved Products List (APL) CRADAs. In the past two years we have added to our CRADA support with the development of Educational Partnership Agreements (EPAs) which has shown some rewards as highlighted in our Success Stories.

We continue to leverage the unique assets of the laboratory's Chief of Cyber Intellectual Property Law residing in the wing 67 CW's JA. It is rare for Air Force laboratories to have direct access with personnel with the depth of knowledge of this office. 67 CW/JA advises on all 67 CW T2 efforts and developed a Cyber Legal Innovation Technology Transfer Sharepoint site to coordinate all laboratory activities.

Most of the 67 CW T2 activities are conducted by our 318th Cyberspace Operations Group (COG) and all APL CRADAs are done by the 346th Test Squadron (346 TS). The 67 COG executes three CRADAs, and three of our existing EPAs. 567 COG, 67 COG, and 867 COG involvement in the wing T2 program is gaining momentum and the ORTA is fostering their involvement in future endeavors.

We are continuing the 67 CW's Whiddler and Integrated Remote Interrogation System (IRIS) patents.

Screenshot by 67th Cyberspace Wing



The Year in Review

Success Stories from FY24

UNIVERSITY OF TEXAS SAN ANTONIO EPA

The Details

In FY24, the University of Texas San Antonio (UTSA) EPA focused on UTSA Staff and 67 CW Personnel developing a cyber course for military members. That course was then offered to Airmen through a separate grant, external from the EPA. Here is an excerpt from the email UTSA put out:

This offer is FREE for all military members and federal civilian employees in the San Antonio area! Please forward to anyone in San Antonio that may be interested and meets this criteria.

Under the terms of the Educational Partnership Agreement between the 67 CW and UTSA, UTSA created a six-day course using Machine Learning (ML) to enhance cyber security of Control Systems. UTSA received a federal grant to offer this course to active duty military and Federal Civilians free of charge.

Learning Objectives:

At the end of the course, students will:

- Have a comprehensive understanding of the history and philosophy of machine learning
- Have familiarity with the current state of the field
- Gain exposure to and experience with commonly used machine learning libraries and modeling techniques in the python language.

318 COG endorsed UTSA to receive a DoD Grant to develop cyber training for military members and they developed and delivered the course according to our requirements and specifications, worked out with them in accordance with (IAW) the EPA.

The Outcomes

About 25 military and civil servants attended the course and gave excellent reviews of the course.

Barriers & Problems

CRADA champion turnover continues to be the wing's most challenging obstacle. The skills sets that the laboratory personnel possess are in high demand, and some are lured away by higher pay, better benefits, or better job growth potential. While wing morale is great and our employees are happy and productive, we are faced with the stark reality of intense competition from the private sector.

Facilities & Equipment

Several companies made extensive use of the 346th Test Squadron (346 TS) facilities for test and evaluation of their products in efforts to gain access to Department of Defense Information Networks (DoDIN) Approved Product List. PESA Inc, Motorola Solutions, Avigilon, Cisco Systems Inc, Science Logis, Citrix Systems Inc, CTERA Networks Ltd, Gigamon Inc, Exacom, SolarWinds and SecureLogix Coorp all used our range for testing.

346 TS is one of four testing entities across DoD that can assist companies with cybersecurity and interoperability testing for potential admission to the DoDIN Approved Products List (APL). When a company's product is added to the DoDIN APL, units from across the DoD can purchase the software or hardware. 67 CW enters into CRADAs with the companies, who reimburse 67 CW for the testing costs.

Resources Utilized

As a defense laboratory, the 67 CW has a deep desire to encourage the study of science, mathematics, and engineering at all levels of education by entering into Education Partnership Agreements (EPAs) with educational institutions around the country. The 67 CW signed an EPA with a local academic institution and has donated excess material to that school. This eventually led to establishing three EPAs this year. The goal is to provide the students direct access to the professional knowledge and experience of 67 CW scientists and engineers. Our scientists and engineers co-teach STEM (science, technology, engineering & math) lessons with local faculty. 67 CW scientists and engineers have opportunities to serve as mentors and tutors to area students. Exposure to high-quality knowledge and real-world projects would not be otherwise available in an educational environment without the 67 CW scientists and engineers collaborating with local educators.

FY24 Metrics

Licensing

Number of total active invention licenses	3
Total active income bearing licenses	3

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	28
Number of CRADAs, Newly Executed	13
Number of Newly Executed CRADAs involving small businesses	1
Total CRADA Revenue	$579,337
Estimated CRADA contributed value	$6,951,078

Educational Partnership Agreements (EPAs)

Number of total active EPAs	4
Number of newly executed EPAs	1

PA CLEARED #G5-20241024

688th Cyberspace Wing

Joint Base San Antonio-Lackland
Air Force Base, Texas

688CW.Tech.Transfer@us.af.mil

https://usaf.dps.mil/sites/11977/A9R

Overview

Mission Statement:

America's First Cyberspace Wing ... engineering, operating, extending, and defending the Air Force Information Network and warfighter communications ... anytime, anywhere!

Laboratory Description:

The 688 CW, headquartered at Joint Base San Antonio (JBSA) Lackland, Texas, is aligned under the Sixteenth Air Force (16 AF, Air Forces Cyber), Air Combat Command. The wing is the DAF's premier cyberspace warfighting organization dedicated to delivering actionable intelligence and tactics, techniques, and procedures, deployable warfighter communications, engineering and installation capabilities, defensive cyberspace operations (DCO), and network security operations across the DAF Information Network.

Geographic Location:

The 688 CW is comprised of over 3,300 professional Airmen operating five weapon systems across four groups with 26 units at 15 locations. The 688 CW conducts persistent global network operations and DCO while maintaining ready combat communications and engineering and installation forces that can deploy on moment's notice in support of DAF, Joint Force Commander and Combatant Commander requirements.

Technology Focus Areas:

The primary technology focus areas for the 688 CW are network operations, cybersecurity operations, expeditionary communications, network/communications engineering and maintenance, user experience, machine learning, artificial intelligence, automation, data management and protection, big data platforms and analytics, Zero Trust, cloud, intrusion discovery and forensics, malware, threat analysis, insider threat, network recovery, and cyber weapon systems crew training, mission assurance, multi-domain cyber operations. Additionally, the 688 CW mission involves employment of forces independently or in synchronization with DAF and Joint cyber units to provide Commanders the ability to defend critical capabilities from attacks originating in the cyber domain.

Year of Commission:

On 10 Jan 2008, Major General Curtis M. Bedke, DAF TEO, delegated the Authority for Review and Approval of CRADAs to the AF Information Operations Center (AFIOC) Commander. On 2 Jul 2014, Major General Thomas J. Masiello, DAF TEO, delegated the Authority to Review and Approval Authority for Education Partnership Agreements and Patent License Agreements and CRADAs to the 688 CW Commander (previously designated as AFIOC).

Strategy

How ORTA fits into Lab Organization and Mission:

The ORTA, headquartered at JBSA Lackland, Texas, manages the activity's T2 program. The ORTA is comprised of individuals with expertise in scientific and technical information, legal, security and contracting. The ORTA oversees agreements between the 688 CW and industry/academia and identifies new technologies that help fulfill warfighter requirements. The 688 CW A5/8/9 Director manages the ORTA, on behalf of the Commander, providing guidance and assisting with agreements to include defining the technical tasks and rights to intellectual property developed under the agreements.

How T2 Tools are a part of the lab strategic planning:

The T2 tools enable the 688 CW to address our strategic planning objectives and strategies at all phases. For example, our Technical Advisors, Engineers and Subject Matter Experts throughout the wing initiate contact with industry, identify possible collaboration opportunities and utilize the appropriate mechanism to achieve our objectives. Also, we evaluate the collaboration efforts semi-annually to ensure its effectiveness and remain focused on our objectives. We will terminate the collaboration and reallocate our resources if there is no progress.

One Year Objectives and Strategy:

Standardize a wing process for internal coordination of collaboration inquiries. Goal of this strategy is to balance the wing's partnership capacity supporting mission objectives while providing a holistic review of technology and industry engagement opportunities.

Near Term Goals and Strategy:

- Integrate all DAF cyber units into the collaboration process.
- Leverage emerging and mature technologies & capabilities to meet requirements tasked to 688 CW by 16 AF and AFCYBER.
- Continue to integrate commercial partners into collaborations both local and non-local.
- Market collaboration opportunities via conferences and visits.
- Focus Collaboration on integrated air, space & cyberspace operational needs.

Long Term Objectives and Strategy:

- Extend collaboration technical areas to cover the full spectrum of 16 AF needs within the 688 CW mission set.
- Influence community R&D to better address DAF cyberspace superiority activities.
- Explore advanced cyber related concepts for risk reduction and viability.
- Expand activities to include cyber resiliency of air, space and cyberspace systems.

The 688 CW is comprised of over 3,300 professional Airmen operating five weapon systems across four groups with 26 units at 15 locations.

688th CW Units:

688th Cyberspace Wing	JBSA Lackland, TX
688th Operations Support Squadron	JBSA Lackland, TX
5th Combat Communications Group	Robins AFB, GA
5th Combat Communications Support Squadron	Robins AFB, GA
51st Combat Communications Squadron	Robins AFB, GA
52nd Combat Communications Squadron	Robins AFB, GA
26th Cyberspace Operations Group	JBSA Lackland, TX
26th Network Operations Squadron	Maxwell-Gunter Annex, AL
33rd Network Warfare Squadron	JBSA Lackland, TX
68th Network Warfare Squadron	JBSA Lackland, TX
68th Network Warfare Squadron Operating Location-A	Fort Bragg, NC
68th Network Warfare Squadron Operating Location-C	Hurlburt Field, FL
68th Network Warfare Squadron Operating Location-D	Fort Meade, MD
38th Cyberspace Engineering Installation Group	Tinker AFB, OK
38th Engineering Squadron	Tinker AFB, OK
38th Operations Support Squadron	Tinker AFB, OK
85th Engineering Installation Squadron	Keesler AFB, MS
690th Cyberspace Operations Group	JBSA Lackland, TX
690th Cyberspace Operations Squadron	JB Pearl Harbor-Hickam, HI
690th Intelligence Support Squadron ***Previously known as 690th Network Support Squadron***	JBSA Lackland, TX
691st Cyberspace Operations Squadron	Ramstein AB, GE
83rd Network Operations Squadron	JB Langley-Eustis, VA
83rd Network Operations Squadron Operating Location-A	Wright-Patterson AFB, OH
83rd Network Operations Squadron Operating Location-B	JB Andrews, MD
561st Network Operations Squadron	Peterson AFB, CO
561st Network Operations Squadron Det 3	Scott AFB, IL

The Year in Review

Success Stories from FY24

UTILITY GRID EXERCISE

The Details

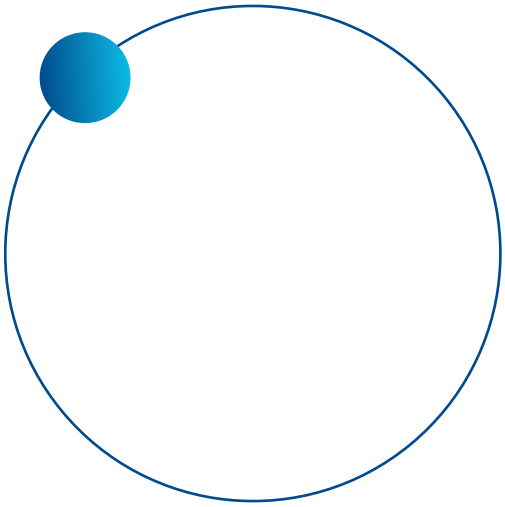
The purpose of the exercise was to test the resiliency of CRADA partner responding to multiple simulated attack injects. These attacks included physical, environmental, and cyber. The goal was maintaining continuing service and sufficient available energy margins for operations.

The scenarios introduced included a range of injects and attacks happening over the course of a week. These injects allowed employees to practice handling malicious and non-malicious scenarios according to their Business Continuity Plan. Certain scenarios were aimed at the entire company, while others allowed different departments to take control, such as public relations, customer service, logistics, transmission operators, cybersecurity, and management.

The Air Force Activity worked closely with the cyber security team and provided subject matter expert advice and recommendations on the cyber-attack injects. Topics discussed during the attacks included incident handling, host forensics, network traffic analysis, incident awareness, and resource utilization. During the event, members from the Air Force Activity floated among the different teams but mostly observed and advised the CRADA partner's cyber (blue) team. The exercise followed a predetermined Master Scenario Events List that included threat actor, terrorism, insider threat, and natural disaster scenarios.

The Outcomes

During the course of the exercise, CRADA partner's IT Cyber personnel were able to refine their tactics, techniques, and procedures based on input from Air Force Activity. Air Force Activity gained a better understanding of the challenges faced when operating and defending a large scale utility grid. CRADA partner and Air Force Activity will continue to transfer knowledge in both directions.



Success Stories from FY24

TECHNOLOGY READINESS LEVEL PROGRESSION

The Details

CRADA partner matured their technology to the point it successfully participated an exercise where it supported a Tactical Operations Center-Light (TOC-L). A TOC-L is a lightweight, scalable battle management system that enables tactical command and control elements to quickly relocate, establish advanced datalinks, connect to a variety of sensors via a resilient communication structure, and successfully operate in a denied, degraded, or contested operational environment. CRADA partner created several analytics.

The Outcomes

CRADA partner's technology allows the warfighter at the tactical edge to obtain a higher degree of situational awareness faster and with increased accuracy in time-critical situations. This technology could be a game-changer for command and control data analysts and operators who need to send decision-level information to the warfighter in the most efficient way they can.

Marketing & Outreach

ORTA personnel attended the 2024 Federal Laboratory Consortium Annual Meeting and the Department of the Air Force Information Technology and Cyberpower Event (DAFITC). Networked among thousands of federal government peers, along with private sector leaders in the IT and cyber security field to discuss technology transfer opportunities. Sought-out potential collaborative engagements with private sector focused on Wing priorities.

Barriers & Problems

688 Cyberspace Wing continues to experience challenges balancing real-world priorities and effectively utilizing CRADA efforts to deliver operational efficiencies. Unit level priorities continue to cause delays with scheduling CRADA partner access into operational space for observations and assessments. ORTA continues to engage Units and CRADA partners to identify opportunities which can accommodate schedules and overcome existing challenges. ORTA short term goal is to increase leadership visibility regarding T2 opportunities and align wing resources to support collaboration efforts.

Resources Utilized

Human Resources:

688 Cyberspace Wing hired one full-time employee in Nov 2023 serving as the primary Wing ORTA who manages the Defense Lab's T3 portfolio. The ORTA role and responsibilities are also shared by the A5/8/9 Emerging Technology Evaluation section. Other Wing members provide the required support in the areas of legal advice, cybersecurity/communications, safety, and physical/industrial security.

T2 Education and Training Provided to Organization/Lab Staff:

The servicing Legal Office provides CRADA 101 training for newly assigned leadership and S&Es while the T2 specialist provides a Wing-specific program overview as needed. The ORTA presented tailored T2 briefings to the Wing Staff. Additionally, Wing members may access the Wing's Technology transfer SharePoint site to view program guidance and resources.

Professional Development of ORTA:

New assigned ORTA member completed T2 Foundations Course and Capstone Event hosted by TechLink. 688 CW ORTA Team attended DAFT3 Quarterly Meetings/Workshops and the Federal Laboratory Consortium (FLC) Annual Meeting.

Facilities & Equipment

Laboratory's URL that lists facilities/equipment information:

688 CW does not list our facilities or equipment information due to operations security concerns.

Unique Capabilities of the Laboratory:

688 CW is dedicated to delivering actionable intelligence and tactics, techniques, and procedures, deployable warfighter communications, engineering and installation capabilities, defensive cyber operations, and network security operations across the Air Force Information Network enterprise.

Examples of how some of these facilities/equipment are used by private sector through CRADAs, test agreements etc:

There are opportunities when the private sector may be granted access to observe operations when approved and activities are aligned with CRADA objectives. There are also opportunities for the private sector to utilize approved Packet Capture (PCAP) Data and Log Files. PCAP Data is defined as all data traversing a network path, regardless of medium incorporated at the physical layer. Log files are defined as all data collected on a subject system that describes the occurrence of an event, condition, and/or set of conditions that trigger the action of saving information regarding the event or condition. Information contained in log files is generally, but not limited to: PCAP Data portions of a larger PCAP Data set, memory address and content data, metadata describing aspects of other data residing on or flowing through the system, descriptive information identifying the occurrence of a specific event or condition, or diagnostic and/or troubleshooting information.

FY24 Metrics

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	8
Estimated CRADA contributed value	$1,400,000

“America’s First Cyberspace Wing … engineering, operating, extending, and defending the Air Force Information Network and warfighter communications … anytime, anywhere!

PA CLEARED #AEDC2024-411

Arnold Engineering Development Complex (AEDC)

Arnold Air Force Base, Tennessee

AEDC.XPE.Workflow@us.af.mil

https://www.arnold.af.mil/

Overview

The Arnold Engineering Development Complex (AEDC) provides more than 90 developmental test and evaluation capabilities to the nation to meet the demands of the National Defense Strategy. Located in eight states, AEDC is one of three wing-level organizations within Air Force Test Center (AFTC), which is one of six centers within the Air Force Materiel Command.

Our Mission: Test and evaluate systems to meet the demands of the National Defense Strategy.

Our Vision: Second to none!

Strategy

Science and Technology supporting technical transfer activities focused on Test and Evaluation ground testing. Serve as local Office of Research and Technology Applications (OTRA) focusing on mission Technology Transfer partnership intermediaries to establish a Partnership Intermediary Agreement(s) (PIA). Supporting technology transfer to participating organizations of sharing, developing, or transmitting ideas, data, information, and technology between government agencies, industry, and academia.

The Year in Review

Marketing & Outreach

Tullahoma, TN consortium meetings with key leadership supporting discussions between government agencies, industry, and academia. Key focus is to establish a potential partnership intermediaries for a future Partnership Intermediary Agreement (PIA).

Barriers & Problems

Funding and manpower supporting ORTA activities as we startup the office. Funding barriers that we are to support a space and office for the ORTA. We also have had barriers to identifying who would be the proper partner for our ORTA. We are still working to overcome our barriers by getting the innovation and process improvement team more involved with the ORTA office and training them. Also, continuing to meet with community partners and leaders to identify who might be a good match for our organization.

Lessons Learned

Attended 2024 August DAFT3 annual summit. Made several connections with other ORTAs/PIAs.

Resources Utilized

Continuousness improvement and Innovation office staff (CI2) supporting technology and innovative ideas for technical transfer outreach.

Facilities & Equipment

Gossick Leadership Center (GLC), and Innovation Center supporting collaboration and experiments with wind tunnel, maintenance, and instrument data and control equipment.

PA CLEARED #AFCEC-2024050

Air Force Civil Engineer Center Readiness (AFCEC/CX)

Tyndall Air Force Base, Florida

AFCEC.CXA.ORTA@us.af.mil

https://usaf.dps.mil/teams/afcec-portal/SitePages/Home.aspx

Overview

Laboratory Mission: AFCEC's Mission Statement is to "Provide Civil Engineering expertise and services…strengthening installations and enhancing combat." AFCEC was established under Program Action Directive (PAD) 12-03 dated 26 Oct 2012. As part of AFCEC, the PAD established an "Airbase Technologies Division" (AFCEC/CXA) responsible for the entire range of Research, Development, Test and Evaluation (RDT&E) and sourcing acquisition solutions under the AFCEC Readiness Directorate. The Air Force Civil Engineer (CE) is responsible for the acquisition of non-base-specific systems, equipment, technology, and design standards to ensure airbase capabilities across the CE enterprise. As such, this division is responsible for all phases of system, equipment, technology, and design data acquisition, in addition to developing and documenting CE operational capability requirements. This division supports all phases of the CE Research Development and Acquisition process.

Description: AFCEC's lab includes a blast effects test range, ballistics laboratory, large-scale robotic vehicles test ranges, firefighting facilities, energy testing facilities, airfield surfaces testing capabilities and soils/pavements laboratories, materials research, and passive chemical and biological defense research laboratories. The in-house fire, robotic, blast, energy, pavement and materials laboratories, ranges, and prototype capabilities provide the development and demonstration platforms necessary to develop, validate, and field actual solutions.

Geographic location: AFCEC Research, Development, RDT&E activities and facilities are located at Tyndall AFB, FL under AFCEC/CX.

Technology Focus Areas:

Airbase Technologies: Possess RDT&E capabilities for cross-cutting applications & processes for all CE functional areas. (1) Civil Engineering Materials & Processes: Research and develop materials and processes for Civil Engineering applications including pavement and airfield damage repair, force protection, and environmental stewardship. (2) **Additive Manufacturing of CE Structures:** RDT&E of additive manufacturing materials and processes to enhance Air Force Civil Engineering capabilities & aid in Unified Facility Criteria (UFC) development.

Airbase Damage Repair/Recovery: Research, develop, test, and certify equipment and materials; tactics, techniques, and procedures for the rapid assessment and repair of airfield damage; identification & mitigation of unexploded ordnances (UXOs); and expedient repairs for fuel and utility systems. (1) Rapid Damage Assessment: Develop, test, and evaluate commercial off the shelf (COTS) and custom build systems to detect and classify damage and UXO after an attack for generation of minimum airfield operating surface (MAOS) candidates to mitigate and repair. (2) Rapid Explosive Hazard Mitigation: RDT&E new robotic systems and appliques that will enable explosive ordnance disposal teams to handle mass ordnance removal with little to no exposure to threats. (3) Rapid Damage Repair: Research & develop materials, equipment, processes, and procedures to provide a MAOS and extend the life of airfield surfaces.

Basing and Protection: Research, develop and transition technologies for hardening and protecting airfield infrastructure from munitions attack, for UXO and aircraft, and for equipment & infrastructure fires including developing new expeditionary infrastructure technologies. (1) Airfield Protection: RDT&E that addresses ballistic protection, explosive effects, forced entry protection, and mitigation of damage due to explosive and environmental threats in order to improve the survivability of fixed and expeditionary airbase assets. (2) Fire and Emergency Services: RDT&E of materials, systems, technologies and processes to enhance Air Force firefighter emergency response. (3) Energy & Utilities: RDT&E in advanced energy & utilities for expeditionary applications resulting in the reduction of fossil fuel consumption and logistic tails required to maintain operations in forward operating bases.

Year of Commission: AFCEC was established 26 Oct 2012 to implement an enterprise-wide civil engineer transformation.

This action included assuming the RDT&E mission that was formerly at AFRL/RXQ. Previously AFCEC was the Air Force Engineering and Services Center, and can trace the Civil Engineering lab roots to the 1960s. The new Office of Research and Technology Applications (ORTA) for AFCEC stood up mid-2013. Authority for AFCEC to approve Cooperative Research and Development Agreements (CRADAs) was granted 15 Oct 2013. The delegation authority to enter into Educational Partnership Agreements (EPAs), Patent License Agreements (PLAs), and Partnership Intermediary Agreements (PIAs) was granted to AFCEC 25 March 2014. On 12 Oct 2022, the DAF Technology Executive Office rescinded the previous designations and provided an updated designation for AFCEC. The memorandum stated "The Air Force Civil Engineer Center's Readiness Directorate (AFCEC/CX), an organization of the Air Force Installation and Mission Support Center (AFIMSC) of the Air Force Materiel Command (AFMC), may enter into CRADAs, CTAs, EPAs, and PLAs. The ranges of AFCEC/CX are suitable facilities for the CTA authority. The Director of AFCEC/CX is designated as the Reviewing Official for CRADAs and the Signatory for EPAs and PLAs. The Divisions within AFCEC/CX may function as Air Force Activities for CRADA purposes. AFCEC/CXA will be the office responsible for providing ORTA functionality, and AFMCLO/JAZ is designated as the servicing legal office."

Strategy

How ORTA fits into Lab Organization and Mission: AFCEC helps develop and commercialize new leading-edge technology by partnering with other DoD laboratories, university laboratories, and with private-sector companies for research and development (R&D), technology licensing, and transfer. These T3 partnerships solve Air Force warfighter problems, create business opportunities, and stimulate economic development while helping AFCEC to achieve its technology transfer and transition missions. By understanding the technology needs of Air Force warfighters; understanding the strengths of academia, industry, and federal laboratories; and by teaming with technology transfer (T2) professionals AFCEC develops productive partnerships for the licensing, transfer, development, and commercialization of technology.

How T2 Tools are a part of the lab strategic planning: T2 tools are an integral part of AFCEC's strategic planning. CRADAs are used to leverage industry knowledge and to provide innovative products for military testing. Foreign Comparative Tests are used to determine the suitability of commercial products for military applications. Through our partnerships with the AF ORTA, the AFMC Intellectual Property Law Division, TechLink, and other T2 professionals, the AFCEC ORTA helps establish new CRADAs and other T2 agreements.

One Year Objectives and Strategy: Establish Educational Partnership Agreements (EPA) with new partners.

Near Term Goals and Strategy: Establish Educational Partnership Agreements (EPA), assist Scientists and Engineers (S&Es) in establishing new transfer mechanisms such as Cooperative Research and Development Agreements (CRADAs), encourage S&Es to file patents and invention disclosures; and encourage supervisors to submit nominations for Technology Transfer Star Awards.

Through our partnerships with the AF ORTA, the AFMC Intellectual Property Law Division, TechLink, and other T2 professionals, the AFCEC ORTA helps establish new CRADAs and other T2 agreements.

The Year in Review

Success Stories from FY24

1ST USAF UFC COMPLIANT 3-D PRINTED BUILDING

https://www.afimsc.af.mil/News/Article-Display/Article/3274984/#:~:text=3D%20printing%20of%20concrete%20buildings%20consists%20of%20a%20computer,

The Details

As part of the Tyndall Base rebuild, and base of the future concept, AFCEC partnered with 3-D Printing company ICON to construct the USAF's first United Facilities Criteria (UFC) compliant 3-D Printed Building. The Robotics Range Control Facility, located at the 9700 area near Mexico Beach, experienced upward of 12 feet of storm surge and was destroyed. Utilizing the Small Business Innovation Research (SBIR) program, AFCEC and ICON designed a replacement facility to be 3-D printed to replace the previous structure. The structure is Miami-Dade compliant, and is designed to withstand upwards of 155 mph winds. Additionally, elements of the facility are designed to withstand storm surge, with electrical, HVAC, and ductwork being elevated to the top of the building. The structure was designed in adherence to structural UFC 3-301-01, which as of 2022 contains design specifications for Additively Constructed Concrete Buildings. Third party American Society of Testing and Materials (ASTM) testing was conducted on samples throughout the printing process, and designs were provided to the Construction Engineering Research Laboratory (CERL) / Engineering Development and Research Center (ERDC) in accordance with the UFC. Additionally, sensors were installed in collaboration with ERDC to monitor the structural behavior of the buildings' wall systems during high wind events. With 3-D Construction being a relatively new technology, lessons learned from the design/construction process, as well as technical data gathered from testing and structural monitoring will be shared across the DoD. This data will help evaluate the technology's practicality and further refine the UFC to pave the way for future 3-D Construction across the DoD.

The Outcomes

First UFC Compliant 3-D Printed Structure was built at Tyndall AFB. Re-established Base Capability by rebuilding the Robotics Range Control Facility. Gathered cost, logistics, and performance data to further refine UFC development for 3-D structures.

Screenshot by AFIMSC Public Affairs

AFCEC TEAM SUCCESS IN TRANSITIONING FROM AFFF TO FLUORINE-FREE FOAMS (F3S)

https://www.afcec.af.mil/News/Article-Display/Article/3762426/tyndall-leads-the-way-in-air-force-eco-conscious-fire-protection/

https://serdp-estcp.mil/projects/details/9976739e-9f76-420a-bbb8-7be15e6d-ac14/field-scale-demonstration-of-second-generation-pfas-free-foams-with-various-foam-delivery-nozzles

The Details

The AFCEC/CXAE Fire Team worked with Environmental Security Technology Certification Program (ESTCP) to successfully transition from Aqueous Film-Forming Foam (AFFF) to Fluorine Free Foams (F3s) for DoD and civilian applications. This will allow suppressing hydrocarbon fires, such as those involved in aircraft crashes with F3 agents. The AFCEC team performed Military Specifications (Mil-Spec) testing, MIL-PRF-24385F and MIL-PRF-32725, at various stages of F3 development by legacy and new foam vendors. The initial testing identified areas of improvement needed to be qualified by the Navy. Several products were then reformulated, some through multiple iterations, to potentially qualify under the new, land-based Mil-Spec. Over thirty such formulations were tested that led to qualification of two products in FY23 and one additional product in FY24, thus helping meet the 2020 National Defense Authorization Act (NDAA) targets on AFFF phase-out. Additionally, two products were readied for qualified product listing (QPL) testing in FY25. The AFCEC Team's efforts provided critical and timely testing of advanced development and demonstration of F3 foams and resulted in adding five F3 agents to the QPL.

While the Mil-Spec provides for simulated conditions to test the firefighting agent's performance, firefighters also needed to learn about how best to fight fires at field scale. Field scale means the fires are two orders of magnitude larger than in laboratory scale settings, therefore the firefighting equipment and tactics may be quite different between the two scales. The AFCEC Team demonstrated how to apply F3s using conventional fire trucks as well as on how to enhance firefighting using different foam delivery techniques, such as compressed air foam (CAF) and ultra-high pressure (UHP). The AFCEC Team prepared and published a guidance document on such technologies and how best to deploy them. Such RDT&E efforts are continuing and are expected to help reduce Operations and Maintenance (I&M) costs for DoD and civilian firefighters.

The Outcomes

Five F3 agents are now on the qualified product list so they can be deployed throughout the AF to replace AFFF.

The AFCEC Team also published a guidance document on how to apply F3s using conventional fire trucks as well as on how to enhance firefighting using different foam delivery techniques.

U.S. Air Force photos by Airman 1st Class Zeeshan Naeem

Marketing & Outreach

AFCEC encourages conference attendance and links between industry and research efforts to leverage technology moving to fielded solutions. It also uses Techlink to help coordinate CRADAs and EPAs.

Lessons Learned

Transitioning viable technology to the field is not an easy or fast process. It may take years between the initial concept/discovery before having a production ready product.

Facilities & Equipment

AFCEC/CXA are technical leaders in deployed aircraft operating surfaces, blast and fragmentation protection, deployed energy solutions, firefighting, civil ground robotics, and airbase sciences. Several of AFCEC/CXA's RDT&E facilities, below, are unique.

1. Airbase Sciences — AFCEC/CXA laboratories for analytical, wet and microwave chemistry, and microbiology at Bio-Safety Levels 1 and 2 support a variety of project areas such as bio-civil engineering.

2. Airfield Operating Surfaces — AFCEC/CXA's re-useable Pavement Test Ranges (with full instrumentation, data acquisition and visualization) assess effects of aircraft loads and weathering on candidate pavements and pavement repairs. Controlled blasts to simulate effect of small and large munitions on airfield in the range of 4-10 pounds are required to make craters for repair research work. Development of C-130 transportable pavement repair equipment that can be used in deployed locations and customized equipment to simulate aircraft wheel loading are on-site and available for testing. Capability to perform on-site pavements materials research at pavements test pad and in-house testing laboratories.

3. Blast and Ballistic — AFCEC has a 54-acre infrastructure hardening technologies blast range with full instrumentation, data acquisition, and visualization to assess blast effects. The site is approved for 2,000 lbs. TNT net explosive weight. AFCEC also has a Material Testing System (MTS) laboratory and a ballistic range. AFCEC uses high-speed video and a myriad of pressure, deflection and acceleration gauges specifically designed for collecting scientific response data of test articles during blast and ballistics experiments. This data collection is synchronized utilizing an auto sequencer that simultaneously triggers the explosive firing system, cameras and data acquisition systems. Data capture uses still image photography, high speed video, and ultra-high-speed video with AFCEC's fastest cameras capable of 626,000 frames per second (fps) at full resolution and up to 1,000,000 fps at lower resolution.

4. Energy — AFCEC hosts a research facility that provides a real-world civil engineering research, development, and demonstration site for the exploration of alternative and renewable energy shelter technologies; energy, fuel, and power distribution; expeditionary engineering; and energy resiliency for Deployed Bases. AFCEC has unique facilities such as a one-of-a-kind Modular Expeditionary Test & Evaluation Resource (METER) test site at 9700 area; BEAR Technology Evaluation & Integration Laboratory (BTEIL) test site at Silver Flag Training Exercise Site; Energy Storage Integration & Testing; Chemistry/Biology lab, and Wastewater Treatment System Laboratory.

5. Firefighting — AFCEC's live-fire aircraft research and training facility uses Jet-A as fuel and has an instrumented aircraft mockup. A wet laboratory for chemical research and development into firefighting agents and combustion characterization of materials and fire hardened facilities for research into highly energetic materials and fixed fire suppression systems and agents are also at AFCEC. Under Project Reliance the USAF is designated to lead DoD's Aircraft Rescue and Firefighting R&D.

6. Ground Robotics — AFCEC has facilities to conduct multi-scale robotics and automation tests including 50 acres of controlled airspace for unmanned aerial vehicle operations and four areas for robotics ground operations: 1) 50 acres for high-speed tests, 2) 25 acres for integration tests, 3) blast range access for explosive and fragmentation test in support of mine clearing and improvised explosive devices, and 4) a NIST indoor urban terrain simulation course for small robot evaluation.

Some of these facilities/equipment are used by the private sector through CRADAs and test agreements. AFCEC/CXA is the technical leader for deployed airbase technologies and works closely with academia, industry, and contractors to exploit R&D with applications for force protection and deployed infrastructure. AFCEC/CXA provides testing facilities to validate industry solutions to military requirements; for example, the blast range is used to determine if overhead protection solutions garnered from industry were sufficient to protect against a selected set of threat munitions. Also, one partner is using the blast facilities under a current CRADA.

Resources Utilized

Training of the lab staff is conducted on an as needed basis throughout the year. The ORTA team attended T2 Virtual Teleconferences (VTCs) led by Mr. Burnette for his work in transitioning Fluorine Free Foams to the field, and Mr. Nikon for leading the construction effort for the 3-D Printed Robotics building received the FY24 Technology transfer Star Award.

Barriers & Problems

Transitioning technology that has information technology is much more difficult to field than 20 years ago. The Risk Management Framework requirements are not sufficiently tailored for stand-alone systems as many of the continuous monitoring requirements assume network access.

FY24 Metrics

Inventions

Number of new inventions disclosed	2
Number of U.S. patent applications filed	1
Total number of active patents	10

Licensing

Number of total active invention licenses	2
Total active income bearing licenses	1
Number of total active income bearing exclusive licenses	1
Number of non-exclusive licenses	2

Time for Granting Invention Licenses

Average time	3 months
Minimum time	3 months
Maximum time	3 months
Number of licenses terminated for cause	1

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	6
Number of CRADAs, Newly Executed	1
Estimated CRADA contributed value	$2,547,000

Educational Partnership Agreements (EPAs)

Number of total active EPAs	11
Number of newly executed EPAs	1

PA CLEARED #AFGSCPA-102024-001

Office of the Chief Scientist

Air Force Global Strike Command (AFGSC/ST)

Barksdale Air Force Base, Louisiana

AFGSC.STWorkflow@us.af.mil

https://www.afgsc.af.mil

Overview

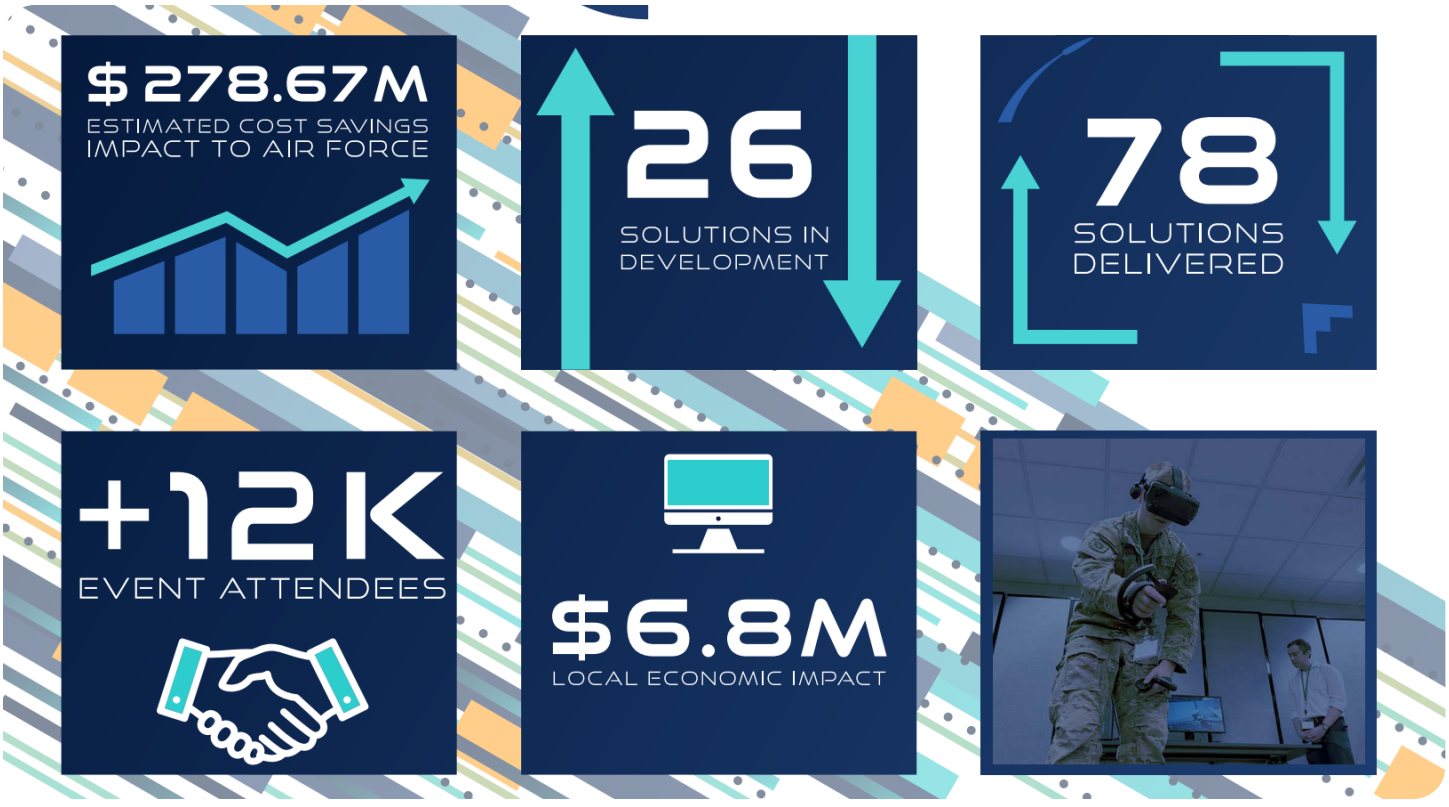
Provide authoritative scientific counsel, technical advice, and guidance throughout the Command on plans and programs within AFGSC mission areas and related technological fields

- Advises on the status of scientific and technical quality of AFGSC, AF, and DoD programs and solutions to AFGSC mission area needs, engages subject matter experts
- Conducts efforts leading to technological enhancement of nuclear deterrence and global strike capabilities

Strategy

Accelerate the transition of new technology to the command as the process owner for the Command's Innovation Board:

- Innovation Board administers/provides oversight of the Command's innovation program
- Deliberate, yet agile mechanism to capture, assess, select, support, advocate, and deliver solutions for Command challenges to advance mission capability, readiness, and lethality
- Key instruments include Partnership Intermediary Agreement w/ CIC, SBIRs, FFRDCs, etc.



Graphics by AFGSC

The Year in Review

Success Stories from FY24

STRIKEWERX DELIVERS NUCLEAR WEAPONS EOD TRAINER

https://www.strikewerx.com/global-strike-eod-crews-get-hands-on-with-advanced-training-tech

The Details

STRIKEWERX, the command's innovation hub, delivered their prototype training capability using commercial virtual reality technologies. The new platform allows Explosive Ordnance Disposal (EOD) personnel to train on safing a nuclear weapons accident site. This is one of 11 joint EOD missions but it never had a training capability. By partnering with a commercial gaming company STRIKEWERX was able to produce immersive multi-player scenarios for EOD crews to train for real-world scenarios. Defense Threat Reduction Agency provided an additional $1M funds to enhance the prototype and provide more hardware to Air Force EOD Airmen.

The Outcomes

- Increased training throughput 300%, no longer have to unpack, clean, dry and repack EOD suits and equipment
- More engaging training, Airmen enjoy the experience much more than computer based training
- Flexible platform, easy to add new weapons, equipment or environments
- Realistic modeling of radiological materials based on environment
- New standard of training for AFGSC

GLOBAL STRIKE, CIC SUPPORT INNOVATION WITH INNOVATION LAB

https://www.strikewerx.com/cic-supports-global-strike-command-innovation-with-strikewerx-expansion

The Details

STRIKEWERX expanded their footprint and capabilities to support Air Force Global Strike Command's mission with its new additive manufacturing and immersive training Innovation Lab. The innovation hub doubled their prototyping floor space, adding over 1,300 square feet for AFGSC Airmen. They've also introduced new equipment and capabilities in the form of augmented reality and virtual reality headsets, computers for modeling and simulation, 3D printers, handheld 3D scanner, maker's space for prototyping, and a new meeting area with teleconferencing capability.

The Outcomes

- Fielded advanced modeling/sim
- Four advanced workstations & s/w
- Four AR/VR stations for evaluating digital models
- Handheld scanner for remote ops
- Trained employee to assist Airmen
- Additional 1,300 square feet for prototyping
- High speed industrial sized 3D printer operates at 5-15 times speed and a large build volume for large parts

Marketing & Outreach

AFGSC/ST and STRIKEWERX attended conferences such as the Air & Space Forces Association Warfare Symposium and Air, Space & Cyber Conference in 2024 to engage with Airmen about innovation and interface with companies who could be potential solution providers.

STRIKEWERX has built and maintains a virtual rolodex of 1,300-plus companies that it notifies of opportunities for collaboration. STRIKEWERX' social media is focused on the LinkedIn platform generating 45,682 impressions in FY2024.

- This led to more than 3,700 clicks, nearly 1,300 reactions, and an overall engagement rate of 10.2%. Engagement rate is calculated by clicks/plays, shares, likes, comments, and/or follows. Hubspot, a CRM industry leader, notes an average engagement rate is 2%.
- Local news mentions - 23 articles shared/re-posted
- Businesswire - Two articles published
- Business websites - Four articles shared/re-posted
- Military-related websites - Three articles shared/re-posted

Resources Utilized

Attended DAFT3 Workshop Conferences in November 2023 and August 2024.

Dr. Paul Hausgen, AFGSC Deputy Chief Scientist, was presented a DAFT3 Annual Summit Award in August 2024.

Facilities & Equipment

https://www.cyberinnovationcenter.org/strikewerx

https://www.strikewerx.com/

AFGSC/ST is the only Air Force Laboratory directly supporting the Air Force Nuclear and Global Strike missions.

USAF CRADA NUMBER FY24-311-AFGSC-01. Cooperative Research and Development Agreement between Air Force Global Strike Command and LSU Health Science Center-Shreveport: An Investigation of Physiological and Cognitive Stress During B-52 Stories

Barriers & Problems

1. The slow process within AFMC to test the B-52 EW Pressure Test Set and B-52 Tow Bar.
2. Companies having larger, more lucrative contracts than building a one-off minimum viable product (Celina Tent Co. on AEHF Antenna Maintenance Shelter, Cocoon Co. on B-52 Power Cart Waterproofing)
3. Barrier to fielding is choosing projects where the SPO or MAJCOM owner doesn't have an intent of scaling. The E-4B NC3 Maintenance Trainer, B-52 Air Refueling Simulator are examples.

Lessons Learned

1. Select projects the respective System Program Office (SPO) will fund that are part of the weapon system (not E-4B NC3 Maintenance Trainer). It was a successful prototype but it has no pathway to fielding.

FY24 Metrics

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	2
Number of CRADAs, Newly Executed	1
Estimated CRADA contributed value	$4,000,000

Inventions

Number of new inventions disclosed	1

PA CLEARED #88ABW-2024-0827

Air Force Institute of Technology (AFIT/CL)

Wright-Patterson Air Force Base, Ohio

AFIT.CZ.ORTA@us.af.mil

https://www.afit.edu

Overview

The Air Force Institute of Technology (AFIT), commissioned in 1919, is a federal institution located at Wright-Patterson AFB Ohio, and is the Department of the Air Force's leader for advanced, multi-disciplinary academic education, as well as its institution for initial technical and professional continuing education. A component of Air University and Air Education and Training Command, AFIT is committed to providing defense-focused graduate education and related research, and operationally-relevant initial skills training and professional continuing education to sustain the technological supremacy of America's air, space, and cyber forces. AFIT's mission is to educate defense professionals to innovatively accomplish the deterrence and warfighting missions of the U.S. Air and Space Forces. While its vision is leading defense-focused education, research, and consultation to accelerate military superiority across all domains. Through four schools and a non-resident civilian institution program, AFIT delivers graduate education to the Medical, Line, Legal and Chaplain Corps, professional continuing education to Civil Engineers, Space, Nuclear, Acquisition, and Logistics professionals, conducts cutting-edge research in many areas including cyber, directed energy, hypersonics, stealth, navigation and space, and provides consultation and analysis support services.

AFIT has been accredited by the Higher Learning Commission since 1960. The Graduate School is a Carnegie-classified High Research Activity doctoral institution with 25 M.S. degree programs, 13 Ph.D. programs, and 19 certificate programs in engineering, applied science, mathematics, and management; seven programs are accredited by Accreditation Board for Engineering and Technology (ABET) at the advanced level. It maintains a typical enrollment of over 650 in-residence students and about 400 students in various distance learning and non-resident programs. The School of Civil Engineering, School of Systems and Logistics, and School of Strategic Force Studies provide initial skills and continuing professional education to thousands of resident and remote students across the globe, including consultation on high-priority defense problems. The Schools' maintain collaborations with research entities and operational units throughout the defense establishment.

Strategy

Near Term Goals and Strategy

- AFIT's Office of Research and Outreach (AFIT/CZ) is designated as the Office of Research and Technology Applications (ORTA). AFIT/CZ has streamlined the process for research within the DoD domain, and the near-term goal is to further adapt and fully utilize that process to enhance AFIT's faculty, staff, and student knowledge that their research can affect and be affected by more than just DoD.
- Promote AFIT ORTA as the first step to the innovation disclosure process and endorse the benefits of patenting new technology. This will be accomplished through quarterly informational releases highlighting unique aspects of Technology transfer and why Technology transfer is beneficial to DoD, AFIT, and the individual.

Long Term Objectives and Strategy

- The office will continue to facilitate technology transfer activities by continuously reviewing and developing processes and mechanisms within the organization to enable effective and efficient execution at all levels. This includes providing guidance, up-to-date templates, assist with the development of draft agreements and modifications, coordinating staff reviews, obtain signatures, send notices and maintaining official copies of required documentation.
- An ongoing objective is to explore potential legislative changes allowing AFIT and other military educational institutions to partner with Federally Funded Research and Development Centers (FFRDCs).
- Continue to promote patent and licensing activities with faculty and management.
- Continue to push AFIT ORTA to the front of the innovation disclosure process.
- Promote the newly released DAF Technology transfer Information System (DTTIS) among AFIT's personnel.

The Year in Review

Success Stories from FY24

PASSIVE PHYSICAL LAYER DISTINCT NATIVE ATTRIBUTE CYBER SECURITY MONITOR

The Details

Former AFIT student J. Addison Betances, AFIT Detachment Commander Col Christopher Rondeau, AFIT Faculty Dr. Michael Temple, and former AFIT contractor Mr. Juan Lopez are co-inventors to an invention titled, "Passive Physical Layer Distinct Native Attribute Cyber Security Monitor." This technology is a method for cyber security monitoring that includes monitoring a network interface that is input-only configured to surreptitiously and covertly receive bitlevel, physical layer communication between networked control and sensor field devices. During a training mode, a baseline distinct native attribute (DNA) fingerprint is generated for each networked field device. During a protection mode, a current DNA fingerprint is generated for each networked field device. The current DNA fingerprint is compared to the baseline DNA fingerprint for each networked field device. In response to detect at least one of RAA and PAA based on a change in the current DNA fingerprint to the baseline DNA fingerprint of one or more networked field devices, an alert is transmitted, via an external security engine interface to an external security engine.

The Outcomes

This technology was issued patent No. 11,856,012 on 26 Dec 2023 and AFIT holds two patent licenses for this technology. The first is a partially-exclusive license issued to a small business applying this technology to the energy infrastructure. The second is a non-exclusive license issued to a small business to evaluate the technology for the U.S. power grid and specifically critical assets such as high-voltage power transformers, control rooms and battery enclosures at transmission and distribution substations. Based on the outcome of the technology evaluation, AFIT will either issue a second partially-exclusive license, encourage sublicensing, or pursue a CRADA to further develop this technology for application to physical security of critical assets.

U.S. Air Force Photo by Ms. Katie Scott

Marketing & Outreach

While research and collaboration are a vital component of an AFIT education, AFIT does not receive congressional funds for research and development (R&D) funds directly from Congress. Rather, AFIT faculty must work closely with AF R&D organizations, DoD, other government agencies, universities, and commercial organizations to support research activities. AFIT has entered into several agreements that enable a safe playing field to participate in and benefit from partnerships active in hypersonics research, cyberspace research, and high-performance computing. AFIT's ORTA is actively seeking new partnerships to expand opportunities with commercial entities, universities, and other government offices.

Facilities & Equipment

The full list of AFIT facilities/equipment can be found at *https://www.afit.edu*

Below is a short list of the unique capabilities within AFIT:

- Alternative Navigation
- Applied Game Theory
- Atmospheric Modeling
- Compact Combustor Development
- Computational Fluid Dynamics
- Cyber Operations and Security
- Data Analytics
- Directed Energy Weapons
- Electronic and Photonic Materials
- Geospatial Information Systems
- Lasers and Electro-Optics
- Machine Learning
- Mission Modeling and Simulation
- Model-based Systems Engineering
- Numerical Analysis
- Nuclear Physics
- Nuclear Weapon and Radiation Effects
- Optimal Space Systems Architecture
- Radar
- Radiation Detection
- Rocket and Space Propulsion
- Space Applications

AFIT often uses technology transfer mechanisms to formalize collaborative projects with non-government organizations. AFIT uses Cooperative Research and Development Agreements (CRADA) to define R&D projects, IP rights and provide financial project support via funding. Limited-purpose CRADAs (LPCRADAs) including non-disclosure agreements (NDA) are used to share information with limited technical activities. Educational partnership agreements enable and encourage Science, Technology, Engineering & Math (STEM) education, loan or transfer of equipment and enhance educational opportunities for AFIT students as well as students from local colleges and universities (primarily within the state of Ohio).

While some AFIT agreements simply provide a basis for research in areas of mutual interest, other agreements may involve access to unique capabilities, collaborator technologies, equipment and facilities and special capabilities, equipment. AFIT has executed patent and joint ownership agreements several of which have begun producing royalties for their innovators and their lab. AFIT researchers have contributed to development of electro-optics and infrared systems for sensors; assisted with the development and refinement of navigation systems for a variety of applications from geo-positioning to inspection applications. AFIT faculty, students and staff have studied and modeled climate and weather systems, developed space systems for launch; studied mechanisms to improve the detection of nuclear events to name a few.

AFIT uses CRADAs and licensing agreements to access support funding from a various sources including government (Small Business Innovation Research (SBIR) & Small Business Technology Transfer (STTR) programs), commercial and private organizations for projects related to AFIT's research and education mission and available resources. AFIT has executed CRADAs with multiple partners (consortiums), international collaborations, as well as numerous agreements that provide access to classified materials.

Barriers & Problems

The Office of Research and Outreach provides New Faculty Orientation during fall quarter when new students and staff arrive. This is the only opportunity to receive information regarding AFIT's Technology transfer program. The AFIT ORTA will being providing quarterly a Technology transfer 'Did you know' message outlining a unique feature of Technology transfer. The goal being to continuously educate faculty, staff, and students on all things Technology transfer in an easily absorbable format throughout the year. This will mitigate intellectual property concerns and education AFIT personnel.

Lessons Learned

Continuous reinforcement of why we need Technology transfer and why we need agreements with non-federal partners is a necessity. Better represent requirements for staffing, support, and expectations to management. Promote the AFIT ORTA to assist with innovation and agreements.

Resources Utilized

- Full-time ORTA representative completed T2U Technology Transfer Fundamentals November 2023
- Full-time ORTA representative attended the required Annual DAF T2 training session in 2024
- Full-time ORTA representative attended the Federal Laboratory Consortium Annual Summit in 2024; This summit offers various educational opportunities.
- Delegated legal review authority to AFIT/JA
- ORTA provides a New Faculty Orientation to incoming faculty (civilians and military) which includes and introduction to AFIT's Technology Transfer Program

FY24 Metrics

Inventions

Number of new inventions disclosed	12
Number of U.S. patent applications filed	26
Total Number of U.S. patents issued	7
Total number of active patents	46

Licensing

Number of total active invention licenses	5
Number of newly executed invention licenses	1
Number of newly executed invention licenses granted to small businesses	1
Total active income bearing licenses	4
Total active non-income bearing licenses	1
Number of total active income bearing exclusive licenses	1
Number of partially exclusive licenses	2
Number of non-exclusive licenses	1
Number of total active income bearing exclusive licenses	1

Time for Granting Invention Licenses

Average time	2 months (FY24 only)
Minimum time	1 month (FY24 only)
Maximum time	4 months (FY24 only)

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	36
Number of CRADAs, Newly Executed	1
Number of Newly Executed CRADAs involving small businesses	12
Total CRADA Revenue	1,006,572
Estimated CRADA contributed value	3,557,780

Educational Partnership Agreements (EPAs)

Number of total active EPAs	7
Number of newly executed EPAs	3

Software Licensing

(licensing in which DoD grants the right to use or sell the software)

Total number of active software licenses	3
Total number of new software licenses	1
Number of newly executed software licenses involving small businesses	1
What authority or authorities did the component use for licensing software?	Section 108

Lantern, Hanscom Collaboration and Innovation Center (AFLCMC/HN)

Hanscom Air Force Base, Massachusetts

aflcmc.hni.lantern@us.af.mil

https://go.mil/lantern

Overview

Located at Hanscom AFB near Boston, MA, the Lantern is a 29,000 square foot R&D facility offering connectivity to 13 R&D and operational networks, access to a technical support staff, secure office space, tactical shelter areas, an inheritable ATO and a 120 feet composite tower in support of mission partners across the DoD. The facility's unique location in close proximity to the Boston technology hub affords manifold opportunities to partner with industry and academia to bring innovative technologies to the Air Force by leveraging AF Technology Transfer & Transition (DAFT3) mechanisms and through Light the Lantern Industry and Demonstration Days, Lantern Innovation Symposiums and Hanscom Innovation Team (HIT) Pitch-It events.

Formally, The Lantern is chartered by leadership to coordinate and partner with local, regional, and national leaders within state and federal governments, Air and Army National Guard Units, Reserve Units, laboratories, FFRDCs, industry, academia, non-traditional capabilities, and those involved with STEM efforts to create a physical and business environment to enhance and extend leading-edge advances in all areas of defense applications, cyber defense techniques with multi-use purposes, and public safety. Additionally, the Lantern functions as an innovation and technology transition "portal" into the DoD Enterprise for small/large businesses, educational institutions, and state and local governments to solve technical problems, expand the knowledge-based economy, and shape the future workforce.

Functionally, and in support of the above, the Lantern executes mission under three core areas:

- Research, Development, Test, and Evaluation (RDT&E) facility: Lab as a Service
- Collaboration and Innovation
- Office of Research of Technology Application (ORTA)

Strategy

The Hanscom ORTA function fits into The Lantern's strategy by providing a formal mechanism by which industry, academia and local program offices can work together to pursue STEM initiatives, cooperatively develop technology, exchange information and perform research. Organizationally, ORTA responsibilities are delegated to the Lantern Executive Director by each of the Hanscom Reviewing Officials designated in the DAF TEO memo dated 3 Apr 24.

The Year in Review

Resources Utilized

ORTA and legal training were leveraged by the ORTA provided AFRL/SP and AFMCLO/JAZ staff at DAFT3 Summit in September 2024.

FY24 Metrics

Inventions

Number of new inventions disclosed	1
Number of U.S. patent applications filed	1

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	7
Number of CRADAs, Newly Executed	1
Estimated CRADA contributed value	$1,548,074

Educational Partnership Agreements (EPAs)

Number of total active EPAs	3
Number of newly executed EPAs	1

Fighters and Advanced Aircraft Directorate (AFLCMC/WA)

Wright Patterson Air Force Base, Ohio

AFLCMC.WA.ORTA@us.af.mil

Overview

The AFLCMC/WA Lab supports a variety of efforts related to development and test of new technologies spanning multiple programs in the Directorate. Lab activities involve approximately 40 individuals comprised mostly of program managers and engineers. The AFLCMC/WA Lab is located in Dayton, Ohio and focuses on reducing risk within the acquisition process by facilitating partnerships with industry that enable the Government to mature technology at reduced costs and accomplish cooperative test and evaluation activities with industry. The Lab was commissioned in 2019.

Strategy

The AFLCMC/WA Office of Research and Technology Application (ORTA) enables acquisition programs to reduce the risk of various technologies the organization is interested in or may have a subsequent requirement to procure. Technology Transfer (T2) tools allow the ORTA to collaborate in the areas of innovative technologies, components, software, modeling, simulation, and systems for aircraft applications to grow the acquisition marketplace.

The ORTA plans to foster competition within innovative technologies, components, software, modeling, simulation, and systems for aircraft applications over the next year to identify “best of breed” technologies and facilitate competition among the defense industrial base.

In the near term, the ORTA will exercise Government ownership of lab assets and test infrastructure to ensure technical maturity with independent assessments of operation, integration, openness, and interoperability of technologies that collaborators bring to the table.

The ORTA will provide AFLCMC/WA the ability to access data from collaborators to help validate and verify technology maturity in order to better inform acquisition decisions that have multi-billion dollar impacts over the life cycle of adopting programs.

The Year in Review

Resources Utilized

AFLCMC/WA lab and test infrastructure, DTTIS training, DELTA Roadshow, DAFT3 Annual Summit.

Facilities & Equipment

The AFLCMC/WA lab’s infrastructure and partnerships with test organizations allowed for evaluation and maturation of technologies with which Government and industry are collaborating.

Collaborators have brought Independent Research and Development (IRAD) hardware and software to the AFLCMC/WA lab to test their systems in a unique Government environment with Government provided data.

FY24 Metrics

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	19
Number of CRADAs, Newly Executed	1
Estimated CRADA contributed value	$4.2M

> **The ORTA plans to foster competition within innovative technologies, components, software, modeling, simulation, and systems for aircraft applications over the next year to identify 'best of breed' technologies and facilitate competition among the defense industrial base.**

PA CLEARED #AFLCMC-2024-0319

Intelligence, Surveillance, and Reconnaissance Directorate (AFLCMC/WI)

Wright Patterson Air Force Base, Ohio

aflcmc.wi.otra@us.af.mil

https://www.aflcmc.af.mil/welcome/organizations/intelligence-surveillance-reconnaissance-special-operations-forces-directorate/

Overview

Intelligence, Surveillance, Reconnaissance (ISR) and Special Operations Forces (SOF), Air Force Life Cycle Management Center (AFLCMC) Air Force Materiel Command, Wright-Patterson Air Force Base, Ohio plays a large role in ensuring combatant commanders have the information gathering and targeting capabilities to make informed decisions and eliminate threats. The directorate has nearly 1,800 employees in 20 locations and leads over 200 programs. The Mission is “Equip Our Warfighters to Win the Fight!” The vision is to live up to its name as “One Team Delivering Innovative Warfighter Capabilities With Speed and Discipline!”

Strategy

The Intelligence, Surveillance, and Reconnaissance Directorate’s intent for Technology Transfer primarily revolves around Cooperative Research and Development Agreements with industry partners whose objectives are maturing sensor, platform, and enabling technology. By entering into CRADAs with selected industry partners, the directorate can provide ISR aircraft with cutting-edge hardware and software that enhance data collection quality. The ORTA functions as the liaison between defense industry partners and the Intelligence, Surveillance, and Reconnaissance Directorate in order to learn about the many technological advances on sensors within their portfolio. The annual objective is to enter into CRADAs with viable industry partners and connect them to five Divisions enabling collaboration on ISR projects.

The Year in Review

Success Story from FY24

ISTARI FEDERAL DIGITAL TOOLS

The Details

Istari is a new start software company that possesses and is willing to share proprietary software to analyze complex processes to ensure customer data, cost, and schedule information. This software allows for complete, timely, and shareable information among customer and stakeholders according to their security level. In exchange, the U.S. Government (USG) has agreed to provide and furnish a program of record classified data for Istari to build a use case study for USG utility of their software. The case study will highlight software compatibility with current USG databases and operating commercial software. This will include current USG software cyber security posture, methods, and operating procedures.

The Outcomes

The USG goal is to acquire a software application that will help automate the current AFLCMC aircraft airworthiness process, achieving shorter schedules, improve data artifacts collection, and quality with the ultimate goal of improving AFLCMC developmental and sustainment programs schedules.

Marketing & Outreach

AFLCMC participates in numerous scientific/engineering symposia, industry open houses, exhibits and other events. Our technical advisors make approaches to prospective vendors, educational institutions, and research laboratories during these events and follow up on potential collaboration opportunities.

Resources Utilized

T2 Education and Training provided to organization/lab staff.

FY24 Metrics

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	10
Number of CRADAs, Newly Executed	1
Number of Newly Executed CRADAs involving small businesses	2

> **One Team Delivering Innovative Warfighter Capabilities With Speed and Discipline!**

Air Force Office of Scientific Research (AFOSR/RT)

Arlington, Virginia

https://www.afrl.af.mil/AFOSR/

Overview

AFOSR's Mission is to Discover, Shape, Champion, and Transition High Risk Basic Research to profoundly impact the future Air and Space Force. With a broad, long-term perspective, AFOSR identifies areas for investment and collaboration to advance the DAF research and development enterprise across the full spectrum of air, space, and cyber operations, builds bridges to the world's most prestigious universities and talented researchers to enhance partnerships and provide revolutionary science and technology discoveries to the Warfighter.

Geographic location: Main Office-Arlington, VA - overseas offices in Chile, Brazil, London, Tokyo, and Australia

Technology Focus Areas: AFOSR has 37 domestic portfolios with AFOSR Program Officers who drive innovation research for the Department of the Air Force -- areas on research including quantum sciences, high-speed aerodynamics, and materials for extreme environments.

Year of Commission: October 1951

Strategy

How ORTA fits into Lab Organization and Mission: ORTA helps leverage internal OSD/DAF partnering to conduct AFOSR Basic research efforts to support the warfighter needs. Additionally, the ORTA builds partnerships with academia and small businesses to support our Basic research mission.

How T2 Tools are a part of the lab strategic planning: AFOSR actively uses EPAs to partner with schools and universities. The AFOSR has also a PIA agreement with VT-ARC (BRICC PIA). BRICC hosts 50+ collaboration events with government and academia partners each year. Additionally, BRICC helps track intellectual property that AFOSR generates with our partners.

One-Year Objectives and Strategy

- Provide T3 training and workshop to relevant AFOSR staff and AFOSR-funded PIs
- In partnership with BRICC PIA, researching and facilitating tech transition opportunities on cutting-edge technologies.

Near-term goals and Strategy

- Make Potential Partners Aware of AFOSR's research and technologies
- Develop and foster relationships with partners within the Air and Space Forces, combatant commands, defense agencies, and advanced research organizations

Long term goals and strategies include

- Engage with and understand the goals of the Program Officers to align basic research with existing capability gaps
- Keep abreast of commercial market issues
- Maintain awareness of capability gaps that arise within the private sector to ascertain potential for the insertion of basic research
- Provide new and current AFOSR personnel insight into the various people, processes and tools available to assist in technology transfer

The Year in Review

Success Stories from FY24

FROM BASIC RESEARCH TO X-62A VISTA

The Details

X-62A VISTA is the first autonomous air-to-air combat platform

Key scientific enablers: decision & physical controllers, both of which were funded by AFOSR and AF RAND

Decision controller: Reinforcement Learning

Physical controller: L1 Adaptive Control

Initial basic research on these enablers were funded by:

- AF RAND (50s - 60s) – Dynamic Programming
- AFOSR (50s) – Stochastic Neural Analog Reinforcement Calculator (SNARC)
- AFOSR (50s - Present) – Control Theory & Dynamical Systems
- AFOSR (80s - 90s) – Reinforcement Learning
- AFOSR (05 – 10s) – L1 Adaptive Control Theory

https://www.afrl.af.mil/News/Article-Display/Article/3745032/usaf-test-pilot-school-and-darpa-announce-breakthrough-in-aerospace-machine-lea/

The Outcomes

DEEP MIND is a company that turned Reinforcement Learning into a product (with Alpha Go, Alpha Zero). Computational power was finally large enough (and training data sets large enough) to put into practice what the scientists funded by AFOSR in the 1980s and 1990s had shown was theoretically (algorithmically) possible with Reinforcement Learning. This in turn led to DARPA's AlphaDogfight in 2017-19, a simulation of dogfighting planes relevant for both autonomous and human pilots. VISTA combines L1 Adaptive Control and Reinforcement Learning in an autonomous airplane capable of dogfighting, demonstrated in 2023.

Photo by Mr. Kyle Brasier

CHIP-SCALE, INTEGRATED OPTICAL FREQUENCY COMBS

The Details

https://optics.org/news/15/10/27

AFOSR-supported science to develop chip-scale, integrated optical frequency comb sources has resulted in a key component to support a photonic interconnect system for high performance computing and data centers. The technology can support hundreds of wavelengths (i.e. data channels) on a single device and fiber, dramatically increasing efficiency and reducing data consumption.

Background:

Alex Gaeta is a world leader in chip-scale optical frequency comb technology and nonlinear optics. Michal Lipson is a world leader in silicon photonics and photonics interconnects. While the photonics system underlying Xscape Photonics' technology platform is based on science supported by many agencies, AFOSR support has played a critical role in the development of the underlying optical source for hundreds of precision controlled wavelengths from a single device. Such optical frequency comb devices have demonstrated exceptionally broad application from position, navigation, and timing (PNT) technologies, to the generation of ultralow phase noise microwaves, to highspeed communications, to spectroscopy! However, this technology has traditionally been limited to the laboratory. AFOSR has played an important role with sustained support for the development of chip-scale, integrated optical frequency combs (with a long history of publications), with the goal of taking metrology out of the lab and into Air and Space Force platforms. The dual-use potential is demonstrated by the Xscape Photonics data center focused market. (Current PO: Andrew Stickrath)

The Outcomes

The PIs, Alex Gaeta and Michal Lipson, at Columbia University, have started a company, Xscape Photonics to commercialize ultrahigh bandwidth photonic interconnects for high-performance computing and data centers. In October 2024, it was announced that Xscape Photonics has raised $44 million in series A funding, bringing total fundraising to $57 million. The latest financing effort was led by IAG Capital Partners, with Altair, Cisco Investments, Fathom Fund, Kyra Ventures, LifeX Ventures, Nvidia, and OUP also joining. ("Silicon photonics startup Xscape backed by Nvidia and Cisco in $44M funding round."

Marketing & Outreach

AFOSR raises awareness by:

- Utilizing social media, internal and external listserves
- Attending conferences and exhibits

Lessons Learned

It is important to stay current with the USPTO changes.

Resources Utilized

Workforce Development works to leverage the expertise and knowledge of technological professionals to promote further basic research and technology advancements for the Department of Air Force while remaining within costly parameters. To yield successful supply, Workforce Development performs extensive competitive research to ensure partnered companies are innovative, agile, and can withstand academic evolutions. Simultaneously, partners, research officers, and students are surveyed thoroughly to allow for incorporation of desired and necessary training, whether it be historical partnerships or new potential partners. With the processes in place, the interested workforce can maintain competing skill sets, engage with advanced technologies, and implement acquired knowledge. Diversity is another crucial component to advancing the workforce; therefore, partnerships through EPAs with K-12 schools, colleges, and universities support the expansion of Technology Transfer (T2) efforts. Workforce Development strives to provide collaborative environments to better promote cohesiveness across academia and industry, along with many other government entities.

Facilities & Equipment

The Basic Research Innovation and Collaboration Center (BRICC) is a collaboration facility supporting AFOSR with Technology Transfer and Transition (T3). The BRICC serves as an intermediary for industry, small businesses, academia, government, and other agencies to improve our stakeholder's ties across the Science and Technology (S&T) ecosystem and seeks to foster and cultivate partnerships that lead to collaboration in research, strategy, policy, and technology innovation. The BRICC operates 40,000 square feet of collaboration facilities in Arlington and Chantilly, VA, and offers a mix of classified and unclassified spaces for in-person and hybrid engagements. The facility is designed to accelerate technology through the maturity pipeline by providing a combination of collaboration, analysis, T3, and workforce development services. The goal is to leverage our unique capabilities to enhance and expand our partners' unique technology objectives. The BRICC offers a variety of services to support T3 activities from outreach to analytic studies, with collaboration spaces designed to meet the specific needs of each partner, with unique offerings such as classified workspace or shared laboratory space.

FY24 Metrics

Inventions

Number of new inventions disclosed	1

Licensing

Number of total active invention licenses	2
Number of non-exclusive licenses	2

Educational Partnership Agreements (EPAs)

Number of total active EPAs	13
Number of newly executed EPAs	8

AFRL 711th Human Performance Wing (AFRL/711 HPW)

Wright-Patterson Air Force Base, Ohio

711HPW.XP.T2@us.af.mil

www.afrl.af.mil/711HPW

Overview

The 711 HPW is the only place within the Department of the Air Force (DAF) focused on the Enable, Sustain, Enhance, and Restore mission for Airmen and Guardians. The 711 HPW was created to realize an integrated team that delivers exceptional human performance science and technology, medical education and training, and subject matter expertise on a multitude of human threats present in the environments in which our Airmen and Guardians operate.

OUR VISION – One Wing as One fully engaged Team, reliably delivering relevant human performance solutions at the speed of need to achieve air- and space-power dominance

OUR MISSION – Discover, develop, and deliver integrative human performance knowledge, technology, and solutions, supporting ready forces, ready future forces, and ready medics

The 711th Human Performance Wing (711 HPW) is a unique combination of the Human Effectiveness Directorate (RH) and the U.S. Air Force School of Aerospace Medicine (USAFSAM). The synergies of combining the ideas, resources and technologies of these units position the 711 HPW as a world leader in the study and advancement of human performance.

HUMAN EFFECTIVENESS DIRECTORATE – RH provides science and leading-edge technology to define Airman and Guardian capabilities, vulnerabilities, and effectiveness; train warfighters; integrate operators and weapon systems; protect Department of the Air Force personnel; and sustain aerospace operations. The Directorate is the heart of Airman and Guardian-centered science and technology for the Air Force. RH focuses on four Core Technical Competencies: Adaptive Warfighter Interfaces, Training, Medical & Operational Bioeffects, and Bioeffects.

USAF SCHOOL OF AEROSPACE MEDICINE – USAFSAM is the premier institute for education and worldwide operational consultation in Aerospace and Operational Medicine. USAFSAM has been a leader in the field of aerospace medicine and human performance from the beginnings of aviation through the onset of the space age and into the present, and is the oldest continually operating institution of its kind. It is also host to the largest aeromedical library in the world.

The 711 HPW accomplishes its mission through distinct but complementary mission units and an integrated staff located at Wright-Patterson Air Force Base, Dayton, OH. The synergies of combining the ideas, resources and technologies of these units position the 711 HPW as a world leader in the study and advancement of human performance. In addition, the Wing includes about a dozen smaller operating locations within the United States and internationally. The 711 HPW leads the development, integration, and delivery of Airman and Guardian-centric research, education, and consultation enabling the Air Force to achieve responsive and effective global vigilance, global reach, and global power now and in the future.

The Wing's multidisciplinary workforce is comprised of more than seventy occupational specialties across science, technology, and aerospace medicine. Leveraging a convergent sciences approach and supported by state-of the-art research facilities and classrooms, the Wing provides the Air Force with unparalleled expertise to maximize Airman availability, enhance Airman performance, and ensure resource efficiency -- now and in the future.

The 711 HPW also functions as a joint Department of Defense Center of Excellence for human performance sustainment and readiness, optimization, and enhancement through partnerships with the Naval Medical Research Unit-Dayton and nearby universities, industry, and medical institutions.

Strategy

The 711 HPW Office of Research and Technology Applications (ORTA) is a team of specialists working to transition new technologies into the hands of the warfighter, as well as transfer the technology into the commercial market through an Air Force program called T3, Technology Transfer and Transition. The 711 HPW ORTA supports 1,200 personnel across the Wing in developing and implementing partnerships with industry and academia, identifying, and protecting intellectual property, and working to commercialize inventions when appropriate. The ORTA also provides education and consultation services to researchers and Wing leadership. In the Wing, the ORTA is also responsible

for alliances (government-to-government agreements), 711 HPW/XP is involved in a significant number of the 711 HPW non-contract partnerships.

As part of AFRL, we lead, discover, develop, and deliver in human performance, with a particular focus on supporting air and space operations. Our core purpose is to produce and deliver knowledge, technology, and solutions to support and prepare Airmen and Guardians for current and future operational challenges. We must continually strive to improve our delivery of integrated capabilities that provide the United States with the ability to deter and defeat our adversaries when necessary. We will accomplish this by a constant emphasis on integrated, capability-focused, human performance products and services.

Goal: Deliver integrated human performance knowledge, technology, and solutions.

Objective: Develop and deliver transformative human performance knowledge, technology, and solutions at speed of need.

It is imperative that we continue to pioneer and transition transformative, impactful human performance technology products to support a more lethal fighting force. Our value proposition is measured by what we transition or transfer to operational use in research, education, and consultation domains. Accordingly, there will be a continued emphasis and attention placed on capability-focused technology development efforts managed at the enterprise level with the intention to transfer that technology to the next stage of development or directly to the field, as appropriate. To do so, we must also apply S&T protection to counter adversaries' use of our technology and efforts to disrupt our innovation, development, and transfer of technologies. A deliberate focus on expanded collaboration within the Wing in education and consultation mission areas will improve the quality of our deliverables

Objective: Strengthen our reputation as a preferred research, education, and consultation partner.

Our research, education and training, and consultation missions encompass the discovery, development, and delivery of knowledge. Our reputation as a highly reliable, trusted partner in the delivery of human health and performance research, education, and consultation is critical. The skills and expertise that are acquired through our research portfolio must result in intellectual property and peer-reviewed publications, conference papers, and reference materials that communicate our value to the Department of the Air Force mission. The education and training we deliver must result in highly performing Airmen and Guardians, prepared, equipped, and capable of supporting Service and Joint Operations anytime and in any environment.

Since the previous fiscal year, we've seen a surge in Scientists and Engineers (S&E) approaching our office with groundbreaking ideas for technology transition. We are committed to nurturing these discussions and empowering them with the knowledge they need to succeed. The BATDOK(R) initiative continues to drive impactful advancements in licensing and technology transition, and our team is working closely with BATDOK(R) Team Leads to ensure seamless collaboration. To enhance our efforts, we've implemented a quarterly battle rhythm, streamlining our joint initiatives.

Furthermore, after years of development, the Defense Technology Transfer Information System (DTTIS) has officially launched, drawing inspiration from NASA's proven model. This cutting-edge tool will revolutionize our ability to manage agreements, patents, royalties, and metrics. By automating workflows, DTTIS boosts efficiency, reduces errors, and standardizes our processes across the board.

Since joining in 2021, our team has been passionately dedicated to these critical initiatives, and we are eager to showcase the significant progress we are making in advancing technology transfer.

We must continually strive to improve our delivery of integrated capabilities that provide the United States with the ability to deter and defeat our adversaries when necessary.

U.S. Air Force photo by Wei Lee

The Year in Review

Success Stories from FY24

AFRL-DEVELOPED PHYSIOLOGICAL MONITORING SYSTEM UNDERGOES FLIGHT TESTS

https://www.afrl.af.mil/News/Article-Display/Article/3741098/afrl-developed-physiological-monitoring-system-undergoes-flight-tests/

The Details

WRIGHT-PATTERSON AIR FORCE BASE, Ohio (AFRL) -- An Air Force Research Laboratory-developed physiological monitoring system for pilots completed a series of F-16 flight tests 4-17 March 2024, at the U.S. Air Force Test Pilot School, or TPS, at Edwards Air Force Base, California. The 422d Test and Evaluation Squadron also completed flight tests on the system in January and February 2024 at Nellis Air Force Base, Nevada.

Six TPS student test pilots and engineers used the Integrated Cockpit Sensing, or ICS, system inside the F-16 to collect data for their capstone test management project. The ICS system, developed by AFRL's 711th Human Performance Wing, Human Effectiveness Directorate, fuses sensors that collect physiologic markers from pilots during flight.

"It aggregates measures of oxygen being provided to the brain, heart rate, respiration rate [and] skin temperature, basically a bunch of markers that provide context and help us understand how the pilot is responding to what he or she is asked to do," said Chris Dooley, lead ICS engineer, AFRL Human Effectiveness Directorate. "This data helps us look at risks such as hypoxia and cabin depressurization as well as stress responses to different phases of flight."

The TPS students partnered with the ICS team to translate customer requirements into test objectives, ultimately developing and executing a comprehensive flight test project.

"We wanted to be able to help the ICS team accelerate their technology through flight tests," said Wei "Fug" Lee, TPS director of research and the lead adviser for this project. "The goal is to demonstrate the ICS's ability to measure physio and environmental data and assess its utility in recognizing physiological insults. The team broke the plan into several specific test objectives to characterize the system's accuracy in measuring aircraft state data."

The tests also examined the relationship between physiological parameters, cognitive performance and flying performance.

ICS is a valuable tool for research since it measures physiological and environmental parameters during flight operations and

identifies normal measures versus problematic ones, said Capt. Tyler Morris, student flight test engineer and project lead.

“Initial testing has shown that the ICS has the ability to detect certain oxygen system malfunctions and the planned development of integrating an alerting system may prove to be critical in keeping aircrew safe,” Morris said.

In one test, the students intentionally swapped to an oxygen mask with a faulty inhalation valve, increasing exhalation resistance, while in another, they temporarily disconnected the oxygen supply while a copilot had control of the aircraft. ICS detected the issue in both instances.

Dooley, who traveled to California to assist with the flight tests, said ICS’s journey from idea to prototype to flight test took roughly four years. Recent successes include the system receiving approval from Air Combat Command to fly on the F-16 and the military flight release for testing from the F-16 System Program Office, or SPO.

The idea for ICS came from the need for an in-flight platform that would merge sensors and data in real time and provide that feedback to pilots. Prior to ICS, investigators merged existing data from sensors after incidents to determine what went wrong.

“We needed the ability to really investigate and then interrogate it on the back end to understand how we can improve safety for pilots as well as enhance mission effectiveness,” Dooley said.

In 2019, AFRL analyzed available commercial sensors and then identified the ones most suitable for the flight environment. Afterward, the team assembled those sensors, built the processes and designed the actual system.

AFRL scientists and engineers worked with BAE Systems (formerly Ball Aerospace) contractors on building software and hardware, as well as resolving data access issues. The team also addressed design features to make the system more acceptable to pilots.

What the team ultimately created is a system with helmet-based, base layer and life-support sensing that provides physiological data in a single package, ensuring holistic information on the pilot and operating environment during flight, Dooley said.

With the initial prototype ready in 2022, AFRL traveled to various SPOs to get the approval to fly the ICS. The team completed airworthiness tests including explosive decompression, rapid decompression, wind blast, manned and unmanned testing in the centrifuge and altitude chambers as well as electromagnetic interference and susceptibility tests, all ensuring the system would be safe and effective for pilots to use on aircraft.

In 2023, the F-16 SPO issued ICS its military flight release, agreeing that the system was safe and effective to fly on

U.S. Air Force photos by Senior Airman Megan Estrada

the F-16. Next, the team went to AFRL's Technical Board and Safety Review Board to receive the approvals to proceed to flight tests.

After communications with the commander of the 59th Test and Evaluation Squadron, the 422d Test and Evaluation Squadron became the first unit to flight test the ICS. Four F-16 pilots completed a series of flight tests in Nevada in early 2024.

"The ICS test is a product of the relationship between AFRL's 711th Human Performance Wing, the 59th and 422d Test and Evaluation Squadrons to be the operational test arm for human performance programs before they go to the Combat Air Forces, same as we do for jet systems and weapons," said Lt. Col. Robert "SWAG" Russell, squadron commander, 422d Test and Evaluation Squadron. "It's a relationship we've been building with the Aerospace Medical Association and AFRL for years."

He noted that the flight test community has been involved with the ICS program since 2020 following a recommendation made by the National Commission on Military Aviation Safety to proactively monitor aircrew physiology.

"This recommendation was borne out of a rash of fatal mishaps where pilots likely lost consciousness while flying, possibly due to oxygen starvation," Russell said. "There are a lot of qualifiers like 'likely' and 'possibly' because while we collect millions of data points on the airplanes we fly, we monitor and collect zero data on pilots."

The data collected by ICS aims to protect pilots by issuing a warning if certain measures like blood oxygen levels are problematic. Therefore, gaining pilots' acceptance of the system is important, Russell said, an assertion echoed by engineers.

"Aircrew flight equipment shops have been invaluable sources of information for getting everything up in the air and flying and figuring out how we can modify it, so it best integrates into pilots' equipment," Dooley said. "Even down to the ergonomics of how this is going to plug into this without interfering with the jet and with the pilot's ability of doing his or her job."

Following the tests at Nellis and Edwards Air Force Base, Dooley said AFRL will compile the feedback received from pilots, take those lessons learned and apply them to the system. Ultimately, AFRL plans to work with other SPOs and program offices and wants to test ICS on additional platforms. The team also hopes to eventually connect ICS to the aircraft itself to enable proactive safety measures in the case of incapacitated pilots.

U.S. Air Force photo by Senior Airman Megan Estrada

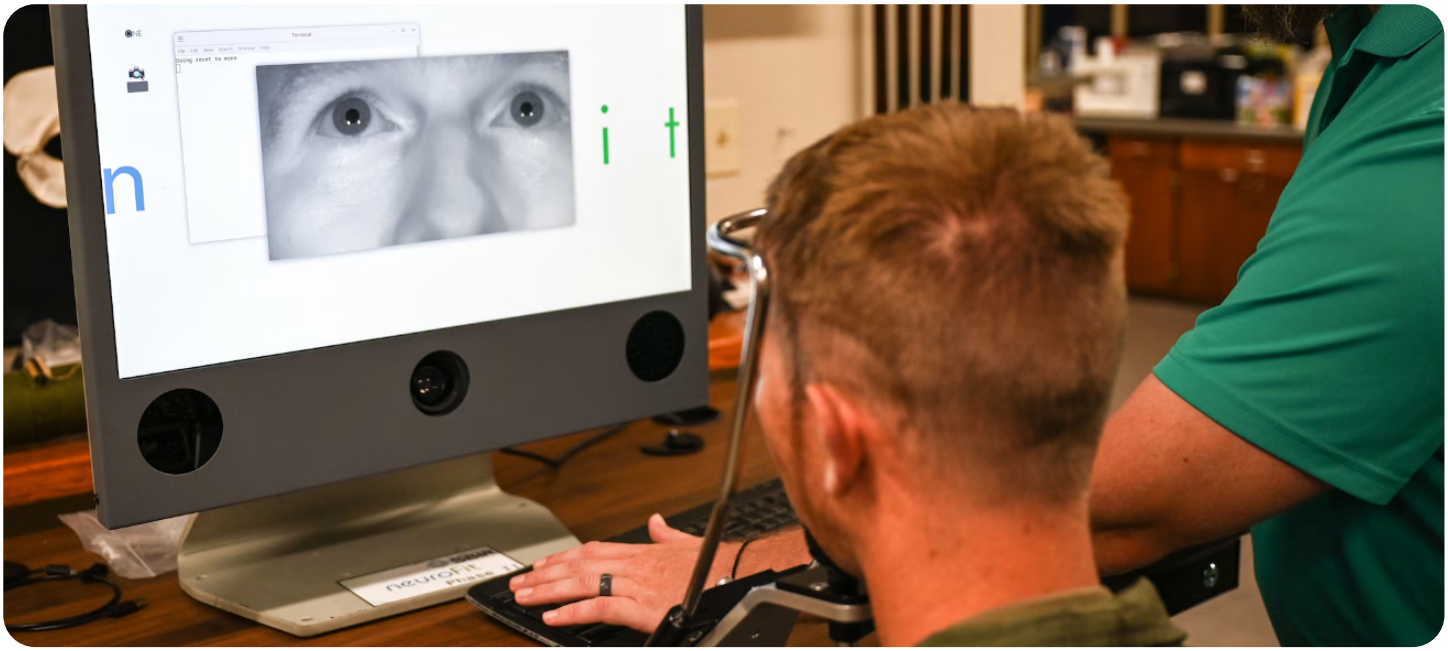
"Our team's work is about ensuring the cockpit environment they're operating in is safe so pilots can complete the mission and come home safely," Dooley said. "There's a lot of possibility with this system. ICS produces a very rich data set that doesn't exist anywhere else in the world."

Teammates from AFRL and TPS said both organizations and the Department of the Air Force benefitted from this experience.

"TPS gets a cool project and our partners in this case, the ICS team, get an accelerated flight test," Lee said. "It's just a mutually beneficial, win-win situation."

The Outcomes

Ultimately, AFRL plans to work with other SPOs and program offices and wants to test ICS on additional platforms. The team also hopes to eventually connect ICS to the aircraft itself to enable proactive safety measures in the case of incapacitated pilots. Teammates from AFRL and TPS said both organizations and the Department of the Air Force benefitted from this experience.



U.S. Air Force photo by 1st Lt. Rebecca Abordo

F-15 HUMAN PERFORMANCE TESTED DURING BAMBOO EAGLE

https://www.af.mil/News/Article-Display/Article/3897626/

The Details

The 85th Test and Evaluation Squadron (85 TES), 59th Test and Evaluation Squadron (59 TES), and Air Force Research Laboratory's 711th Human Performance Wing (AFRL/711 HPW) collected human performance data on F-15EX/E aircrew during Bamboo Eagle 24-3, from 5-8 August 2024.

A typical F-15 sortie lasts a few hours, but the extended missions provided insights into how prolonged flights affect aircrew performance. The missions, each lasting about ten hours in duration, involved four separate sorties totaling nearly two days of continuous data collection. This extended testing helps refine procedures for managing long-duration operations and enhances aircrew readiness for potential conflicts in the Indo-Pacific region.

"Our data collection plan is extremely unique because it gathers real-time data on multiple physiologic and cognitive processes directly from pilots during flight," said Chris Dooley, 711 HPW core research area lead. "This data will help us address two key questions: the impact of long duration sorties on aircrew and what recovery is needed before they are fit for another flight."

Researchers measured glucose levels, sleep recovery, cortisol levels, cognitive reaction times and hydration. The teams monitored aircrew members before, during and after the flights to gather comprehensive data.

Inflight physiologic systems, with sensors integrated into the aircrew's helmets, captured real-time physiological data. They also used glucose monitors, collected waste samples, and recorded weight to assess hydration and energy levels. Post-flight, the team measured cognitive reaction times using an operational vision testing machine.

BE 24-3 also marked the first in-flight testing of the FOCUS Mission Readiness App, a fatigue risk management mobile application for warfighters developed by AFRL's Human Effectiveness Directorate. F-15EX/E aircrew completed the Psychomotor Vigilance Test (PVT), which provides an at-the-moment fatigue assessment.

"We used PVT data in the application to provide more individualized fatigue assessments and predictions from our modeling capabilities," said Dr. Megan Morris, 711 HPW research psychologist and core research area lead.

The FOCUS app provides real-time, individualized fatigue assessments and predictions based on sleep and behavioral data, as well as personalized fatigue countermeasure suggestions, Morris said. The app aims to increase performance and decrease safety risks during missions.

"This testing provides quantifiable data to show how our bodies are reacting to certain inputs, whether that's stress, dehydration, or eating different types of foods," said Maj. David Partin, 85 TES F-15 Division Chief. "That data informs the need for the education, training and preparation necessary before flight."

Lt. Col. Matthew Russel, 85 TES Director of Operations, and Partin both collected performance data during their sortie in the F-15E.

U.S. Air Force photo by 1st Lt. Rebecca Abordo

"Ultimately, human performance dictates our battle rhythm," said Russel. "Prioritizing self-care is essential for effective recovery and sustaining tactical operations in forward operating locations."

This testing helps refine tactics, techniques, and procedures (TTPs) by offering insights into how long flights affect energy levels and cognitive functions. The results will help assess risks associated with long duration flights and improve preparation for extended missions.

"For operational test, we want to start looking at the best way to inform TTPs for the future," said Abigail Santek, 59th TES Human Performance Program Analyst. "Efforts like this are a great opportunity for us to educate operators on how to improve performance indicators such as sleep, nutrition, and fatigue management strategies."

The partnership and collaboration between AFRL and the 53rd Wing's operational test units was integral to the comprehensive data collection plan.

"Diversity of thought and background is critical in human performance research," said Dooley. "The relationships we have between AFRL and operational test, united by a common goal, enhances our ability to drive significant advancements."

The units plan on collecting and testing more human performance data during the next iteration of Bamboo Eagle. TEST!

Marketing & Outreach

While our technologies weren't selected for FedTech's Foundry and Forge Programs in FY23, we were excited to be selected as potential participants for the Homeland Security Startup Studio in FY24 — a major leap forward in our outreach efforts. These programs have spotlighted many of our lab's groundbreaking technologies that may have previously gone unnoticed in licensing discussions. Since FY21, our Office of Research and Technology Applications (ORTA) has been relentless in our mission to elevate awareness of our innovations, and these initiatives are crucial in driving that objective. Our commitment to enhancing our marketing strategies has already shown significant results.

In partnership with the Wright Brothers Institute (WBI), a leading innovation partnership intermediary, we are supercharging our marketing strategies. WBI has crafted targeted marketing materials that articulate how our technologies can be commercialized to address specific unmet needs, highlighting their wide-ranging applications. Additionally, WBI provides vital analyses and feedback, ensuring our patent strategy aligns with industry demands.

While we have set our sights on submitting more technologies for the Federal Laboratory Consortium (FLC) awards, our recent submission for the FLC 2025 Planner stands out. This prestigious opportunity could provide our lab's technologies with year-round visibility. Although our entry was not selected amid over 140 submissions—a 59% increase from last year—we remain steadfast in our commitment to showcase our exceptional work.

We have also entered the "LabTech in Your Life" initiative, which merges cutting-edge technologies into an engaging virtual city, although these innovations have yet to be unveiled.

Lastly, the ORTA should prioritize the development of a dedicated website to showcase all available patents for licensing, creating a robust platform for potential collaborators and investors to explore our groundbreaking innovations.

Barriers & Problems

Since last fiscal year, a key challenge for our team has been achieving a comprehensive understanding of our Patent and License Portfolio. We initiated this evaluation at the start of FY23 and have systematically identified numerous critical issues requiring immediate attention in our licensing agreements. While many of these concerns have already been addressed, we are committed to continuous improvement.

Our next goal is to meticulously document this knowledge for future reference, ensuring we avoid reinventing the wheel. What initially seemed like barriers have transformed into valuable opportunities for enhancement—not just for our team, but potentially at higher levels within the Department of the Air Force Technology Transfer and Transition (T3) Program Executive Office (PEO). This proactive approach positions us to drive meaningful change and elevate our licensing practices.

Lessons Learned

Since the Wing launched the Continuous Learning and Improving Practices (CLIP) Initiative last fiscal year, we've made remarkable strides in revitalizing outdated information and processes that needed urgent attention. The patent and licensing portfolio has emerged as a key learning area, and our next objective is to thoroughly document this knowledge for future reference, ensuring that we don't have to reinvent the wheel.

We have invested countless hours in mastering critical processes, including the timely issuance of invoice letters, streamlining royalty payments — aiming for all our licensees to pay via direct transfer — issuing termination letters, and clarifying the intricacies of licensing agreements. This focused effort is setting the stage for a more efficient and effective operation moving forward.

Facilities & Equipment

"Integrated Cockpit Sensing"

The Integrated Cockpit Sensing (ICS) system provides a modular, airworthy platform for comprehensive physiological, life-support and environmental monitoring to improve pilot safety and performance. A team from the Air Force Research Laboratory's 711th Human Performance Wing, Human Effectiveness Directorate began developing the system in 2020 and flight tested it on the F-16 in 2024. Scientists and engineers designed the system to identify, explain and mitigate in-flight physiological events. Ultimately, the warfighter will benefit from increased understanding of combat aircrew physiology during flight, allowing for multiple paths to improve aircrew safety and effectiveness.

The Department of Defense has ongoing concerns regarding physiological events impacting pilots of training, fighter and attack aircraft with both the U.S. Air Force and U.S. Navy grounding aircraft and expending considerable resources in search of causes and solutions. Ongoing research and development efforts seek to improve the scientific understanding of physiological performance in these environments.

The idea for ICS came from the need for an in-flight platform that would merge sensors and data in real time and provide that feedback to pilots. Prior to ICS, investigators merged existing data from sensors after incidents to determine what went wrong. Cockpit sensing remains a key gap as there are no fielded solutions to provide data for root cause analysis, which in turn could drive pilot decision making as well as resource prioritization for life support systems modification.

"En Route Care Training"

The En Route Care Training Department in the United States Air Force School of Aerospace Medicine, or USAFSAM, trains medical personnel across the Department of Defense to transport and deliver care to warfighters all over the world. USAFSAM is part of the Air Force Research Laboratory's 711th Human Performance Wing.

USAFSAM is an internationally renowned center for aerospace medical learning, consultation, aerospace medical investigations, and aircrew health assessment. It promotes readiness and protects force and community health by using a range of tools and expertise including environmental & health surveillance, laboratory & risk analysis, process re-engineering, consultation, and technological innovation to maximize operational health capabilities. USAFSAM trains approximately 6,000 students each year.

"Biotech"

Biotechnology is an engineering discipline that works with living systems to produce a wide range of technologies and products. Much like artificial intelligence, this disruptive technology will have global economic, socio-political, and military impacts. Located at Wright-Patterson Air Force Base, the 711th Human Performance Wing (HPW) and the Air Force Research Laboratory are unique organizations that bring together scientists, engineers, and aeromedical professionals to protect our No. 1 asset – our Airmen and Guardians. Our mission is to discover, demonstrate, and transition knowledge products and technology solutions

from the full spectrum of bioscience, biotechnology, and aerospace medicine, to enable, enhance, sustain, and restore the health and performance of our multi-domain warfighters.

"Research Altitude Chambers"

The Air Force Research Laboratory's Research Altitude Chambers (RAC), managed by the lab's 711th Human Performance Wing, are a family of four computer-controlled altitude chambers where researchers can perform a variety of studies to ensure the durability of flight equipment as well as to determine the effects altitude has on the human body. These chambers also provide a training capability that prepare air crews to perform their missions at various altitudes. The RAC joins AFRL's centrifuge and Naval Medical Research Unit-Dayton's KRAKEN to create an epicenter of aerospace physiology research at Wright-Patterson Air Force Base. This partnership brings a wealth of knowledge and expertise to the Dayton area that works to enable, enhance and sustain military air crews and their missions. The data accrued from research in AFRL's RAC ensures our air crews have durable equipment they need during flight operations. Further, the chambers provide the crews essential altitude training so they can complete their missions efficiently and effectively, and return home safely to their families. Aerospace Physiology research and training is essential to the readiness of our air crews and their missions.

"Infectious Disease Training"

The Center for Sustainment of Trauma and Readiness Skills (C-STARS) in Omaha, Nebraska, is a medical training program offered through the United States Air Force School of Aerospace Medicine (USAFSAM), in partnership with the University of Nebraska Medical Center/Nebraska Medicine. This program, which joins three other C-STARS programs around the U.S., was designed to prepare Air Force medical personnel to respond to highly hazardous communicable diseases – infectious diseases that are capable of causing serious illness and spreading from person-to-person – to ensure operational readiness and maintain clinical currency. The Air Force's C-STARS program and partnerships with civilian hospitals provides opportunities for medical Airmen to receive advanced training outside of their military treatment facility in skills needed in an operational setting. With the addition of C-STARS Omaha, this training platform will continue to evolve to ensure medical Airmen remain current and ready.

C-STARS Omaha's inaugural course is "Principles of Biocontainment Care", which will cover recognition, diagnosis, and management of highly hazardous communicable diseases; infection prevention and control principles; communication, skills training, and simulation scenarios while donned in appropriate personal protective equipment. The program, which was designed and developed following the 2014-2016 Ebola outbreak, trains and prepares medical Airmen to respond to infectious disease threats that could impact military personnel and operations. Medical Airmen require specialized training to not only deliver safe and effective care to the patients suffering from infectious diseases, but also to protect themselves from infection. The other C-STARS locations are in Cincinnati, OH; Baltimore, MD; and St. Louis, MO. USAFSAM is located at Wright-Patterson Air Force Base in Dayton, OH, and is part of the Air Force Research Laboratory's 711th Human Performance Wing.

"Epi Lab - Epidemiology Reference Laboratory"

The Air Force Research Laboratory's Epidemiology Reference Laboratory, which is housed in our 711th Human Performance Wing's USAF School of Aerospace Medicine, focuses on clinical diagnostic, public health testing and force health screening, routinely performing tests six days a week (or about 2.1 million tests a year) for clinics and hospitals treating active duty service members, reservists and National Guard members, and their beneficiaries. The Epi Lab, as it's commonly referred to, is the Air Force's sole clinical reference laboratory, and because of this, has proven experience testing respiratory infection samples and working with the Centers for Disease Control and Prevention processes. This lab has been operating since 1990.

The lab routinely performs testing for immune status, screening for STIs, and infections such as Human Immunodeficiency Virus (HIV), gonorrhea, syphilis and hepatitis. The lab was also involved in past global outbreaks such as SARs and Ebola. The collected data from these tests enables the analysis of disease within the joint force. It is also shared with civilian public health agencies, contributing to the tracking of diseases such as influenza and sexually transmitted diseases, as well as supporting disease prevention efforts such as the formulation of vaccines.

Resources Utilized

To enhance our support for our S&Es, our team is committed to participating in every training session offered by the DAFT3PO. Each team member is required to attend at least one training session per fiscal year, ensuring we remain at the forefront of T3 knowledge.

Beyond these mandatory sessions, we actively engage in key conferences, such as the Federal Laboratory Consortium (FLC) and the DAFT3 Annual Summit, where we deepen our expertise on critical T3 topics. Insights gained from these events are integrated into our ongoing training for S&Es, with a particular emphasis on Intellectual Property—a subject that has garnered significant interest.

In collaboration with TechLink, our partnership intermediary, we have significantly enriched our training offerings, in addition to mandatory topics like T3 processes and

procedures. We are committed to addressing the direct feedback from our S&Es, including requests for in-depth sessions on Intellectual Property, which will be implemented promptly. Moreover, we are actively exploring innovative strategies to elevate our training programs and better serve our S&E community, ensuring they have the knowledge and skills to excel.

Additionally, we provide tailored training and briefings at leadership's request. Throughout the fiscal year, we have delivered multiple presentations on the Wing's royalties to key figures, including the Wing Commander, Human Effectiveness Director, and Chief Scientist. Ongoing discussions focus on potential incentives and awards aimed at boosting the number of patents issued by the Wing, reinforcing our commitment to innovation and excellence.

FY24 Metrics

Inventions

Number of new inventions disclosed	6
Number of U.S. patent applications filed	15
Total Number of U.S. patents issued	16
Total number of active patents	100

Licensing

Number of total active invention licenses	37
Number of newly executed invention licenses	12
Number of newly executed invention licenses granted to small businesses	12
Total active income bearing licenses	28 (PLA & ELA)
Total active non-income bearing licenses	4 (ELA)
Number of total active income bearing exclusive licenses	4
Number of partially exclusive licenses	3
Number of non-exclusive licenses	29
All other licenses, not including invention or software, total active	9 (TLA)
Number of total active income bearing exclusive licenses	4
All other licenses, not including invention or software, granted to small businesses	33

Time for Granting Invention Licenses

Average time	3 months
Minimum time	11 days
Maximum time	7 months
Number of licenses terminated for cause	8

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	59
Number of CRADAs, Newly Executed	15
Number of Newly Executed CRADAs involving small businesses	6
Estimated CRADA contributed value	$123,586,801

Educational Partnership Agreements (EPAs)

Number of total active EPAs	17
Number of newly executed EPAs	3

Software Licensing

(licensing in which DoD grants the right to use or sell the software)

Total number of active software licenses	4
Total number of new software licenses	1
Number of newly executed software licenses involving small businesses	1
Total number of royalty bearing software licenses	4
Total royalties received from software licenses	$21,000
What authority or authorities did the component use for licensing software?	Sec 801 of Public Law 113-66

AFRL Directed Energy & Space Vehicles (AFRL/RD & RV)

Kirtland Air Force Base, New Mexico

AFRL.RDOX.OrgBox@us.af.mil

https://www.afrl.af.mil/RV/

Overview

AFRL Directed Energy (RD) Directorate is the Department of the Air Force's (DAF) Center of Expertise for directed energy and optical technologies. Located at Kirtland Air Force Base, New Mexico, the Directorate develops and transitions technologies in four core technical competencies: laser systems, high power electromagnetics, weapons modeling and simulation, and directed energy and electro-optics for space superiority.

AFRL Space Vehicle's (RV) Directorate Mission Statement: From developing the latest in space component technology to flying state-of-the-art satellite experiments, AFRL/RV ensures that the United States and its allies maintain space superiority. The Space Vehicles Directorate is the Air Force's center of excellence for space research, develops and transitions technologies that provide space-based capabilities to the nation. RV scientists and engineers lead premier spacecraft programs.

Strategy

ORTA Role & Impact: The ORTA plays a pivotal role in shaping the RD and RV approach to technology transfer and transition by actively developing and promoting effective partnerships between government and the private sector. The ORTA serves as the bridge between research and commercialization, ensuring that the innovative technologies developed within the directorates are successfully transferred to the marketplace and by scouting and assessing innovation and capability in the private sector for transition to the DAF. By fostering collaborations and facilitating the licensing of intellectual property, the ORTA enables the directorates to leverage the expertise and resources of commercial, academic, and public entities, leading to accelerated development. And through innovative commercial technology assessment programs, the ORTA accelerates the adoption of cutting-edge technologies. This partnership-driven approach not only enhances the impact and reach of the directorate's research efforts but also contributes to economic growth through the commercialization of intellectual property.

By working closely with researchers, industry partners, and other stakeholders, the ORTA serves as a connector between research and application, translating scientific discoveries into tangible solutions that address the challenges faced by the air, space, and cyberspace domains. Technology transfer and transition (T3) fits into the strategy of both directorates by enabling the successful transfer of research outcomes into practical application and the successful adaptation of technology from the private sector in support of the warfighter.

T3 Tools & Directorate Strategy: Technology transfer agreements and tools contribute to the advancement of the strategy and mission of the lab by enabling effective collaboration, resource sharing, and commercialization of intellectual property. They enable the directorates to collaborate with industry partners, fostering the development and commercialization of lab-originated technologies. Furthermore, these agreements and tools help in protecting intellectual property rights, ensuring the lab's strategic interests are safeguarded while promoting technological advancements. For example, Cooperative Research and Development Agreements (CRADAs) allow the directorates to partner with external entities, accepting funds, personnel, services, and property to advance research and development efforts. This fosters collaboration and knowledge exchange, enabling the lab to leverage external expertise and resources to accelerate technological advancements. Commercial Test Agreements (CTAs) provide the opportunity for the lab to make its testing facilities and services available to external entities for a fee. This not only generates revenue but also promotes the practical application and validation of the lab's technologies in real-world settings, furthering the mission of the lab. Patent License Agreements (PLAs) facilitate the commercialization of intellectual property developed by the lab's inventors. By licensing the technology to commercial entities, the lab can generate revenue and ensure widespread adoption and use of its innovations. This not only supports the lab's mission but also contributes to the advancement of technology in various industries. Education Partnership Agreements (EPAs) allow the directorates to partner with academic institutions, promoting scientific study and

engagement at all levels of education. This collaboration facilitates knowledge transfer, curriculum development, and research opportunities for students and faculty. Additionally, EPAs enable the lab to loan or donate surplus equipment, enhancing educational resources and fostering a culture of learning and innovation. These examples of technology transfer and engagement are some of the many tools that facilitate the strategy and mission of the lab. Other tools at the disposal of the directorates, include but are not limited to: Information Transfer Agreements (ITAs) — software and date, Material Transfer Agreements (MTAs) — material and material information only for test and evaluation activities, Joint Ownership Agreements (JOAs) — manage the co-ownership of intellectual property between the lab and an external party.

ORTA One-Year Objectives & Strategy: One year objectives for technology transfer include increasing the number of licensing agreements with industry partners to facilitate the commercialization of lab-developed technologies. Another objective is to enhance collaborations with academic institutions and private sector entities to accelerate the transition of research into commercial applications. Lastly, the office aims to improve its intellectual property management strategies to protect the lab's interests and promote innovation.

ORTA Near Term Goals & Strategy: Near term goals include establishing more strategic partnerships with industry leaders to expedite the commercialization of lab-developed technologies. The office also aims to streamline its processes for identifying, protecting, and licensing intellectual property to ensure efficient technology transfer. Additionally, the office plans to enhance its outreach and engagement efforts to attract potential collaborators and licensees, thereby promoting the transfer of research into market-ready applications.

ORTA Long Term Goals & Strategy: Long term goals include building on the successful legacy of engagement with the private sector to discover and assess promising technology for National Security Space by serving as a catalyst for innovation by fostering an environment that encourages creativity, entrepreneurial endeavor, and the advancement of groundbreaking technologies for both Space and Directed Energy capabilities. The office aims to be a key connector for the lab with industry and academia, establishing robust networks and partnerships that facilitate the exchange of ideas, resources, and expertise. Lastly, it seeks to be a facilitator of research activity, providing the necessary support and infrastructure to enable researchers to advance their work, thereby accelerating the spin-out of lab-developed technologies into commercial applications and spin-in of commercial technology toward DAF mission capabilities.

The Year in Review

Success Stories from FY24

AFRL NM STEM OUTREACH CELEBRATES MILESTONE ANNIVERSARIES

https://www.afrl.af.mil/News/Article-Display/Article/3821641/afrl-recognizes-2024-new-mexico-excellence-in-stem-at-annual-awards-event/

The Details

AFRL celebrated two STEM outreach anniversary milestones during the Mission to Mars Link-Up Day event on 25 April 2024: the 30th anniversary of Mission to Mars and the 20th anniversary of DoD Science and Technology Academies Reinforcing Basic Aviation and Space Exploration New Mexico (STARBASE NM). Thirty-six invited guests joined the AFRL Tech Engagement team to network and share details about the students and teachers impacted by these programs, and the volunteers who contributed to their success.

The Outcomes

Lt Governor Howie Morales shared remarks during the event and Albuquerque Economic Development Director Max Gruner read a proclamation declaring 25 April 2024 as AFRL STEM Day!

Photo by AFRL Public Affairs

DONATION: 60 YEAR-OLD ANTIQUE BAKER-NUNN TELESCOPE

The Details

A 60-year-old antique Baker-Nunn telescope was donated by AFRL/RDSM (Air Force Maui Optical & Surveillance Squadron, AMOS) to the Space Foundation Discovery Center's historic displays, STEM-related environment located in Colorado Springs, CO.

The Outcomes

The telescope was successfully shipped and received by the Space Foundation. The display will provide an understanding of the importance of space observation to visitors of the Discovery Center. The Space Foundation uses historic displays to educate visitors on the roles people and systems played to prepare us for a strong future of space programs benefiting our nation and others. The Space Foundation will also facilitate a 1-week summer 'space camp' for Maui youth, providing an excellent STEM outreach collaboration.

Marketing & Outreach

1. Via the South West Innovation Alliance (SWIA) PIA and sub awardee New Mexico State University (NMSU): Arrowhead Center an AFRL Tech SPRINT was conducted for 5 weeks: (16 Oct-13 Nov 2023). Our very first AFRL RD & RV Tech SPRINT involved three AFRL Inventors: Matt Squires, (RV) Dana Teague (RD) and Scott Milster (RV).

   Content:

   1. Identifying the primary applications and/or direct applications as a product or stand alone system of their technology.
   2. Identify alternate applications.
   3. Problem solving
   4. Customer discovery.
   5. Application/customer segments, competitors, market analysis and value proposition for technology usage.
   6. Potential licensees, costs/revenue, and recent acquisitions for technology usage.

2. In FY24, 16 technologies were identified with over 257 companies and technology synergies through market research. Of the 257 companies four companies are interested in collaborating with RD & RV. One company is in process of a patent license agreement. Background: Via the SWIA PIA with New Mexico Tech and sub awardees University of New Mexico (UNM) and New Mexico State University (NMSU) team up to gather Mailing/Targeted Campaigns for the RD & RV IP portfolio. They facilitate partnerships with other state or federal organizations and other educational institutions on technology expansions or technology transfer/ transition opportunities to enhance and meet strategic objectives for long or near term project needs for RD & RV. Through technology marketing efforts, one of the objectives is to increase commercialization of RD & RV patented technologies, which may lead to an increase in finding industry or small business partners interested in collaborating through technology transfer agreements with RD & RV. Some of these efforts include continuing discussions with companies who are initially interested in certain technology focused areas.

3. AFRL Innovate NM Showcase (5 March 2024) was held and 2 AFRL inventors participated and presented their technologies at the Showcase

4. Also, VIA the SWIA PIA with NM Tech "technology transfer/ transition team" help connect the following cohorts to potential government opportunities. Two Cohort sessions were conducted in FY24: Speaker Melissa Ortiz, T3 Manager presented to Cohort w/Space Tech Talk (NM Trade Alliance PIA): (16 May 24) six companies; Cohort with Catalyst Campus Colorado for CASDA2: (21 May 24) 6 companies; CAAML Cohort for Catalyst folks in Colorado Springs (30 August 2024) 6 companies

5. A Patent Process Discovery session w/ Dr. Scott Erwin, RV Chief Scientist & Erin PettyJohn, RD Director are discussing a to create a member board for invention disclosure evaluations (IDE) (May/June 2024) more to follow.

Barriers & Problems

6 PLAs have not paid their royalties for some time and the Technology transfer & Transition team in RDOX struggled for the last year or two to obtain the correct process lead by Dayton Ohio. Our office worked with the 711th ORTA to formalize the correct verbiage and dollar values to collect for the First letter distribution.

Resources Utilized

1. ANTARES w/Maui (RDS) folks to present on Patent process and technical progress, challenges, risks, and opportunities in ANTARES activities: Speakers: Melissa Ortiz, T3 Manager, SWIA PIA and David Narciso, Patent Attorney (8 May 2024) 25 participants
2. AFRL Scholar Lunch and Learn: Speakers: Melissa Ortiz and Susan Cornelius on "Cultivating the Intrapreneur" - What happens after research and discovery? If you have an idea, how do you protect it? How do you commercialize it? (11 June 24) Educated 10 Scholars and AFRL mentors and the outcome was very productive and interactive!
3. PRS PM/BM How to utilize EPAs! (30 April 2024) 50 participants
4. DAFT3 workshop in Arlington, VA (3 staff members of the SWIA PIA attended on 12-15 Aug 2024)
5. PRS PM/BM Forum on the Patent Process and joint ownership inventions! (21 Aug 2024) 30 participants

AFRL Collaboration Centers: the purpose of our collaboration centers is to serve as spaces where creativity, innovation, and education converge to benefit our workforce, partners, and the broader community. Our vision is to continually optimize these spaces, ensuring they remain at the forefront of transformative progress, propelling the lab toward a future characterized by ingenuity, collaboration, and lifelong learning. With approximately 24,481 square feet under management, these spaces are dynamic, adaptable, and purpose-driven. These spaces include: Q Station (off-base, "front door"space), AFRL STEM Academy (on-base, K-12+ outreach/education center), AFRL Innovation Lab (off-base, seminar/workshop/meeting center), AFRL Maker Hub (on-base, creative project and prototyping support facility).

Facilities & Equipment

Unique Labs and facilities are being utilized at AFRL RD & RV through CRADAs and CTAs see list of labs:

- Advanced Space Power Laboratory (ASPL)
- Deployable Structures Experiment Laboratory (DeSEL)
- Infrared Radiation Effects Laboratory (IRREL)
- Large Area Space Structures (LASS) Laboratory
- Microelectronics Test and Measurement Laboratory
- Materials Testing Laboratory (MTL)
- Radiation Hardening Test Facility
- Spacecraft Charging and Instrument Calibration Laboratory (SCICL)
- Static Load Testing Laboratory
- Thermal Laboratory

One example through several CTAs and CRADAs over the last 15 years IRREL has completed over $10M worth of industry funded focal plane arrays (FPA) characterization directly impacted double digit billion E/O procurement. Of these facilities being used by industry on the technical approach is to determine the radiation degradation of visible and infrared focal plane arrays (IRFPAs) and process evaluation chips (PECs) in a proton fluence/TID environment. The IR detectors will be short-wavelength, mid-wavelength, and long wavelength infrared detectors. Benefits to AFRL: These FPA technologies may be used in future Government satellite programs and the radiation tolerance of these devices needs to be assessed. These experiments will provide the Government with insight into both the radiometric and radiation performance of the visible and infrared detector technologies, which will permit the Government to shape future investments in this technology.

FY24 Metrics

Inventions

Number of new inventions disclosed	**8**
Number of U.S. patent applications filed	**21**
Total Number of U.S. patents issued	**10**
Total number of active patents	**7**

Licensing

Number of total active invention licenses	10
Total active income bearing licenses	6
Number of total active income bearing exclusive licenses	4
Number of non-exclusive licenses	3
All other licenses, not including invention or software, total active	6
Number of total active income bearing exclusive licenses	6

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	101
Total CRADA Revenue	$68,532.00
Estimated CRADA contributed value	$18,652,030.00

Educational Partnership Agreements (EPAs)

Number of total active EPAs	55
Number of newly executed EPAs	15

PA CLEARED #AFRL-2024-5979

AFRL Information Directorate (AFRL/RI)

Rome, New York

AFRL.RI.TT@us.af.mil

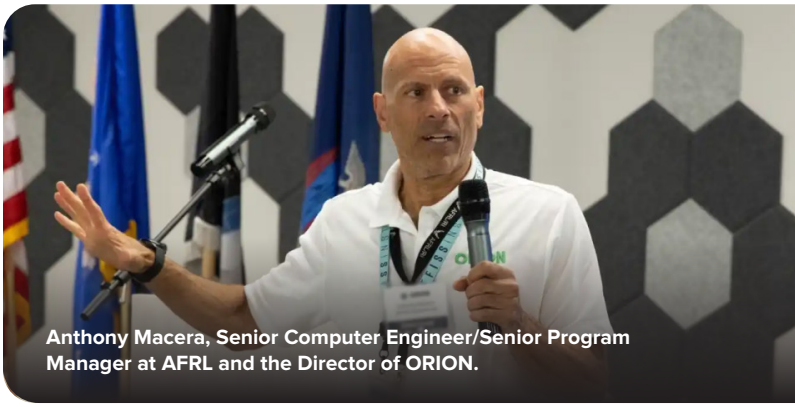
https://www.afrl.af.mil/RI/

Overview

The Information Directorate (RI) is the Air Force's and nation's premier research organization for Command, Control, Communications, Computers, and Intelligence (C4I) and Cyber technologies. The directorate explores, prototypes, and demonstrates high-impact, affordable and game-changing technologies. These technologies transform data into information and subsequently knowledge for decision makers to command and control forces. This knowledge gives our air, space and cyberspace forces the competitive advantage needed to protect and defend the nation. Our mission is to explore, prototype, and demonstrate high-impact, game changing technologies that enable the Air Force and Nation to maintain its superior technical advantage. With a vision to lead the Air Force and Nation in command, control, communications, computers, and intelligence (C4I) and cyber science, technology, research and development. We are located in central New York at the crossroads of the Adirondack Mountains, the Great Lakes, Southern Tier and passage to NYC.

Strategy

The ORTA office at the Information Directorate sits within the Alliances, Transitions and Customer Relations branch with the delegated authority enter into and execute CRADAs, CTAs, EPAs, PLAs, SLAs, and ITAs. The ORTA is weaved with the legal office, divisions and investment strategy process to capture technology transfer opportunities early and often. The ORTA in combination with our PIA partners, the Griffiss Institute and New York State Technology Enterprise Corporation (NYSTEC), aim to continue to improve our invention disclosure education and process, continue to educate our Subject Matter Experts (SMEs) and partners in technology transfer opportunities, provide opportunities to interact with outside industry and academia, and continue to be a force multiplier in technology transfer.



Anthony Macera, Senior Computer Engineer/Senior Program Manager at AFRL and the Director of ORION.

The Year in Review

Success Stories from FY24

OPEN-ARCHITECTURE RESILIENT IOT FOR OPERATIONAL NETWORKS (ORION)

https://orionassured.com/news-and-events/

The Details

ORION as the region's first cross-organizational tech partnership focused on the Internet of Things (IoT). IoT connects everyday devices and objects to the internet, allowing them to communicate with each other. This technology enhances our lives by making everyday tasks more convenient and efficient, such as controlling home devices remotely or tracking health metrics.

ORION is a technology accelerator and innovation ecosystem aimed at augmenting the Department of Defense's (DoD) ability to develop, secure, deploy, and utilize IoT technology. Operating as a force in cyber assurance, integration, demonstration, and transition, the ribbon-cutting acknowledged ORION's team of technical experts and partners that possess the skills and capabilities needed to ensure the integrity

and resilience of critical systems through customizable environments and cutting-edge tooling.

Impact:

Since their start in May, Innovation & Partnerships (I&P) has supported inventors with twenty one invention disclosure forms in various states of draft with one of these disclosures finalized and submitted resulting in a patent application filed. I&P is about to begin pursuing approximately an additional ten with early ideas/concepts.

Inventor Soamar Homsi states, "The Griffiss Institute (GI) provided me with excellent communication to facilitate the invention disclosure process. With just my publication, they were able to understand my invention and break it down into simple terms for the disclosure, conducted all the market research and filled out the heavy lift of the disclosure document, saving me a lot of time. I've never had this level of service before and in such a quick turnaround time."

The Outcomes

ORION is not only a testament to local ingenuity but also a significant step forward for the IoT industry, offering a model of cross-organizational collaboration that could inspire similar partnerships across the country.

ORION has two locations on Rome's Griffiss Business & Technology Park and the facilities offer specialized testing services to meet distinct needs. The ORION IoT Laboratory at Innovare Advancement Center focuses on evaluating and ensuring the quality of software through performance and security testing, while NTROPEE is dedicated to assessing hardware durability and reliability through rigorous physical and environmental testing.

INVENTION DISCLOSURE PROCESS IMPROVEMENT

The Details

Background:

For the past few months, the I&P office of the Griffiss Institute has been conducting internal scouting in support of the T2 mission at the Information Directorate. This effort has been led by Tanya Waite, Senior Manager, Commercialization & Innovation and Kurt Bessel, Senior Manager for IP & Invention Support. This includes building relationships with researchers, scientists, and engineers at RI, promoting awareness and education about intellectual property and the importance of technology transfer to the mission, identifying novel innovations, and helping support the submission of invention disclosures to protect such potential intellectual property (both patents and unpatented software).

Impact:

Since their start in May, I&P has supported inventors with twenty one invention disclosure forms in various states of draft with one of these disclosures finalized and submitted resulting in a patent application filed. I&P is about to begin pursuing approximately an additional ten with early ideas/concepts.

Inventor Soamar Homsi states, "The GI provided me with excellent communication to facilitate the invention disclosure process. With just my publication, they were able to understand my invention and break it down into simple terms for the disclosure, conducted all the market research and filled out the heavy lift of the disclosure document, saving me a lot of time. I've never had this level of service before and in such a quick turnaround time."

The Outcomes

Process Improvements:

The process improvements to the invention disclosure process the GI has implemented include:

- A focus on the customer experience for inventors;
- Providing a primary point of contact for each inventor for all things related to inventions;
- Outreach to inventors who have publications in the last year with potential inventions in order to meet the one year patent bar;
- Taking on much of the drafting of the invention disclosure so that the burden of time is very minimal for the inventor;
- Providing regular educational sessions about intellectual property and why T2 is important;
- Providing marketing slick sheets;
- Improved communication so that the inventor is always in the loop;
- Close communication with ORTA and AFMCLO/JAZ patent attorneys who are drafting and filing the patents;
- Building relationships with inventors to advise on early-stage ideas and identify potential partnering pathways.

Marketing & Outreach

Utilizing the Griffiss Institute PIA, an external scout has been working this last year to extend our outreach activities by traveling on our behalf and interacting with outside industry and academia making connections to RI SMEs as well as SMEs across the directorates.

Barriers & Problems

1. The collections process when a licensee is no longer in business but did not communicate with the AF on their dissolution. Improved processes to stay current and communicate with licensees with clear statements in a cover letter of their agreement spelling out the expectations of all parties.
2. Length of time to get international agreements through the SAF approval process. Not overcome, yet.

Lessons Learned

This FY we audited our licenses, conducted collection methods and terminated inactive licenses which provided awareness in the lack of these processes in prior years, the need to remain current, and consistently communicate with our licensees.

Resources Utilized

T2 education and training to lab, Professional development of ORTA team

Facilities & Equipment

Stockbridge/Newport sites- 12 commercial testing agreements are in place to utilize the, 78 Acres, 360 degrees pattern measurement with ideal geography for essential measurements of the F-35 aircraft antenna patterns, inflatable reflector antennas for Special Operations Command (SOCOM), aircraft and vehicle antenna performance measurements, critical capability for future aircraft/vehicle design and development and terahertz comm demonstration - provides LPI/LPD/AJ air-to-air comm links.

ORION at NTROPEE Facility- Open-Architecture Resilient IoT for Operational Networks (ORION) is the region's first cross-organizational tech partnership focused on the Internet of Things (IoT). ORION is a technology accelerator and innovation ecosystem aimed at augmenting the Department of Defense's (DoD) ability to develop, secure, deploy, and utilize IoT technology. Operating as a force in cyber assurance, integration, demonstration, and transition. ORION is a congressionally funded initiative between the Air Force Research Laboratory Information Directorate (AFRL), Assured Information Security (AIS), Quanterion Solutions, the Griffiss Institute, and the New York State Technology Enterprise Corporation (NYSTEC).

Commercial Test Agreement executing DAF CLOUDworks in classified environments. CloudWorks comprises an agile pipeline that allows for rapid updates to meet evolving needs, where software applications can be written, traverse a number of "evaluation stops" to assess readiness and move into operational use.

FY24 Metrics

Inventions

Number of new inventions disclosed	17
Number of U.S. patent applications filed	7
Total Number of U.S. patents issued	3
Total number of active patents	18

Licensing

Number of total active invention licenses	140
Number of newly executed invention licenses	1
Number of newly executed invention licenses granted to small businesses	1
Total active income bearing licenses	38
Number of total active income bearing exclusive licenses	38
Number of partially exclusive licenses	2
Number of non-exclusive licenses	16
All other licenses, not including invention or software, total active	6
Number of total active income bearing exclusive licenses	11
All other licenses, not including invention or software, granted to small businesses	29

Time for Granting Invention Licenses

Average time	45 days
Minimum time	30 days
Maximum time	50 days
Number of licenses terminated for cause	11

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	75
Number of CRADAs, Newly Executed	16
Number of Newly Executed CRADAs involving small businesses	7
Total CRADA Revenue	$52,000
Estimated CRADA contributed value	$32,885,927

Educational Partnership Agreements (EPAs)

Number of total active EPAs	136
Number of newly executed EPAs	16

Software Licensing

(licensing in which DoD grants the right to use or sell the software)

Total number of active software licenses	3
Total number of royalty bearing software licenses	3

PA CLEARED #AFRL-2024-5587

AFRL Aerospace Systems Directorate (AFRL/RQ)

Wright Patterson Air Force Base, Ohio
Edwards Air Force Base, California
Arnold Air Force Base, Tennessee

Afrl.rq.orta@us.af.mil

https://www.afrl.af.mil/RQ/

Overview

Laboratory Mission Statement - Boldly pioneering transformative space and air capabilities to make the fight unfair.

Description of organization/laboratory - The AFRL/RQ brings together world-class facilities including a fuels research facility, structural testing labs, compressor research facility, rocket testing facilities, supersonic and subsonic wind tunnels, flight simulation lab, and many other cutting-edge research capabilities.

Geographic location - The Directorate is headquartered at the Wright Research Site, Wright-Patterson Air Force Base, OH, and supplemented by additional personnel and research facilities located at Edwards Research Site, Edwards Air Force Base, CA, and Arnold Air Force Base, Tullahoma, TN.

Technology Focus Areas - The Aerospace Systems Directorate is focused on capability-based research and development related to aerospace weapon systems. In addition to general aviation technology expertise, the laboratory seeks to expand capability related to airframe, propulsion, and power integration, high-speed platforms and weapons, rapidly produced and upgraded platforms, space power and resilience from Earth to Cislunar, and leveraging autonomy and digital material management.

Year of Commission - 2012 (Reorganization and merger of AFRL Air Vehicles and Propulsion Directorates)

Strategy

How the ORTA fits into Lab Organization and Mission - AFRL/RQ has established an Office of Research and Technology Applications (ORTA) to coordinate and promote technology transfer. AFRL/RQ scientists and engineers should consider technology transfer as an individual responsibility and their performance evaluations include technology transfer as a factor.

How T2 Tools are a part of the lab strategic planning - The Air Force Research Laboratory's Aerospace Systems Directorate (AFRL/RQ) takes an active role in establishing collaborations and engages with outside partners. AFRL/RQ uses Cooperative Research and Development Agreements (CRADAs), Commercial Testing Agreements (CTAs), Information Transfer Agreements (ITAs), and Educational Partnership Agreements (EPAs) as formal mechanisms to create these win-win partnerships. In addition, the ORTA is part of the Strategic Planning and Engagement Branch which is located in the Strategic Planning and Analysis Division. The ORTA is also functionally aligned with duties associated with government partnerships, both domestic and international. The ORTA is a valued member of the Strategic Engagement Outreach Team and works to gather, analyze, and disseminate critical information related to strategic decision making and utilization of new and varied partnering opportunities.

One Year Objectives and Strategy

01 **Objective** – Expand personnel capability by increasing technology transfer and intellectual property education

Strategy – Establish regular and recurring access to learning opportunities to increase workforce knowledge through focused and measured instructional interactions.

02 **Objective** – More accurately identify constraints to improve efficiency and advocate for resources

Strategy – Utilize digital tools to identify bottlenecks and streamline strategic decision making

03 **Objective** – Support development of expanding and formalizing processes and direction related to strategic partnering

Strategy – Maintain proactive and open lines of communication with communities of interest in both technology transfer and other partnering disciplines in order to inform policy with tangible data and promote credibility through consistent presence and messaging

Near Term Goals and Strategy

Objective – Develop Standard Operating Process and digital tools

Strategy – Partner with directorate stakeholders to gather insight and align future posture for optimal support of primary mission

Long Term Objectives and Strategy

Objective – Continue to evolve the strategic capabilities of RQ specifically by utilizing technology transfer in strategic planning

Strategy – Maintain and grow engagement within RQ by monitoring developments in T2 community and proactively providing subject matter expert (SME) inputs to further develop strategic guidance

The Year in Review

Success Stories from FY24

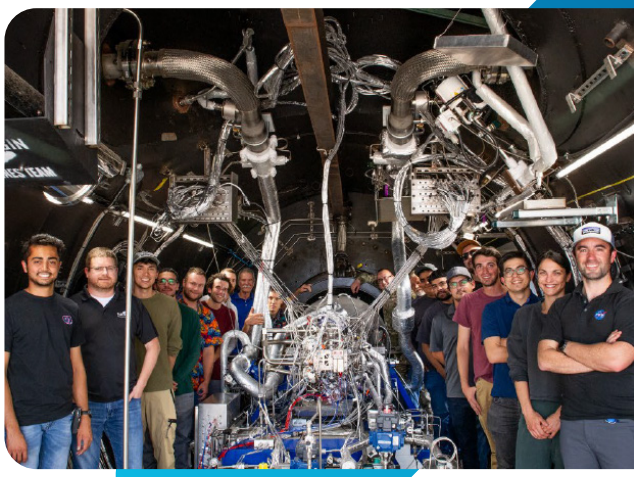
BLUE ORIGIN (BE-7)

The Details

Leveraging a national asset capability in a one-of-a kind vacuum test facility, AFRL and Blue Origin began a long-term collaboration for the vacuum testing, qualification and operational support of Blue Origin's BE-7, which will support NASA's human landing system program. The 15-year collaboration agreement provides the means to validate the BE-7s capabilities in a vacuum environment. This collaboration began with upgrading of one of AFRL's large vacuum test cells.

The test cell originally designed for large solid motor upper stages, was upgraded with new cryogenic propellant systems unique for BE-7. These upgrades provide for increased national capability for testing of cryogenic vacuum engines beyond BE-7. The upgrades provided by this Public Private Partnership has achieved mutual benefit from combining the Blue Origin funded capital improvements with the AFRL test expertise. AFRL and Blue Origin have successfully accomplished an initial vacuum test of the BE-7 engine. The BE-7 engine is a liquid oxygen and liquid hydrogen-fueled, highly efficient, and reusable rocket engine developed by Blue Origin for space exploration.

Photos by AFRL/RQ



ASTROBOTIC

The Details

The partnership between AFRL and Astrobotic is to develop an AFRL Rocket Flight Test Range for Vertical Takeoff/Vertical Landing (VTVL) rockets at Edwards AFB along with the joint flight demonstration of Liquid Rocket Engine (LRE) and Rotating Detonation Rocket Engine (RDRE) technologies. The technologies being developed include combustion chambers, injectors, nozzles, powerpacks, and associated subcomponent designs, testing, and optimization, with particular emphasis on methane (CH4) / liquid oxygen (LOX) and Rocket Propellant-2 (RP-2) / LOX powered rocket-propulsion systems. Upcoming major tests include the flight test of an Astrobotic VTVL rocket at AFRL Edwards. Rocket-powered Vertical Takeoff/Vertical Landing technology allows for reusability of space vehicles and point-to-point cargo transport.

AFRL/RQ

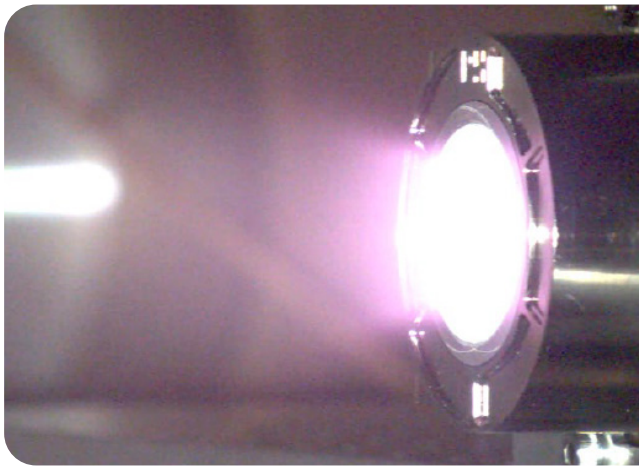
PHASE FOUR

The Details

Phase Four and AFRL's partnership is to develop an RF thruster design that can operate on both traditional and non-traditional electric propulsion propellants. The testing will consist of various sizes of RF thrusters using non-traditional molecular propellants along with collaborative discussions regarding mission requirements and capabilities. This partnership includes the use of AFRL test facilities and available AFRL diagnostics to collect additional telemetry while running a thruster. The accomplishments thus far include a successful demonstration of a thruster running on a molecular propellant and data that has aided the development of a new, larger thruster design that is significantly more capable than its predecessor.

RF thrusters are advanced propulsion systems that use radio frequency energy to ionize a propellant, generating thrust for applications in space exploration and satellite maneuvering.

Photos by AFRL/RQ

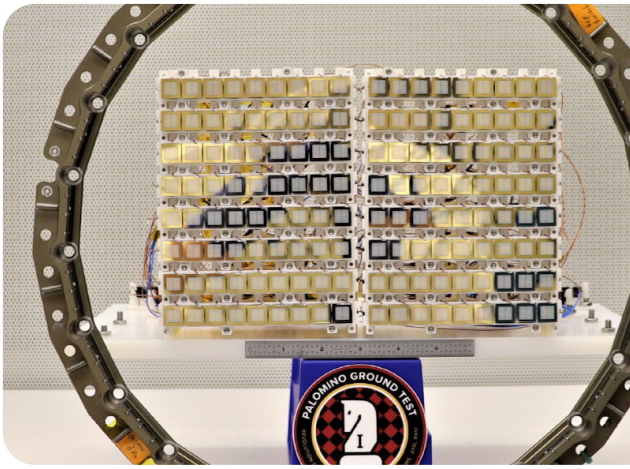


REVOLUTION SPACE

The Details

The CRADA with Revolution Space provided access to AFRL modeling and simulation capabilities and test facilities to rapidly advance the design maturity of the company's PALOMINO ion array thruster for in-space operations. The ion array thruster provides twice the thrust to power of existing electric propulsion systems while maintaining high fuel efficiency. Five successful ground tests were performed at AFRL, leading to a thruster design that will support USSF operations requiring sustained space maneuver throughout Low Earth Orbit (LEO) and cislunar space. The CRADA was critical to advancing the revolutionary PALOMINO conceptual design and enabled Revolution Space to secure a competitively awarded flight opportunity. PALOMINO is scheduled for on-orbit testing as part of a Cygnus resupply mission to the ISS in 2025 with commercial propulsion modules available in 2026.

PALOMINO Ion Array fits within industry standard 15" adaptor and can connect to any spacecraft.



X-BOW

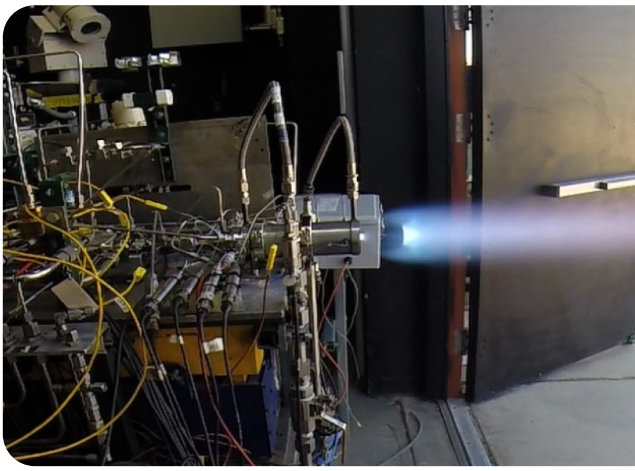
The Details

The overall objective of this CRADA is to develop new SRM technologies that will lower cost, improve quality, expand performance, and reduce existing development and manufacturing timelines. This CRADA enables cooperative development of breakthrough manufacturing technologies including high-temperature composite cases and modular rocket motors. Impacts to date include acceleration of propellant formulation and mechanical testing for use with novel propellant processing techniques. Solid rocket motor technologies involve the use of solid propellants, which are mixed, cast, and cured into a solid cylindrical shape, to produce thrust for space and military applications.

SPACEX RAPTOR DEVELOPMENT

The Details

Photos by AFRL/RQ



This CRADA established the means by which to evaluate gas-gas main combustion chamber (MCC) injector hardware in cold flow and hot-fire tests for the SpaceX Raptor engine program. Subject matter expertise from AFRL including injector design methodologies, propellant thermo-fluid behavior, and chemical reactivity was made available to assist in the characterization of performance, compatibility, and stability characteristics of candidate injector element designs in an integrated, subscale, staged combustion configuration comprising fuel-rich and oxidizer-rich pre-burners.

This AFRL-SpaceX collaboration followed the transfer of AFRL's Integrated Powerhead Demonstrator (IPD) engine hardware, drawings, design and data packages to SpaceX. IPD served as the first American Full Flow Staged Combustion engine design developed and tested, creating a knowledge base for the American industry. The early Raptor development program benefited from AFRL's IPD technology to accelerate early conceptual development and design. These efforts increased innovation, mitigated risk for commercial entities, and motivated the inclusion of advanced technology into flight systems for the DoD and the nation.

Subscale experimental tests of rocket engine elements assist in the development of full systems by characterizing performance and reliability.

HONEYWELL HALAS

The Details

AFRL has a partnership and contracted efforts with Honeywell Aerospace Technologies to demonstrate a cutting-edge LiDAR weather sensing technology. AFRL has identified the High-Altitude LiDAR Atmospheric Sensing (HALAS) system, developed by Honeywell, as a key enabling technology for range operations for Space Launch. Under this collaboration and in coordination with USSF Space Launch Delta 30 (SLD 30), AFRL and Honeywell initiated a 12-month proof-of-concept demonstration this September at Vandenberg Space Force Base (VSFB). This activity is part of a real-world demonstration of the system with operators from the VSFB Weather Operational Support Squadron (OSS) during commercial and DoD launches. If operational objectives are met, AFRL seeks to transition this technology to the Warfighter in 2025. This technology development and maturation will provide operational support for Tactically Responsive Space (TacRS), National Security Space Launch (NSSL), Missile Defense, and Global Strike missions.

The ability to launch on time within tight launch windows requires accurate high-altitude weather data. Weather has historically been a leading cause of launch delays and launch scrubs. HALAS delivers up-to-date environmental information that launch decision authorities need, to make marginal "go/no-go" decisions with confidence.

HALAS is a remotely operated ground-based weather information system that uses laser pulses to measure the atmosphere in targeted areas of interest. They system is capable of delivering refreshed weather readings every 5 minutes.

HALAS positioned at Tranquility Peak, overseeing the airspace above the launch pads at Vandenberg SFB, providing maximum coverage of all launch sites.

Marketing & Outreach

The AFRL/RQ ORTA utilizes the DoDs network of partnership intermediaries (PIAs), but especially the local PIA, to perform active marketing activities related to Intellectual Property. The ORTA also actively supports empowering S&Es to better understand T2 mechanisms in order to proactively identify partnering opportunities. In addition, AFRL/RQ supports requests to highlight items of interest, notable activities in technology transfer, and engages in networking with other ORTAs, related organizations, and traditional or non-traditional partners dedicated to technology efforts of interest.

Resources Utilized

The ORTA continues to provide ad hoc training and award inventors through additional incentive programs. The ORTA continues to maintain SME-level expertise through professional development and proactive participation in DoD and Federal lab T2 communities.

Lessons Learned

The ORTA continues to feel strongly that technology transfer capacity is at or near sustainable limits. Invention activity and partnering activity are at risk. Disclosures for technologies need to increase through education and partnering, especially through flexible and accessible T2 vehicles, is becoming paramount to AF and national security mission success. The ability to properly protect intellectual property and leverage stronger communities of interest through partnerships will be necessary to advance critical technologies in support of national defense and the United States industrial base. Greater investments in T2 management and application are necessary, through both personnel and tools.

Barriers & Problems

The ORTA continues to face diminishing returns on activity due to bandwidth constraints. Efforts to enhance lab understanding and capability are offset by limited availability to support expanded leveraging of T2 mechanisms. Lack of available resources, such as time, contribute to a cost-benefit analysis decision on level of effort and further instantiates a first in first out methodology versus a potentially more effective model focused on priority and expected returns. Currently, the ORTA continues to leverage external resources as available to fill gaps in capability, such as through the PIAs, AF Public Affairs, and DAFT3 Program Office personnel.

“The ability to properly protect intellectual property and leverage stronger communities of interest through partnerships will be necessary to advance critical technologies in support of national defense and the United States industrial base.

Facilities & Equipment

The Wright Research Site includes the following facilities:

- Advanced Instrumentation Lab
- Aerospace Power and Materials Components (APMC) Lab
- Combined Environment Acoustic Chamber (CEAC)
- Combustion Research Complex (CRC)
- Combustion & Laser Diagnostics Research Complex (CLDRC)
- Component Research Air Facility (CRAF)
- Compressor Aero Research Lab (CARL)
- Detonation Engine Research Facility (DERF)
- Direct Connect Supersonic Combustion Facility
- Engine Environment Research Facility (EERF)
- Environmental Test Chambers (ETC)
- Extreme Environment Vibration Facility
- Fabrication and Prototyping Lab
- Free Surface Water Tunnel (FSWT)
- Full Scale Structural Test Facility (FSSTF)
- Heat Flux Instrumentation Lab (HIFL)
- Heat-Transfer & Aerothermal Lab (HAL)
- High Pressure Combustion Research Facility (HPCRF)
- Low Speed Wind Tunnel Facility (LSWTF)
- Mach 3 High Reynolds Number Facility
- Mach 6 High Reynolds Number Facility
- Main Test Floor (MTF)
- Material and Testing Lab (M&T Lab)
- Mechanical Systems Research Lab (MSRL)
- Modeling, Simulation, Analysis, & Test (MSAT) Lab 2012
- National Aerospace Fuels Research Complex (NAFRC)
- Power Electronic Components Lab (PECS)
- Small-Engine Research Lab (SERL)
- Sub-scale Direct Connect Supersonic Combustion Facility (Research Cell 18)
- Sub-Element Facility (SEF)
- Subsonic Aerodynamic Research Lab (SARL)
- Supersonic Research Facility
- Thick Film Deposition Lab (TFDL)
- Trisonic Gas-Dynamics Facility (TGF)
- Turbine Engine Fatigue Facility (TEFF)
- Turbine Research Facility (TRF)
- Two-phase Thermal Energy Management Systems (ToTEMS)
- Vertical Wind Tunnel (VWT)

The Edwards Research Site includes the following capabilities:

- 19 Liquid Engine Stands to 8,000,000-pound thrust
- 13 Solid Rocket Motor Pads to 10,000,000-pound thrust
- Altitude Facilities from milli-pound to 60,000-pound thrust
- Open Space Hazardous Destruct Areas
- Propellant Laboratories
- National Hover Test Facility
- Computer and Data Analysis Centers
- Combustion Plume Laboratory
- High Energy Density Matter Laboratory
- Electric Propulsion Facility
- Solar Propulsion Facility

The capabilities at Arnold AFB include:

- Supersonic and Hypersonic Wind Tunnel D

FY24 Metrics

Inventions

Number of new inventions disclosed	13
Number of U.S. patent applications filed	25
Number of foreign patent(s) applications filed	1
Number of PCT application(s) filed	1
Total Number of U.S. patents issued	20
Total number of active patents	148

Licensing

Number of total active invention licenses	4
Total active income bearing licenses	4
Number of partially exclusive licenses	2
Number of non-exclusive licenses	2
All other licenses, not including invention or software, granted to small businesses	3

Time for Granting Invention Licenses

Average time	6 months
Minimum time	3 months
Maximum time	12 months
Number of licenses terminated for cause	2

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	63
Number of CRADAs, Newly Executed	19
Number of Newly Executed CRADAs involving small businesses	11
Total CRADA Revenue	$555,270.38
Estimated CRADA contributed value	$101,071,000

Educational Partnership Agreements (EPAs)

Number of total active EPAs	32
Number of newly executed EPAs	6

Software Licensing

(licensing in which DoD grants the right to use or sell the software)

Total number of active software licenses	1
Total number of royalty bearing software licenses	1
Total royalties received from software licenses	$125,000
What authority or authorities did the component use for licensing software?	Section 801

AFRL Munitions Directorate (AFRL/RW)

Eglin Air Force Base, Florida

afrl.rw.techtransfer@us.af.mil

https://www.afrl.af.mil/RW/

Overview

Laboratory Mission Statement

Lead the discovery, development, integration, and transition of affordable weapons technology, enabling the warfighter to win across all domains.

Laboratory Description

The Air Force Research Laboratory Munitions Directorate (AFRL/RW), located on Eglin Air Force Base, Florida, develops conventional munitions technologies to provide the Air Force with a strong technology base upon which future air-delivered munitions can be developed to neutralize potential threats to the United States.

The rich history of the AFRL/RW can be traced to air armament efforts initiated at Eglin Field during the early stages of World War II. Following the war, the development of jet aircraft outpaced the development of conventional air armament. Sparked by the heightening Vietnam conflict, research and development activities for non-nuclear armament were accelerated. On 1 March 1966, the predecessor to the Munitions Directorate, the Air Force Armament Laboratory, was created to provide a community of scientists, engineers, and infrastructure to advance conventional weapons technology.

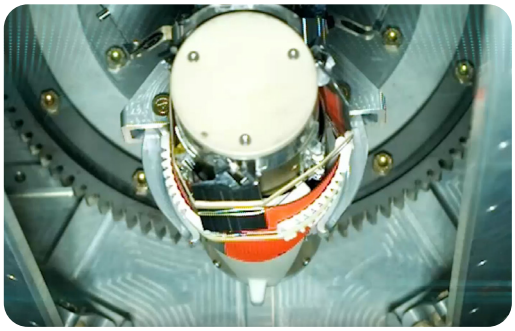
From the unit's inception, the research and development efforts have focused on the warfighters' needs. Applying leading edge technology provides the user with the state-of-the-art weaponry and makes a dramatic impact on the outcome of any given strike mission. During the Vietnam conflict, the infamous Thanh Hoa Bridge near Hanoi was a sterling example of the Munitions Directorate's leading-edge technology being applied with state-of-the-art weaponry provided a quality armament that worked significantly better than anyone had ever seen. The Thanh Hoa Bridge remained intact after 800 sorties were flown against it. Ten aircraft were lost trying to destroy the bridge. Thanks to armament technology, what 800 sorties couldn't do was accomplished with only four sorties with aircraft carrying laser guided bombs. Technology endeavors since Vietnam manifested into a variety of non-nuclear air armament, some of which were employed during effective "surgical" strike operations in Libya and Desert Storm. Examples of these technologies included the GBU-28 "Bunker Buster" which contributed to bringing Iraq to its knees when deployed early in 1991. This weapon was developed and deployed in a record 28 days. Adversaries could no longer hide in hardened buried bunkers.

The Joint Direct Attack Munition (JDAM)-GBU-31/32/38 is a guidance tail kit that, when paired with existing unguided bombs, turns them into accurate "smart munitions." Developed by RW in the 1990's, this effective weapon system uses signals from Global Positioning System (GPS) satellites combined with an inertial navigation system to accurately guide itself to the target. This new weapon clearly showed great potential and eventually led to the production of the first affordable precision guided weapon, JDAM, in 1997. By 2005, a large assortment of weapons utilized the GPS-INS navigation technologies developed by directorate engineers, who continue updating these technologies. These weapons represent a significant increase in capability, especially in Iraq and Afghanistan during both Operation Iraqi Freedom and Operation Enduring Freedom.

The Munition Directorate's key transition and introduction of the Small Diameter Bomb (SDB) in its first combat employment in October 2006 has quickly become a mainstay for combat operations in both Iraq and Afghanistan campaigns. The directorate also transitioned a SDB variant, known as the Focused Lethality Munition (FLM), for the reduction of collateral damage. The FLM arose from an urgent combat requirement and the first 50 were delivered to the Air Force in March 2008.

Helicopter Brownout still costs the U.S. military in countless lives and aircraft in ongoing conflicts, especially in Iraq and Afghanistan. A joint-service team led by members of the Munitions and Sensors Directorates completed a successful flight test demonstration (Dec 2009) of the three-dimensional landing zone (3D-LZ) brownout technology. The team integrated a laser detection and ranging (LADAR) high-resolution imaging sensor with the Brown-Out Symbology Set aircraft state symbology onto a US Army EH-60 Black Hawk helicopter. The combination of these systems provided an integrated degraded visual environment landing

Screenshots by AFRL/RW



solution, as well as aircraft guidance and obstacle avoidance information. Pilots from the US Army, Air Force, Navy, and Marine Corps achieved an unprecedented 70-80% landing rate in full brownout conditions. AFRL will extend imaging LADAR technology to include cable warning and obstacle avoidance for a full mission capability. AFRL, Army Aeroflight Dynamics Directorate (AFDD), and Naval Air Systems Command (NAVAIR) are exploring collaborative strategies to rapidly transition this breakthrough technology.

Faced with a dwindling ammunition inventory and forced to consume expensive and precious High Explosive Incendiary (HEI) wartime ammunition for 40mm Bofors cannon training used on the AC-130 gunships, the Air Force Special Operations Command (AFSOC) turned to Armor Piercing (AP) rounds left over from WWII production inventories to meet stringent training requirements. Unfortunately, the AP round leaves little or no impact signature when fired making spot-on target impact assessment and aim corrections virtually impossible. Needing an affordable, efficient training round with an observable impact assessment capability, AFSOC turned to AFRL's Munition Directorate for the solution. The Fuzes Branch quickly answered the warfighter's need by teaming with the 780th Test Squadron, HQ AFSOC, and USAF Non-Nuclear Munitions Safety Board, to develop and test a functional spotting charge round by modifying the existing WWII AP round. This modification provides AFSOC with immediate accuracy assessment capability at a reduced cost and saves the use of precious wartime assets. With an estimated 350,000 AP rounds in inventory available for modification, a potential savings of $100 million could be realized.

The Munitions Directorate always rises to the warfighter challenge, transitioning novel innovative solutions like: the BLU-129 munition, which advanced from prototype-to-combat in 9 months, allowed close air support of targets that previously could not be engaged, and saved countless lives of warfighters and civilians. The "Gunship in a Box", an affordable palletized weapon system, allowed multiple types of cargo aircraft to be rapidly equipped with gunship capability in the field. Distributed Embedded Fuze Design (DEFS), enabled accurate, survivable, void-sensing compatibility with legacy and future penetrators to reach previously unattainable Hard and Deeply Buried Targets. The Massive Ordnance Penetrator (MOP) was created to go after those very hardened and deeply buried targets utilizing enabling technology like DEFS. RW's Dialable Effects Munition program delivers both Air Combat Command and Air Force Special Operations Command a cockpit-programmable weapon for low collateral damage targets in various scenarios and target sets.

Today, the AFRL Munitions Directorate continues to make technological breakthroughs for future air armament. The Directorate's emphasis is on the weapon's capability to operate with complete autonomy and with high accuracy when delivered against ground targets in all weather conditions, day or night, using long- or short-range delivery tactics. Air-to-air missiles benefit from this technology with increased single-shot kills and larger no-escape zones. In addition, advances in hard target penetrating warheads are supplying mission flexibility by providing a conventional armament capability to defeat hardened targets traditionally reserved for nuclear weapons. In summary, paramount to every AFRL/RW technology decision is the answer to the question, "What does it do for the user?"

Geographic Location

AFRL Munitions Directorate is located on Eglin Air Force Base, Florida.

The Munitions Directorate technology research areas are mainly concentrated in Modeling/Simulation, Autonomy/Navigation & Controls, Energetic Materials, Terminal Seekers, and Ordnance Sciences.

Technology Focus Areas

The laboratory conducts research in the following Defense Science and Technology subject areas:

- 01 Aviation Technology
- 07 Chemistry
- 09 Electrotechnology and Fluidics
- 10 Power Production and Energy Conservation (Nonpropulsive)
- 11 Materials
- 12 Mathematical and Computer Sciences
- 14 Test Equipment, Research Facilities and Reprography
- 15 Military Sciences
- 16 Guided Missile Technology
- 17 Navigation, Detection and Countermeasures
- 19 Ordnance
- 20 Physics
- 25 Communications

Year of Commission

On 1 March 1966, the predecessor to the Munitions Directorate, the Air Force Armament Laboratory, was created to provide a community of scientists, engineers, and infrastructure to advance conventional weapons technology.

Strategy

How the ORTA fits into the Lab Organization and Mission

The ORTA is located within the Partnerships Branch, Strategy Division (RWSP), with a dotted line reporting to the Chief Scientist. The ORTA serves as the focal point for T2 activities and identifies potentially successful T2 opportunities. The Munitions Directorate T2 program assures that the Air Force science and engineering activities promote the transfer and/or exchange of technology with state and local governments, academia, and industry to create jobs, improve productivity, and increase competitiveness while supporting the Air Force mission. The Munitions Directorate T2 program offers partners an outstanding opportunity to leverage Munitions Directorate technology and expertise to achieve solutions and realize significant cost savings while enhancing economic competitiveness.

How T2 Tools are a part of the lab strategic mission

Partnering with the Munitions Directorate can be readily accomplished through a variety of agreements. These partnerships can be in the form of collaborative research, testing of innovations or products, providing excess equipment to schools, or licensing Munitions Directorate technologies.

Near Term Goals and Strategy

The ORTA will continue to increase the number of invention disclosures and grow the overall quantity as well as quality of the RW intellectual property portfolio. We will work with DAFT3PO to implement new T2 database and transfer all current data/information into the system. The new database will allow us to more easily enter/track & market the RW intellectual property portfolio while reducing the chance for making mistakes. The office will ensure appropriate legal and patent attorney resources are available to support the future growth of the IP portfolio. We will expand our relationships with the Doolittle Institute, TechLink, and the Federal Labs Consortium to ensure all RW IP has detailed marketing materials and plans. The ORTA office will increase awareness and use of Innovation Discovery Events, Entrepreneurial Opportunity Program and the IP Awards and Incentive Program. The ORTA will coordinate with the Doolittle Institute innovation staff to help expand the usage of Technology Sprint & Innovation Discovery events that can help promote technology development and new invention disclosures.

Long Term Objectives and Strategy

In addition to continuing to grow the RW intellectual property portfolio, the ORTA will seek to capitalize upon expanded marketing, outreach, and local PIA expertise to increase the number of CRADA and License agreements, grow the amount of royalty income from patent licenses, support increased technology transition to directly support the Warfighter, and bring new military as well as civilian products to market. Through our local PIA, the Doolittle Institute, create an entrepreneurial, innovation ecosystem to support a full range of commercialization and joint research activities, including new company formation based upon RW developed technology. The ORTA will work the National Security Innovation Network (NSIN) to participate in their Foundry& Forge programs to identify RW technologies that would be good candidates for entering the program and having a team of entrepreneurs build a business plan for potential commercialization.

The Year in Review

Success Stories from FY24

"WHAT-IF" TECHNOLOGY WORKSHOP

https://doolittleinstitute.org/event/what-if-technology-workshop/

The Details

Coordinated with PIA, Doolittle Institute, to put on two-day event titled "What-if Technology Workshop" which is the first in a series of RW Technology Ideation Assessment Events. Event objective was to encourage participants to creatively explore potential future predicaments and technology solutions envisioned for the year 2050. Ideas developed during the session will be used to generate future technology demand signal for 2050 and beyond.

The Outcomes

Forty-plus in person attendance with seven professional facilitators created ideation solutions for 14 futuristic scenarios to generate future technological needs.

INVENTOR WORKSHOP

The Details

Coordinated with Doolittle Institute to put on one day Inventor Workshop training to train RW scientists and engineers about the invention disclosure process and how to stimulate more invention disclosures. Developed and presented a "Patents 101" training for inventors to better understand the invention disclosure and patenting process.

The Outcomes

Lead to increased inventor awareness of benefits of protecting intellectual property (IP), the process, and knowledge of the U.S. patent system.

> **"...Paramount to every AFRL/RW technology decision is the answer to the question, 'What does it do for the user?'**

Marketing & Outreach

The ORTA briefed and participated in the local economic development community as well as numerous local/regional organizations including participation in local Industry Days. The ORTA continually creates awareness about how to partner and collaborate with AFRL through a variety of tools and platforms. After collaboration with the Doolittle Institute, RW expanded our marketing efforts to include focused email marketing campaigns and social media outreach. Several new one-page technology summaries were completed, and we will continue to collaborate with the Doolittle Institute to market those technologies and eventually have a technology marketing website where all of the available technologies are listed. We will reach a much larger group of commercial entities and expand our efforts to collaborate with a diverse group of partners outside of the Munitions Directorate. The ORTA office will also continue to coordinate with TechLink and the National Security Innovation Network to help market our technologies for commercialization.

Facilities & Equipment

Laboratory's URL:
http://www.eglin.af.mil/Units/AFRL-Munitions-Directorate

Unique Capabilities of the Laboratory

Technical Library: The Air Force Research Laboratory Technical Library enables and enhances access to scientific and engineering information to the scientists and engineers of Eglin Air Force Base, FL. This facility is available to active-duty military, civil service personnel and support contractors of Eglin Air Force Base.

Advanced Navigation Laboratory: The Advanced Navigation Lab researches and develops tactical weapons navigation and control technology. This facility is available and utilized for in-house development and experimentation.

Environmental Science Lab: The Environmental Science Lab performs basic and applied environmental research necessary to determine the environmental effects of a variety of conventional munitions, weapon systems, and related materials under development by the Air Force Research Laboratory Munitions Directorate. Further, it conducts environmental monitoring, chemical pharmacy operations and hazardous material/waste management to ensure compliance with applicable directives regulations and laws. This Lab can support other government and defense-related industry organizations on a reimbursable basis as schedule and resources permit.

Fuzes Research and Development Facility: The purpose of the Fuzes Research and Development Facility is to provide capability to develop and evaluate technologies for fuzes, sensors and signal processing circuitry components for conventional munitions. The facility is utilized primarily for the research and development of in-house and contractor designed fuzes and components.

Advanced Guided Weapon Test Bed (AGWT): The AGWT develops, implements, and transitions scene generation and hardware-in-the-loop simulation technologies for evaluation of advanced weapon guidance systems for Air Force, Missile Defense Agency, and other DoD weapon concepts. The AGWT is the only U.S. facility that researches, develops, characterizes, and integrates real-time high-fidelity phenomenology codes.

Prototype Munitions Fabrication Lab: The Prototype Munitions Fabrication Lab produces scaled and full-size munition components which support Directorate technology development experiments and demonstrations. This facility is primarily used for internal research and other government agencies when available.

Seeker Technologies Research and Evaluation Facility (STRAEF): The STRAEF develops, tests, and evaluates active imaging direct detection laser radar (LADAR) sensors and seekers. This facility is primarily used for in-house and contracted research programs.

Advanced Warhead Experimentation Facility (AWEF): In support of our Ordnance Sciences Core Technical Competency, this facility includes the Warhead Evaluation Arena (C64-A), Terminal Ballistics Evaluation (C-64C), Indoor Warhead Test Lab (C-64C), Reusable Test Lab (RUT) and Blastpad.

High Explosives Research & Development Facility (HERD): With over a hundred acres and numerous buildings, this facility supports our Ordnance Sciences Core Technical Competency and includes a Properties Lab, Processing Lab, Advanced Energetics Lab, and Dynamics Testing and X-Ray Lab.

Seeker Phenomenology Evaluation & Research (SPEAR): The facility was completely refurbished early in 2010 to enhance RW's Core Technical Competency in Terminal Seekers. It has 2 large buildings which contain a component testing lab, location for indoor range for prototype testing, access to an outdoor range, office and conference space, and future electronics manufacturing and testing capabilities.

Rapid Design Engineering Facility (RDEF): Located at C-6, the RDEF designs, models, and prototypes small weapon airframes. The facility incorporates a fuselage construction area, an electronics workshop, and a machine shop. This facility supports flight demonstrations of weapon airframes and subsystem technologies.

Research and Engineering Education Facility (REEF): RW partners with the University of Florida, leveraging the advantages of one of the world's finest engineering programs, which provide a state-of-the-art facility in support of the Munitions Aerodynamics, Guidance and Navigation

and Control Core Technical Competency. This partnership includes conducting technical research critical to the advancement of national defense and security capabilities.

Many of the facilities and equipment are unique and access to them is available to our government, industry and academic partners utilizing Technology Transfer Mechanisms.

Examples include:

- Fuzes Research and Development Facility (Dynamic Shock Laboratory and the Fuze Experimentation Cannon Test Facilities at Range A-22) were used to support Commercial Test Agreement (CTA) 11-294-RW-01 with Alliant Techsystems Operations to demonstrate performance and shock survivability of the Hard Target Void Sensing Fuze (HTVSF) during impact penetration environments, and CTA 17-191-RW-01 with the Raytheon Company for fragmentation testing.
- Advanced Guided Weapon Test Bed (AGWT) Kinetic Kill-Vehicle Hardware-in-the-Loop Simulator (KHILS) was used to Support Cooperative Research and Development Agreement (CRADA) 16-113-RW-01 with Johns Hopkins University Applied Physics Laboratory. The purpose is to conduct research and development pertaining to the operation of a 1024x1024 OASIS scene projector, associated drive electronics, array anneal procedures and non-uniformity correction algorithms.

Resources Utilized

Human Resources

The ORTA office currently has one government employee and one support contractor.

T2 Education and Training Provided to Organization/Lab Staff

The ORTA office regularly provides training, education, and informational slides related to technology transfer to the laboratory staff to include information on how to file invention disclosures, intellectual property protection, technology transfer mechanisms, CRADA agreements & patent licensing. The ORTA office has also requested patent attorney training visits from AFRL legal office to come train lab personnel about the specifics of patent applications and technology transfer agreements.

Professional Development of ORTA

The ORTA participated in all appropriate T2 workshops, training and conferences offered by the various federal agencies and T2 consortiums, as well as numerous conference courses. In addition to attending DoD, Air Force and Federal Labs annual training conferences the ORTA will also attend industry training/conferences such as the Association of University Technology Managers (AUTM) and the Licensing Executives Society (LES). The ORTA also completed the ORTA Foundations eight-week class hosted by TechLink.

Incentives/Awards

The Munitions Directorate has the one of the most liberal recognition and incentive programs in AFRL and has given out over $100,000 in incentive awards since the implementation of the policy.

FY24 Metrics

Inventions

Number of new inventions disclosed	2
Number of U.S. patent applications filed	7
Total Number of U.S. patents issued	7
Total number of active patents	49

Licensing

Number of total active invention licenses	3
Total active income bearing licenses	3
Number of total active income bearing exclusive licenses	3

Time for Granting Invention Licenses

Average time	5 months
Minimum time	2 months
Maximum time	12 months

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	65
Number of CRADAs, Newly Executed	10
Number of Newly Executed CRADAs involving small businesses	5
Estimated CRADA contributed value	$14,000,000

Educational Partnership Agreements (EPAs)

Number of total active EPAs	7
Number of newly executed EPAs	1

PA CLEARED #AFRL-2024-5829

AFRL Materials & Manufacturing Directorate (AFRL/RX)

Wright-Patterson Air Force Base, Ohio

AFRL.RX.T2@us.af.mil

https://www.afrl.af.mil/RX/

Overview

AFRL/RX Core Technical Competencies:

- Photonic, Electronic, and Soft Materials
- Manufacturing and Industrial Technologies
- Composites, Ceramics, Metallics, and Materials Performance

Mission:

Accelerate the availability of advanced and cost-imposing materials and manufacturing technologies for the Airman and Guardian by driving the state of the possible and uniting the community.

Vision:

We invent the stuff that makes the future.

Strategy

The RX ORTA establishes T2 agreements that help the Air Force achieve its mission and T2 mandate by leveraging the innovative skills, resources, and capabilities of non-federal entities, principally industry and academia.

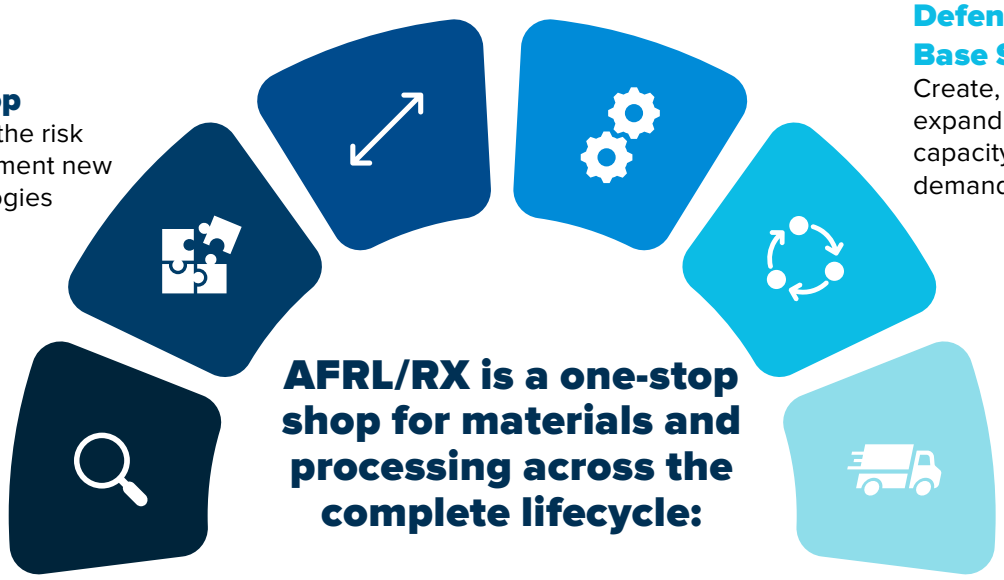
Among other things, these T2 agreements enable the Air Force to jointly develop critically needed new technology; expand the defense industrial base by engaging innovative, agile companies that are not traditional defense contractors; transfer its inventions to industry for final development and manufacture; and develop, recruit, and grow its scientific workforce by collaborating with K-12 schools, colleges, and universities. The RX ORTA has a comprehensive toolbox of T2 mechanisms available to achieve their objectives.

Scale Up
Make it big (or small) enough & in sufficient quantity to meaningfully impact the application

Manufacture
Produce it at a rate, cost and quality relevant for implementation

Defense Industrial Base Supply Chain
Create, modernize, or expand U.S. industry capacity to meet DAF demand/requirements

Develop
Reduce the risk to implement new technologies



AFRL/RX is a one-stop shop for materials and processing across the complete lifecycle:

Discover
Identify cutting edge scientific phenomena

Deploy
Transition war-winning technologies to DoD operators

The Year in Review

Success Stories from FY24

EPA DONATION TO THE BOONSHOFT MUSEUM OF DISCOVERY

The Details

EPA Donation to the Boonshoft Museum of Discovery of a Scanning Electron Microscope (SEM) from AFRL/RX that will be used in their STEM programs.

Per Boonshoft's proposal:

"Our intent is to be able to demonstrate the uses of a SEM through exposing students, educators, and families to the equipment. We will be able to use samples from our collections and align the demonstrations to content within the museum as well as activities taking place in our community. For example, being able to show the detailed structure of a snake scale or bird feather while talking about the importance of conservation. We can look at a microchip and educate about what microelectronics are and why they are growing in popularity for use in everything from phones to cars to space programs including the work being done by Intel and others."

The Outcomes

The SEM was donated to the Boonshoft Museum where it is currently being used to assist in the education of Museum guests.

EPA DONATION TO MIAMI UNIVERSITY

The Details

EPA Donation to the Miami Ohio University of an ultra-high vacuum scanning tunneling microscope from AFRL/RX.

Per Miami University's proposal:

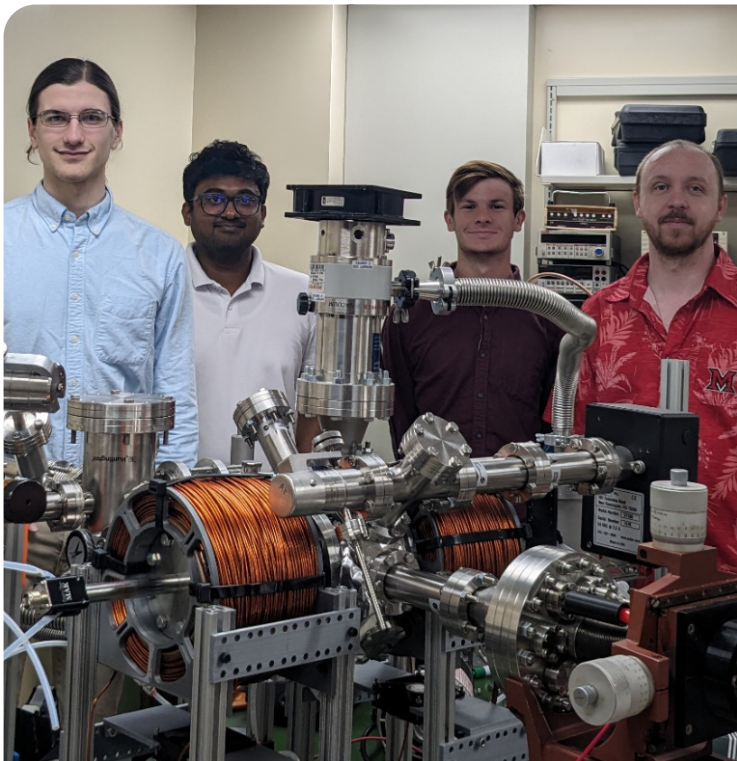
"... this scanning tunneling microscopy (STM) instrument will be utilized to train students and post-docs in atomic-scale imaging of surfaces alongside spectroscopy measurements to ascertain local density of states of materials and defects. Band structure construction will be made through quasi-particle interference imaging complimenting local density of states (LDOS) spectroscopy. Spin-polarized imaging and spin-split LDOS measurements will also occur with the addition of ferromagnetic tips."

The Outcomes

The equipment was donated to the university where it is currently being utilized by students and educators.

https://www.afrl.af.mil/News/Article-Display/Article/3795695/afrl-equipment-donation-helps-prepare-emerging-stem-workforce/

Photo by Mr. Rannet Manning



Marketing & Outreach

Several marketing and outreach activities via DoD PIA (TechLink, MilTech) and local PIA Wright Brothers Institute. These efforts help us better understand the technology landscape, current market, and potential commercialization opportunities/pathways to help get Air Force technology out of the lab.

Barriers & Problems

The tracking and collecting of royalties from Patent License Agreements is the biggest challenge in all of T2, to this office. There is too much manual labor involved, to the point where it could be a full time job to track PLAs, track deliverables from each PLA, follow-up with all licensees to ensure deliverables are submitted, etc. There has to be a better way.

Resources Utilized

- ORTA Training
- T2 training provided to AFRL/RX scientists and engineers

Facilities & Equipment

Facility CRADAs

- Pilot-scale Processing Plant and Alloy Development Laboratory (PADL)
- Electromagnetic Characterization and Field Support (EMCaFS) Facility
- Ceramic Materials and Processes Laboratory (CeMPL)
- Advanced Materials and Structures Nondestructive Characterization Facility
- Materials Application, Removal, and Testing (MART) Facility
- Materials Characterization Facility (MCF)
- Laser Hardened Materials Evaluation Laboratory (LHMEL)

FY24 Metrics

Inventions

Number of new inventions disclosed	**25**
Number of U.S. patent applications filed	**39**
Total Number of U.S. patents issued	**28**
Total number of active patents	**248**

Licensing

Number of total active invention licenses	21
Total active income bearing licenses	9
Total active non-income bearing licenses	4
Number of total active income bearing exclusive licenses	3
Number of partially exclusive licenses	5
Number of non-exclusive licenses	3
All other licenses, not including invention or software, total active	2
Number of total active income bearing exclusive licenses	4

Time for Granting Invention Licenses

Number of licenses terminated for cause	2

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	117
Number of CRADAs, Newly Executed	38
Number of Newly Executed CRADAs involving small businesses	9
Total CRADA Revenue	$395,120
Estimated CRADA contributed value	$4,665,362

Educational Partnership Agreements (EPAs)

Number of total active EPAs	32
Number of newly executed EPAs	8

AFRL Sensors Directorate (AFRL/RY)

Wright-Patterson Air Force Base, Ohio

AFRL.RY.ORTA@us.af.mil

https://www.afrl.af.mil/RY/

Overview

The Sensors Directorate (AFRL/RY) leads sensor, sense making, and spectrum warfare innovation in an effort to deliver timely and cost-effective capabilities to warfighters across the DAF. Housed on "Sensors Hill" at Wright Patterson AFB, RY is structured into two capability areas:

- Surveillance and Targeting of Airborne Threats
- Surveillance and Targeting of Surface Threats

That integrate technology from our eight technical areas:

- Electro-Optical and Infrared Sensing
- Radio Frequency Sensing
- Electromagnetic Spectrum Warfare
- Positioning, Navigation, and Timing
- Sensing Autonomy
- Multi-Domain Sense Making
- Photonics
- Microelectronics

Strategy

The RY ORTA was recently moved from an organizational support division within RY to a division with a strategic focus on planning and delivery of integrated capabilities. This move is reflective of a desire to change the way RY approaches partnering of all types, including via our technology transfer agreements. While the full nature of this change is still being determined, it is expected that over the long term, the ORTA will become more involved with key phases of RY's new strategic planning process, including horizon scanning and technology transition planning, where establishing external connections can be the key to success. To enable this shift, our near term goals include leveraging ongoing digital transformation initiatives to increase our workflow automation for agreement initiation, tracking, and other purely administrative tasks.

The Year in Review

Marketing & Outreach

Yes, we continued to work with both Tech Link and Wright Brothers Institute to market a few PIA-selected technologies online and through industry-peer networks.

Facilities & Equipment

Air Force Research Laboratory - Sensor's Directorate Bldg 600 Complex at Wright-Patterson Air Force Base, Ohio

Lessons Learned

Never again allow such a significant backlog of patent application submissions.

AFRL/RY

Barriers & Problems

The largest obstacle this year was dealing with a large backlog of Department of Defense (DoD) Patent Application Review System (DPARS) patent application submissions (853) that needed review within AFRL/RY. With new personnel, the ORTA office put together a new team of reviewers and set goals to reduce this number, including all new patent submissions for review (20-30 per month). In just a five month span, this new team has already reduced this number down to 359 patent application submissions. A feat that seemed almost impossible to reach. To continue RY's goal in only having new monthly patent application submissions to review, the ORTA office will plan on adding even more reviewers to enable rotating teams to prevent burnout reviewing.

FY24 Metrics

Inventions

Number of new inventions disclosed	10
Number of U.S. patent applications filed	17
Total Number of U.S. patents issued	12
Total number of active patents	97

Licensing

Number of total active invention licenses	23
Number of newly executed invention licenses	4
Number of newly executed invention licenses granted to small businesses	3
Total active income bearing licenses	9
Total active non-income bearing licenses	14
Number of total active income bearing exclusive licenses	23
Number of partially exclusive licenses	4
Number of non-exclusive licenses	2
Number of total active income bearing exclusive licenses	12

Time for Granting Invention Licenses

Average time	6 months
Minimum time	4 months
Maximum time	12 months

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	29
Number of CRADAs, Newly Executed	10
Number of Newly Executed CRADAs involving small businesses	3
Estimated CRADA contributed value	$105,239, 817

Educational Partnership Agreements (EPAs)

Number of total active EPAs	11
Number of newly executed EPAs	4

Software Licensing

(licensing in which DoD grants the right to use or sell the software)

Total number of active software licenses	17 (ITAs)
Total number of new software licenses	5
Number of newly executed software licenses involving small businesses	3

PA CLEARED #72ABW24-0058

The Air Force Sustainment Center (AFSC/EN)

Tinker Air Force Base, Oklahoma

Overview

The Air Force Sustainment Center (AFSC) is located in Oklahoma City at Tinker AFB. We are the headquarters of AFSC. Our lab is committed to sustaining the operational readiness and effectiveness of the Air Force through a comprehensive suite of technical solutions. We embrace innovation and cutting-edge technology by implementing the Technology Transfer (T2) mechanism. AFSC actively engages with industry, academia, and governmental entities to share knowledge and resources, enhancing our capabilities and accelerating innovation in FY24.

Strategy

ORTA facilitates Technology Transfer (T2) applications to support AFSC in integrating innovative solutions and advanced technologies into sustained capabilities that drives modernization efforts to improve efficiency, effectiveness, and strategic planning. ORTA fosters collaboration with private-sector companies and research institutions to access resources without exchanging funds but still accelerates operations and reduces manual labor. Our one year goal is to prioritize technology needs that can enhance maintenance and operational efficiency. In the future, we would like to cultivate enduring partnerships with key stakeholders in the defense industry, institutions, and innovators because we are growing.

The Year in Review

Success Stories from FY24

ORAL ROBERTS UNIVERSITY

The Details

10 U.S. Code § 2194 (b)(5)

Multiple AF projects have been offered to allow Oral Roberts University faculty and students to participate in along with AF engineering personnel.

The Outcomes

Oral Roberts University has selected two projects to participate titled “76 PMXG Robotic Dymax Application Cell Design” and “Non-Destructive Inspection X-Ray Tube Adaptor” for the 2024-25 academic year.

E-DRILL CRADA

The Details

A multi-fastener locator for a handheld electrical discharge machining (EDM) drill was reported by a collaborator on 14 Mar 2024. The single assembly locator includes a slotted bar with multiple locators positioned along the span with adjustable attachment points at either end of the bar for securing the assembly to the parent part via holes from initially removed fasteners.

The Outcomes

This CRADA built a strong collaboration between AFSC-OC-ALC and E-Drill company. It accelerated technology for sustainment at Aircraft Maintenance Group (AMXG).

Marketing & Outreach

We highlighted success technology transfer initiatives and their impacts on mission outcomes, efficiency and collaboration with partners to AFSC newsletter. At S&E annual meeting, ORTA briefed the granted patent to influence the impacts of technology transfer (T2). Quarterly, ORTA hosts a Lunch & Learn to train AFSC to get familiar with T2, there were 150-plus attendees last training.

Resources

ORTA utilized professional T2 training from DAFT3PO to share and broaden knowledge of Technology transfer to AFSC folks. There were 150 attendances at Lunch & Learn, S&Es were excited at T2 opportunity. AFSC also starts applying the defense technology transfer information system (DTTIS) to collect or track T2 agreements, this system features a user-friendly database that allows individuals to check our lab activities.

Lessons Learned

Lesson Learned 1:

EPA provides opportunity for students and AFSC to participate the university events. The networking opportunities at the events has allowed collaboration between universities and other entities.

Lesson Learn 2:

Career fairs are a first approach with universities to start a strong relationship with partners. And then AFSC can initiate EPA or CRADA that fits with our lab requirements.

Lesson Learned 3:

Universities and AFSC/SW need to have an annual cadence to identify goals and activities for the university partnership.

Facilities & Equipment

CRADA between AFSC and Space ISAC Supply Change Risk Management (SCRM):

Two AFSC Employees are the leaders for the Software Bill of Materials (SBOM) Task Force for the Information Sharing and Analysis Center (ISAC) and have been collecting information for deploying SBOM infrastructure at the ISAC. This is moving forward and we are planning a meeting in November for architecture out this capability. This was after about nine months of collecting information from ISAC members.

CRADA between AFSC and SuperMicro SCRM:

AFSC updated technical supplier assessment, AI/ML benchmarking, and SBOM analysis. Technical docs have been drafted and research is still in progress.

FY24 Metrics

Inventions

Number of new inventions disclosed	**1**
Number of U.S. patent applications filed	**4**
Total Number of U.S. patents issued	**1**
Total number of active patents	**5**

Licensing

Number of total active invention licenses	1

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	3
Number of CRADAs, Newly Executed	2
Number of Newly Executed CRADAs involving small businesses	1
Estimated CRADA contributed value	$520,000

Educational Partnership Agreements (EPAs)

Number of total active EPAs	32
Number of newly executed EPAs	6

Air Force Technical Applications Center (AFTAC/SI)

Patrick Space Force Base, Florida

AFTAC.SIRR.Mailbox@us.af.mil

https://www.16af.af.mil/Units/AFTAC/

Overview

Deliver Decision Advantage Against Enduring Weapons of Mass Distruction (WMD) Threats and Emerging Weapon Systems.

Strategy

Our ORTA office falls under the "Strategic Integration" directorate, charged with integrating and fostering R&D within AF.

The Year in Review

Success Story from FY24

HIGH IMPACT RESEARCH

The Details

Project was to identify high impact research authors and articles in academia using machine learning.

The Outcomes

Project was to identify high impact research authors and articles in academia using machine learning.

Marketing & Outreach

Seminar series at University of Florida and University of Central Florida. Reached out to Texas A&M University (TAMU) to establish an EPA. Also, the outreach program opened the door to use the National Security Innovation Network (NSIN) which allows us to work with TAMU on a Capstone Project.

Barriers & Problems

Understanding the correct POCs at respective universities who can coordinate/sign agreements, which of those POCs inside individual departments that can cut across several departments.

Lessons Learned

Working the first full EPA with TAMU, learned more about intent and logistics of these agreements. This includes having to educate ourselves and the university on how clearances can/should be incorporated into EPAs for faculty.

Resources

Human Resources, Recruiting, Professional Development of ORTA, Awards to recognize work of ORTA individuals

Facilities & Equipment

AFTAC computing resources

FY24 Metrics

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	3
Number of CRADAs, Newly Executed	1
Estimated CRADA contributed value	$220,000

Educational Partnership Agreements (EPAs)

Number of total active EPAs	1

PA CLEARED #PAO-3089

Department of Defense Cyber Crime Center (DC3/XE)

Linthicum, Maryland

AFOSI.DC3.ORTA@us.af.mil

https://www.dc3.mil

Overview

Laboratory Mission Statement: A Federal Cyber Center that delivers innovative capabilities and expertise to enable and inform law enforcement, cybersecurity, and national security partners.

Description of organization/laboratory: Department of Defense Cyber Crime Center (DC3) is among the largest accredited digital forensics laboratories in the world, and the number one source for a complete spectrum of advanced cyber technologies solutions for the DoD. Besides providing forensic analysis and litigation support on criminal cases, DC3 also conducts leading edge research and development (R&D) and provides quality training in Digital Forensics and Cybersecurity. DC3 operates along six core lines of business that contribute to advancing digital and multimedia (D/MM) forensics and cyber analytic capabilities for the DoD.

The 6 Core Lines of Business:

- Fully accredited (ISO:17025) Digital Forensics Laboratory Services
- Cyber Training
- Cybersecurity and Critical Infrastructure Protection
- Vulnerability Sharing
- Technical Solutions Development
- Cyber Threat Analytics

Geographic location: 911 Elkridge Landing Rd, Linthicum, MD

Technology Focus Areas: DoD Directive 5505.13E specifies DC3 as the executive agent for Digital Forensics across the DoD and to advance D/MM forensics RDT&E of new forensic capabilities, collaborate with government and private industry to keep abreast of innovative technology, and provide technical assistance to DoD Component D/MM forensics laboratories.

Year of Commission: 1998

Strategy

How ORTA fits into Lab Organization and Mission: The DC3 ORTA is essential for advancing D/MM forensics capabilities within the DoD. The authority to enter into CRADAs and EPAs allows DC3 to collaborate with industry and academia on forensic standards, processes, and capabilities. Digital forensics is an evolving and nascent field and is heavily reliant on academic and industry research to identify new methods in addressing the rapid change in digital technology and devices. DC3 has a long-standing history with academia and has effectively harnessed its capabilities as a force multiplier to address the needs of the Department. Over the next few years, DC3 is well postured to develop a network of schools and universities that it will bring together to work in a mutually cooperative environment. In the near term, DC3 is focusing on diverse partnerships to ensure inclusivity and strengthening its ability to reach a wide audience of students, academics, and researchers.

How T2 Tools are a part of the laboratory strategic planning: T2 mechanisms are a valuable tool for mutual benefit to industry and government. As previously mentioned, CRADAs and EPAs afford the opportunity to bring exchange of technologies to the benefit of both DoD and industry.

One Year Objectives and Strategy: Continue expanding T2 partnerships through outreach to commercial industry, academia and R&D centers, and refine processes for DC3 intellectual property.

Near-term Goals and Strategy: DC3 stand-up of a Strategy and Partner Engagement Directorate has positioned us to forge greater partnerships with defense, private sector, and academia to share insights through broader RDT&E and opportunity to enter into CRADAs that contribute to DC3 goals for advancing D/MM forensics technologies, and the T3 mechanisms are valuable tools for accomplishing these goals. DC3 participation in conferences and trade shows in FY24 involving private industry and academia has contributed to an extensive list of potential opportunities for T3 collaboration.

Long-term Objectives and Strategy: Build purposeful partnerships that allow DC3 to expand additional resources to stakeholders and other customers.

This will be accomplished by objectives listed below:

- Expanding T3 partnerships through outreach to commercial industry, academia, and R&D centers to identify and share current DC3 and cyber industry trends. Currently being conducted through DC3 Partner Engagements.
- Enhancing the DC3 mission by developing deliberate partnerships, and increasing and improving support to current partners.
- Incorporating small business awareness, outreach, and support into the DC3 mission through CRADAs.

DC3 remains committed to fostering forensic standards through participation in a wide range of activities and partners, including other federal entities, engagement with the academic community, and other entities both within and outside of the government.

The Year in Review

Success Stories from FY24

APPLIED RESEARCH LABORATORY FOR INTELLIGENCE AND SECURITY (ARLIS)

DC3 conducted this project under the OUSD (I&S) Research for Intelligence and Security Challenges (RISC) Summer Internship Program with ARLIS, and is evaluating the need to enter into a long-term CRADA.

RESEARCHER'S TOOLKIT & DOD VDP

The Details

ARLIS graduate students developed a formalized methodology to identify vulnerabilities (both known and unknown) on websites, web-based applications, and other public facing services used by the federal government. DC3's Vulnerability Disclosure Program (VDP) receives, verifies, and assists in the remediation of these submitted vulnerabilities on systems across the Department of Defense. By crowd sourcing the work of independent researchers, VDP acts as a force multiplier to the Department's defense-in-depth strategy. VDP sought to develop a formalized framework for the identification and remediation of vulnerabilities to assist and support future researchers in this endeavor.

The Outcomes

This study will inform the creation of the Researcher's Toolkit – a set of formally developed methodologies, standardized tools, best practices, and other relevant materials that will arm future researchers. The study also intends to provide recommendations on strengthening the DoD VDP program and future areas of program development.

ARLIS & ARTIFICIAL INTELLIGENCE

The Details

ARLIS supported DC3 Cyber Forensics Lab (CFL) by researching ways to leverage Artificial Intelligence (AI) in the processing of ransomware, which is one form of malware. Due to delays in the execution of Non-Disclosure Agreements by ARLIS personnel, as well as technical delays that prevented ARLIS researchers from gaining access to the DC3 sample data, ARLIS' progress toward the goal was significantly diminished as a result of the amount of time they had available to them once approvals and test environments were in place. As a result, all research was conducted on publicly available ransomware samples found from various open-source malware repositories.

Cuckoo is an open-source malware analysis sandbox tool that allows for the safe execution of malware by preventing the malware from accessing the local machine, network, or Internet.

The Outcomes

ARLIS researchers successfully developed an AI/ML model that processes the output from Cuckoo analysis to automatically identify some instances of ransomware and other malware.

DC3/CFL is interested in continuing to partner with ARLIS by enabling and funding continued ARLIS research into how AI/ML can be effectively leveraged to increase the throughput of malware analysis by effectively automating the identification of malware within groups of files of unknown origin.

Lessons Learned

Information sharing across partner schools can significantly impact the research being conducted and significantly impact the field of study. Developing programs across schools, and ensuring diversity among the schools in population, demographics, and geography, can create a sustainable pipeline of research activity more effectively than focusing on single agreements.

Resources

- Two DC3 ORTA Action Officers successfully completed the Technology transfer Foundations (formerly ORTA Foundations) In-Person Capstone Training Course and Award Ceremony hosted in Arlington, VA.
- One DC3 ORTA Action Officer attended the 2024 DAFT3 Annual Summit and participated in professional development workshops hosted in Arlington, Virginia.

Facilities & Equipment

Laboratory's URL that lists facilities/equipment information: ***https://www.dc3.mil/tools***

Unique Capabilities of the Laboratory: As far as traditional digital forensic capabilities are concerned, DC3 possesses a portion of DoD's powerful forensic toolset. Specifically, digital evidence processing and electronic media repair and analysis for DoD criminal law enforcement and counterintelligence. The DC3 Cyber Forensics Laboratory performs D/MM forensics examinations, device repair, data extraction, as well as robust intrusion and malware analysis capabilities. The DC3 Information Technology Directorate tailors software and system solutions engineered to the specific requirements of Digital Forensic Examiners and Cyber Intrusion Analysts, and the DC3 Cyber Training Academy institutes innovative technology and lessons learned into courseware and teachings to the DoD and International Partners.

Examples of how some of these facilities/equipment are used by the private sector through CRADAs, test agreements, etc.: As previously mentioned, none at this time; however, the new DC3 Senior Technical Leader is currently in the process of collaborating with industry and academia partners to expand our private sector and academic outreach.

Marketing & Outreach

DC3 hosted three virtual sessions with academia facilitating discussions centered on strengthening partnership opportunities, developing existing offerings, and gathering inputs focused on revitalizing and expanding DC3's Center of Digital Forensics Academic Excellence (CDFAE) Program. Ultimately, through engagement with the academic community we were able to collaborate on new ways to revitalize the program to provide more benefits to the students, faculty, and the broader DoD Cyber community.

In addition to the virtual information sessions, DC3 Strategy and Partner Engagement Directorate participated in 13 public conferences and events to engage cyber community stakeholders, partners, and interested organizations. Some of these engagements included:

- The Rocky Mountain Cyberspace Symposium (19-22 Feb 2024)
- International Summits and Workshops (20-21 Mar 2024 and 9-11 Apr 2024)
- The Federal Laboratory Consortium (9-11 Apr 2024)
- National Cyber Crime Conference (23-25 Apr 2024)
- RSA 2024 (6-9 May 2024)
- International Association of Chiefs of Police (IACP) (12-14 Apr 2024 and 21-23 May 2024)
- National Initiative for Cybersecurity Education (NICE) Conference (3-5 Jun 2024)
- Armed Forces Communications and Electronics Association (AFCEA) TechNet Conferences (25-27 Jun 2024 and 19-22 Aug 2024)
- Department of the Air Force Information Technology and Cyberpower (DAFITC) (26-28 Aug 2024)
- The National Cyber Summit (25-26 Sept 2024)

FY24 Metrics

Inventions

Total number of active patents	**1**

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	**4**
Number of CRADAs, Newly Executed	**1**

Educational Partnership Agreements (EPAs)

Number of total active EPAs	**10**

PA CLEARED #24-19NASIC1420

National Air and Space Intelligence Center (NASIC/XO)

Wright-Patterson Air Force Base, Ohio

nasic.xoxc.t2orgbox@us.af.mil

https://www.nasic.af.mil/

Overview

Since 12 January 2017, the National Air and Space Intelligence Center (NASIC) has been designated approval authority for two type of Technology Transfer (T2) agreement, the Cooperative Research and Development Agreements (CRADAs) and Education Partnership Agreements (EPAs). This designation reconstitutes the capability within NASIC to review and approve all CRADAs, which was delegated by the Department of the Air Force Technology Executive Officer (DAF TEO).

Strategy

NASIC's mission is to discover and characterize air, space, missile, and cyber threats to enable full-spectrum multi-domain operations, drive weapon system acquisition, and inform national defense policy.

How ORTA fits into Organization and Mission:

- Increase engagements with Intelligence Community (IC), DoD, Academia, and commercial partners to develop high risk, high reward partnerships.
- We shall facilitate interdependent, cross-functional teaming. We shall reach across NASIC, government, private sector, and allied organizations to harness the internal and external capabilities needed to meet the challenges of a diverse and dynamic threat environment. Our collaborative processes will be lean, anticipatory, flexible, and timely with automation to quickly focus on mission priorities to provide unique insights and expertise.

NASIC CRADAs with collaborators are for the parties to share knowledge on specific mission related issues. NASIC EPA with academia give the NASIC Groups' Intelligence Analysts an opportunity to evaluate the research/briefings of Mercyhurst University (MU) students and a possibility of offering employment at NASIC.

The Year in Review

Success Story from FY24

NASIC ANALYSIS IMPROVED WITH AVIATION ENGINE INDUSTRY CRADA'S

The Details

Over the course of FY24 NASIC has engaged with our aviation engine industry partners via the CRADAs (P&W and GE Aviation) in several key ways. The most significant has been several opportunities we've been afforded to tour P&W and GE state-of-the art test, development, and manufacturing facilities in OH, CT, FL. Through state-of-the-art facility tours and technical briefings, we've developed a better understanding of propulsion related capabilities and technologies that will inform our future analysis of adversary capabiliites.

The Outcomes

Information shared and consumed through these engagements has informed our our understanding of adversary technology developments and capabilities which has been directly ingested in technical intelligence products. We've additionally had the opportunity to brief adversary capabilities to cleared GE and P&W workforce members informing threat capabilities and supporting tech-protection activities.

Facilities & Equipment

Our primary resource used was the utilization of facility and industry spaces to host meetings and engage with our CRADA partners.

NASIC's mission is to discover and characterize air, space, missile, and cyber threats to enable full-spectrum multi-domain operations, drive weapon system acquisition, and inform national defense policy.

FY24 Metrics

Inventions

Number of new inventions disclosed	1
Total Number of U.S. patents issued	1

Federal Collaborative R&D Relationships (CRADAs)

Number of CRADAs, Total Active	8
Number of CRADAs, Newly Executed	1
Number of Newly Executed CRADAs involving small businesses	1
Estimated CRADA contributed value	$300,000

Educational Partnership Agreements (EPAs)

Number of total active EPAs	1

PA CLEARED #SSC-PA-1006-10232024

Space Systems Command (SSC/SZ-BC)

Los Angeles Air Force Base
SSC.TechOutreach@spaceforce.mil

https://www.ssc.spaceforce.mil/

Overview

AFRL Commander and DAFT3 TEO Brigadier General Jason Bartolomei shares current AFRL research advances with former AFRL Commanders Major General Scott Cain, Major General (Ret) Heather Pringle at the AFRL technology booth during the 2024 Air, Space and Cyber Conference."

Strategy

The SSC/SZ-BC ORTA, located at Los Angeles Air Force Base, El Segundo, CA supports two of five Program Executive Officers (PEOs). SSC/SZ-BC addressed the needs of: Space Domain Awareness (SDA) and Combat Power (SSC/SZ), and Battle Management Command Control and Communications (BMC3) (SSZ/BC). The Engineering and Integration Division (SSC/SZ-BC/INT) is responsible for managing all aspects T3 and CRADAs across SSC/SZ-BC. SSC/SZ-BC is the only organization at SSC that has "Delegation of Authority to Enter into CRADAs" by DAF TEO; SSC/SZE-BCE is the Office of Research and Technology Application (ORTA) for SSC/SZ-BC. Technology Focus Areas – Satellite acquisition, space sensor development, ground control systems, position-navigation-timing (PNT) systems (GPS space and ground systems), Launch systems, payload development, and technology R&D.

The Year in Review

Success Story from FY24

REDWIRE CORP BRIEFS USSF LEADERS ON SPACE BASED 3-D PRINTER

The Details

SSC/SZ-BC's NDA-CRADA with Redwire Corporation lead to an introduction with leaders at the Space Rapid Capabilities Office (SpRCO). SMEs expressed interest in leveraging Redwire's space based 3D printer originally developed on a National Aeronautics and Space Administration (NASA) contract. There is interest in exploring this technology for a future SSC Space Test Program (STP) flight.

The Outcomes

Introduction to SpRCO SMEs that have interest in leveraging Redwire's space technologies for DoD applications that were originally developed for civilian space applications such as NASA.

U.S. Space Force photo by Van Ha

U.S. Space Force (USSF) Lt. Gen. Philip Garrant, Commander, Space Systems Command (SSC), and USSF Chief Master Sgt. Jacqueline Sauvé, SSC's Senior Enlisted Leader, address questions from the SSC workforce following Garrant's announcement of his command plan to additional insight on its development and the way forward during an Ask Me Anything event hosted in person and virtually from Los Angeles Air Force Base, El Segundo, CA, 22 October 2024.

Marketing & Outreach

SSC/SZ-BC and SSC/SZE-BCE participated in the 38th Space Symposium in Colorado Springs, Colorado. The event brings together leaders from commercial, government and military space from around the world. Over 10,000 space professionals and decision makers attend the Space Symposium every year. Laboratory and ORTA leadership attended the event and held one-on-one meetings with industry partners.

SSC/SZ-BC and SSC/SZE-BCE attended the Advanced Maui Optical and Space Surveillance Technologies (AMOS) Conference. A premier technical conference, the event is devoted to space situational awareness/space domain awareness. Laboratory and OTRA leadership attended the event and held one-on-one meetings with industry partners.

Resources Utilized

The SSC/SZ-BC laboratory is staffed by one government civilian and one SETA contractor. All remaining functions that are needed to process CRADA documents are handled on a case by case ad hoc basis.

Lessons Learned

Applying DD254s (Security Requirements) to CRADAs is a problem. The forms experience multiple road blocks during processing and are difficult to route through security management offices (SMO). SMO policies and procedures are inconsistent across military departments, organizations, and across the military services.

FY24 Metrics

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	23
Number of CRADAs, Newly Executed	5
Number of Newly Executed CRADAs involving small businesses	1
Estimated CRADA contributed value	$200,000

PA CLEARED #USAFA-DF-2024-767

US Air Force Academy (USAFA/DFQ)

Colorado Springs, Colorado

https://www.usafa.edu/

Overview

USAFA/DFQ Mission Statement 2024: Advancing our cadets, faculty, and forces through research.

Strategy

Evolve Research Office to support research as a core requirement for USAFA education (IAW AFMD12).

The Year in Review

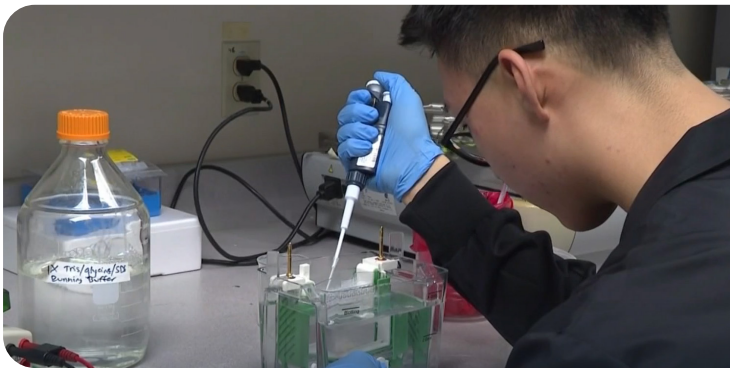
Success Stories from FY24

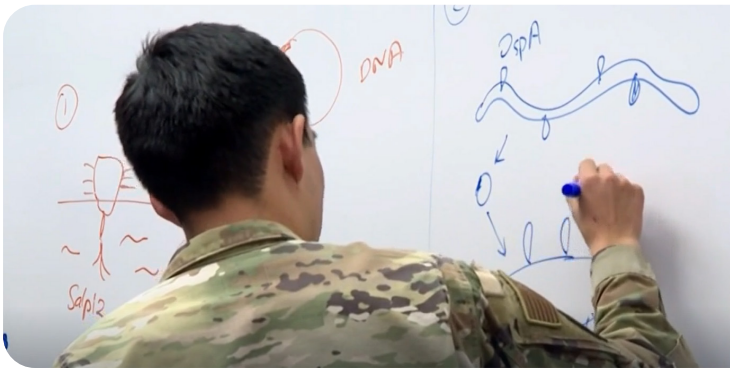
LYME DISEASE RESEARCH

https://www.koaa.com/news/covering-colorado/air-force-academy-cadets-honored-for-lyme-disease-early-detection-patch-idea

(IGEM TEAM, DEPARTMENT OF BIOLOGY)

Screenshots from KOAA NEWS 5, Southern Colorado





The Details

Lyme-AID is a genetically engineered system using a three-step biosensor to attract, inhibit, and detect Lyme disease-causing bacteria. It's designed as a stick-on patch for early detection of Lyme disease. The project aims to create a cost-effective, efficient, and easy-to-use detection system. The U.S. Centers for Disease Control and Prevention (CDC) estimates nearly half a million Americans get Lyme disease annually. If left untreated, Lyme disease can spread to joints, the heart, and the nervous system. The team plans to continue their research with the goal of creating the first Lyme-AID patch prototype in the next few years. They hope to make the patch easily accessible and include it in first-aid kits for hikers. The project demonstrates the potential for innovative solutions to real-world health problems through interdisciplinary collaboration and synthetic biology research.

The Outcomes

The cadet team won a gold medal at the international Genetically Engineered Machine (iGEM) Grand Jamboree in Paris13. They competed against nearly 400 teams from over 50 countries.

GAZE ASSISTED WHEELCHAIR

https://www.youtube.com/watch?v=ycuGMKtH5MQ

(DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING)

The Details

Near completion after five years: The U.S. Air Force Academy is close to finalizing a "gaze-assisted" wheelchair project that began in 2018.

Innovative technology: The wheelchair uses an advanced eye-motion-assisted controller that tracks eye direction to control the chair's movement.

Iterative development: Multiple classes of senior cadets have contributed to the project, refining prototypes and improving usability.

Patent pending: The graduating seniors who worked on the project will have their names attached to the patent application.

Dual-purpose application: The technology has potential military applications (e.g., for pilots or vehicle controllers) as well as humanitarian uses.

Interdisciplinary collaboration: Cadets from various disciplines (Electrical and Computer Engineering, Systems Engineering) brought different expertise to the project.

Real-world impact: The team plans to present the completed wheelchair to someone who needs it, fulfilling a humanitarian goal.

Improved usability: The latest team redesigned control interfaces based on video game experiences, making the wheelchair more user-friendly.

Potential for broader impact: The project demonstrates how assistive technology can improve mobility and independence for people with disabilities.

The Outcomes

Educational value: The project provided hands-on experience for cadets in reverse-engineering, prototyping, and refining complex systems.

Potential for broader impact: The project demonstrates how assistive technology can improve mobility and independence for people with disabilities.

U.S. Air Force photo by Trevor Cokley

Marketing & Outreach

The Office of Research assisted the USAFA Headquarters Public Affairs Office in the coordination of more than a dozen media articles and news features that specifically focus on the Research Enterprise. The most recent being two articles in Southern Colorado Business Forum & Digest and NORTH Magazine.

Barriers & Problems

The Academy will conduct research and all associated business activities to ensure research opportunities worthy of an elite undergraduate institution may be executed by faculty and cadets in all academic disciplines. Many Engineering and Basic sciences utilize T2 mechanisms to partner with external organizations. However, USAFA has overcome its struggle with supporting the Humanities and Social Science (SocSci) Divisions as we successfully gained authority from SecAF in order to accept grant funding from non-government entities.

Lessons Learned

We learned that we needed a whole new position to manage and run our Cadet Summer Research Program (CSRP). The program allows over 300 cadets to do research throughout the globe and with that comes an increased need for research agreements. The new addition to the DFQ Team has taken on the role as the Assistant Director of Research and Curriculum.

Resources

- In the summer of 2024, the Associate Dean of Research and the Dean of Faculty, Office of Research (DFQ) T3 PM traveled to Arlington, VA to attend the DAFT3 Summit.
- In the winter, DFQ T3 PM will attend the Government IP certification program through the University of Dayton.

Facilities & Equipment

Multi-Domain Lab we have 48 multi-domain operations workstations, 24 immersive learning devices (flight simulators), 12 remotely piloted aircraft stations, and 12 air battle management stations, all of which are integrated with data/voice. No other academic institution has such a robust multi-domain operations immersive learning environment.

The Aeronautics Department features the following capabilities:

Subsonic Wind Tunnel: This facility is a closed-return subsonic wind tunnel capable of conducting a range of experiments from fundamental fluid dynamics to applied aerodynamics. The tunnel has a square test section (3 feet x 3 feet) and is capable of reaching speeds of approximately half the speed of sound (Mach 0.5 - 550 feet per second or 165 meters per second). A number of diagnostic capabilities are available, including force/moment measurements (both static and dynamic) and advanced quantitative flow visualization techniques.

In the past year, this facility has supported work for a number of partners, including: NASA Johnson Space Center, the A-10 Systems Program Office (AFLCMC/WAA), the Air Force Research Laboratory (AFRL/RQ), University of Colorado.

FY24 Metrics

Inventions

Number of new inventions disclosed	5
Number of U.S. patent applications filed	16
Total Number of U.S. patents issued	6
Total number of active patents	45

Licensing

Number of total active invention licenses	2
Total active income bearing licenses	2
Number of partially exclusive licenses	1
All other licenses, not including invention or software, total active	2
Number of total active income bearing exclusive licenses	1

Federal Collaborative R&D Relationships (CRADAs)

(i.e., any agreements using 15 USC 3710a)

Number of CRADAs, Total Active	114
Number of CRADAs, Newly Executed	38
Number of Newly Executed CRADAs involving small businesses	8
Total CRADA Revenue	$56,391.35
Estimated CRADA contributed value	$617,488.59

Educational Partnership Agreements (EPAs)

Number of total active EPAs	5
Number of newly executed EPAs	2

Annual Report Acronyms

The following acronyms are used throughout the Department of the Air Force Technology Transfer and Transition Program Office (DAFT3PO) Annual Report.

#

318 COG	318th Cyberspace Operations Group
346 TS	346th Test Squadron
3D-LZ	Three-dimensional landing zone
412 TW	412th Test Wing
567 CoG	567th Cyberspace Operations Group
67 COG	67th Cyberspace Operations Group
67 CW	67th Cyber Wing
688 CW	688th Cyber Wing
867 COG	867th Cyberspace Operations Group

A

ABET	Accreditation Board for Engineering and Technology
AEDC	Arnold Engineering Development Complex
AFCEC	Air Force Civil Engineering Center
AFCEA	Armed Forces Communications and Electronics Association
AFCEC/CX	Air Force Civil Engineer Center Readiness Directorate
AFCEC/CXA	Airbase Technologies Division
AFCyber	Air Force Cyber
AFDD	Army Aeroflight Dynamics Directorate
AFFF	Aqueous Film-Forming Foam
AFGSC	Air Force Global Strick Command
AFI	Air Force Instruction
AFIOC	Air Force information Operations Center
AFIT	Air Force Institute of Technology
AFIT/CZ	AFIT's Office of Research and Outreach
AFLCMC	Air Force Life Cycle Management Center
AFLCMC/HN	Lantern, Hanscom collaboration and Innovation Center
AFLCMC/WA	Fighters and Advanced Aircraft Directorate
AFLCMC/WI	Intelligence, Surveillance and Reconnaissance Directorate
AFIMSC	Air Force Installation and Mission Support Center
AFMC	Air Force Materiel Command
AFMCLO/JAZ	Air Force Materiel Command Intellectual Property Legal Office

AFOSR/ST	Air Force Office of Scientific Research
AFRL	Air Force Research Laboratory
AFRL/711 HPW	Air Force Research Laboratory 711th Human Performance Wing
AFRL/RD-RV	Air Force Research Laboratory Directed Energy & Space Vehicles
AFRL/RI	Air Force Research Laboratory's Information Directorate
AFRL/RQ	Air Force Research Laboratory's Aerospace Systems Directorate
AFRL/RW	Air Force Research Laboratory's Munitions Directorate
AFRL/RX	Air Force Research Laboratory's Materials & Manufacturing Directorate
AFRL/RY	Air Force Research Laboratory's Sensors Directorate
AFRL/SP	Air Force Research Laboratory's Strategic Partnership Directorate
AFSC	Air Force Sustainment Center
AFSOC	Air Force Special Operations Command
AFTAC/SI	Air Force Technical Applications Center
AFTC	Air Force Test Center
AGWT	Advanced Guided Weapon Test Bed
AMOS	Air Force Maui Optical & Surveillance Squadron
AMXG	Aircraft Maintenance Group
AP	Armor Piercing
APEX	Academic Partnership Engagement Experiment
APL	Approved Products List
APMC	Aerospace Power and Materials Components Lab
AI	Artificial Intelligence
AIS	Assured Information Security
ASCENT	Advanced Spacecraft Energetic Non-Toxic
ASPL	Advanced Space Power Laboratory
ASTM	American Society of Testing and Materials
ATO	Authorization to Operate
AWEF	Advanced Warhead Experimentation Facility
AUTM	Association of University Technology Managers

B

BAA	Broad Agency Announcement
BRICC	Basic Research Innovation Collaboration Center
BATDOK	Battlefield Assisted Trauma Distributed Observation Kit
BTEIL	BEAR technology Evaluation & Integration Laboratory

BE-7	Blue Origin
BMC3	Battle Management Command Control and communications

C

C4I	Command, control, Communications, Computers and Intelligence
CAF	Compressed Air Foam
CARL	Compressor Aero Research Lab
CDC	U.S. Centers for Disease Control and Prevention
CDFAE	Center of Digital Forensics Academic Excellence
CE	Civil Engineer
CEAC	Combined Environment Acoustic Chamber
CeMPL	Ceramic Materials and Processes Laboratory
CERL	Construction Engineering Research Laboratory
CFL	Cyber Forensics Lab
CH4	Methane
CIC	Cyber Innovation Center
CI2	Continuousness improvement and Innovation
CLDRC	Combustion & Laser Diagnostics Research Complex
CLIP	Continuous Learning and Improving Practices
CONUS	Continental United States
CPI	Career Pathways Initiative
CPO	Collaborative Project Orders
COTS	Commercial off the shelf
COG	Cyberspace Operations Group
CRADA	Cooperative Research and Development Agreement
CRAF	Component Research Air Facility
CRC	Combustion Research Complex
CSRP	Cadet Summer Research Program
CSTARS	Center for Sustainment of Trauma and Readiness Skills
CTA	Commercial Test Agreement
CTO	Chief Technology Officer
CW	Cyberspace Wing

D

DAF	Department of the Air Force
DAFITC	Department of the Air Force Information Technology and Cyberpower
DAFT3	Department of the Air Force Technology Transfer and Transition
DAFT3PO	Department of the Air Force Technology Transfer and Transition Program Office
DAF TEO	Department of the Air Force Technology Executive Officer
DAFITC	Department of the Air Force Information Technology and Cyber-power
DARPA	Defense Advanced Research Projects Agency
DC3/XE	Department of Defense Cyber Crime Center
DCO	Defensive Cyberspace Operations
DERF	Detonation Engine Research Facility
DEFS	Distributed Embedded Fuze Design
DeSEL	Deployable Structures Experiment Laboratory
DFQ	Dean of Faculty, Office of Research
DHA	Defense Health Agency
DHS	Department of Homeland Security
DI	Doolittle Institute
D/MM	Digital and Multimedia
DNA	Distinct Native Attribute
DoC	Department of Commerce
DoD	Department of Defense
DODIN	Department of Defense Information Networks
DPARS	Patent Application Review System
DTTIS	Defense Technology Transfer Information System

E

EAFB	Edwards Air Force Base
EDM	Electrical Discharge machining
EEB	Experiments in Extraterrestrial Botany
EERF	Engine Environment Research Facility
ERDC	Engineering Development and Research Center
EOD	Explosive Ordnance Disposal
EMCaFS	Electromagnetic Characterization and Field Support Facility
EPA	Educational Partnership Agreement
ESTCP	Environmental Security Technology Certification Program
ETC	Environmental Test Chambers

F

F3s	Fluorine Free Foams
FLC	Federal Laboratory Consortium
FLM	Focused Lethality Munition
FFRDC	Federally Funded Research and Development Centers
FPA	Focal Plane Arrays
FSSTF	Full Scale Structural Test Facility
FSWT	Free Surface Water Tunnel
FY	Fiscal Year

G

GI	Griffis Institute
GLC	Gossick Leadership Center
GPS	Global Positioning System

H

HAL	Heat-Transfer & Aerothermal Lab
HALAS	High-Altitude LiDAR Atmospheric Sensing
HERD	High Explosives Research & Development Facility
HIFL	Heat Flux Instrumentation Lab
HIT	Hanscom Innovation Team
HPCRF	High Pressure Combustion Research Facility
HPW	Human Performance Wing
HTVSF	Hard Target Void Sensing Fuze

I

IAC	Innovare Advancement Center
IACP	International Association of Chiefs of Police
IAW	In Accordance With
IC	Intelligence Community

ICS	Integrated Cockpit Sensing
IDE	Invention disclosure evaluations
iGEM	International Genetically Engineered Machine
IoT	Internet of Things
I&P	Innovation & Partnerships
IP	Intellectual Property
IPD	Integrated Powerhead Demonstrator
IRAD	Independent Research and Development
IRFPA	Infrared Focal Plane Arrays
IRIS	Integrated Remote Interrogation System
IRREL	Infrared Radiation Effects Laboratory
ISAC	Information Sharing and Analysis Center
ISR	Intelligence, Surveillance, & Reconnaissance
ISS	
ITA	Information Transfer Agreement

J

JA	Judge Advocate
JBSA	Joint Base San Antonio
JOA	Joint Ownership Agreements
JDAM	Joint Direct Attack Munition

K

KHILS	Kinetic Kill-vehicle Hardware-in-the Loop Simulator

L

LADAR	Laser Detection and ranging
LASS	Large Area Space Structures
LDOS	Local Density of States
LEO	Low Earth Orbit
LES	Licensing Executives Society

LHMEL	Laser-Hardened Material Evaluation Laboratory
LiDAR	Laser Detection and Ranging
LOX	Liquid Oxygen
LPCRADAs	Limited Purpose CRADAs
LQEP	Laboratory Quality Enhancement Program
LRE	Liquid Rocket Engine

M

M&T Lab	Material and Testing Lab
MAOS	Minimum Airfield Operations Surface
MART	Materials Application, Removal, and Testing
MCC	Main Combustion Chamber
MCF	Material Characterization Facility
MEP	Manufacturing Extension Partnership
METER	Modula Expeditionary Test & Evaluation Resource
ML	Machine Learning
MOA	Memorandum of Agreement
MOP	Massive Ordnance Penetrator
MRA	Manufacturing Readiness Assessment
MRL	Manufacturing Readiness Levels
MSAT	Modeling, Simulation, Analysis, & Test Lab 2012
MSRL	Mechanical Systems Research Lab
MTA	Material Transfer Agreement
MTF	Main Test Floor
MTL	Materials Testing Laboratory
MTS	Material Testing System
MU	Mercyhurst University

N

NAFRC	National Aerospace Fuels Research Complex
NASA	National Aeronautics and Space Administration
NASIC/XO	National Air and Space Intelligence Center
NAVAIR	Naval Air Systems Command

NDA	Non-Disclosure Agreements
NDAA	National Defense Authorization Act
NICE	National Initiative for Cybersecurity Education
NIST	National Institute of Standards and Technology
NGSS	Next Generation Science Standards
NMSU	New Mexico State University
NSIN	National Security Innovation Network
NSSL	National Security Space Launch
NYSTEC	New York State Technology Enterprise Corporation

O

O&M	Operations and Maintenance
ORION	Open-Architecture Resilient IOT for Operational Networks
ORTA	Office of Research and Technology Applications
OSD	Office of the Secretary of Defense
OSS	Operational Support Squadron

P

PAD	Program Action Directive
PADL	Pilot-scale Processing Plant and Alloy Development Laboratory
PEC	Process Evaluation Chips
PECS	Power Electronic Components Lab
PEO	Program Executive Officer
PCAP	Packet Capture
PDWG	Professional Development Working Group
PI	Partnership Intermediaries
PIA	Partnership Intermediary Agreement
PLA	Patent License Agreement
PNT	Position-Navigation-Timing
POC	Point of Contact
PVT	Psychomotor Vigilance Test

Q

QRS	Quantum Research Sciences
QPL	Qualified Product Listing

R

RAC	Research Altitude Chambers
R&D	Quantum Research Sciences
RDT&E	Research, Development, Test & Evaluation
RDEF	Rapid Design Engineering Facility
RDRE	Rotating Detonation Rocket Engine
REEF	Research and Engineering Education Facility
Research Cell 18	Sub-scale Direct Connect Supersonic Combustion Facility
RH	Human Effectiveness Directorate
RI	Information Directorate
RISC	Research for Intelligence and Security Challenges
RP-2	Rocket Propellant
RUT	Reusable Test Lab
RWSP	Partnerships Branch, Strategy Division

S

S&Es	Scientists and Engineers
SAF/AQ	Assistant Secretary of the Air Force for Acquisition
SARL	Subsonic Aerodynamic Research Lab
S&T	Science and Technology
SBIR	Small Business Innovation Research
SBOM	Software Bill of Materials
SCICL	Spacecraft Charging and Instrument Calibrations Laboratory
SCRM	Supply Change Risk Management
SDA	Space Domain Awareness
SDB	Small Diameter Bomb
SECAF	Secretary of the Air Force

S&Es	Scientists and Engineers
SAF/AQ	Assistant Secretary of the Air Force for Acquisition
SARL	Subsonic Aerodynamic Research Lab
SAR	
S&T	Science and Technology
SBIR	Small Business Innovation Research
SBOM	Software Bill of Materials
SCICL	Spacecraft Charging and Instrument Calibrations Laboratory
SCRM	Supply Change Risk Management
SDA	Space Domain Awareness
SDB	Small Diameter Bomb
SECAF	Secretary of the Air Force
SEF	Sub-Element Facility
SEM	Scanning Electron Microscope
SERL	Small-Engine Research Lab
SETA	Systems Engineering and Technical Assistance
SLA	Software License Agreements
SLD 30	Space Launch Delta 30
SME	Subject Matter Experts
SMO	Security management Offices
SNARC	Stochastic Neural Analog Reinforcement Calculator
SOCOM	Special Operations Command
SocSci	Social Science
SOF	Special Operations Forces
SOW	Statement of Work
SPEAR	Seeker Phenomenology Evaluation & Research
SPO	System Program Office
SpRCO	Space Rapid Capabilities Office
SRM	
SSC	Space System Command
SSC/SZ	Combat Power
SSC/SZ-BC	Space Systems Command
SSC/SB-BC/INT	Engineering and Integration Division
S&T	Science & Technology
STARBASE	Science and Technology Academies Reinforcing Basic Aviation and Space Exploration

STEM	Science, Technology, Engineering, and Mathematics
STI	
STM	Scanning Tunneling Microscopy
STP	Space Test Program
STRAEF	Seeker Technologies Research and Evaluation Facility
STTR	Small Business Technology Transfer
SWIA	South West Innovation Alliance
SWWG	Software Working Group

T

T2	Technology Transfer
T2U	T2 University
T3	Technology Transfer and Transition
TacRS	Tactically Responsive Space
TAMU	Texas A&M University
TEFF	Turbine Engine Fatigue Facility
TEO	Technology Executive Officer
TFDL	Thick Film Deposition Lab
TGF	Trisonic Gas-Dynamics Facility
TILE	Thrust-Induced Light Electrospray
TLA	Technology Licensing Agreements
TOC-L	Tactical Operations Center-Light
ToTEMS	Two-phase Thermal Energy Management Systems
TPOC	Technical Point of Contact
TR-Elevator	Tech Readiness Elevator
TRF	Turbine Research Facility
TRL	Technology Readiness Level
TS	Test Squadron
TTPs	Tactics, techniques, and procedures

U

UFC	Unified Facility Criteria
UHP	Ultra-high Pressure

UNM	University of New Mexico
USAF	United States Air Force
USAFA/DFQ	United States Air Force Academy
USAFSAM	United States air Force School of Aerospace Medicine
USG	US Government
USSF	United States Space Force
UTSA	University of Texas San Antonio
UXO	Unexploded Ordnances

V

VDP	Vulnerability Disclosure Program
VSFB	Vandenberg Space Force Base
VT-ARC	Virginia Tech-Applied Research Corporation
VTC	Virtual Teleconferences
VTVL	Vertical Takeoff/Vertical Landing
VWT	Vertical Wind Tunnel

W

WBI	Wright Brothers Institute
WMD	Weapons of Mass Destruction
WPAFB	Wright-Patterson Air Force Base

X

XP	Wing Plans and Programs Office

Y

Z