DAFTB

DEPARTMENT OF THE AIR FORCE
TECHNOLOGY TRANSFER AND TRANSITION

23

ANNUAL REPORT

2023

AFRL Clearance #AFRL-2024-0009

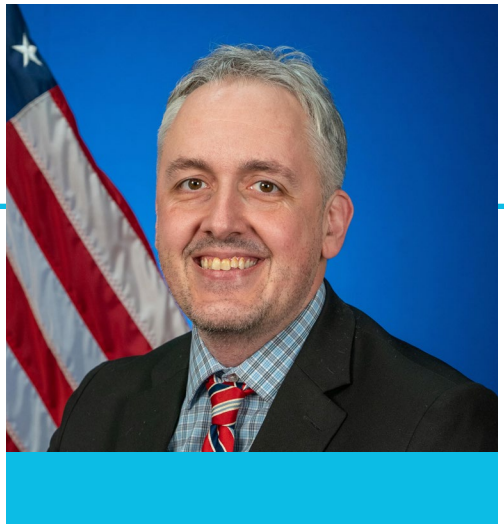
PARTNERING WITH A SHARED VISION

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

Designed by: Ms. Shania Horner | Sr. Graphic Designer

CONTENTS

WORDS FROM OUR
PROGRAM 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 FY23 report demonstrates how the DAFT3 Office and 37 other DAF organizational activities, both Air Force and Space Force, have been successful in Technology Transfer (T2) activities.

Scott Aughenbaugh was appointed by the DAFTEO 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 towards 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 Tech Transfer Agreements and Partnership Intermediaries, as described in more detail, later in the this report.

A FEW WORDS FROM SCOTT

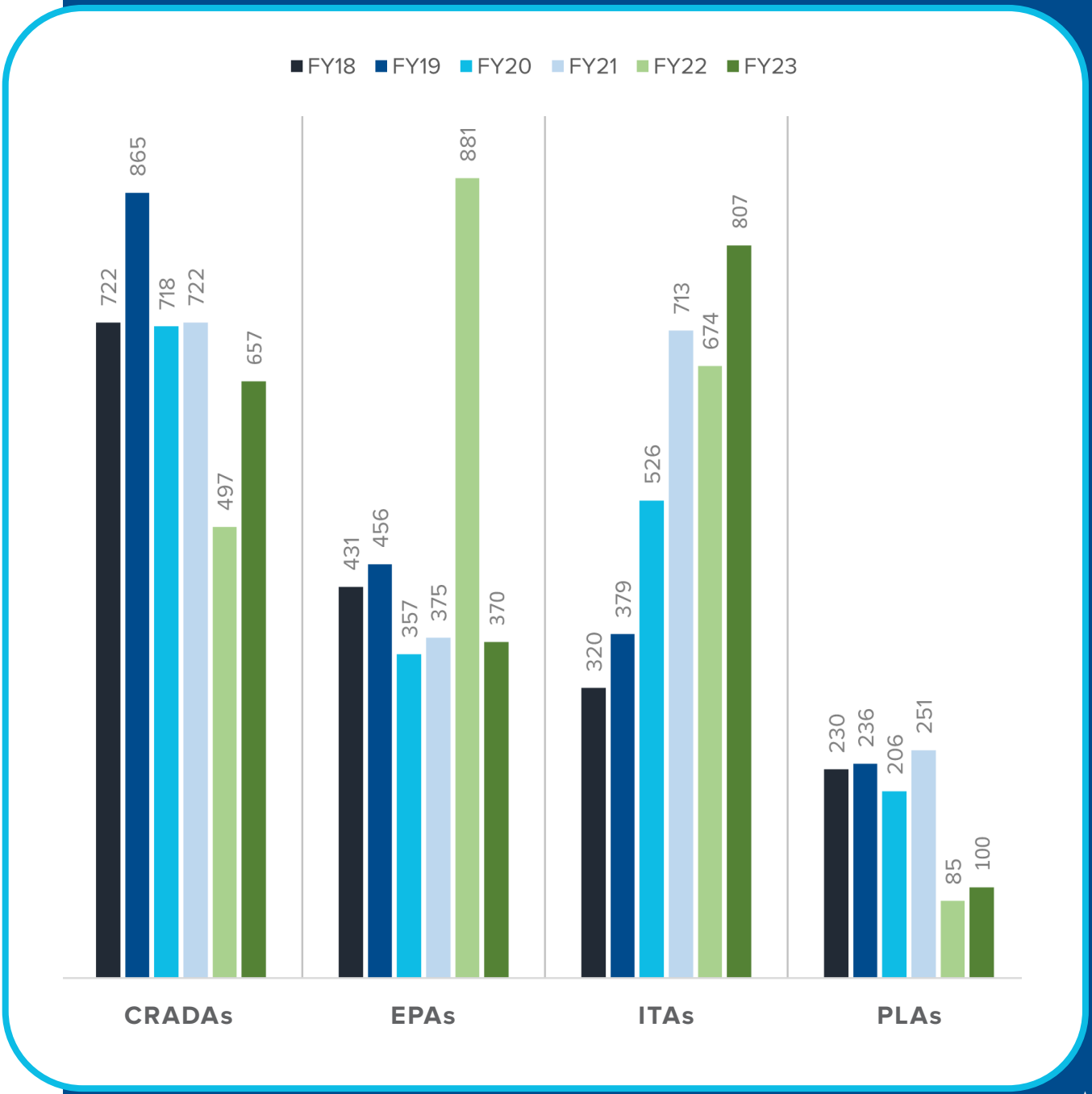
Having spent the last decade in and around defense and intelligence communities, most of the time is trying to optimize the different ways we can solve our problems with the use of FAR (Federal Acquisition Regulation) and non-FAR based tools. While one of the dominant recommendations back have often included more usage of Other Transactions Authority, I have been excited by a series of other non-FAR tools (Prize Authority, CRADAs, EPAs, PIAs) that can also help us accomplish our goals. While the DAF is not the first through the door in trying them out, there is a continual need to educate our leaders. This ensures that utilizing non-FAR based tools help the mission and are used as Congress intended. Tech Transfer agreements come with no-funds leaving the federal government, but instead rely on our workforce having the time to commit to various workplans/ projects.

Coming into this new role after five great years of leadership under Joseph Gordon, I have spent the first six months trying to understand what is working well, what areas need improvement, and how we can further support the DAF with these tools. In my experience “innovation” is just a fancy word for the scientific method of observing, questioning, hypothesizing, experimenting, and measuring. Much of the challenge stems from a more risk-averse mindset, which is both observable and appreciable. if you see the paperwork challenges with executing contracts and agreements. My chief focus has been evaluating some of those processes and policies to ensure we have streamlined where we can help our legal, contracting, and programmatic professionals. I hope we continue to apply these methods to continual process improvement and layout some new pilots for professional development, commercialization and partnership intermediaries heading into FY25 and FY26.

While I only served in this role for a portion of FY23, our team is proud of the data we present in our 2023 Annual Report. These data points will help us further refine our metrics and pilots going forward. I would point out that one of the great trends we documented in FY23 was the growth in innovation occurring outside the traditional lab and you will see that with some of the reports from our DAF ORTAs. While the stories contained within are often multi-year transition stories, topics like our patent portfolio continue to payback in royalties and other advantages over their lifetimes. Finally, moving forward with the Defense Technology Transfer Information System (DTTIS), as it heads into production in FY24, will further streamline the collection of data on our agreements for both the DAF and OSD.

2023 ACTIVE AIR FORCE

AGREEMENTS SNAPSHOT



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Full DAFT3 Metrics can be found on page 36

T3 PROGRAM HISTORY

In addition to the mission-related reasons for the Department of the Air Force (DAF) to engage in Technology Transfer (T2), there also is the legal obligation. Before the introduction of the first T2 legislation in 1980, many inventions generated in federal agencies were often shelved and never reached the market due to a lack of government manufacturing capability. Thus came the challenge of bridging the "valley of death." The Stevenson-Wydler Technology Innovation and Bayh-Dole Acts were game changers for T2. With their introduction in 1980, government-funded intellectual property could be licensed to the private sector (industry and academia) so inventions could be further developed, manufactured, and commercialized.

Federal agencies are now required by law (15 USC §3710) to attempt to transfer their inventions to industry "to ensure the full use of the results of the Nation's Federal investment in research and development." This mandate obliges all federal labs to establish dedicated T2 offices and personnel, makes T2 the responsibility of every lab scientist and engineer, and requires federal agencies to annually report their T2 metrics to the Office of Management and Budget (OMB) as part of their annual budget submission. Additional legislation (10 USC §2514) specifically directs Department of Defense (DoD) to attempt to transfer its inventions to the U.S. industrial base.

Complementing these seminal laws are nearly forty years of federal legislation, executive orders, and Presidential memoranda as well as DoD's own directives, memoranda, instructions, and other issuances. DoD Directive 5535.3 and Instruction 5535.8 direct the T2 mandate within the Department of Defense. Per Instruction 5535.8: "T2 activities shall be an integral element of the DoD national security mission, a high-priority role in all DoD acquisition programs and recognized as a key activity of the DoD laboratories... Commercial availability of DoD-developed technologies can be expected to lower the costs of acquiring military equipment by providing the opportunity to take advantage of economies of scale and buy from a larger commercial industrial base."

Within the DAF, the key T2-implementing document is Air Force Instruction 61-301, dated 16 September 2019. Per this instruction: "Air Force technology transfer activities are key components of the Air Force contribution to the DoD national security mission. This mission requires the best possible use of national scientific and technical capabilities and a strong industrial base to meet the DAF's and the Nation's needs. DAF T2 activities promote the best possible use of national scientific and technical capabilities by improving the quality of the defense laboratories, increasing their ability to perform their designated missions effectively and efficiently, and by using their taxpayer-funded infrastructure to support private sector activities in the areas of air, space, and cyberspace."

Since the 1980s, the Department of the Air Force Technology Transfer Office has served as the Office of Research and Technology Application (ORTA) for all Air Force and Space Force Laboratories and/or Technical Activities having only a technology transfer focal point. DAFT3 continues to aid other DAF organizations with the requirements of DAF and DoD T2 guidance, thereby allowing DAF organizations to carry out their respective missions and most importantly, benefit the Warfighter.

Before 1980...

Inventions generated in federal agencies were often shelved and never reached the market.

WHY?

Due to a lack of government manufacturing capability. This was otherwise known as the **Valley of Death.**

1980

Introduction of the First T2 Legislations

The Stevenson-Wydler Technology Innovation and Bayh-Dole Acts were game changers for T2. Government-funded intellectual property could now be licensed to the private sector so inventions could be further developed, manufactured, and commercialized.

DAFT3PO has served as the ORTA for all Air Force and Space Force Laboratories and/or Technical Activities having only a technology transfer focal point.

More than 40 Years...

of federal legislation, executive orders, and Presidential memoranda as well as DoD's own directives, memoranda, instructions, and other issuances.

"T2 activities shall be an integral element of the DoD national security mission, a high-priority role in all DoD acquisition programs and recognized as a key activity of the DoD laboratories

Air Force Instruction 61-301

- The **KEY** T2-implementing document
- This mission requires the best possible use of national scientific and technical capabilities and a strong industrial base to meet the DAF's and the Nation's needs.

Today

It's the Law

to attempt to transfer their inventions to industry.

- Establish dedicated T2 offices and personnel
- makes T2 the responsibility of every lab scientist and engineer
- requires federal agencies to annually report their T2 metrics to the OMB

The DAFT3PO continues to aid other DAF organizations with the requirements of DAF and DoD T2 guidance, thereby allowing DAF organizations to carry out their respective missions and most importantly, benefit the Warfighter. ★

DAFT3
PROGRAM OFFICE

The Department of the Air Force Technology Transfer and Transition Program Office (DAFT3PO), under Director Scott Aughenbaugh, operates under the Air Force Research Laboratory's Strategic Partnership Directorate (AFRL/SP). The AFRL/SP Director is Mr. James Bieryla and its Deputy Director is Mr. Brian McJilton.

The DAFT3PO manages and supports all Technology Transfer (T2) activities and serves as the DAF Office of Research and Technology Applications (ORTA), focusing on the processing of T2 agreements, training, guidance, assistance, and ORTA services for organizations that do not have a designated ORTA. The DAFT3PO also handles delegations, as granted by the DAF Technology Executive Officer (TEO) and makes determinations of new ORTAs and Delegated Authority requests, all of which are coordinated with the Air Force Materiel Command Intellectual Property Legal Office (AFMCLO/JAZ). The DAFT3PO also supervises 14 Partnership Intermediaries (PI) and provides Partnership Intermediary Agreement (PIA) Training. The DAFT3PO is also responsible for updating Air Force Instruction (AFI) 61-301, as necessary, and publishing the T3 Handbook. Additionally, the DAFT3PO oversees and issues patent royalty disbursements, outreach efforts, technology scouting, awards, social media presence, publishing success stories, and calculating metrics.

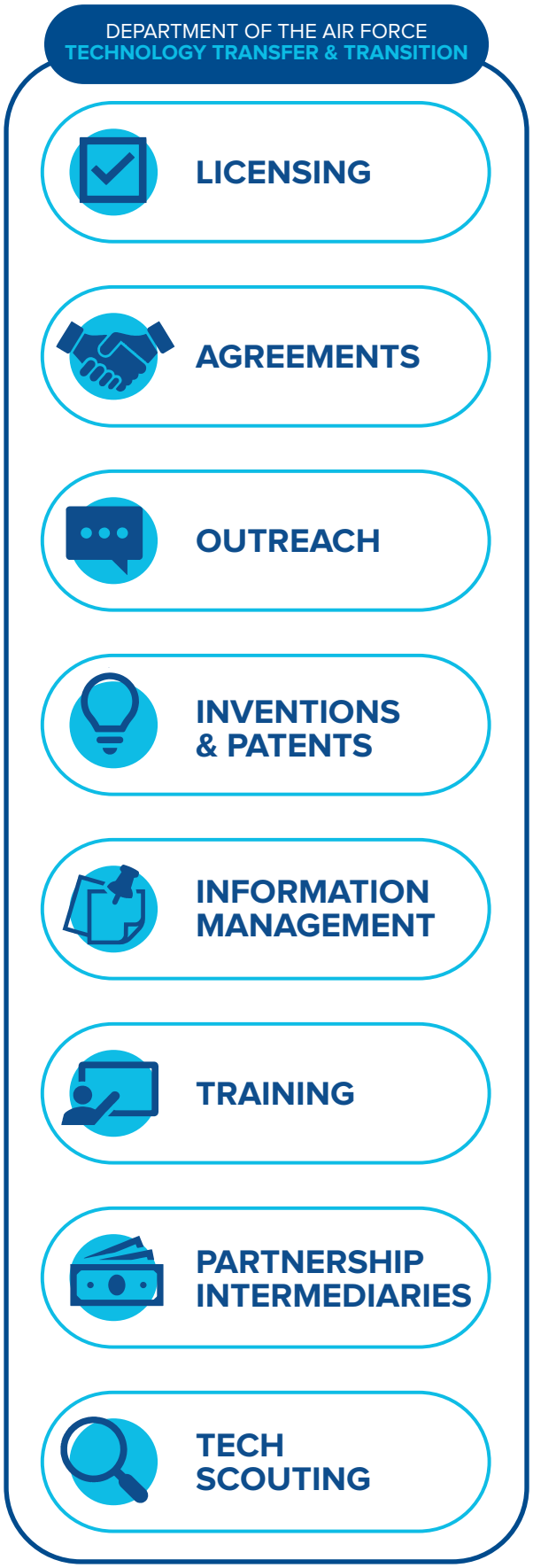
The premier effort by the DAFT3PO is the development of the Defense Technology Transfer Information System (DTTIS) which will enable all Department of Defense (DoD) T2 Activities to successfully manage agreements, patents, royalties, and metrics. As of now, it is at the Air Force level. The deployment of DTTIS is anticipated in early FY24. All these areas have detailed write-ups throughout this report.

MISSION

The mission of the Department of the Air Force Technology Transfer and Transition Program Office (DAFT3PO) is 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. 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.

According to 15 USC §3710:

Our mission is to help Air Force and Space Force organizations transfer technologies developed in the laboratories or technical activities to the commercial market and transition technologies to the warfighter.



KEY OBJECTIVES:

- Internal Process Improvements.
- Innovation Enhancements.
- Positive Economic Impacts; and
- Complete Development of New Software Tool for Agreement Tracking, Storage, Metrics, and Patent Docketing.

HOW WE ACCOMPLISH THE MISSION:

- Protecting intellectual property and managing the DAF intellectual property portfolio.
- Championing the development and commercialization of DAF discoveries.
- Serving as a focal point of interaction between and promoting collaborations with academia, industry, nonprofits, and government agencies.
- Negotiating agreements to support DAF research programs.
- Providing guidance and training on T2; and
- Leveraging partnerships to stimulate local, regional, and national economic development.

PROGRAM STRATEGY

STRATEGY TO OBTAIN OBJECTIVES

The Department of the Air Force Technology Transfer and Transition Program Office (DAFT3PO) continues the process of updating policy documentation while enhancing strategies to accelerate technology transfer. An updated Air Force Instruction (AFI) 61-301, the domestic technology transfer process and the offices of research and technology applications cooperative research and development agreements was issued on September 16, 2019. The DAFT3PO seeks to continue the process of updating and improving AFI 61-301 in FY24 to continue streamlining processes.

TECHNOLOGY TRANSFER TRAINING

The DAFT3PO made Office of Research and Technology Applications (ORTA) training, as well as Intellectual Property training for Scientists and Engineers (S&Es), among its top priorities in FY23; successfully executing eleven events across the following locations:

Wright Patterson Air Force Base (October 25, 2022, January 12, May 25, and September 20, 2023)
Niceville, Florida (October 19, 2022)
Kirtland Air Force (March 1-2, 2023)
Los Angeles Air Force Base (April 20, 2023)
Hanscom Air Force Base (May 16-17, 2023)
Hill Air Force Base (June 1, 2023)
San Antonio, Texas (November 4, 2022)
Tinker Air Force Base (August 14, 2023)

All trainings were held in conjunction with AFMCLO/JAZ attorneys to ensure proper procedures were thoroughly detailed and opportunities for improvement were identified.

UPDATE AIR FORCE AGREEMENT TEMPLATES

The DAFT3PO, with the assistance of Air Force Materiel Command Law Office Division (AFMCLO/JAZ), remains in the process of updating agreement templates to make them more cohesive and assure a greater understanding for all parties involved. In FY23, a thorough review of the Patent License Agreement (PLA) template was undertaken. Suggested changes were submitted to SAF/GCQ for concurrence.

The DAFT3PO and AFMCLO/JAZ will continue to work to improve the clarity of agreements in FY24. Once the proposed PLA template is approved by SAF/GCQ, attention will turn to updating the templates for the Educational Partnership Agreement (EPA) and Cooperative Research and Development Agreement (CRADA).

MARKETING AND OUTREACH

The DAFT3PO will continue to leverage social media, as well as participate in and host events to educate industry, academia, government organizations and the public about the program and its benefits, which includes patented Air Force and Space Force innovations available for licensing, collaborative research opportunities, and equipment and labs available for commercial testing.

DTTIS

The DAFT3PO is developing the Defense Technology Transfer Information System (DTTIS), a DoD-level software tool for agreement tracking, storage, metrics, and patent docketing. The development team has been establishing Cloud One Test, integration, and production environments for DTTIS to support limited testing during FY23. Initial operational capability is on schedule for FY24. ★

OUR LEADERSHIP

The Deputy Assistant Secretary of the Air Force for Science, Technology and Engineering (SAF/AQR) is the Office of Primary Responsibility for the Department of the Air Force Technology Transfer and Transition (DAFT3) Program and is responsible for establishing its objectives consistent with Air Force and Space Force research priorities.

SAF/AQR has delegated program management responsibility of the DAFT3 Program to the Department of the Air Force Technology Executive Officer (DAFTEO). The DAFTEO has appointed the DAFT3 Director to accomplish the objectives of the DAFT3 Program, as well as direct, coordinate, and implement all guidance and procedures related thereto.

In 2023 to enhance partnerships, AFRL stood up the Strategic Partnership Directorate (AFRL/SP) at Wright Patterson Air Force Base (WPAFB), Ohio. ★

Ms. Kristen Baldwin

The Pentagon

Deputy Assistant Secretary of the Department of the Air Force Office of Science, Technology, and Engineering

Office of the Assistant Secretary of the Department of the Air Force for Acquisition

Dr. Yvette Weber

The Pentagon

Deputy Assistant Secretary of the Department of the Air Force Office of Science, Technology, and Engineering

Office of the Assistant Secretary of the Department of the Air Force for Acquisition

Mr. Dan Ogg

The Pentagon

Department of the Air Force Technology Transfer Program Element Monitor; Innovation Team Lead

Office of the Assistant Secretary of the Department of the Air Force for Acquisition

Maj Gen Scott A. Cain

Wright Patterson Air Force Base

Air Force Research Laboratory Commander

Department of the Air Force Technology Executive Officer

Mr. Scott Aughenbaugh

Wright Patterson Air Force Base

Department of the Air Force Technology Transfer and Transition Director

Air Force Research Laboratory

Mr. James Bieryla

Wright Patterson Air Force Base

Strategic Partnering Directorate Director

Air Force Research Laboratory

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Jim Ingram
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WORDS FROM THE DAFT3/TEO

Maj Gen Scott A. Cain

In June of 2023, Major General Scott Cain became the Department of the Air Force (DAF) Technology Executive Officer (TEO). The TEO is responsible for the management of the DAF Tech Transfer and Transition (T3) Program, as directed by SAF/AQ. This includes the appointment of the DAFT3PO Director, signing Tech Transfer agreements and granting delegated signature authority in accordance with Air Force Instruction (AFI) 61-101. The DAF TEO is dual hatted as the Air Force Research Laboratory (AFRL) Commander, both located at Wright-Patterson AFB.

With a background in astronautical and aerospace engineering, and national resource strategy overseeing a technology portfolio focused at anticipating the needs of the warfighter, Maj Gen Cain is inherently aware of the profound value of Technology Transfer and Transition. He believes the partnerships and collaborations currently being done is shaping the future of the DAF.

Maj Gen Cain comes to the program after having previously served as Director of Air, Space, and Cyberspace Operations, Headquarters at AFMC. He previously, Maj Gen Cain served three years as the 96th Test Wing Commander, Eglin Air Force Base in Florida. He received his commission from the United States Air Force Academy (USAFA) in 1995 as a distinguished graduate before being selected to fly the F-16 Fighting Falcon. ★

Former Director
of Air, Space, and Cyberspace Operations

Served 3 yrs
96th Test Wing Commander

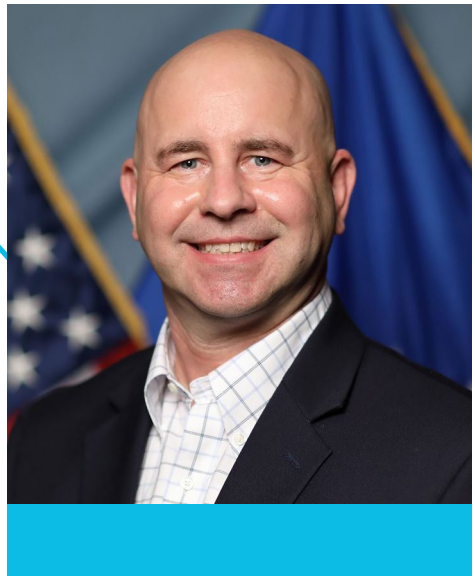
Former Pilot
F-16 Falcon

Dual Hatted
as Commander and TEO

"In this era of great power competition, the Department of the Air Force's Technology Transfer and Transition Program is pivotal. Through collaboration with academia, industry, state, and local governments, it embodies our nation's approach to harnessing technological innovation, ensuring a unified strategic advantage that secures our warfighting competitive edge and the economic strength of the United States."

- Major General Scott A. Cain
Department of the Air Force Technology Executive Officer

WORDS FROM THE
AFRL/SP DIRECTOR



Mr. James “Sass” Bieryla

James Bieryla serves as the first Director of the newly established Air Force Research Laboratory Strategic Partnering (AFRL/SP) Directorate. The former Air Force fighter pilot amassed nearly 3,000 hours flying various fighter jets and other airplanes during his more than 20 years of active duty. Following his retirement, Bieryla transitioned to the AFRL where he led classified technology development efforts. He most recently served as the Air Force Work Project (AFWERX) Deputy Director, the innovation arm of the Department of the Air Force (DAF).

Bieryla is excited to be the first to guide the directorate.

“It’s always interesting to be in a position like this; to be able to influence how a whole organization grows up. You get to put your fingerprints on it,” he said. However, he’s quick to point out many of the key pieces to making SP a success were in place prior to his arrival. “It’s a very unique situation where it’s a new organization, but it is already working at a high level and accomplishing a lot of great things. Now we get to tweak it and make sure we are all aligned and able to take things to the next level.”

The Department of the Air Force Technology Transfer & Transition Program Office (DAFT3PO) resides within the SP Directorate. The program is tasked with facilitating the implementation of Air Force innovative technologies in products and services to benefit the warfighter and the public, while supporting DAF research through collaborative partnerships. Its mission is to help Air Force and Space Force organizations transfer technologies developed in the laboratories or through technical activities to the commercial market and transition technologies to the warfighter. The importance of the technology transfer is not lost on Bieryla.

“In this era of emerging powers, it is more critical than ever to make sure we harness the power of collaborative research with industry and academia. By enhancing economic competitiveness and promoting productive partnering, we can drive the fight to develop and transition the technology that our present and future warfighters need to win,” he said.

Based on his time with AFWERX, Bieryla finds some similarity with his new organization in relation to working with highly functioning organizations and fusing them together so that those groups work in the same strategic direction. Drawing from his active-duty experience, Bieryla finds it’s prepared him for his new role in ways that may not be obvious to most. That includes his time serving during conflict in the Middle East.

“When I think back to my days as a pilot and some specific and unique experiences, my time serving in Iraq comes to mind. I was flying over the country in an F15,” he began. “Anytime you’re doing that, you’re hyperaware of your surroundings and what’s going on. You must process all that information and make real-time decisions. They’re not always going to be perfect decisions, but you can’t wait.”

That is part of the philosophy Bieryla is bringing to the directorate, acting timely with the best information available.

1st
AFRL/SP Director

Former pilot
for the USAF

3,000 hrs
flying

20+ years
of active duty

"You can't just sit back and wait for 100 percent of the data. You must be able to find that balance between making a good decision while recognizing you don't have all the information, but knowing a decision has got to be made," he said.

While Bieryla wants to focus on acting quickly so opportunities aren't missed, he also stresses the importance of not making abrupt actions. He expects SP to innovate at an accelerated pace while being well-informed.

"We don't want to make rash decisions. When I relate it back to my experience flying in Iraq, you get some unique indications on your radar or radio. You don't just want to make a snap decision just based on that," he said. "The same thing applies here. You want to find that balance. You've got to be able to get as much available information as you can and then make the best decision you can with what you've got."

The new director also wants to focus on nurturing relationships strategically within the innovation ecosystem. Bieryla believes in looking at not just what's best for the AFRL but what will best serve the DAF overall. He's pleased with the many relationships the AFRL has been able to forge and benefit from over the years, however, he's looking to help foster broader success. While there will always be a need for one-on-one Subject Matter Experts (SMEs) working with technical experts for individual challenges, SP should pivot to looking at the bigger picture.

"What we mean by 'strategic' now is learning how we can do that same type of outward looking and relationship building but do it so that impacts more than just one researcher or partner. If I can have a strategic partnership that three to six technical directorates can take part in due to aspects that align with things they are all trying to do, that is what we see as being strategic. Then it's impacting across the enterprise," Bieryla said.

When Brig Gen Scott Cain recently took over as Commander of the AFRL, Air Force Materiel Command (AFMC) at Wright-Patterson Air Force Base (WPAFB), he challenged all organizations to amplify the culture of the warfighter. Bieryla says he wants to approach meeting that challenge in three distinct ways: 1) Being mission focused, 2) Possessing a critical mindset, and 3) Providing innovation and adaptability.

"Being mission focused, to me, is thinking about anything I'm doing and how do I tie that into the mission. If it appears to be the smallest and most mundane thing, that's okay. I still want to take a step back and figure out how that's tying into the mission of the Air Force.

"Secondly, having the ability to look critically at what I'm doing and making sure I'm doing the right things and looking for opportunities for improvement. If I can critically look at it and be truthful about what I'm seeing and doing, then I should be able to make sure that it is aligned from a mission perspective," Bieryla said.

"Finally, I truly mean we need to be looking for ways to use innovation and adaptation to improve the way we do business every day. Whether that means generating more awareness for the rest of the ecosystem about what's happening, decreasing the length of time it takes for a partner to work with us, or looking for new flexibilities that exist to bring into our toolkit to improve the process," he concluded.

Bieryla is honored to help lead SP into the next era of AFRL innovation and believes the ability to take better advantage of opportunities is paramount.

"We, as the AFRL, cannot operate in a vacuum and we must harness the whole of the science and technology (S&T) environment that's out there, both on the Department of Defense side and government side as well as the industry, academic, and international sides." ★

> **"It's a very unique situation where it's (AFRL/SP) a new organization, but it is already working at a high level and accomplishing a lot of great things. Now we get to tweak it and make sure we are all aligned and able to take things to the next level."**

LEGAL SERVICES

INTELLECTUAL PROPERTY LAW DIVISION

The Intellectual Property Law Division of the Air Force Materiel Command Law Office (AFMCLO/JAZ), or "LO/JAZ", is the servicing legal office for patent and technology transfer matters for much of the Air Force. Aside from Rome Laboratory, New York (Randall Jones, Attorney) and Kirtland Air Force Base, New Mexico (David Narciso, Attorney), LO/JAZ provides patent preparation and prosecution services for all other Air Force organizations.

In coordination with the focal points in the Office of Research and Technology Applications (ORTA), LO/JAZ provides patent legal services to scientists and engineers across the Department of the Air Force. The breadth of technology expertise of patent attorneys includes chemical, electrical, mechanical, and biological arts. Several attorneys have more than a decade of patent experience both inside and outside the fence, and can assist in identifying Intellectual Property, portfolio development, and patent filing strategies.

In addition to patent work, LO/JAZ also supports the Department of the Air Force Technology Transfer and Transition (DAFT3) mission in several ways. As the servicing legal office to most Air Force designated laboratories, attorneys provide legal reviews of all types of Technology Transfer (T2) agreements. LO/JAZ is also the servicing legal office for the DAFT3PO. In this capacity, they provide legal advice on delegations and updates to model agreements, as well as legal reviews of T2 agreements for organizations that are not designated as a laboratory. Further, they assist in the training of focal points within the ORTA and other legal offices on all aspects of T2 and other related intellectual property matters.

LO/JAZ is proud to provide legal support for these two very important missions, which protect and leverage the Air Force's investment in the innovations, discoveries, and developments of new technologies. These missions assist in promoting competition in transition to acquisition and the warfighter, while maintaining a level of control over technologies transferred for use in commercial applications. ★

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Richard Mescher
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Aero/Mechanical

Jeffrey Moore
Patent Attorney
Aero/Mechanical

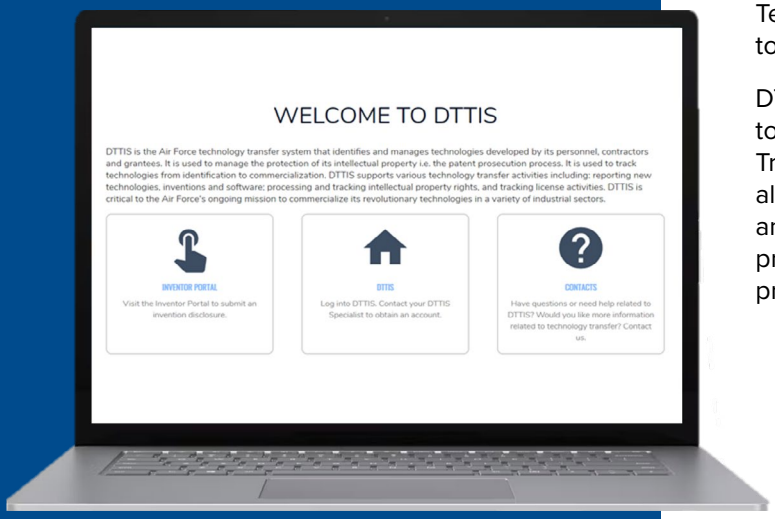
Vacant
Patent Attorney
Electrical/Software

DTTIS

DEFENSE TECHNOLOGY TRANSFER INFORMATION SYSTEM

Key Capabilities:

- An Inventor Portal where inventors and reviewers submit, review, and approve invention disclosures
- An Agreements Workspace where T3 specialists submit, track, and review T3 agreements
- A Legal Docketing Workspace for Patent Docketing and Patent Task Tracking
- A “Reports Workspace” where users view metrics for invention disclosures, patents, agreements, etc.
- Includes downloadable Excel reports and a “Report Builder” tool allowing users to create and save ad-hoc reports



DEFENSE TECHNOLOGY TRANSFER INFORMATION SYSTEM

As previously mentioned in the FY22 report, the Department of the Air Force Technology Transfer and Transition Program Office (DAFT3PO) has enjoyed a remarkable increase in the number of partnering agreements with industry, academia, and other government entities. One of the primary objectives for the DAFT3PO has been to develop and employ an updated tracking system to automate the technology transfer process. Previously, the DAFT3PO had been utilizing an outdated database to function as a tracking system for managing all agreements, along with a complicated set of various other tools for tracking its invention disclosures. That outdated system left much to be desired in several areas including efficiency and expediting innovation.

Other inefficiencies included:

- Inability to facilitate collaboration on agreements
- Increased possibility of duplicate and redundant work processes
- Inability to upload documentation, allowing only metadata to be input
- Isolation of database from collaborative and enterprise partners
- Inability to track royalties
- Increased manual workload time in gathering information and producing reports

The DAFT3PO began assessing multiple Commercial-Off-the-Shelf (COTS) and Government-Off-the-Shelf (GOTS) software tools for compatibility and usability in 2019. This led to a collaboration with National Aeronautics and Space Administration (NASA) on a pilot initiative to use the NASA Technology Transfer System, known as NTTS, which was endorsed by the Office of the Secretary of Defense (OSD). The DAFT3PO, working with NASA, customized NTTS with unique Air Force workflows. The new system, called Defense Technology Transfer Information System (DTTIS), is predicted to yield a high Return on Investment (ROI).

DTTIS is a scalable data system that automates workflows to standardize and streamline Technology Transfer and Transition (T3) business rules by collecting information from all technology transfer offices, patent attorneys, innovators, and more. It includes a search and reporting capability to provide visibility and insight into Technology Transfer (T2) programs.

Some key functions of DTTIS are:

- An Inventor Portal where inventors and reviewers submit, review, and approve invention disclosures
- An Agreements Workspace where T3 specialists submit, track, and review T3 agreements
- A Legal Docketing Workspace for patent docketing and patent task tracking
- A Reports Workspace where users view metrics for invention disclosures, patents, agreements, etc. It includes downloadable Excel reports and a "Report Builder" tool allowing users to create and save ad-hoc reports.

This led to the DAFT3PO creating an initial software development team who collaborated with NASA to transition final DTTIS development to the Air Force cloud environment in June of 2021. The team obtained required hardware and established accounts for the creation and migration of the new database. Phase 3.3 of DTTIS, which addressed issues reported during user testing, was delivered months later. The first DTTIS baseline source code was developed in October of 2021 to allow testing and preparation phases for hosting on an approved DoD Cloud Hosting service.

DTTIS collects information from T2 offices, patent attorneys, innovators, and other stakeholders and can automate workflows to standardize and streamline T2 business rules. This results in efficiency, standardized processes, and fewer errors. The database also gives T2 professionals the ability to use the search and reporting engine features while providing visibility and insight into individual T2 programs. Additionally, DTTIS can sustain current and past T2 data while allowing the ability to adapt for new changes to that data in the future. DAF implementation of this system shall serve as a pilot for adoption across the Department of Defense (DoD) Enterprise and provide a DoD-wide solution for a common data platform and information management system.

The first major demonstration of DTTIS took place at the annual T3 workshop on November 1-2, 2022, in San Antonio, Texas for more than 60 technology transfer professionals. A more detailed demonstration was held in Washington, D.C. in December for representatives of the Army, Navy, Air Force Office of Scientific Research (AFOSR), the Defense Information Systems Agency (DISA), and Defense Health Agency (DHA).

In FY23, the development team established Cloud One Test, Integration, and Production environments for DTTIS to support limited testing. DTTIS 3.3 was made available for testing by DAF users with a CAC (Limited testing) in January 2023 and DTTIS 3.3 User Acceptance Testing (UAT) was completed in March 2023.

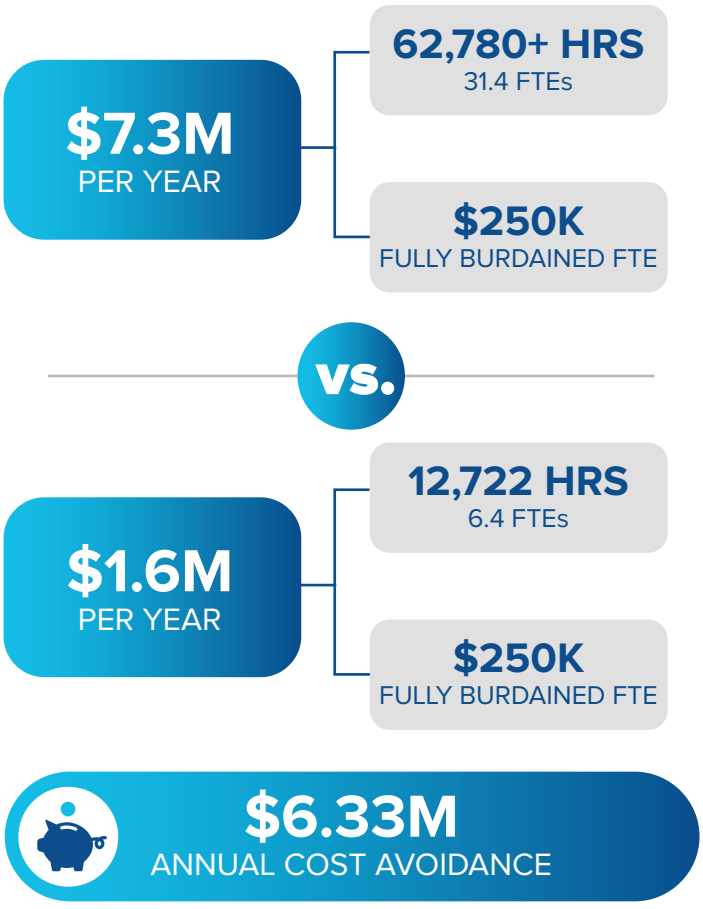
DTTIS 3.4 is expected to be available for testing by DAF CAC holders in November 2023, with certification and accreditation (C&A) tentatively completed in December 2023. Also in December, the DAF data migration will begin along with user on-boarding training. DTTIS 3.4 is expected to go live for DAF users on Cloud One (CK1) in January 2024. Once fully implemented, DTTIS is projected to provide an annual $6.25M cost savings across the DAF by automating and streamlining T3 activities.

WHAT IS DTTIS?

The Defense Tech Transfer Information System (DTTIS) is a scalable cloud hosted data system that automates workflows to standardize and streamline T3 business rules. It collects information from tech transfer offices, patent attorneys, innovators, and more. It includes a search and reporting capability to provide visibility and insight into T3 Programs. DTTIS leverages a proven NASA patented GOTS software platform to provide best value to AF and DoD T3 community.

DTTIS AND THE S&T COMMUNITY

The DTTIS application is owned and managed by the DAFT3 PMO. The DAFT3 Program falls under the responsibility of the TEO The DTTIS application is in direct support of the DAF S&T community. It tracks and automates the patent application process. It tracks and automates all T3 agreements between DAF and industry. The biggest user of DTTIS is AFRL. ★



2023 TECHNOLOGY TRANSFER

ANNUAL SUMMIT AWARDS

711 Human Performance Wing's Office of Research and Technology Application



Stacy Mills, Crystal Taylor, Jaclyn Williams

The 711 Human Performance Wing (HPW) Office of Research and Technology Application (ORTA) is hereby awarded the 2023 Department of the Air Force Technology Transfer and Transition (DAFT3) award for their outstanding efforts in collecting past due royalties owed to Air Force inventors. The 711 HPW ORTA includes Stacy Mills, Crystal Taylor, Jaclyn Williams. Throughout Fiscal Year (FY) 23 the team reviewed 48 income-producing licenses. Of those 48 licenses, it was determined 38 licensees were delinquent with payments, resulting in unpaid royalties to Air Force inventors. Thanks to their hard work, the team has collected $168K to date in past due royalties.

Air Force Research Laboratory's Information Directorate, Office of Research and Technology Application




Stephen Colenzo, Rachel Mann, Sarah Metott, Lydia Ortiz

The Air Force Research Laboratory's Information Directorate (AFRL/RI) Office of Research and Technology Application (ORTA) is hereby awarded the 2023 Department of the Air Force Technology Transfer and Transition (DAFT3) award for their outstanding efforts in collecting past due royalties owed to Air Force inventors. The AFRL/RI ORTA includes Stephen Colenzo, Rachel Mann, Sarah Metott, and Lydia Ortiz. Since an audit in 2022, the team has worked diligently to understand their patent and software portfolio and, in coordination with the DAFT3 Program Office and Air Force Materiel Command Intellectual Property Legal Office (AFMCLO/JAZ), identified delinquent licenses and calculated past due royalties. To date, the team has successfully collected $27K in past due royalties.

Air Force Research Laboratory's Materials and Manufacturing Directorate, Office of Research and Technology Application


Jeremy Gratsch, John DePinto

The Air Force Research Laboratory's Materials and Manufacturing Directorate (AFRL/RX) Office of Research and Technology Application (ORTA) is hereby awarded the 2023 Department of the Air Force Technology Transfer and Transition (DAFT3) award for has their outstanding efforts in collecting past due royalties owed to Air Force inventors. The AFRL/RX ORTA includes Jeremy Gratsch and John DePinto. As a result of a 2022 audit, the team has worked diligently to understand their patent portfolio and, in coordinate with the DAFT3 Program Office and AFMCLO/JAZ, identified delinquent licenses and calculated past due royalties. To date, the team has successfully collected $25K in past due royalties.

2023 TECHNOLOGY TRANSFER ANNUAL SUMMIT AWARDS

Mr. Tommy Le

Air Force Sustainment Center, Office of Research and Technology Application

Mr. Tommy Le is hereby awarded the 2023 Department of the Air Force (DAFT3) award for his leadership in the Air Force Sustainment Center's (AFSC) Office of Research and Technology Application (ORTA). Upon taking his position in the AFSC ORTA, Mr. Le immersed himself into their Tech Transfer program by revamping processes, establishing new agreements, and overseeing a new restructuring for AFSC delegated authority. Mr. Le also took the lead to host and coordinate a regional DAF ORTA Training at Tinker Air Force Base, which included AFSC leadership, Subject Matter Experts (SMEs) and other DAF organizations in attendance.

Ms. Karleine Justice

Air Force Institute of Technology, Office of Research and Technology Application

Ms. Karleine Justice is hereby awarded the 2023 Department of the Air Force (DAFT3) award for her leadership in the Air Force Institute of Technology (AFIT) Office of Research and Technology Application (ORTA). Ms. Justice has been in the position less than one year and has immersed herself into AFIT's Tech Transfer Program by conducting an extensive review of AFIT's agreements, milestones and dates termination to make extensions as necessary. The AFIT ORTA has non-domestic partners, and she is currently an international pending SAF/IA and GCQ approval. Ms. Justice has also immersed herself into AFIT's patent portfolio by learning the invention disclosure and patent application process. As a result, Ms. Justice has been proficient in her role in the AFIT ORTA.

Mr. Joshua Laravie

Air Force Research Laboratory's Aerospace Systems Directorate, Office of Research and Technology Application

The Air Force Research Laboratory's Aerospace Systems Directorate (AFRL/RQ) Office of Research and Technology Application (ORTA) is hereby awarded the 2023 Department of the Air Force Technology Transfer and Transition (DAFT3) award for their outstanding efforts in collecting past due royalties owed to Air Force inventors. The AFRL/RQ ORTA is managed by Joshua Laravie. As a result of his efforts, Mr. Laravie has collected $350k in past due royalties owed on patent and software licenses. ★

IN THE NEWS
SUCCESS STORIES

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

LATEST AFRL PATENT HELPS THE WARFIGHTER TAKE A LOAD OFF SAFELY

AFRL Clearance #AFRL-2023-3974

Wright-Patterson Air Force Base, Ohio

United States Designed Patent: D976192

A team of innovators from the Air Force Research Laboratory (AFRL) have patented their design of a device that could save millions yearly while reducing pain to the warfighter.

It's the job of a loadmaster to make sure cargo is loaded and unloaded from an aircraft quickly and safely. One of the tools used to do this is called a cargo ramp support strut, known colloquially as the milk stool. They are typically strapped down in the cargo hold and placed under the ramp during loading and unloading. In the past, milk stools have been made of pressure treated lumber and weighed anywhere from 70 to 120 pounds and have been physically demanding of loadmasters. Combining that with having to do all this quickly under potential enemy threat, it could lead to acute and long-term injuries.

"(The Air Force) was looking for a solution to have a lighter weight, but just as strong, version of the milk stool/strut support to install in an aircraft," said Chris Falkowski, an electrical engineer with the AFRL Materials and Manufacturing (RX) Directorate.

Falkowski and his teammates – mechanical engineer J.D. Bales and chemist Maj. Jason Goins – started looking at the milk stool and how it could be improved, particularly while being used on C-130 planes. They did this through an AFRL/RX program called Junior Force Warfighter Operations in RX (JFWORX) where scientists and engineers can volunteer their time to help solve immediate challenges the warfighter faces. This collaboration led to patent #US D976192 S: Support For A Cargo Ramp.

"When the C-130 was built, the original design was to have a wooden strut that goes under the rear door. When you palletize anything heavier than 2,000 pounds, that strut has to be under there. If it isn't, the aircraft can do a wheelie," Falkowski explained.

During their research, the team discovered the United States Air Force Academy (USAFA) conducted a similar research project by four cadets. The study found that aluminum could possibly be used to produce a lighter replacement to the wooden version. While the USAFA prototype was only tested to 20,000 pounds, Falkowski and his teammates saw room for improvements in their design and testing.

"The base on their model wasn't as wide as the original wooden version, which it needs to be, so it doesn't punch a hole in the tarmac," he said. "So, we had to modify it. Also, because the aircraft lands on uneven surfaces occasionally, it could rock back and forth with the aircraft. We needed to add gussets next to the pipes so that it would hold the welds."

The aluminum milk stool design the team produced in-house ran through a battery of testing – including two ergonomic studies focusing on the effects to loadmasters' backs -- before it was given the green light. The height can be modified, and crews can still add wood or rubber to the top or bottom depending on the circumstances while loading. What C-130 loadmasters will most likely enjoy best about the design is it weighs just 35 pounds.

"We made 12 versions of the milk stool using the iterative design method to find the optimal balance of wood and aluminum during our testing. Our lab test plan included endurance tests and withstanding pressure up to at least two and a half times more than the aircraft's maximum loading. The operational test plan demonstrated resiliency through impacts, especially if someone threw it off the aircraft, and still functioned the way it needed to," Falkowski said.

While this new milk stool should help loadmasters have longer careers, and hopefully less pain after retirement, the taxpayer will see less pain in the pocketbook. The team has calculated the new design will translate into $2.5 million in fuel savings across the Department of Defense (DoD) and $4.4 million worldwide if adopted internationally as well.

While this is the fourth of five patents for Bales, this is the first for Goins and Falkowski. It's extra special for Falkowski who lost his father – who earned a patent while with General Motors -- at an early age. However, Falkowski says getting a patent wasn't the primary objective of the team.

"When we started this project in 2017, our goal wasn't to invent something. J.D., Jason, and I wanted to make something that helped these C-130 loadmasters save their backs by providing a lightweight and reliable solution. Looking back now, I count it as a blessing that I was able to be a part of a team that will positively change loadmaster's lives in the DoD," he said. ★

AFRL PATENT COLLABORATION LEADS TO IMPROVED INSTRUMENT CALIBRATION

AFRL Clearance #AFRL-2023-0294

Though chemical warfare is internationally condemned in the form of the Geneva Protocol of 1925 and the Chemical Weapons Convention (CWC) of 1993, that hasn't completely erased the danger of their potential use against the American warfighter.

According to the Arms Control Association, Russia, a signee of the CWC, claimed in 2017 to have destroyed its cache of chemical weapons. However, they used an advanced chemical agent to kill a suspected spy and his daughter the following year. North Korea, who did not sign the CWC agreement, is largely believed to possess more than 5,000 metric tons of chemical weapons, including mustard, phosgene, and nerve agents. In addition, any terrorist organization, domestic or otherwise, could use chemical agents in any given attack.

While there are detection methods available, a recent set of patents from an Air Force Research Laboratories (AFRL) collaboration could be a vast improvement in the accuracy of detection. Mitchell Rubenstein, Ph.D., of the 711th Human Performance Wing (HPW) Airman Systems Directorate (RH) and Benjamin Clapp of the United States School of Aerospace Medicine (USAFSAM) have been awarded two patents derived from their study of gas chromatography-mass spectrometry instruments, which are used to detect chemical warfare agents (CWA) in the vapor. In fact, Rubenstein has already earned two patents and co-authored numerous published studies related to the subject.

"After implementation of US Patents 11,099,165 (August 2021), Focusing agents for improving the accuracy and precision of gas chromatography-mass spectrometry field instruments, and 11,215,596 (January 2022), Focusing agents and methods of using same, it was apparent that the low-level values had a lack of precision," Rubenstein said.

His two most recent patents, in collaboration with Clapp, 11,456,163 (September 2022), Method of improving an analytical instrument and improved analytical instruments, and 11,515,133 (November 2022) Method for Improving a Mass Spectrometer and an Improved Mass Spectrometer, both deal in quantifying low concentrations of highly toxic substances in vapor samples.

"I began working on Focusing Agents in 2017 and the current patent(s) (were) submitted two years ago. The bulk of the mathematics was developed by Mr. Clapp and proofed by my data interpretation," Rubenstein explained.

The first of these patents is a calibration correction module for instruments to report the most accurate results using a formula modifying the relative squared error. A relative squared error is what the result would have been if a predictor had been used. The predictor is decided by the average of actual values.

Wright-Patterson Air Force Base, Ohio

United States Awarded Patents: 11,099,165, 11,215,596

"Here we realize that there is a large error when quantifying small amounts of toxic substances. Primarily because commonly used least squares emphasize the greater values on a curve. This patent indexed the least squares so that the low points are more properly quantified. This results in a significant improvement of the analytical instrument in question that leads to more precise and accurate results." Rubenstein said.

The second patent – Focusing agents and methods of doing the same -- deals with applying that correction module to improve mass spectrometers – instruments used for separating isotopes, molecules, and molecular fragments according to mass.

Rubenstein believes these two developments shall provide a significant benefit to the Air Force and beyond.

"The patent(s) will allow precision at lower-level concentrations and directly aid in low-level detection of nerve agents to protect the warfighter. This has numerous applications for laboratories conducting analyses in industry, academia, and other government agencies," he said.

Rubenstein says persistence is how he and Clapp got to the point where they could celebrate two patents and just as many goals reached. ★

> **"Of course, one must meet the needs of the mission, but it is exciting to pursue innovation to push science forward."**

LOW-COST, THREE-PATENT BREAKTHROUGH IS MORE THAN MEETS THE EYE

Wright-Patterson Air Force Base, Ohio

United States Awarded Patents: 10,942,313B2, 11,156,782B2 and 11,204,468B2

It may take an inventor their entire career to earn a patent. But, for others, patents come in bunches as has been the case for Air Force Institute of Technology (AFIT) engineer Hengky Chandrahalim, PhD and his team. Their work in sensors led to fabricating an improved Fabry–Perót (FP) cavity, which was achieved with a combination of three patents. The team have developed a quick, simple, and comparatively inexpensive process through this work.

The patents, "Temperature-immune self-referencing Fabry–Pérot cavity sensors" (U.S. Patent #10,942,313B2), "Method of making temperature-immune self-referencing Fabry–Pérot cavity sensors" (U.S. Patent #11,156,782B2), and "Temperature-immune self-referencing Fabry–Pérot cavity sensors" (U.S. Patent #11,204,468B2), involve the use of a Fabry–Pérot interferometer.

The FP cavity is a tool first developed in 1899 by Charles Fabry and Alfred Perót to determine optical resonance.

"It's an optical device we can use to trap light of a specific wavelength," Chandrahalim explained. "Traditionally, people used the FP cavity, which features a pair of parallel, highly reflective mirrors to allow a small amount light of a particular wavelength to pass through. These are separated by a certain distance, which is usually implemented on a very large optical table. When the light of a certain wavelength is trapped in this device, it corresponds to an integer multiple of the separation between the two reflective mirrors. It is here where we can observe optical resonance. The optical resonance can be used to sense different physical phenomena."

However, what Chandrahalim and his team, made up of mostly AFIT engineers – with assistance from two researchers from the Air Force Research Laboratory (AFRL), have developed is an improvement on this device that they believe will lead to many uses. They implemented a two-photon polymerization process fabrication technique that is quick, simple, and inexpensive compared to traditional microfabrication methods. This makes it easier for rapid prototyping and offers the ability to adapt to new requirements. These devices also allow for true 3D design freedom, which can shape microscale optical elements in typically difficult geometries and is able to detect thermal radiation.

"Using this (improved method), we are able to shrink this optical system to a much smaller area," Chandrahalim said. "It can be miniaturized and integrated into our existing technology. We always want to improve the power and performance of our devices. In many applications we have stringent, spatial requirements. With this technology, we can integrate high-performance sensors easily to our existing technology."

While the team is optimistic this device can be of valuable use to the Department of Defense and the warfighter in things like aircraft and microsatellites, they also see a large potential in the commercial sector.

"This would be good for many different things. For example, a sensor monolithically integrated onto an optical fiber, employed within the medical industry, can be utilized internally within the human body to detect various diseases and viral infections," Chandrahalim said.

He also sees the 3D FP cavity arrays as powerful scientific allies, providing real-time insights into natural disasters and offering predictive measures of their impending severity.

"In the realm of detecting seismic events such as earthquakes or tsunamis, the portable FP cavity transforms into a high-precision seismometer. When such a force of nature manifests, it triggers a movement in the ground, consequently causing displacement in a mirror constituent of the FP cavity. This device is used to attract a certain light with a particular wavelength. An earthquake or tsunami is going to produce a large amplitude of mechanical waves."

While all this sounds very impressive, Chandrahalim and his team aren't finished yet. They continue to work on improving the 3D FP while searching for more ways to apply it for the DoD and beyond. Chandrahalim encourages his fellow innovators to not be afraid of research and data coming from areas that may be foreign to them.

"Be open-minded to ideas that come from different disciplines. Be open to a multidisciplinary research experience," he said. ★

AFRL ENGINEERS HEAT UP WITH THIRD PATENT TO KEEP AIRPLANES COOL

AFRL Clearance #AFRL-2023-1166

With continued advances in high-performance aircraft comes the need for higher-powered onboard electronics. While these technological gains may be exciting at first blush, the heat from these electronics can lead to mechanical failures within the aircraft. Several methods of dispelling this low-grade heat (20-30°C) have been employed in the past. However, a group of engineers, including two from the Air Force Research Laboratories (AFRL), have patented a process that seeks to improve upon conventional thermal management systems.

In 2013, Soumya Patnaik, PhD., and Nicholas Niedbalsk, Ph.D., from the AFRL Aerospace Systems Directorate (RQ), teamed up with Douglas Johnson, and Jamie Ervin, Ph.D., of the University of Dayton Research Institute to combat the issue of high-flux, low-grade waste heat in aircrafts. Heat flux is a thermodynamic term referring to the rate of heat energy transfer through a given surface. The higher the flux, the higher the heat removal rate must be to maintain a device at its operating temperature.

"Thermal management systems on aircrafts transport heat away from its source to the heat sink. Two of the most commonly available heat sinks on aircraft are fuel and ram air cooling," Patnaik explained. The fuel method involves employing a heat exchanger – a system of transferring heat between a source (that is creating heat) and the working fluid (fuel). Ram air cooling is a cooling system which uses the air taken abroad an aircraft during flight.

"The technical objective of this project was to evaluate and demonstrate the feasibility, advantages, and risks of an expendable thermal management system for directed energy weapons from an integrated systems perspective," Patnaik said. "So, we started to design a feasible thermal management system to address some of the limitations of the state-of-the-art technologies."

Wright-Patterson Air Force Base, Ohio

United States Awarded Patents: 10,578,369 and 11,150,029

The group, which had earned two previous patents for developing a thermal management system (US #10,578,369 and US #11,150,029), received this most recent patent for designing and demonstrating a heat exchanger reactor as part of a novel thermal management system.

When high-flux, low-grade heat is present in an aircraft, high-capacity cooling systems are often necessary. That can require a bulky system onboard to manage thermal energy in the form of a heat sink.

"(There are) two main advantages in our proposed method compared to these two," Patnaik said. "First, is that our proposed method is independent of flight condition whereas fuel cooling or ram air cooling is dependent on the flight conditions. The amount of cooling available from fuel depends on the amount of fuel needed by the engine and it decreases with flight time. Similarly, the amount of cooling that can be achieved from ram air depends on its temperature and flow, which in turn depends on the flight condition," Patnaik said.

The second advantage is that the team's method creates an endothermic reaction – any chemical reaction that is used to absorb heat -- with Ammonium Carbamate which is converted from a solid to a gas. Then the gas dissipates. Being that chemical reactions can absorb a large amount of heat, the heat sink in this method can manage high energy and dissipate larger amounts of heat. The team found their cooling method showed a significant improvement over the previous methods but believe this is only the beginning.

"Twenty percent more cooling was shown for a specific heat load application as a way to provide a benchmark, but the method can show even higher benefit depending on applications," Patnaik added.

It was late in 2022 when the team learned they had earned their third patent with this system improvement. "We were glad that we pursued the patent application and are also thankful to our Air Force patent attorney and AFRL Aerospace Systems Directorate (RQ) Business Development Office for all their support. At AFRL we have access to some of the best technology transfer specialists who made this process manageable for us." Patnaik said. ★

> **"So, we started to design a feasible thermal management system to address some of the limitations of the state-of-the-art technologies."**

SENSORS DIRECTORATE ENGINEER CELEBRATES PATENTLY PRODUCTIVE YEAR

Wright-Patterson Air Force Base, Ohio

United States Awarded Patents: 11,259,402, 11,404,773, and US 10,770,206

It's always a boon to the Air Force Research Laboratory (AFRL) when one of its scientists or engineers earns a patent to assist the warfighter. But Sensors Directorate (RY) Senior Electronics Research Engineer Emily Heckman, Ph.D. had a banner year in 2022, producing three patents for the Department of the Air Force (DAF). However, she's quick to assert her work was the result of a team effort.

"It's always, always a collaboration! Each of these patents involved a team. We work together to bounce ideas off each other, play devil's advocate, and do the actual manufacturing and testing," Heckman said.

Last February, Heckman – along with Jeffrey Massman, Roberto Aga, and Fahima Ouchen – received a patent for the "Fabrication of Electrical and/or Optical Crossover Signal Lines Through Direct Write Deposition Techniques." Among its benefits, this technology eliminates layers of a printed circuit board (PCB) using printed crossovers. A PCB mechanically supports and electrically connects electronic components with a series of tracks using laminated copper sheets. Heckman's team invented a method to allow more flexibility for radio frequency (RF) and direct current (DC) lines in the design of PCBs among other benefits.

In August, Heckman and collaborator Aga were awarded a patent for an *Additively Manufactured Omnidirectional Antenna*. The invention is an alternative way to produce omnidirectional antennas faster and more cost effective than conventional antenna fabrication methods.

Finally, the duo was awarded another patent in September for devising a System and Method for Fabricating a Strain Sensing Device Directly on a Structure. "(This) involves directly writing a strain gauge on a structure using additive manufacturing (AM) techniques," Heckman explained. She sees these patents benefiting the DAF in terms of size and weight of previously existing technologies while being more cost effective and faster to manufacture.

One might assume this trio of patent awards came from a sudden flurry of great ideas in a short timeframe, but Heckman said it took longer than you might think.

"In most of these cases, the patents are the culmination of a few years of effort. We want to make sure we have tested our concepts over and over before we file for a patent. They also take a while to develop. It really varies from patent to patent. Some are organically grown out of the research we are doing, and we realize we stumble across something novel (for example, the printed crossover), and some involve completely thinking about a problem in a new way and flipping traditional methods on their heads, for example, the printed strain gauge."

Heckman, whose first love was performing onstage in the theater while in high school, gravitated to a career in science and now shares her story with students through a STEM outreach program. She also mentors both undergraduate and graduate students through internships in her laboratory at the Sensors Directorate. Her advice to both up-and-coming students and current scientists and engineers involves teamwork.

"It's hard to work in a vacuum. My greatest advice would be to seek out a team that can help you, and of course it doesn't hurt to work in a world class research lab surrounded by brilliant researchers." ★

THE THREE PATENTS

1. **Fabrication of Electrical and/or Optical Crossover Signal Lines Through Direct Write Deposition Techniques.**
2. **Additively Manufactured Omnidirectional Antenna**
3. **System and Method for Fabricating a Strain Sensing Device Directly on a Structure**

AFRL SCIENTIST'S PATENT MAKES "HEADS" AND "TAILS" OF TRICKY ANTIBODY STORAGE

Wright-Patterson Air Force Base, Ohio

United States Awarded Patent: 11,338,037

Protecting the warfighter at all costs is the primary objective for all of the innovators working within the Air Force. But what if you could do so at a reduced cost? That's the intended result of a patent coming from the work of Patrick Dennis, Ph.D., of the Air Force Research Laboratory (AFRL).

The patent involves a process which makes "ultra-stable" antibodies. Antibodies are blood proteins that chemically bind to antigens – foreign substances that cause the body to issue an immune response – to destroy them. The problem is most antibodies require refrigeration or freezing for long-term storage. This obviously calls for equipment that may not be very practical on the battlefield.

Dennis and Joseph Slocik, Ph.D., both of the Materials and Manufacturing Directorate (RX), in collaboration with Rajesh Naik, Ph.D. former Chief Scientist from the 711th Human Performance Wing, developed a way to make the antibodies more tolerant of high temperatures. The trio have had numerous breakthroughs resulting in eight additional patents from their antibody research, which led them to this process out of an urgent need for stable biomolecules that were also heat resistant.

"To achieve ultra-stable antibodies, primary antibodies are modified by the addition of multiple positive charges on the protein surface, electrostatically paired with stoichiometric amounts of anionic wrapping polymers to form an antibody-polymer complex, and dried via lyophilization to remove all water," Dennis explained.

What does all that mean? Dennis likened it to the concepts of freeze-drying coffee and washing clothes.

"The lyophilization process we use to drive off bulk water is basically freeze-drying. For the polymer wrapping of the antibody, I like to point out that the anionic wrapping polymer is essentially a detergent, but instead of interacting with the protein via its greasy 'tail' -- the way detergents are able to remove dirt from clothing --we're interacting the detergent with the protein using its charged 'head'. (We're) literally flipping the detergent on its head," he said.

Once the excess water is removed, the proteins interact with one another through their tails, which creates a protein-based liquid. This breakthrough, in keeping with the Technology Transfer & Transition goal, benefits both the military and the commercial sector.

Dennis says he and his fellow collaborators have had so many breakthroughs in antibody research because they refused to believe in the impossible.

"Benefits to the military include refrigeration-free storage and handling as well as the use of antibody-based vaccines or anti-venoms for treatment of military personnel against chemical and biological agents under harsh battlefield conditions," Dennis said. "These thermally-tolerant materials will significantly reduce cost and decrease the substantial weight load of specialized equipment required for refrigeration during a mission."

Commercially, in addition to being relatively easy to transport throughout the world, the polymer-wrapped proteins can be incorporated into plastics and easily produced using molds or 3D printing methods.

Dennis says he and his fellow collaborators have had so many breakthroughs in antibody research because they refused to believe in the impossible.

"Do not talk yourself out of trying out crazy new ideas," he began. "Theoretically, there are many reasons one could rationalize why this technology should not work with a complex molecule like a protein. At some point, the researcher should let nature do the thinking and perform the experiment, even though your brain is telling you it will never work." ★

> **"Do not talk yourself out of trying out crazy new ideas."**
>
> **- Dr. Dennis Slocik**
> Materials and Manufacturing Directorate (RX)

SOME SHOCK WAVES NEED A MONOCLE

Eglin Air Force Base, Florida

United States Awarded Patents: 11,567,054

Though testing energetic materials used in weapons systems is absolutely crucial to the success of the Air Force, it is typically a lengthy and expensive process. One approach relies upon the use of large-scale gun systems to generate precision shocks, which are significant infrastructural investments. Unfortunately, there are only four such testing facilities equipped to test with explosives – the Air Force Research Laboratory (AFRL) Eglin Air Force Base Munitions Directorate (RW) in Florida, Sandia and Los Alamos National Laboratories in New Mexico, and Lawrence Livermore National Laboratory in California –which commonly means being on a waiting list to test a material.

A second approach to test energetic materials relies upon the use of a pressed explosive technology produced by Los Alamos National Laboratories. Although precise, those assets typically require long lead times to acquire. Then there's the expense of obtaining and storing those assets . Finally, as great as they are, each lab has limitations in terms of the scale of these tests due to gun barrel diameters or limitations of pressing large diameter explosives. Fortunately, one Air Force Research Laboratory (AFRL) engineer has patented a method -- Lens for shaping an explosively generated shock -- that proposes an answer to alleviate each of those issues. Eric Welle, Ph.D., at AFRL/RW began thinking about ways to address the challenges using commercially available items, thus, accelerating the realization of DoD weapon's technology.

"This technology allows you to use off-the-shelf materials and machined items to generate this precision shock where (previously used) technologies require expensive material sets that are more hazardous by nature," Welle said.

Munitions labs typically use a Plane Wave Generator (PWG) to help them pinpoint the characteristics of any given explosive being tested. "There are different technologies that allow you to generate precision shocks. When I say a precision shock, I mean a shock that has a very specific, spatial, and temporal characteristic. By doing that, it allows us to describe equations of state and aspects of the chemistry of explosive being tested. Those properties are essential to design weapons systems," Welle explained.

He began making calculations and determined he could use a lens and a commonly found flammable liquid instead of pressed explosives to generate the precision shock. He says an additional benefit is that his method gets more precise results than the traditional PWGs.

"I'm using nitromethane. That's what the American Hot Rod Association uses," Welle said. "You can buy this in barrels from commercial chemical suppliers. It's an off-the-shelf item you can buy and store in a flammable liquids cabinet."

A contoured lens is also used to obtain these results. Similar to how eye glasses shape light waves fed into our eyes to enhance vision, the Liquid Plane Wave Shock Generator (LPWSG) lens reshapes a shockwave so it arrives at the same time.

"If I just detonated nitromethane (without the lens) and let the shock show up at a surface, the variation in timing across the surface is approximately a microsecond. It's approximately fifty times more variation than we want for precision experiments," Welle said.

Because this patented design relies upon readily available commercial materials and machined items, these tests can be done at most weapon's complex explosive sites rather than having to transport materials to any of the aforementioned facilities.

"Those facilities essentially have fixed link scales that they cannot go above because they use guns to throw projectiles," Welle began. "If you imagine having a gun, you can't just change the diameter of the barrel at will. A benefit of this technology is it's entirely scalable. You can scale it to a diameter of 20 inches if you want. Similarly, with the explosively-pressed lenses, there are certain diameters above which you just can't press those types of charges. This is because the pressures you have to achieve are not available with our conventional explosive manufacturing facilities."

Once Welle convinced himself his idea could work, through analysis, he leveraged his team of engineers to build the necessary hardware and test the LPWSG to discover every aspect of it, good or bad. Now, with patent in hand, his next step is to transition this technology to the warfighter, commercial entities and the British MOD, where the AFRL Midwest Regional Hub is one option to accomplish the transition.

"The point of these regional hubs is to transition technologies and to incentivize innovation. One of the things they do is send out a proposal for white papers (to fund technology)," he said. "The military will benefit by the low-cost nature of this tool that allows laboratories and industrial sites to collect data on materials that may be used for engineering design or government qualification. Also, this tool directly supports Digital Engineering approaches being embraced by the Department of Defense (DoD) which rely upon model-based engineering." ★

AFIT ENGINEER SOLVES EXTRATERRESTRIAL DILEMMA WITH NEW PATENT

AFRL Clearance #AFRL-2023-1184

Wright-Patterson Air Force Base, Ohio

United States Awarded Patent: 11,312,512

You never know when inspiration will strike. In the case of one Air Force Institute of Technology (AFIT) engineer, inspiration led to innovation from a situation that had captured the world's attention.

In 2017, Lt. Col. Robert Bettinger, Ph. D., a faculty member at AFIT, was formulating a course which involved atmospheric reentry. Among his course objectives was educating his students on charting and monitoring space vehicles reentering the Earth's atmosphere. "I sought to enhance the realism of the course content by assigning a final project for my graduate students pertaining to the reentry prediction of an uncontrolled, naturally decaying object in low Earth orbit," Bettinger said. Orbital decay is the gradual reduction of distance between two orbital bodies, such as a satellite or space station in relation to the Earth. For objects in low-Earth orbits (LEO) – 1,200 miles or less – orbital decay is often caused by atmospheric drag. It just so happened at that time that Bettinger had a real-world model for his graduate students to apply what they learned.

"Concurrent with the course was the decaying orbit of the Chinese Tiangong-1 space station, a space vehicle that captured international attention due to the uncertainty of when and where it was to reenter the atmosphere. I used this space vehicle as the test case for the final project and tasked the students with predicting reentry time and location," he said.

Tiangong-1, launched in 2011, was a 34-foot long, 18,000-pound experimental space station that had been for all intents and purposes de-commissioned by China in 2016. While danger to human life on Earth was considered extremely unlikely, it didn't stop many from wanting to know when and where it would reenter. Various organizations, including the United Nations Office for Outer Space Affairs (UNOOSA), the Inter-Agency Space Debris Coordination Committee (IADC), and similar agencies from all over the world were involved in attempting to predict when and where the space station would reenter.

Ultimately, Tiangong-1 reentered on April 1, 2018, at 8:16 pm (EST), according to United States military officials, breaking up and plummeting into the South Pacific. This left Bettinger with questions in the aftermath.

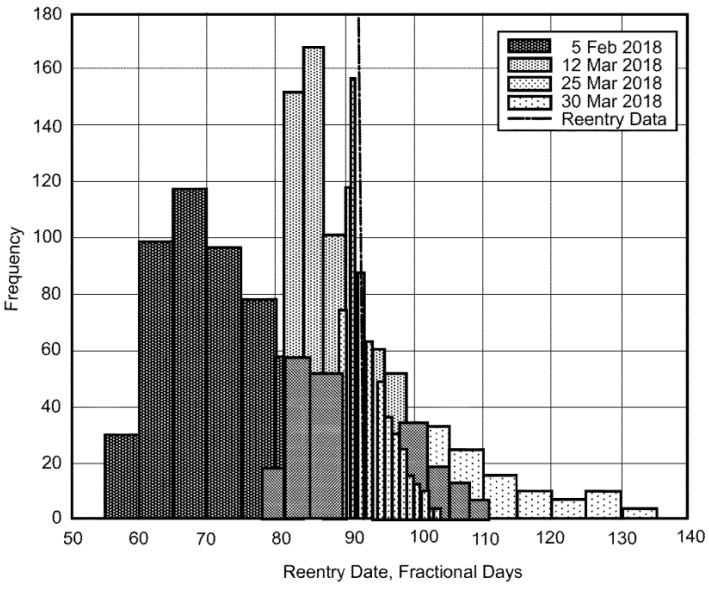
"Can reentry predictions improve? If so, then can high-accuracy predictions be made with simplistic models?" he asked. "For the rest of 2018, I developed a simplistic algorithm for reentry time prediction that enables prediction accuracy deviation of less than eight hours approximately five days before reentry."

Bettinger's algorithm was found to inexpensively predict spacecraft reentry times faster and with more accuracy using available trajectory information, regardless of design configuration of said spacecraft.

"I envision this technology benefiting the military and civilian sectors by providing a low-complexity means of attaining high-accuracy reentry time predictions. Such predictions are important to help understand areas on the ground that are at-risk for casualty and/or property damage due to the reentry of uncontrolled objects/space vehicles," Bettinger said.

While his solution is considered a relatively easy module for reentry predictions, Bettinger believes even the "simple" ideas are rich in merit.

"Don't dismiss the 'easy' or 'simplistic' solution for answering complex questions. Sometimes the best solutions require the least amount of overhead and fidelity to achieve the desired results." ★



THIS AFRL SCIENTIST'S TRIP LEADS HER TO A PATENT THAT CAN SAVE LIVES

AFRL Clearance #AFRL-2023-1759

Wright-Patterson Air Force Base, Ohio

United States Awarded Patent: 11339208-B1

Inspiration comes in many forms. It can even occur while reading a magazine on a plane. That's what happened to Camilla Mauzy, Ph.D., of the Air Force Research Laboratory (AFRL) while traveling. It eventually led to her latest patent.

"While on temporary duty travel in 2005 I read an article in a science magazine describing nanobodies. The stability and ease of production made them especially amenable for needed DoD products," she recalled.

Nanobodies are an unconventional form of antibodies. While having some similar functions as regular antibodies, nanobodies are structured differently. Whereas conventional antibodies are large, complicated proteins comprised of two functional units, called VH and VL, nanobodies don't have VL domains but only have a smaller subset of the VH domain (VHH). Despite this, they are known for being highly stable. This inherent stability allows the nanobody to perform under field conditions, with its extremes in temperatures and humidity. They can remain functional (binding their target molecule) in temperatures as high as 176°F and in extreme pH levels. Additional nanobody advantages include being much easier and cheaper to produce compared to normal antibodies.

This patent, Mauzy's seventh to date, describes nanobodies which have been developed to several surface proteins to the bacteria Yersinia pestis (Y. pestis). Y. pestis is a gram-negative bacillus that causes plague in its natural form and is considered a Class-A biological weapon. Gram-negative bacteria are particularly problematic to combat because they are resistant to many drugs and most available antibiotics.

"Nanobodies are naturally occurring single-domain antibodies found in camelids (animals from the same family as camels). Nanobodies also have several properties which make them excellent components for therapeutics, sensors, and synthetic biology elements," Mauzy said. "First, they consist of only the target binding domains found in antibodies (i.e., the VHH), therefore they are very small (15 vs. 150 kilodalton found in normal antibodies). This property allows them to be produced in large quantities in bacteria. This small size also allows them to access small clefts in target molecules. There are reports that they can even cross into the brain."

Mauzy began developing nanobodies to fight Y. pestis in 2007, moving the technology approach on to create Pseudomonas nanobodies for fuel biocontaminant sensors in 2017. She began collaborating with a known international expert in the field while developing the pestis patent.

"We worked with Serge Muyldermans at Vrije Universiteit Brussel for development of these nanobodies. Dr. Muyldermans was the first scientist to identify the utility of these naturally occurring small antibodies," Mauzy explained.

Being awarded the patent for this development in 2022, Mauzy sees several advantages for its use.

"Firstly, I see development of Y. pestis LcrV therapeutics using our nanobodies sequences -- which would not require refrigeration -- to provide onsite therapeutic protection against Y. pestis infection while allowing transportability for field use or in underdeveloped countries," she began. "Secondly, the full three-protein set of Y. pestis nanobodies against the three surface proteins could be used as capture elements in simple lateral flow tests for field testing or decontamination analysis."

Mauzy also suggested using nanobodies in assisting in decontaminating equipment as well as modifying nanobodies for use in more complex live bioproducts.

"I am especially interested in examination of nanobodies for uses in the gut or lung as a synthetic biology microbiome product to scan and remove toxins and/or pathogenic bacteria," she said.

This is yet another breakthrough for Mauzy whose career has been filled with firsts. Those include initiating the first human performance genetics efforts in the DoD to work through the Institutional Review Board's concerns with genetic-specific training, developing the first Air Force research program in Military Working Dog Performance Genetics, and recently being the first to identify a panel of urinary biomarkers which can predict the manifestation of Acute Mountain Sickness prior to accent while still at sea level.

Of course, Mauzy has come across many unexpected results during her career. She says those are particularly valuable.

"Keep an eye open for unusual or unexpected results – those can reveal something interesting if examined further." ★

NEW PATENTED ENGINE DESIGN PROVING GREAT THINGS COME IN SMALLER PACKAGES

AFRL Clearance #AFRL-2023-0226

Wright-Patterson Air Force Base, Ohio

United States Awarded Patent: 11,415,046

"Re-inventing the wheel" is a well-used phrase with negative connotations. But what about "reconfiguring the engine" to improve it? That's the idea behind a recently patented invention coming out of the Air Force Institute of Technology (AFIT).

The invention is a new configuration of a gas-turbine jet engine, referred to as the "disk engine." The components in a typical engine are arranged from front to back from the intake, the compressor, the combustor, the turbine, and the nozzle. However, this new version places the combustor outboard of a radial compressor and a radial turbine that are positioned back-to-back. This means the combustor, the compressor, and turbine pair occupy the same axial length.

"The idea came out of my master's work. The project was to integrate an ultra-compact combustor (UCC) into a traditional gas-turbine engine," said Lt. Col. Brian Bohan, Ph.D., who was studying aeronautical engineering at AFIT at the time. "In a UCC, the combustor is shaped as a circumferential cavity where the fuel and air are swirled inside and exhausts radially inward. Think of this as a burning swirl inside a donut and exhausting into the hole."

The concept Bohan created was an engine that is much shorter, though wider in diameter, than a traditional gas-turbine engine. He believes this engine could be used in turbo-shaft applications to drive a propeller, rotor, or a generator.

"With its shorter axial length, the engine and generator combined could be about the length of just the engine by itself of a typical gas-turbine configuration," Bohan explained. The foundational research for this invention goes back as far as 2006 with Bohan and many AFIT student researchers, advised by Dr. Marc Polanka – a co-inventor of the disk engine -- toiling away. But it began to pick up speed in 2015.

"I brought the idea to incorporate a radial turbine below the combustor to Dr. Polanka when I returned to AFIT for my PhD. I had intended to create and research this engine for my dissertation but was advised that it was too large of a project for a single person to tackle," Bohan recalled.

He and his team faced many challenges with integrating a UCC into a traditional gas-turbine engine, including getting all the hot gases out of the circumferential cavity to span the entire turbine height and make a uniform temperature profile going into the turbine. Over the years the concept evolved into a new design that achieved what the team had set out to do.

"However, because the hot gases in a UCC are swirling and they exhaust radially inward, this is the perfect setup for a radial inflow turbine as used in the patented invention," Bohan said. "Once this concept was created, it was a matter of incorporating the compressor and achieving a flow path inside the combustor that would achieve complete combustion before exiting into the turbine."

When he became a faculty member at AFIT, Bohan decided to employ a divide-and-conquer approach to the disk engine project, breaking the process down into phases with students assigned to each. Active research intensified in 2019 and Bohan submitted documentation for a patent in 2020 with a patent being awarded in August of 2022.

Since this engine design takes up less axial space, it would benefit the Air Force by leaving more room on an aircraft for other integral systems such as fuel or weapons. It could also have practical use for ground-based power generation and would be more portable for deployed units.

Patent in hand, Bohan says it is the realization of a dream he's had for a long time, and he has advice for likeminded visionaries.

"Since I was in high school, I wanted to invent something completely original and receive a patent I could hang on my wall. I hope that this is the first of many," he said. "The process may seem daunting and the timeline for approval is long. But if you have an idea you are passionate about, it is worth pursuing."

Bohan is currently the deputy Chief of the Innovative Solutions and Disruptive Technologies team at Air Force Futures at the Pentagon. He continues to search for developing technologies that will make significant impacts to assist the warfighter. ★

A SIMPLE QUESTION LEADS TO SEVENTH PATENT FOR AFRL PHYSICIST

Eglin Air Force Base, Florida

United States Awarded Patent: 11,372,134 B2

Sometimes a simple question can lead to a great idea that grows into improved technology. Joshua Lentz, Ph.D., of the Air Force Research Lab Munitions Directorate (AFRL/RW) at Eglin Air Force Base in Florida, just happened to be the person to ask such a question, which led to a patent involving photonic crystals.

“A photonic crystal is a generic term for an engineered optical material that has a repetitive structure just like a crystal,” Lentz said. “There is no limit to the number or types of materials used, the number of layers, the size and shape of the repeating features, and there are some very interesting optical responses that can be created by carefully designing such a crystal.”

Lentz had been contemplating utilizing photonic crystals as something similar to window tinting. Was it possible to attach them to existing materials such as glass or plexiglass to enhance how they’re used?

Though he thought the idea was too simplistic to be patented, Lentz – an experienced physicist currently working on his doctorate in Intelligent Systems & Robotics -- decided to get someone else’s opinion.

“While participating in an Innovation Discovery Event (conducted by TechLink) for another one of my concepts, I asked one of the panel members if a ‘peel-and-adhere’ photonic crystal concept would be patentable for a generic photonic crystal. His response was positive, (so) I filed the invention.” Lentz explained.

While benefits to the average consumer would vary depending on what designs were available and at what cost, the invention would have a more practical use in laboratories. Being able to modify optical elements by placing a photonic crystal film that could be applied to existing materials to enhance their properties in a matter of minutes would save a great deal of time in the long run.

The entire timeline for preparing this patent idea was literally a matter of a few weeks of Lentz thinking about the idea, a few minutes of asking about it, and a couple more hours of writing up the disclosure. Having a total of seven patents to his credit, he’s become very familiar with each step.

Though this invention didn’t involve other collaborators, Lentz credits the culture of problem solving at Eglin for equipping him with the right mind frame to propose solutions.

“Experience working in the Air Force test and evaluation community on Eglin gave me an intimate understanding of how certain systems works, what their limitations are and what needs to be improved for the future of hardware-in-the-loop testing. Problems motivate solutions, and at some point, when technology cannot provide through incremental progress, innovation is necessary to make a more substantial advance,” he said.

In his spare time, Lentz stays active playing sports, doing CrossFit, hiking, paddleboarding, gardening, and reading. He says those activities, along with his faith, have contributed to his overall physical and mental wellness to better serve the warfighter. ★

> **“There is no limit to the number or types of materials used, the number of layers, the size and shape of the repeating features, and there are some very interesting optical responses that can be created by carefully designing such a crystal.”**

NEW BRANDING

The most important thing about the Department of the Air Force Technology Transfer and Transition (DAFT3) division, is that the program serves the broader DAF mission. We've been reenforcing that over the last few years. Developing project pathways and telling a better story of how those pieces connect, are a huge part our success as a division.

BRANDING
MATTERS

With our focuses on innovation and efficiency, those two things can be lost if we do not unite in our brand. The whole goal is to speak as one. The following brand rules unite our unique imagery, logo, style, tone, and other aspects that make us who we are to the public. Since we are united in purpose, we need to be united in appearance as well.

It's all about consistency and building trust with our audience.

WHY
REBRAND?

DAFT3's previous branding was highly reflective of typical Air Force logos; a circle patch with imagery within. The mission is to "facilitate the implementation of Air Force innovative technologies in products and services to benefit the warfighter and the public, while supporting Air Force research through collaborative partnerships." The main keyword of our mission is "innovative." Innovative means introducing new ideas; original and creative in thinking.

DAFT3 is striving towards this idea of innovation and cutting-edge technology. The branding needs to also reflect this notion. By creating a recognizable and modern brand, DAFT3 will be able to, not only stand out amongst typical Air Force organizations, but also compete with other modern tech transfer organizations.

In addition, the new brand creates opportunities for updated assets in order to market DAFT3 to potential partners. ★

NEW
LOGO & BRANDING

DEPARTMENT OF THE AIR FORCE
TECHNOLOGY TRANSFER AND TRANSITION

The Meaning Behind the Logo

- Color palette similar to AFRL's while incorporating our partnership and support with Tech Link
- The "D" circuits/data points allude to the forward moving of technology that we aim for.
- "A" alludes to the Space Force
- Simple iconography for versatile use

MARKETING & COMMUNICATIONS

SOCIAL MEDIA SNAPSHOT

POSTS
376

FOLLOWERS
894

IMPRESSIONS
29K

TWEETS
378

FOLLOWERS
1.7K

IMPRESSIONS
20K

POSTS
494

FOLLOWERS
1.8K

IMPRESSIONS
23K

27% increase from 2022

Our Website

The program office's primary hub for all information related to technology transfer and transition is located at *https://www.aft3.af.mil*. This site features a number of 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. Due to the recent rebrand, a new website layout will be launched sometime in 2024. New mockups and developments are underway.

The Monthly Update

This electronically distributed newsletter is sent out at the beginning of each month and was designed as an internal marketing tool to connect members of the technology transfer community with the latest news, events, personnel showcases, social media updates, and training opportunities. As with the website, this is an ongoing effort with constant changes made to better serve its intended audience. If you'd like to be included on the mailing list send a request to: **AF.Technologytransfer@us.af.mil**

Patent Licensing Opportunities

Available patents for licensing, derived from DAF innovators, were advertised weekly on the DAFT3 social media sites. The posts were designed around unique monthly concepts, listed patents specifically selected to match the theme, and included a direct link to the TechLink website for full patent licensing details. Department of the Air Force Technology Transfer and Transition Program Office's (DAFT3PO) intent was to assist entities interested in DAF technology to connect and transfer cutting-edge patents to their company for product development. Capitalizing on these efforts in F24, the office will create a complete marketing spotlight on DAF innovators who are awarded patents, featuring their technology on the DAFT3 website, social media channels, and the monthly electronic newsletter. The goal is to encourage and create new partnerships that further advance technology in support of the mission.

Social Media

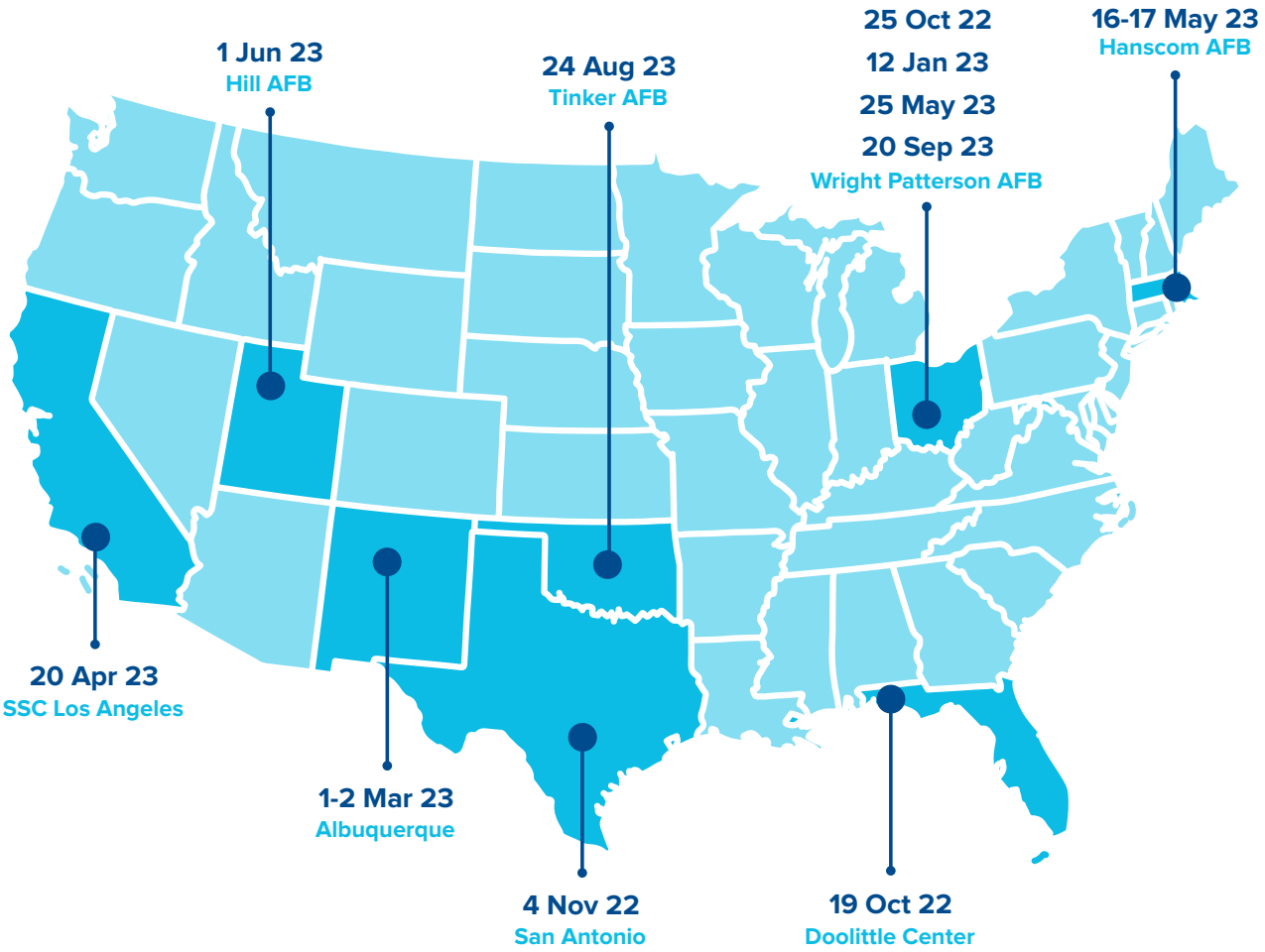
The DAFT3 social media program continues to grow steadily since its inception just three years ago. The outreach team maintains three primary channels – LinkedIn, Twitter, and Facebook – with daily posts featuring technology available for licensing and other information of interest to the technology transfer community. While all three sites have gained new followers during the last fiscal year, the LinkedIn and Facebook pages have experienced the most significant growth. ★

Social Media Graphic Examples

EVENTS

MEETINGS & TRAININGS

The Department of the Air Force Technology Transfer and Transition Team has had a busy and successful year with events. We have traveled all over the country for multiple trainings and events in order to build relationships and help expand knowledge. In total, we have traveled to 11 sites and have trained over 90 individuals. We can't wait to see what the new fiscal year has in store for travel, events, and training. ★



TECHNOLOGY
SCOUTING

Technology Scouting is the process of matching internal requirements (customer needs) with external technologies for strategic purposes by utilizing Integrated Priority Lists, Science and Technology Integrated Priority Lists, Joint Urgent Operational Needs, and Joint Emerging Operational Needs listings to search for solutions. Tech scouts can open doors to new opportunities, gain access to expertise in technologies related to the customer, and engage with technology both inside and outside the fence. A Tech Scout "socializes" the technology with the Federal Bureau of Investigation (FBI) , Department of Homeland Security, Major Commands, Combat Commands, Department of Defense agencies, federal laboratories, and other entities based on customer needs.

The challenges of the Coronavirus disease (COVID) have significantly impacted tech scouting efforts, which typically involve traveling the country to various events to meet and network with technology professionals. The Department of the Air Force Technology Transfer and Transition Public Office (DAFT3PO) continues to monitor and follow DAF guidelines with regard to travel and plans to increase these scouting efforts as health and safety guidance allows." ★

"***TECH SCOUTS*** **can open doors to new opportunities, gain access to expertise in technologies related to the customer, and engage with technology both inside and outside the fence."**

DAF METRICS

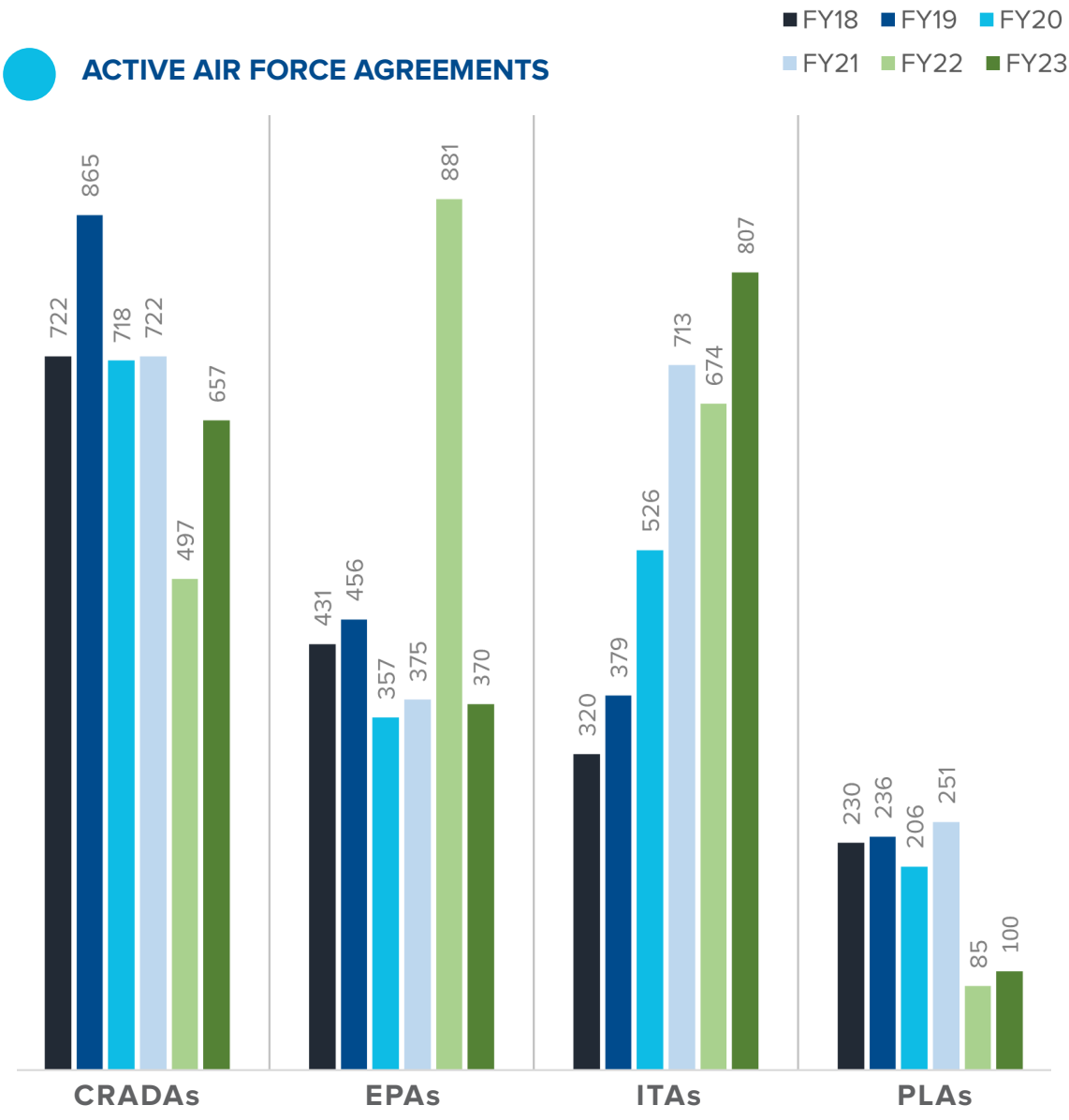
The following Department of the Air Force Technology Transfer metrics are used to measure progress and evaluate the success of new efforts to encourage technology transfer activities. Metrics include Cooperative Research and Development Agreements (CRADAs), Educational Partnership Agreement (EPAs), Information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

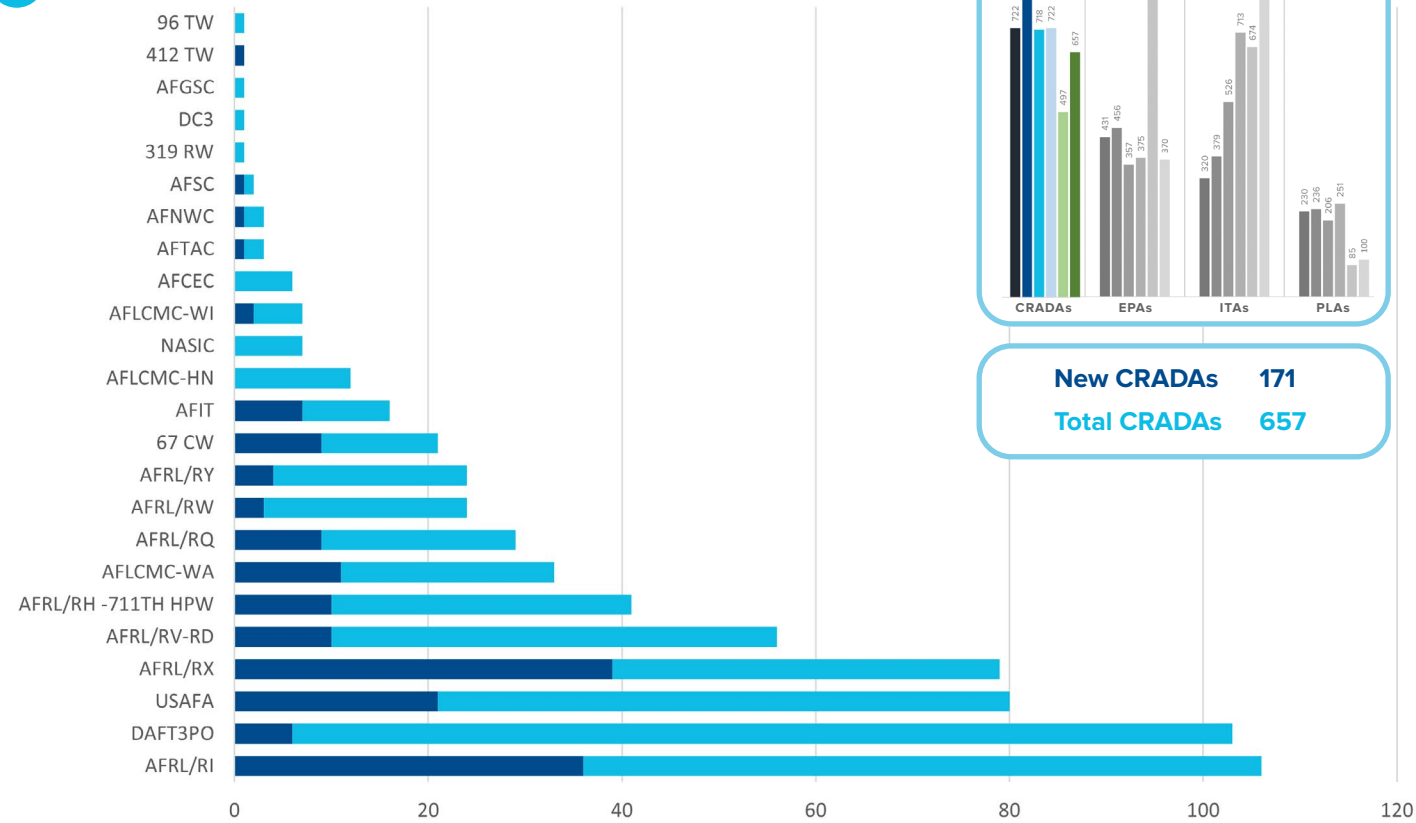
Technology transfer activities are not spontaneous events. Inventions typically require years of research effort before they are disclosed. A review of a patent application may take several years before the patent is awarded. It may also take years to license a Federal patent or form the collaborative 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. ★

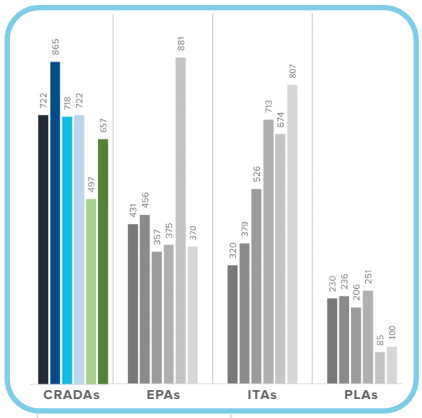
ACTIVE AIR FORCE AGREEMENTS



New Agreements Active Agreements
Includes New Agreements in Total

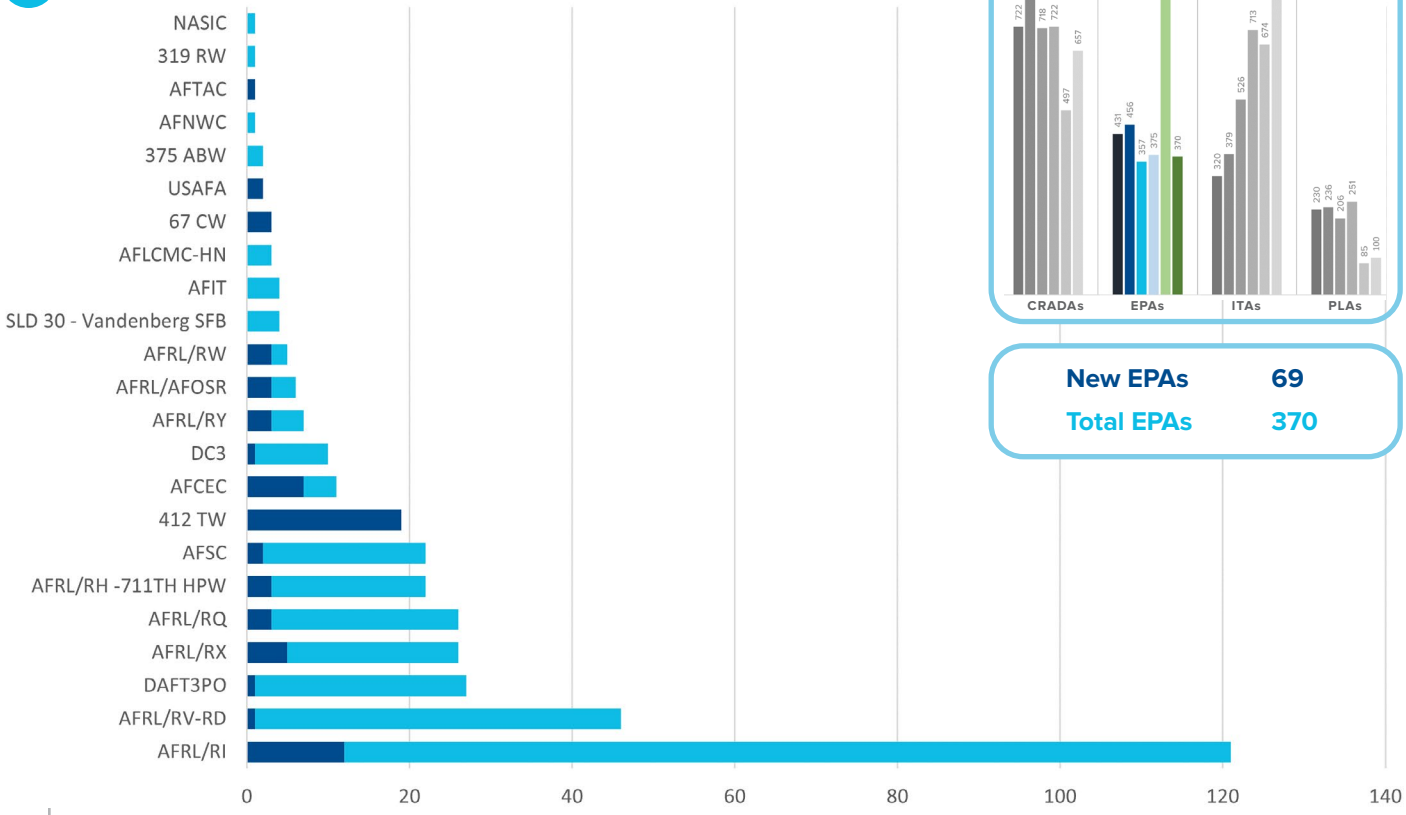
COOPERATIVE RESEARCH & DEVELOPMENT AGREEMENTS

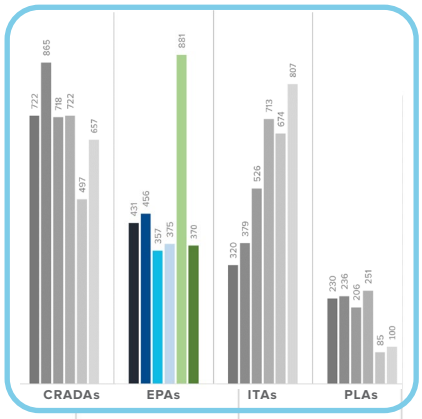




New CRADAs	171
Total CRADAs	657

EDUCATION PARTNERSHIP AGREEMENTS

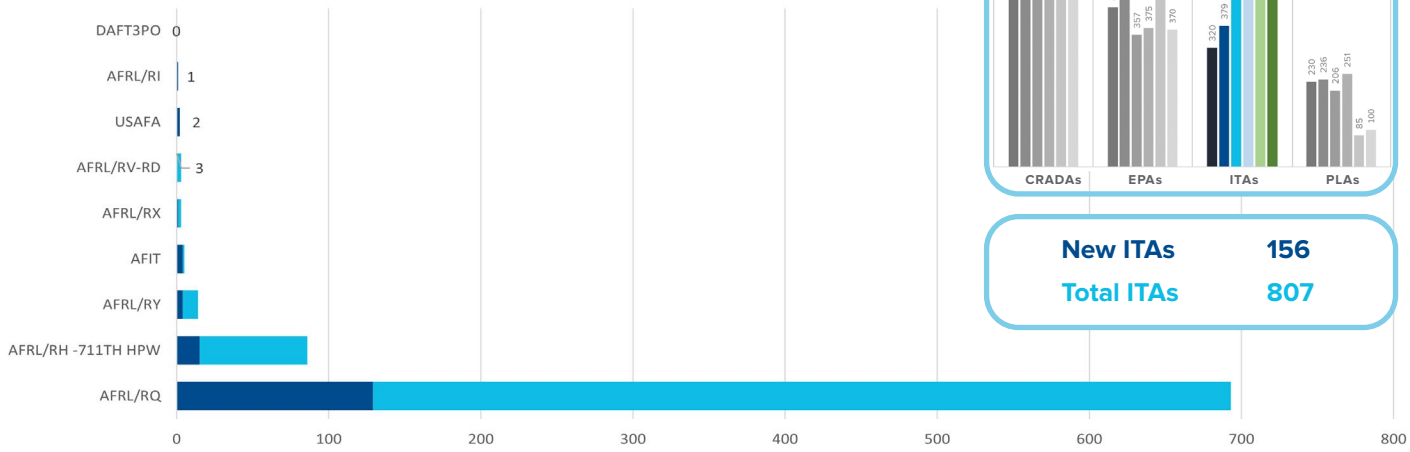


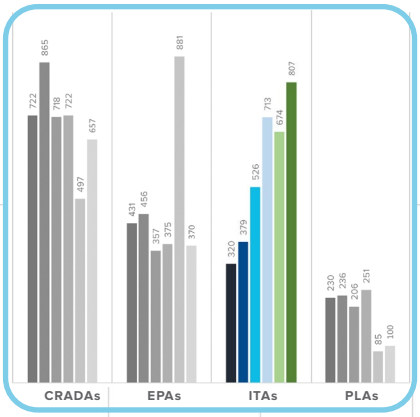


New EPAs	69
Total EPAs	370

New Agreements **Active Agreements**
Includes New Agreements in Total

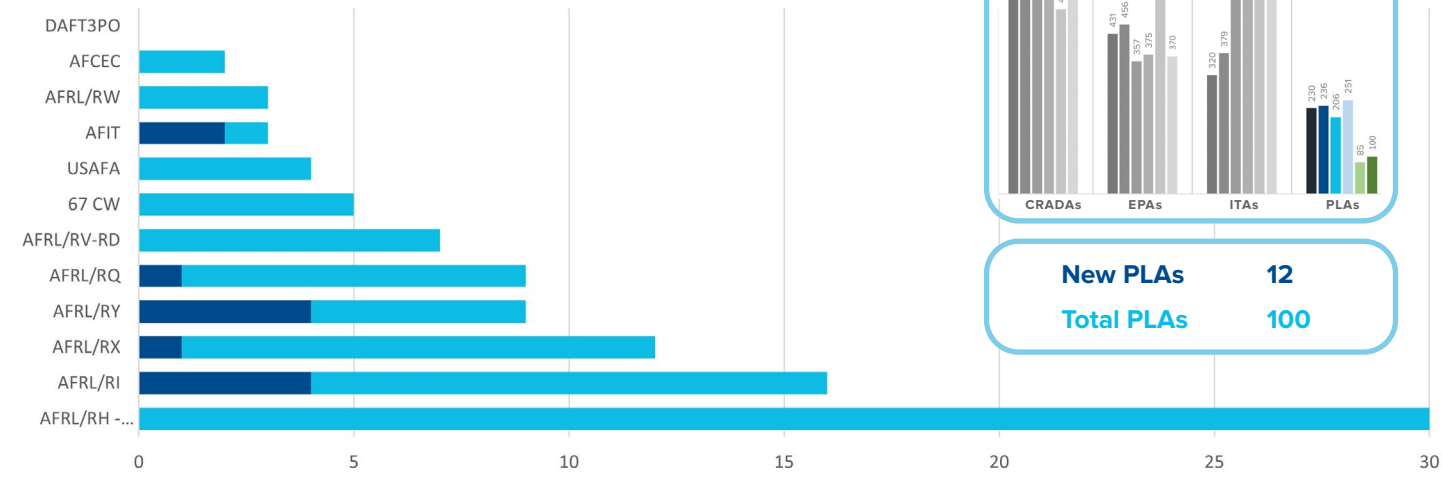
INFORMATION TECHNOLOGY AGREEMENTS

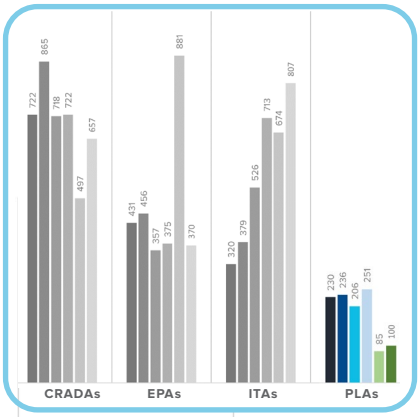




New ITAs	156
Total ITAs	807

PATENT AND LICENSING AGREEMENTS



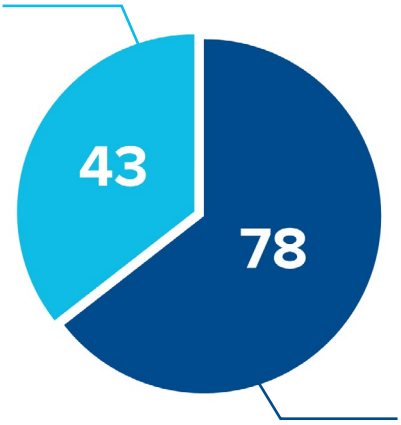


New PLAs	12
Total PLAs	100

AFRL OTHER

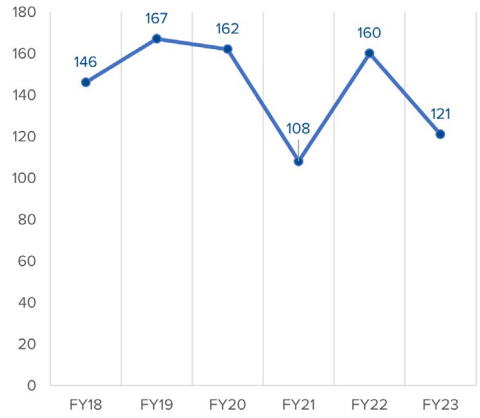
INVENTION DISCLOSURES RECEIVED

446th	1
412 TW	2
SPARK	9
Unknown	1
AETC	2
AFIT	9
AFSC	4
Hanscom	1
PACAF	3
Pentagon	1
AMC 89 APS/ TROK	1
USAFE 52 FW	1
AAC 4 CMS/ MXMCE	1
USAFA	7



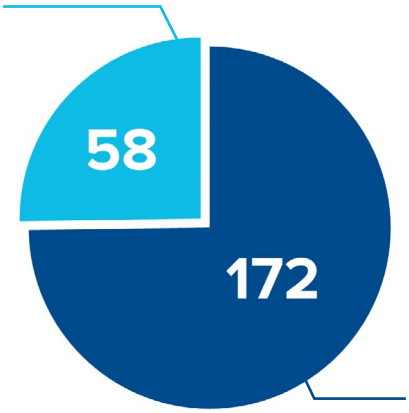
711 HPW	3
711 HPW/RH	3
RD	2
RI	9
RQ	18
RV	11
RW	7
RX	13
RY	12

FISCAL YEAR TRENDS



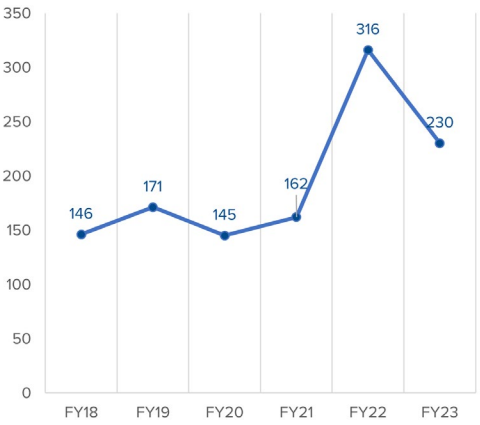
APPLICATIONS FILED

412 TW	1
88 ABW	1
AETC	3
AFCEC CXA	1
AFGSC	1
AFIT	12
AFLCMC WI	1
AFLCMC XZ	1
AFSC	5
AFSC/EN	3
AMC	2
Hickam AFB	1
446th	1
PACAF	2
SPARK	7
USAFA	16



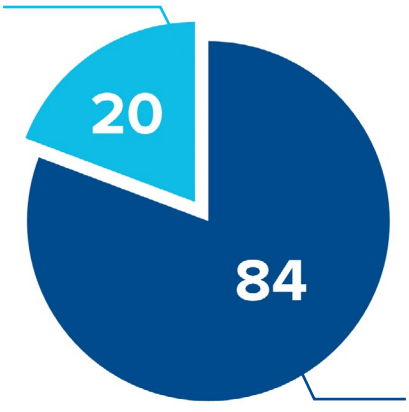
711 HPW	18
RD	3
RI	8
RQ	37
RV	18
RW	9
RX	36
RY	43

FISCAL YEAR TRENDS



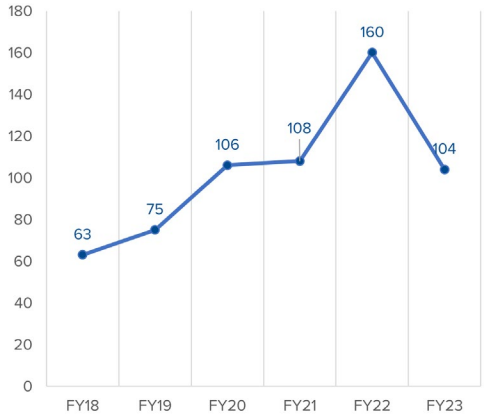
PATENTS ISSUED

19 LRS	1
59 MDW	1
60 MDG	1
88 ABW	1
AFCEC CXA	1
AFCENT	1
AFIT	5
AFLCMC WI	2
AFSC	1
AMC	1
USAFA	5



711 HPW	7
RD	4
RI	4
RQ	13
RS	1
RV	11
RV/RD	1
RW	9
RX	16
RY	18

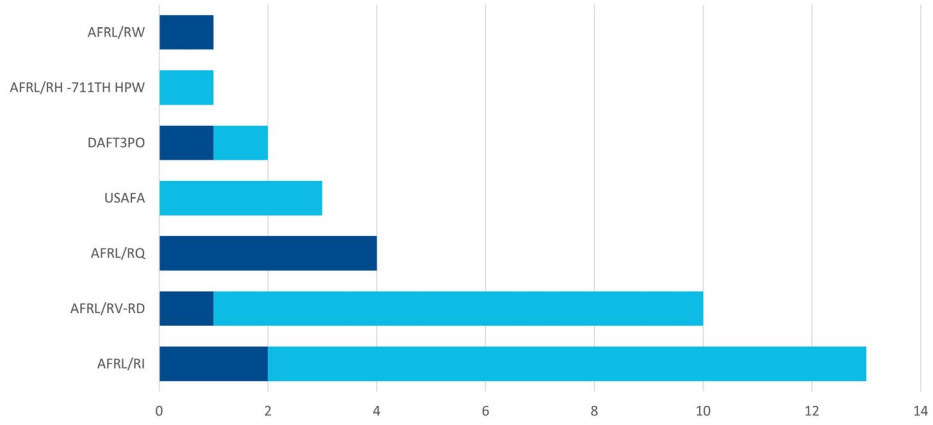
FISCAL YEAR TRENDS



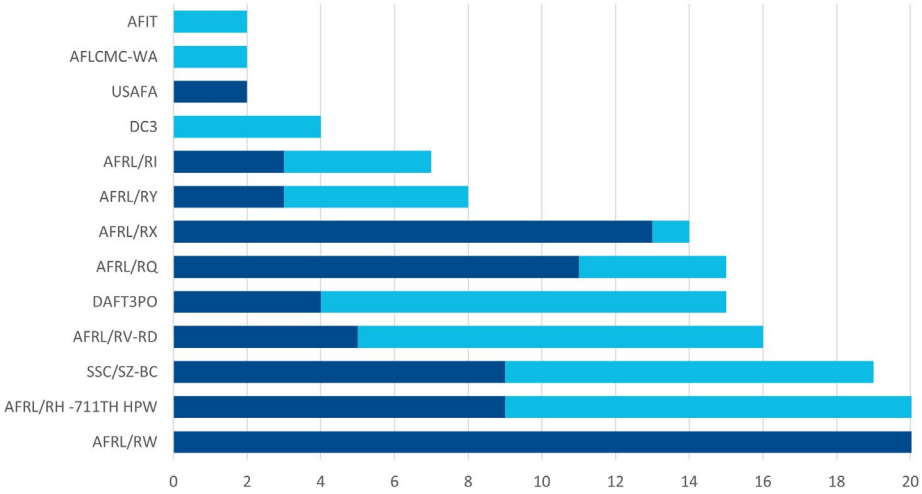
New Agreements

Active Agreements
Includes New Agreements in Total

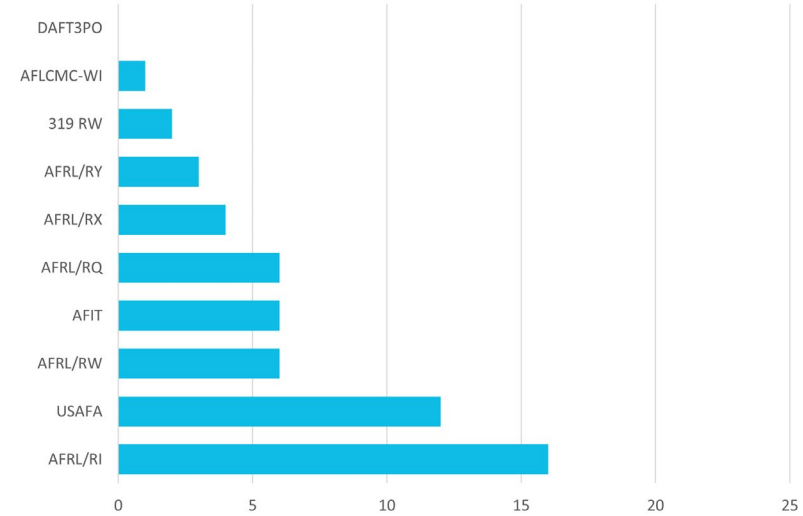
COMMERCIAL TEST AGREEMENTS



LIMITED PURPOSE CRADAS



NEW COOPERATIVE RESEARCH & DEVELOPMENT AGREEMENTS WITH SMALL BUSINESSES



ESTIMATED COOPERATIVE RESEARCH & DEVELOPMENT AGREEMENTS CONTRIBUTED VALUE

AFRL/RI	$369+ M
AETC	$75+ M
67 CW	$43+ M
AFRL/RW	$31+ M
AFRL/RX	$24+ M
711 HPW	$20+ M
688 CW	$12+ M
AFRL/RY	$3+ M
AFRL/RQ	$2+ M
CFSCC	$894+ K
AFSC	$521+ K
AFIT	$348+ K
DC3	$11+ K

DAF ROYALTIES

The Department of the Air Force Technology Transfer & Transition Program Office (DAFT3PO) is responsible for processing royalty payments owed to all Air Force and Space Force inventors. Department of the Air Force (DAF) inventors (including contractors) 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 are eligible to receive royalties. DAF inventors are eligible for the first $2,000.00 in royalty income from every license every year and 50% of any additional royalty income. The remaining 50% is distributed to the DAF lab where the intellectual property originated. DAF labs can use the money for research and development, education, training, and for awards or incentives to lab personnel.

ROYALTIES COLLECTION PROCESS

- **Office of Research and Technology Applications (ORTA) reviews license to assess how much money is due.**
- **Use audit ledger created by AFMCLO/JAZ**

- **ORTA issues Collection Memo #1**
- **CC: T3 Office**
- **Wait 30 Days**

- **ORTA issues Collection Memo #2**
- **CC: T3 Office**
- **Wait 30 Days**

- **ORTA informs DAFT3 Director**
- **DAFT3 Director determines next steps to include turning collection over to US Treasury**

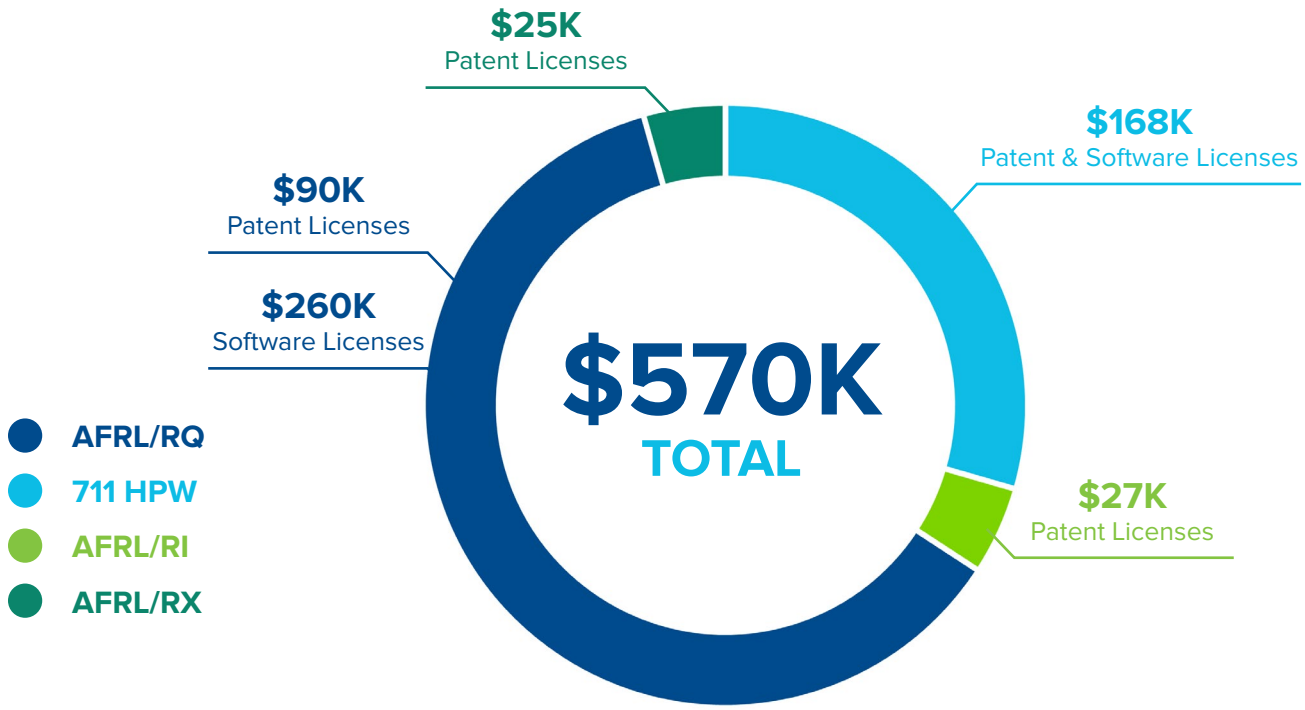
The Coronavirus disease (COVID-19) pandemic presented numerous challenges across industries, and the field of technology transfer was not spared. However, the DAFT3 office, despite facing unprecedented circumstances, demonstrated remarkable efficiency in clearing a significant backlog during the COVID-19 pandemic; 2 years worth to be exact. Leveraging innovative strategies and technologies, the team was able to overcome obstacles and make substantial progress in processing pending requests. Our dedication and commitment to service allowed us to catch up on a backlog that would have otherwise taken years to address.

With the backlog cleared and in-person training back on track, the DAFT3 office has turned its attention to reviewing known DAF patent license and software license agreements. This meticulous process revealed a concerning issue of delinquent royalty payments by several licensees. Recognizing the importance of upholding contractual obligations, this office undertook proactive measures to address this issue promptly.

Through the dedicated efforts of the DAFT3 office, a staggering $570,000 in royalties have been collected to date. By implementing a systematic approach to follow up on delinquent payments, licensees were made aware of their financial obligations, resulting in a significant boost in royalty collection. This achievement not only ensures fair compensation for intellectual property owners but also strengthens the overall ecosystem of technology transfer, encouraging further innovation and investment.

The DAFT3 office's success in clearing the backlog, resuming in-person training, and diligently addressing compliance issues highlights their commitment to promoting a thriving environment for technology transfer. The challenges posed by the COVID-19 pandemic did not hinder their progress; instead, they served as catalysts for innovation and adaptation. As the world moves forward, it is crucial to recognize and appreciate the efforts of organizations like the DAFT3 office, whose dedication plays a pivotal role in driving progress and fostering a culture of collaboration in the ever-evolving field of technology transfer. ★

> **By implementing a systematic approach to follow up on delinquent payments, licensees were made aware of their financial obligations, resulting in a significant boost in royalty collection.**



PARTNERSHIP INTERMEDIARIES

The program management team hosts regular meetings with contracting and fiscal managers to ensure timely executions of activities and to discuss any issues or concerns which may arise. In addition, program managers regularly meet with the Partnership Intermediaries (PIs) to assist in strategic planning and establishing metrics and goals. Other functions performed by program managers include reviewing monthly, quarterly and annual reports, approving invoices, monitoring spend plans and contract ceilings, and conducting annual program reviews with the appropriate stakeholders for each PI.

TechLink & MilTech

Sponsored by the Office of the Secretary of Defense, in conjunction with Montana State University

Managed by Ms. Tricia Randall

Wright Brothers Institute (WBI)

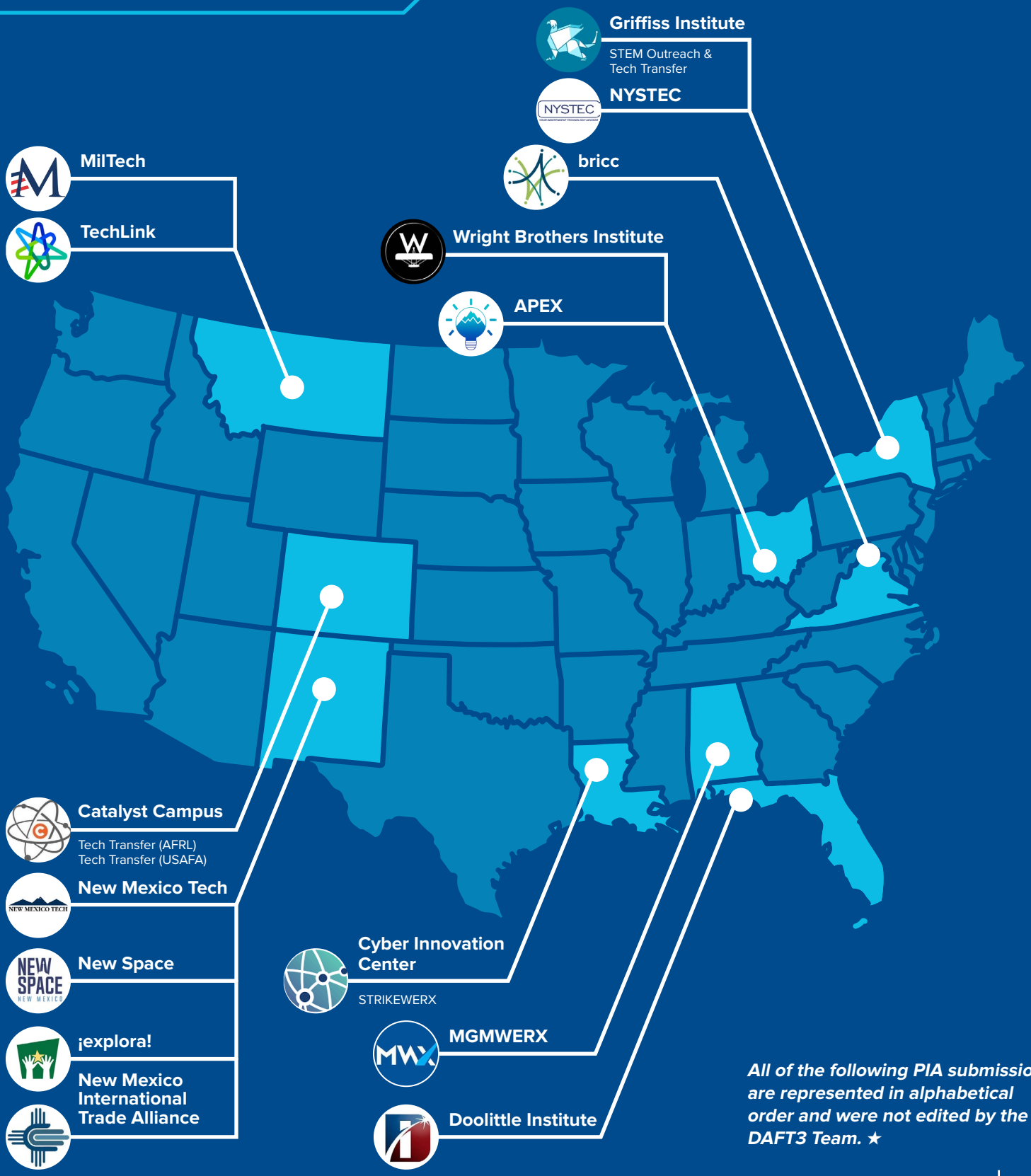
Managed by Mr. Terry Cunningham

Academic Partnership Engagement Experiment (APEX)

Sponsored by the Air Force

Managed by Mr. Justin Earley (see left) & Ms. Tricia Randall

PIA
LOCATIONS



All of the following PIA submissions are represented in alphabetical order and were not edited by the DAFT3 Team. ★

AFRL Southwest Regional PIA with New Mexico Tech University

Main campus in Socorro, New Mexico
PI Offices in Albuquerque, New Mexico

https://www.nmt.edu/
https://afrlnm.com/stem/

Who We Are

The New Mexico Institute of Mining and Technology, also known as New Mexico 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).

What We Do

Conduct, facilitate and enable T3 for the Air Force Research Lab Space Vehicles and Directed Energy Directorates. Specifically facilitate and enable tech 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 he 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.

Success Stories

International CRADA between AFRL and Indian Startups: The tech transfer team, through the PIA with the New Mexico Institute of Technology, facilitated the development and execution of the Space Force's first International Cooperative Research and Development Agreement (CRADA). The agreement is with the Indian start-ups 114 AI (a Catalyst Space Accelerator alum) and 3rdiTech. Both companies will work with General Atomics to co-develop components using cutting edge technologies in AI and semiconductors respectively. The agreement was highlighted at a White House Press Briefing (22-June) in light of the Indian PM Modi's visit to the White House.

AFRL Innovation Awards recognize excellence in tech transfer: The Air Force Research Laboratory's Directed Energy Directorate and Space Vehicles Directorate held a 2023 Innovation Awards ceremony in Albuquerque, in Dec, 2023, marking the sixth annual ceremony. The event was created to recognize and inspire the laboratory's inventors and collaborators who develop technologies in support of the nation's defense and whose research promotes the transfer of technology to partners, academia and the private sector. The 2023 AFRL Innovation Award ceremony honored eight individual scientists and engineers, support workforce members and one team, with acknowledgements going to the noteworthy accomplishments of more than 20 other inventors.

AFRL/University of Arizona Tech Collider: The University Tech Collider Working Group (UTCWG) held a collider at the University of New Mexico's Science and Tech Park Rotunda, in Albuquerque, New Mexico, on April 13-14, 2023. The event was hosted in partnership with New Mexico Institute of Technology-Southwest Innovation Alliance and the University of Arizona. The two-day event featured scientific presentations and AFRL tours seeking to improve knowledge of career opportunities for University of Arizona students, advanced technological development in the state of Arizona and expanded science, technology, engineering and math, or STEM, education outreach initiatives. The Tech Collider also addressed critical needs for information sharing and collaboration between university partners and AFRL. Over 40 participants from AFRL's Space Vehicles Directorate, Directed Energy Directorate, University of Arizona and others met to address critical needs for information sharing and collaboration between university partners and AFRL.

2023 HyperspaceChallenge Partnership Accelerator: The Air Force Research Laboratory partnered with CNM Ingenuity, or CNMI, the economic development arm of Central New Mexico Community College, to launch the 2023 Hyperspace Challenge Accelerator, now in it's sixth year. This year, in support of the Space Rapid Capabilities Office (Space RCO), 6 companies, including 3 internationally based, are participating to determine product-mission fit for capabilities being sought by the Space RCO pertaining to Autonomy, Maneuverability, and Situational Awareness. The accelerator concludes with an Accelerator Week in Albuquerque, New Mexico, Nov. 1-3 at the Q-Station collaboration facility, where the companies will participate in intensive interactions with the Space RCO, Space Systems Command, and AFRL to assess company products for use in USSF missions. This year's cohort is an evolution of the Hyperspace Challenge that theTechnology Engagement Office began in 2018, through the PIA with New Mexico Tech, with the goal of discovering promising commercial technology for National Security Space purposes and has garnered attention several media outlets including Space News (*https://spacenews.com/startups-from-four-nations-join-2023-hyperspace-challenge/*). More than 150 participants from space technology, small businesses, academia, government, investors and others from the space community took part in the 2022 Hyperspace Summit. To date, the Hyperspace Challenge has worked with 38 government problem sponsors and 61 companies & universities enabling $419M in follow-on funding from government contracts and $185M from VC investment.

STEM Outreach & Workforce Development: AFRL STEM outreach and engagement activities serve as a significant driving force in cultivating a robust technical workforce for the DoD and Department of the Air Force. AFRL's STEM Academy in New Mexico seeks to raise student interest in, and knowledge about, STEM by providing hands-on, minds-on STEM outreach programs and projects that engage students, especially those underserved and underrepresented in STEM fields, and teachers in the application of STEM content in context and introduce connections to STEM careers. In 2022, approximately 2,800 students were engaged across five different focused mission areas (or programs) with 14% participating in multiple missions. The students are drawn from diverse backgrounds with 73% identifying as minority and 47% female.

NSF Engines Grant Finalist: The Space Valley Coalition, a private sector collaboration between the New Mexico Partnership Intermediaries serving AFRL's Tech Engagement Office in New Mexico (including the New Mexico Trade Alliance, Central New Mexico Community College, New Mexico Tech, University of New Mexico, New Mexico State University and New Space Nexus), and other New Mexico organizations, is 1 of 16 finalist for the $160M NSF Engines grant. More coverage here.
(https://www.krqe.com/news/space-news/new-mexico-space-valley-selected-as-finalist-for-national-science-competition/)

The Space Valley Coalition was also featured as the main case study example in the Brookings Institute piece "How Multi-phase place-based economic policies can enhance the nation's development capacity."
(https://www.brookings.edu/articles/multi-phase-place-based-economic-policies-can-enhance-the-nations-development-capacity/) ★

Academic Partnership Engagement Experiment

APEX
ACADEMIC PARTNERSHIP ENGAGEMENT EXPERIMENT

Clearance #AFRL-2024-0301

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

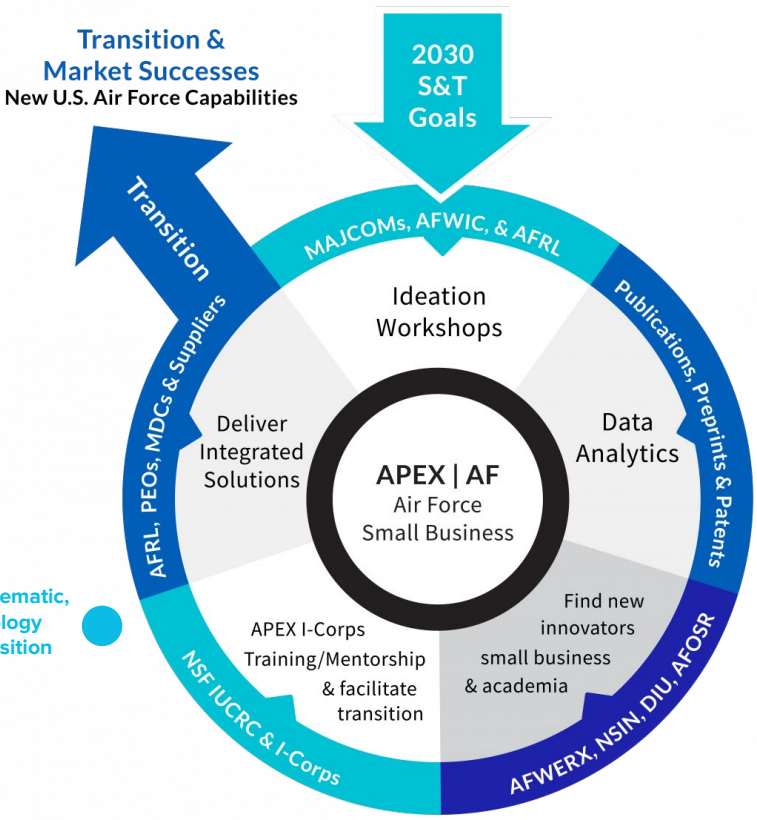
BUILD & CONNECT a nationwide network of innovators and technologists from universities, small businesses and government

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

Success Stories

Since its inception, APEX has built a network comprised of 33K+ academic, small business, and economic development organizations to build university-industry partnerships that advance the Nation's research and development ecosystem. By taking a funneled approach, the PIA is able to start at the top by identifying and educating our nation's top innovators on relevant funding opportunities and then guiding them through the process to understand how to successfully transition this technology into the hands of our airmen and guardians. To date, APEX has assisted 600+ small business owners and academic researchers to win 300+ funding awards to advance their science and technology innovations. The total funding for these APEX-assisted awards exceeds $100M and this assistance has successfully led to Phase III transitions. ★



APEX integrates stakeholders and processes into a systematic, repeatable operation that spans the science and technology lifecycle and is designed to maximize probability of transition

The Basic Research Innovation and Collaboration Center

Arlington, Virginia

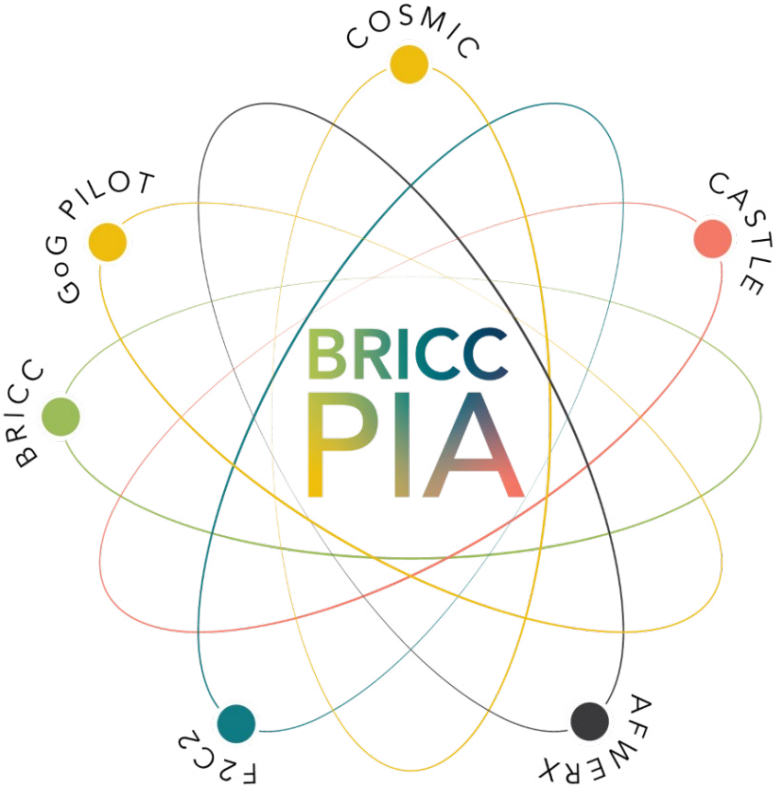
https://vt-arc.org/

Who We Are

The Basic Research Innovation and Collaboration Center (BRICC) helps AFOSR to identify, investigate, and exploit research opportunities that will transform future Air Force (AF) and Department of Defense (DoD) capabilities.

What We Do

The BRICC is designed to help 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 AFOSR's technology objectives as well as those of our partnership network.



Success Stories

Shared environments open a door for collaboration for individuals within and beyond our partner's own organizations, enabling the collision of ideas that is so important for technology transition and transfer. The BRICC operates 100,000 sq. ft. of collaboration facilities in Arlington and Chantilly, VA and Colorado Springs, CO. The facilities offer a mix of classified and unclassified spaces equipped for in person and hybrid engagements. The BRICC supports hundreds of T3 activities and hosted thousands of guests from Government, Industry, Academia, and Nonprofits.

The BRICC provides data-driven insights to support our partners and inform their technology investment decisions. Our analytic support helps our partners identify, investigate, and exploit research and T3 opportunities using a range of capabilities including data engineering, scientometrics, market scanning, mission engineering, operational analysis, and more. The BRICC completes completes hundreds of analytic studies and introduced new market research capabilities to the T3 program.

Technology innovation begins with a strong STEM workforce. The BRICC works with our partners to support the current innovation workforce as well as inspire and engage with the future STEM generation. ★

Catalyst Campus for Technology & Innovation

https://catalystcampus.org/program/catalyst-space-accelerator/

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-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, and through intensive collaboration with the various components of the National Security Space enterprise in in Colorado, assists in determining a mission fit for the technologies and capabilities discovered.

Success Story

Catalyst Space Accelerator: The Catalyst Campus for Technology Innovation (CCTI) based in Colorado Springs, CO serves as the home of the Catalyst Space Accelerator, a program to discover and determine product-mission fit for nontraditional companies. The end goal is to boost the growth of relevant technologies for DAF purposes and quickly determine which are self-sustainable in a market-driven economy. Cohorts of 8 nontraditional companies are selected to participate in a semi-in-residence 10 week program at the Catalyst Campus in Spring and Fall. The 2023 cohorts focused on discovering promising technologies to enable Defensive Cyber Operations for Space and AI/ML for Space and Maritime applications, the latter co-sponsored by the Naval Information Warfare Center Pacific. From 2018 thru 2023, the Catalyst accelerator supported 12 total cohorts, cultivated 94 total alumni companies, and contributed to the creation of 1,348 jobs. Accelerator alumni companies obtained $284M in follow-on funding from federal and non-federal government sources and $243.1M in private investment. Local Colorado coverage:

(https://www.fox21news.com/business/press-releases/globenewswire/8751924/eight-companies-join-catalyst-accelerators-defensive-cyber-operations-for-space-cohort/) ★

Doolittle Institute

Clearance #AFRL-2024-1449

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 11 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 sq ft facility enables AFRL/RW personnel, academia, industry and other government organizations to participate in innovation and collaboration activities in unique ways. In FY23 we hosted more than 100 meetings that were attended in-person by more than 5,000 innovators.

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:

Tech 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.

Tech 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 tech 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.

Future Workforce Development: DI's STEM team administers a variety of STEM programs for K-12 students 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

Innovation Ecosystem Reset

DI's focus for 2023 was to re-energize and grow its innovation ecosystem. After discovering that many non-traditional organizations were reluctant to work with AFRL/RW because they were not familiar with government tech transfer processes and were unclear on what technologies AFRL/RW is interested in. DI's T2 Program Manager began meeting one-on-one with any businesses/universities who expressed interest in working with AFRL/RW. In these initial intake sessions, DI shared the technological areas of interest to RW, a link to the RW patent portfolio, an overview of the four key T2 agreements and information about upcoming events and partnership opportunities. In 2023, DI met with more than 170 organizations and due to word-of-mouth and social media marketing efforts, added more than 1,000 new connections to our innovation ecosystem. We also experienced a significant uptick in industry participation at our innovation events.

Energetic Materials Industry Day

In July 2023, DI organized an industry day event on behalf of the Energetic Materials branch (RWTE) of AFRL/RW. This event featured the unveiling of two novel energetic material formulations developed at AFRL/RW and upcoming partnership opportunities for industry within the Advanced Munitions Technology Complex. Energetic Materials is a niche field that very few businesses nationwide have capability in, however, due to extensive market research and marketing outreach efforts, DI was able to identify more than 40 industry participants. The event was attended by more than 57 individuals and resulted in the execution of 24 CRADA-NDAs. Three companies were selected by AFRL/RW for further collaboration after the event.

Patent Portfolio Marketing

In 2023, DI embarked on a mission to revamp and ramp-up marketing for the AFRL/RW patent portfolio. Rather than continuing to market the entire portfolio, we conducted a detailed assessment of all the patents and identified 5 that had the most commercialization potential. We created websites for each of these patents where we included a summary of the technology, potential use cases and other written material and videos highlighting the benefits of the technology. Two of our patents were also featured in the 2023 NSIN Foundry program and DI's T2 Program Manager served as a mentor to two groups participating in the program, meeting with them weekly to discuss commercialization strategies and answer questions about various T2 mechanisms that can be used to engage with the Lab.

STEM Outreach Activities

In FY23, DI's FIRST Lego programs for grades PK-12 were attended by more than 500 students, including several from under-served populations. DI's STEM team also started a monthly databot program that focused on teaching students real-world applications of scientific concepts through instruction and guidance provided by a scientist or engineer from AFRL/RW. The program received an enthusiastic response from the scholastic community and more than 90 students attended. Lastly, in an effort to recruit more volunteers and students for STEM programs, DI's STEM outreach team participated in two regional community festivals attended by more than 500 students and their families.

DI is excited to continue its success serving as a connector between industry and AFRL/RW in innovative new ways. In FY24 we aim to continue our industry outreach activities, ramp up patent marketing and use our marketing skills to increase the number of participants in the AFRL/RW SBIR/STTR program. The DI STEM Outreach team will continue to grow its STEM offerings to reach new participants, with an emphasis on providing STEM programming to under-served populations. ★

DEFENSEWERX
Innovation Hub

DOOLITTLEINSTITUTE
speed·innovation·solutions

AFRL
THE AIR FORCE RESEARCH LABORATORY
LEAD | DISCOVER | DEVELOP | DELIVER
Innovation Institute

¡Explora! (Explora Science Center & Children's Museum of Albuquerque)

Albuquerque, New Mexico

https://www.explora.us/

Who We Are

Explora is an innovative experiential learning center with a mission of creating opportunities for inspirational discovery and the joy of lifelong learning through interactive experiences in science, technology engineering, art, and math (STEAM). We address our mission with hands-on exhibits, educational programs, and community initiatives for people of all ages and backgrounds, and strive to support individuals who are historically underrepresented in science and technology fields or face barriers to access because of their ethnicity, gender, or ability. Explora collaborates with a network of over 100 partner organizations to help overcome challenges that stifle access to educational opportunities, and we are committed to working systemically to improve educational outcomes, drive economic development, and build community prosperity through our Cradle through Career STEAM Learning Strategic Plan.

What We Do

Since opening in Old Town Albuquerque in 2003, Explora has provided families and people of all ages a space for learning through more than 250 exhibits, attracting more than 400,000 visitors a year. We have also offered a variety of hands-on learning programs in STEAM content areas for students in pre-K through 12th grade, serving 80,000 New Mexican students each year through 2,700 school educational programs in 95% of the state's school districts. Field trips to the museum account for a large portion of these programs, attracting approximately 10,000 students on field trips in a typical school year, with an additional 20,000 students and their families attending Family Science Night through an ongoing program with Albuquerque Public Schools' Title I. The service-delivery process includes both year-long programs with partner organizations (like APS) and individual registration of teachers or schools for one-time visits, including to X Studio, our new teen workforce development center that opened in February 2023.

Success Stories

The Teacher Professional Development Workshop series, the centerpiece of the current PIA, has allowed Explora to serve nearly 250 teachers a year, impacting more than 6,000 students each year since 2018. The workshops cover a variety of topics in STEAM each year, and every participating teacher receives a resource kit to take back to classrooms. The Maker Educator Community of Practice has also offered monthly meetings to support more than 100 educators each year, providing opportunities to share information about Maker-centered activities for students. Another key component of the current PIA is Explora's work on the nationally designated STEM-NM Learning Ecosystem, whose purpose is to bring together businesses, non-profits, professionals, and educators to create exciting STEAM learning opportunities across the state. Starting in 2022, the PIA has also funded the App Contest program, a semester-long curriculum for middle school and high school students, which culminates in the App Contest Demo Day. In its inaugural year, seven local schools participated in the program, involving nearly 120 students and resulting in 20 teams competing in the Demo Day. In addition, the PIA has facilitated the co-creation of a directed-energy exhibit between AFRL and the Explora Exhibits team. The exhibit is now showcased in X Studio, Explora's new teen workforce development center, highlighting career pathway opportunities in the directed-energy field and beyond. Supported by the PIA, X Studio is expected to serve more than 15,000 students a year through its programming that utilizes more than a dozen hands-on exhibits, a cutting-edge Makerspace, a computer lab, multipurpose classrooms, and the Teen Lounge. ★

The Griffiss Institute

Griffiss Institute, New York

https://www.griffissinstitute.org/who-we-work-with/afrl/stem

Who We Are

The purpose of this PIA is to help the Air Force (AF) in implementing Science, Technology, Engineering and Mathematics (STEM) K-12 efforts in elementary, middle, and high schools and the Leadership Experience Growing Apprenticeships Committed to Youth (LEGACY) Program across the Air Force.

Ceiling Amount: ~$99M
Current Obligation Amount: ~$20M
Funding Type: 3600
Two Main Funding Sources: Air & Space Force K-12 Outreach and AF LEGACY

Period of Performance: Sept 2019 – Sept 2024

https://dafstem.us/

What We Do

The Air & Space Force K-12 STEM Outreach Program coordinates and executes K-12 STEM Outreach efforts across the USAF and the USSF in support of the DoD STEM mission to "inspire, cultivate, and develop exceptional STEM talent" by exposing students, teachers, and their influencers to Dept of Air Force opportunities and resources across the US and overseas locations. ★

FY22 IMPACT NUMBERS

701,000 Students

29,000 Teachers

3,000 S&E Volunteers

17,000 S&E Volunteer Hours

Highlights

- Piloted new evaluation program to move towards measuring short-term outcomes across the Enterprise
- Introduced new teacher professional development programs - 16 defense education workshops across 11 bases
- Growth of STEMtoSpace virtual Space Force Program to include sister Air Force Program, STEMtoSky
- Introduced AFA Cyber and Space Camps at 6 base locations.

MILTECH™

Clearance #AFRL-2024-0301

Montana State University - 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). Follow-on PIAs are with Air Force Research Lab.

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 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

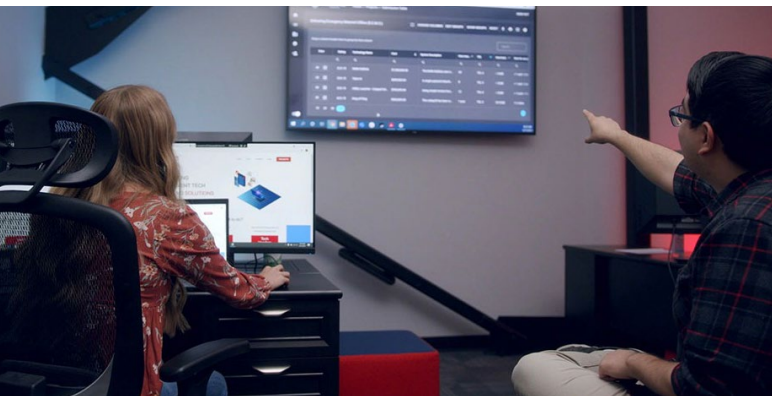
MilTech assists with on-time delivery of technology and knowledge transition to the U.S. Warfighters through hands-on assistance to integrated product teams and vendors. MilTech supports the U.S. Government by:

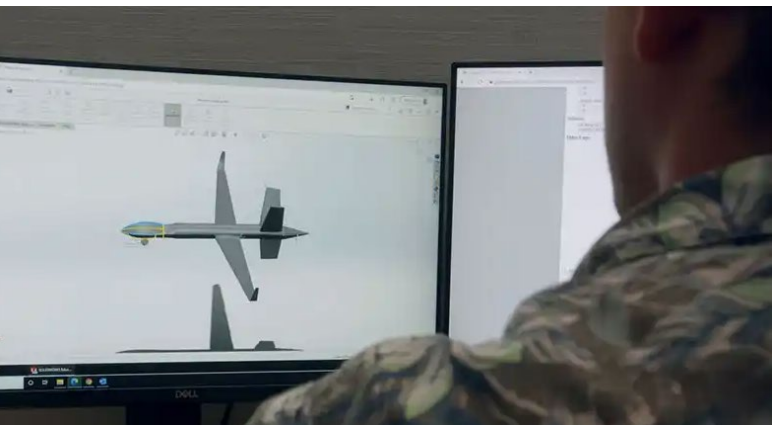
- Identifying, qualifying and actively engaging industry partners, subject matter experts, and academia
- Assisting with advancing user-initiated innovations, solving problems, and advancing Technology Readiness Levels (TRL)
- Transitioning technology in and out of government labs
- Ensuring that end 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 enhancing efficiency and reducing costs for government partners while actively advancing technology into DOD programs. Core competencies span:

- 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, cost effectiveness, ruggedization and safety.





Success Stories

MSU's MilTech selected as permanent host for the DoD Interservice Body Armor Working Group (IBAWG)

The IBAWG is a bi-annual event to synchronize efforts across all DoD Services for body armor, head, and eye protection. Congressional directive DODI 4140.63 sets the stage for joint material solutions across Services via synchronized testing and efforts.

MilTech, the only non-Service IBAWG member, has supported body armor projects for all Services for over ten years and has twice had the privilege of hosting the rotating-Services event. In 2023, MilTech at Montana State University (MSU) was selected as the permanent host of the bi-annual event.

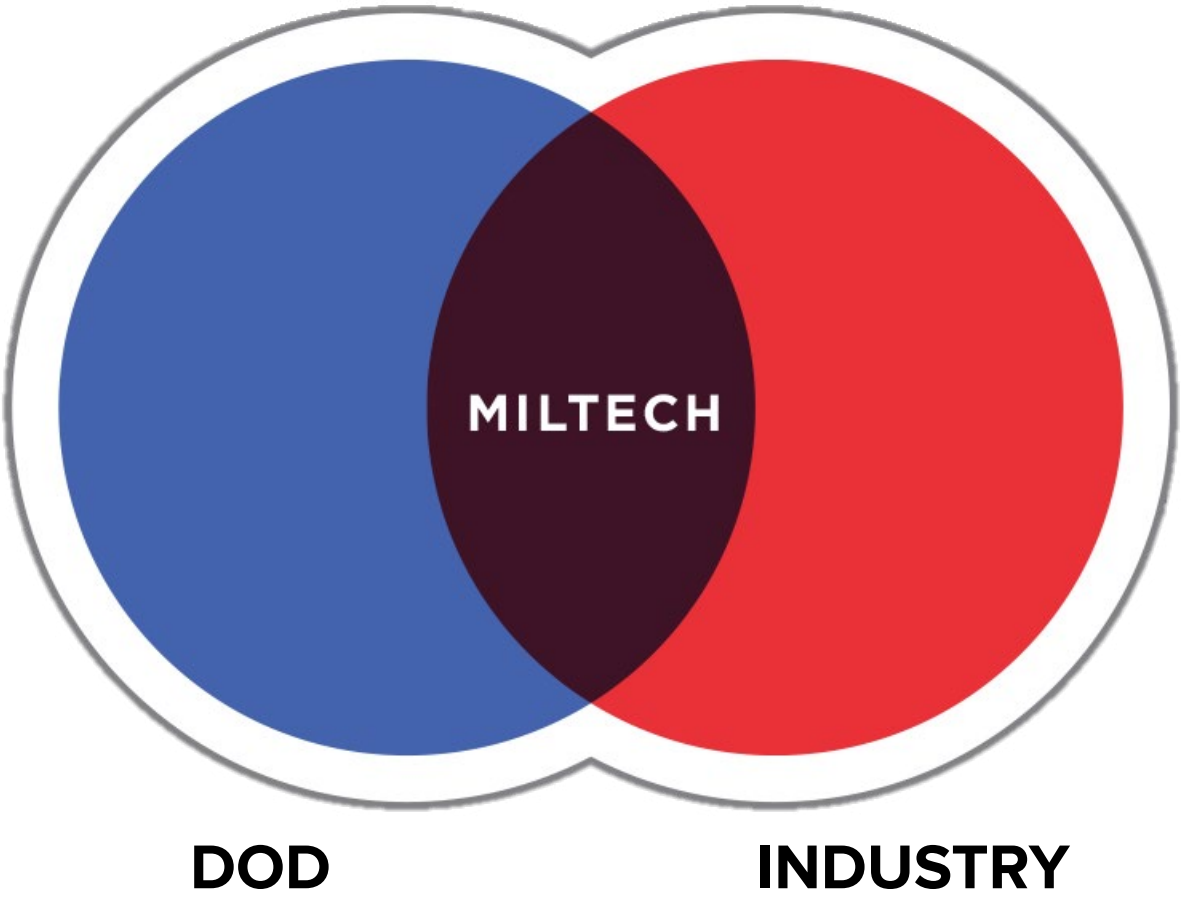
Overt support of National Security, rating as a Top Ten Veteran Friendly university, and 20 years of successful technology transitions that protect Soldiers, Sailors, Airmen, Marines, and Guardians; MilTech is honored to be selected as the permanent IBAWG host.

Pylon Stand Modification for the 52nd Fighter Wing Innovation and Transformation Office

Listening to and implementing end-user feedback resulted in a maintenance technology that reduced development time, cost, and damage to pylons and personnel, and improved airmen safety.

The F-16 has several pylons that attach to the bottom of each wing and carry weapons, fuel tanks, or other equipment. These pylons need to be removed and maintained at regular intervals, but they are heavy, awkward, and difficult to handle, which can result in dropped and damaged pylons and personnel injuries. Airmen at Spangdahlem Air Force Base in Germany sketched a conceptual design to resolve deficiencies with existing equipment to make pylon handling safer.

MilTech and several industry partners, guided by the USAF inventors' input, assisted with advancing the pylon stand design. Two evaluation samples were delivered that not only secure and transport the pylon, but also flips the pylon over to allow airmen to access the machinery on the bottom side. When the pylon stand is fielded, airmen will have a tool that makes their work faster, easier, and safer -- enabling mission readiness and increasing sortie generation. ★



New Mexico Trade Alliance

Albuquerque, New Mexico

Who We Are

New Mexico's premiere state designated trade organization driving economic opportunity through international business and foreign relations services.

What We Do

The New Mexico Trade Alliance (NMTA) develops, plans and executes several innovative programs and initiatives to assist AFRL-NM with its Technology Transfer and STEM outreach objectives to form and maintain productive technology and collaborative partnerships with small business, industry, academia and the greater tech community. NMTA develops comprehensive marketing and promotion plans to help execute these programs and ensure that AFRL and the Space Vehicles and Directed Energy Directorates gain the most exposure and opportunities from instituting these cutting-edge programs. Specifically, NMTA operates the Q-Station collaboration facility, AFRL's flagship collaboration space in partnership with the City of Albuquerque, dedicated to forming and maintaining productive technology and collaborative partnerships with small business, industry, academia and the greater tech community. The specific programming offered in support of AFRL's Tech Transition mission include, the Q-Station Space Tech Cohort, Space Regulatory Bootcamp, Reverse Technology Capabilities Showcase, Global Tech Match, Global Innovation Market Roadshow, Innovation Residency Pilot Program, and Public/Private Capability Assessment Inventory And Mapping Pilot Program. NMTA also operates AFRL's large statewide STEM publicity and engagement events Super STEM Saturday, the NM Excellence in STEM Awards (STEMYs), and NM STEM Signing Day.

https://catalystcampus.org/program/catalyst-space-accelerator/

Success Stories

Q Station and the Space Tech Cohort: Serves as the primary collaboration center for the Directed Energy Directorate and Space Vehicles Directorate to engage with the public. The facility is co-managed by New Mexico Tech and the New Mexico Trade Alliance through their partnership intermediary agreements. The facility enables government, businesses, academia and organizations to collaborate, create and innovate. The Q-Station hosted over 46 events in 2023 including the inaugural Space Regulatory Bootcamp. Beginning in 2022, the New Mexico Trade Alliance launched the Space Tech Cohort for small business and start-up companies to grow their business and help connect them to potential government opportunities. Since its inception the program has worked with 11 companies (5 alone in 2023) in the year-long cohort. Company outcomes include $4.65M in SBIR awards, $400K in private investment, 5 inter-cohort commercial partnerships, and $1.25M+ in non-cohort SBIR or commercial contract activity. Local coverage *(https://www.bizjournals.com/albuquerque/inno/stories/news/2022/12/06/q-station-five-companies-space-tech-cohort-2023.html)*

NSF Engines Grant Finalist: The Space Valley Coalition, a private sector collaboration between the New Mexico Partnership Intermediaries serving AFRL's Tech Engagement Office in New Mexico (including the New Mexico Trade Alliance, Central New Mexico Community College, New Mexico Tech, University of New Mexico, New Mexico State University and New Space Nexus), and other New Mexico organizations, is 1 of 16 finalist for the $160M NSF Engines grant. More coverage here. *(https://www.krqe.com/news/space-news/new-mexico-space-valley-selected-as-finalist-for-national-science-competition/)*

The Space Valley Coalition was also featured as the main case study example in the Brookings Institute piece "How Multi-phase place-based economic policies can enhance the nation's development capacity." *(https://www.brookings.edu/articles/multi-phase-place-based-economic-policies-can-enhance-the-nations-development-capacity/)* ★

New Space Nexus

Kirtland AFB, New Mexico

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

Who We Are

NewSpace Nexus is a 501 (c)(3) non-profit that is accelerating the pace of space innovation by uniting and igniting the industry. Through Unite & Ignite Space, a first-of-its-kind co-innovation hub, stakeholders gain access to workspaces, equipment, programming, rapid prototyping and demonstration, and resources needed for innovation and rapid progress. Services include access to space ecosystem knowledge, public events, and networking; navigation services that provide tailored guidance and direct assistance to fast-track business growth; and collaborative innovation services that ignite product and solution development.

What We Do

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. Established in partnership with Air Force Research Laboratory (AFRL), space companies can apply to join NewSpace Ignitor and move from concept to product to with services that focus on accelerating product development and customer contracts. NewSpace 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.

Success Story

The New Space Ignitor, the direct outflow of the successful Space Force Accelerators (Hyperspace Challenge and Catalyst Space Accelerator) and Q-Station Space Tech program, concluded it's first year activity. Established by the Tech Engagement Office through a PIA with the non-profit NewSpace Nexus under a Congressional Add, the Ignitor "incubates" participating companies exhibiting promising mission fit through limited technology readiness level assessment and advancement activities that include interactions with AFRL experts, Space Systems Command (SSC) and Space RCO personnel, and technology and manufacturing advisement from the Southwestern technology community including Sandia, Los Alamos, CNM Ingenuity and the NM Manufacturing Extension Partnership. So far, 23 companies have participated enabling $17.7 million in government contracts or investments. The ignitor has been covered by Space News and local TV.
(https://www.krqe.com/nm-frontiers/how-newspace-nexuss-ignitor-program-is-making-space-safe-from-debris/)

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(https://www.brookings.edu/articles/multi-phase-place-based-economic-policies-can-enhance-the-nations-development-capacity/) ★

NYSTEC
YOUR INDEPENDENT TECHNOLOGY ADVISOR

New York State Technology Enterprise Corporation
NYSTEC

https://nystec.com/

Rome, New York

Who We Are

NYSTEC is an independent, nonprofit technology and management consulting company serving as a trusted advisor to the government and to public- and private-sector companies. We were incorporated in 1996 to act as a state equivalent of a federal systems engineering and technical assistance (SETA) advisor — providing objective, expert technical advice to government entities for their ongoing and future technology initiatives, as well as to help leverage technologies and expertise from AFRL for the benefit of government entities statewide.

NYSTEC is a local partner with the Innovare Advancement Center, whose vision includes emergence as a global catalyst to converge world-class talent with cutting-edge facilities and focused technology challenges to accelerate the development of game-changing capabilities that protect and empower our countries.

What We Do

- Use an expanded outreach model of private-public partnerships based on community-building experience and best practices to facilitate innovative ecosystems and potential strategic partnerships among entrepreneurs, academic organizations, investors, and government agencies.
- Expedite and facilitate the advancement and commercialization of technology through the identification and analysis of potential market sectors and communities, securing experts for evaluative engagement and technical reviews, as well as the exploration of methods to improve the successful commercialization and adoption of government funded technologies.
- Provide SBIR/STTR and small business programming, including accelerator programming, training services, and procurement assistance.
- Plan and execute events, including meetups, workshops, speaker series, and conferences to advance intellectual and leadership innovation, provide meaningful networking and partner engagement, and support government and technology transfer missions. ★

TechLink

Bozeman, Montana

Clearance #AFRL-2024-0301

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 MOA.

What We Do

TechLink's approach adds value across the entire invention-to-impact lifecycle and has been honed in the twenty-four years of direct support of the DOD T2 enterprise, and the nearly thirty 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.

Track Record of T2 Partnership Success

Technology + Partner = T2 Partnership

TECHLINK T2 PARTNERSHIP METRICS

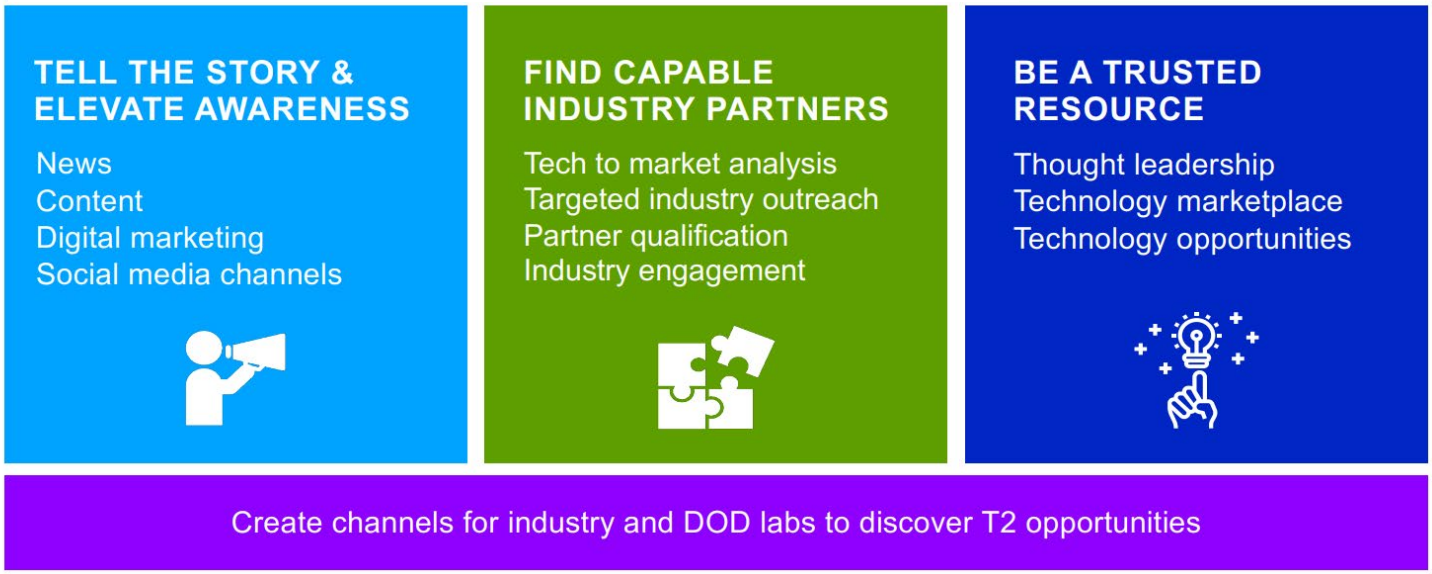
Since 1999

2,000+	20K+	85+
T2 agreements facilitated	DOD patents and applications evaluated	DOD labs supported

KEY ACTIVITIES

- IP Portfolio Evaluation
- Marketing and Business Development
- Expert-level T2 Agreement Facilitation
- Commercialization / Productization Support

National Marketing Program for DoD T2



Success Story

During FY 2023, TechLink facilitated a total of 97 metric-related agreements between DOD and industry, exceeding set metric goals. Air Force agreements account for 16 total T2 partnerships.

Achieving impactful partnerships is centered around the success of the following key activities:

1. Identification of DoD lab T2 partnership opportunities through intellectual property (IP) review, market assessment and lab engagement; and
2. Promotion of T2 partnership opportunities through strategic marketing and engagement with the U.S. industrial base; and,
3. Facilitation of T2 partnerships between DoD labs and businesses, educational institutions, and other organizations.

In addition to TechLink's metric-related accomplishments, an incredible amount of activity driven by our business units and cross functional teams enables TechLink to achieve technology transfer success for the Air Force and DOD.

National Marketing Program for DoD Tech Transfer

TechLink's marketing program strategically implements a multichannel approach that connects technology transfer opportunities from DOD labs to qualified industry partners nationwide. TechLink's website contains the only comprehensive marketplace of DOD IP for T2, and features technology summaries, news, helpful resources, and success stories deployed strategically via targeted campaigns and media channels, delivering sustained connections to industry and non-traditional partners.

These marketing efforts result in marketing leads that are qualified, nurtured and advanced to our team of licensing experts, who then guide both industry partners and labs toward successful partnerships. As our target industry insights grow, TechLink's earned leads continue to turn to us for new commercialization opportunities with Defense labs.

304,534
Website Pageviews

130,630
Technology Views

560
Inbound Leads

76
News & Content Published

3,888
Cumulative Newsletter Subscribers

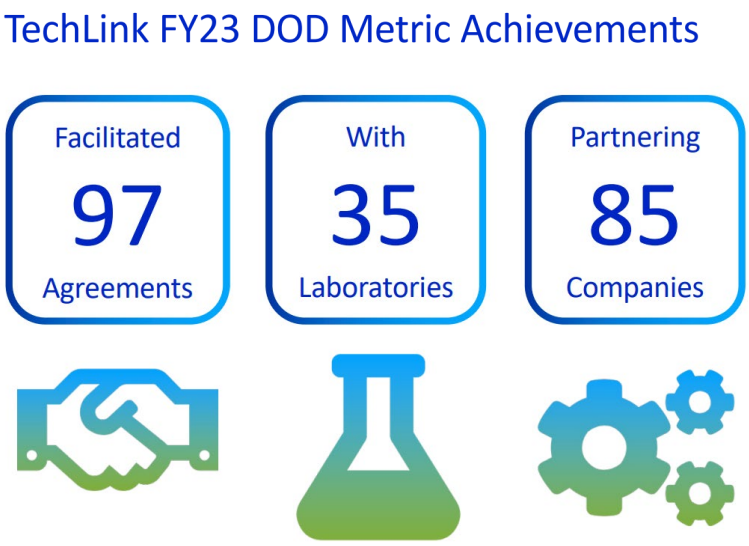
92
New Technologies Featured

Website performance:

- 304,534 pageviews
- 76 news stories and featured content driving industry to T2 partnership with DOD
- 49% increase average time on webpages
- 92 new technology opportunities on marketplace
- 130,630 web marketplace views of technology opportunities
- 76.6% increase time spent on technology pages
- More engaged audiences:
- Industry R&D and Innovation practices study and T2 insights
- National stage for DOD tech transfer: IndustryWeek webinar
- Harnessing more active interest in IP, licensing and T2 via digital campaigns
- 560 inbound leads

Tech Transfer University – T2U

T2U completed its first offering of the ORTA Foundations course in November 2022 by hosting a capstone experience attended by more than 45 ORTA professionals in Bozeman, Montana. More than 75 students participated in Spring 2023 session, including 30 participants for the in-person capstone event. The course was substantially revised and renamed "Tech Transfer Foundations," based on feedback from the first two course offerings. The Fall 2023 cohort, launched in September 2023, had 76 tech transfer professionals enrolled. In total, T2U engaged more than 230 members of the DoD T2 community of practice in FY23. The Air Force had excellent participation with 48 T2 professionals enrolled to date, 35 in FY23; and of those enrolled a total of 14 attended a capstone event, nine of whom attended in FY23.



The target audience for the updated Tech Transfer Foundations (T2F) course is the new DoD tech transfer professional. The backbone of the course is 29 online lessons addressing various aspects of the innovation workflow - from before invention disclosure through protection, partnering, and beyond. Interactions with key stakeholder groups, including lab scientists and engineers, legal counsel, external partners, and lab management, feature prominently in the knowledge content. T2F also features four live online breakout sessions and continues to include a two-day in-person capstone experience to further synthesize learning and provide valuable networking opportunities.

Economic Impact Study of Army and Navy CRADAs

In November 2022, TechLink began a comprehensive economic impacts assessment of over 8,000 Cooperative Research and Development Agreements stemming from Army and Navy research laboratories. The study team is conducting a rigorous survey of the industry partners (to include private sector businesses, non-profits, and universities) to determine the total sales of new products and services resulting from these CRADAs. The study, which is currently 45% complete, examines sales categories including sales of products and services both to the commercial sector and the U.S. military, follow-on R&D contracts, royalties or sales by licensees, and sales by spin-out companies. The research and analysis is expected to be complete prior to the end of FY2024; while preliminary analysis of combined sales is difficult and notoriously unreliable at this point, notable successful CRADAs involve research into MRAP underbody armor, MH-60 radar upgrades, advancement of research into robotics and scramjet capabilities, and vaccine development.

National Awards Program Support

TechLink wrote the following FY 2023 FLC awards: Metcalf Award (NSWC Crane Division), Excellence in T2 (NRL), Outstanding Researcher/Small Research Team (NRL), Rookie of the Year (Army DEVCOM), Excellence in T2 (DISA), Rookie of the Year (AFRL 711 HPW, Mills), Rookie of the Year (AFRL, Romigh), George Linsteadt Award (NAWCDC), George Linsteadt Award (ARL)
We supported 13 award nominations this year and will support 12-13 nominations next year with clearer guidance and expectations for labs requesting help from TechLink. ★

Wright Brothers Institute

Dayton, Ohio

https://www.wbi-innovates.com/

Who We Are

Founded in 2002, Wright Brothers Institute has been setting the bar with a proven track record in innovation. From early problem exploration, to final warfighter application; we have been the Air Force Research Lab's first stop for 20+ years.

What We Do

The Wright Brothers Institute (WBI) is a cutting-edge center for innovation and technology commercialization. WBI provides breakthrough solutions to US Air Force's most complex initiatives by leveraging resident experts, unique facilities, disruptive innovation processes and extensive networks. We drive defense and commercial market solutions through exceptional innovation leadership.

> **WBI provides breakthrough solutions to US Air Force's most complex initiatives by leveraging resident experts, unique facilities, disruptive innovation processes and extensive networks.**

Success Story

WBI's Tech Transfer efforts connect Akron-based company to Air Force materials and manufacturing capabilities.
(https://www.wbi-innovates.com/blogs/post/MemPro)

In February of 2023, Akron-based company MemPro USA Ltd visited the Air Force Research Laboratory's Materials and Manufacturing Directorate (AFRL/RX) to see a demonstration of the technology titled "Extruded Ceramic Nanofibers and Derived Materials." MemPro's focus is reducing the cost of critical metals, including rare earths and catalysts. Demand for such metals is growing, while supply is limited. Thus, increasing the effective surface area is a good way to better satisfy demand with limited supply.

In the fall of 2022, Rene' Meadors, WBI's Commercialization Program Manager carefully evaluated some new AFRL/RX inventions that were disclosed for commercial potential and selected "Extruded Ceramic Nanofibers and Derived Materials" for further active marketing efforts. A deep dive market assessment identified MemPro as a potential partner for the laboratory. Meadors connected MemPro President, John M. Finley to AFRL/RX Office of Research and Technology Applications representative Jeremy Gratsch and AFRL inventor, Matthew Dickerson, to start the conversation.

As a result, a non-disclosure agreement was executed between MemPro and AFRL/RX and a laboratory visit was arranged. MemPro's goal was to determine if the AFRL technology could augment their current manufacturing process that will scale to global demand for new catalysts. WBI also gave MemPro insights into additional patents in other DoD labs that could diversify MemPro's intellectual property portfolio for future projects. MemPro is currently in negotiations with RX to pursue a licensing agreement for the ceramic nanofiber technology.

"We are very grateful for WBI's help. Without that assistance, we would not have known about the impressive research being carried out at WPAFB's Research Laboratory. Because of those efforts, we want to explore a licensing agreement with AFRL," said Finley when asked about his experience with WBI. ★

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 contract administrators. The following pages contain Air Force ORTA locations and reports detailing their successes, best practices, strategies, and metrics. Information contained herein has been submitted by each organization and included verbatim.

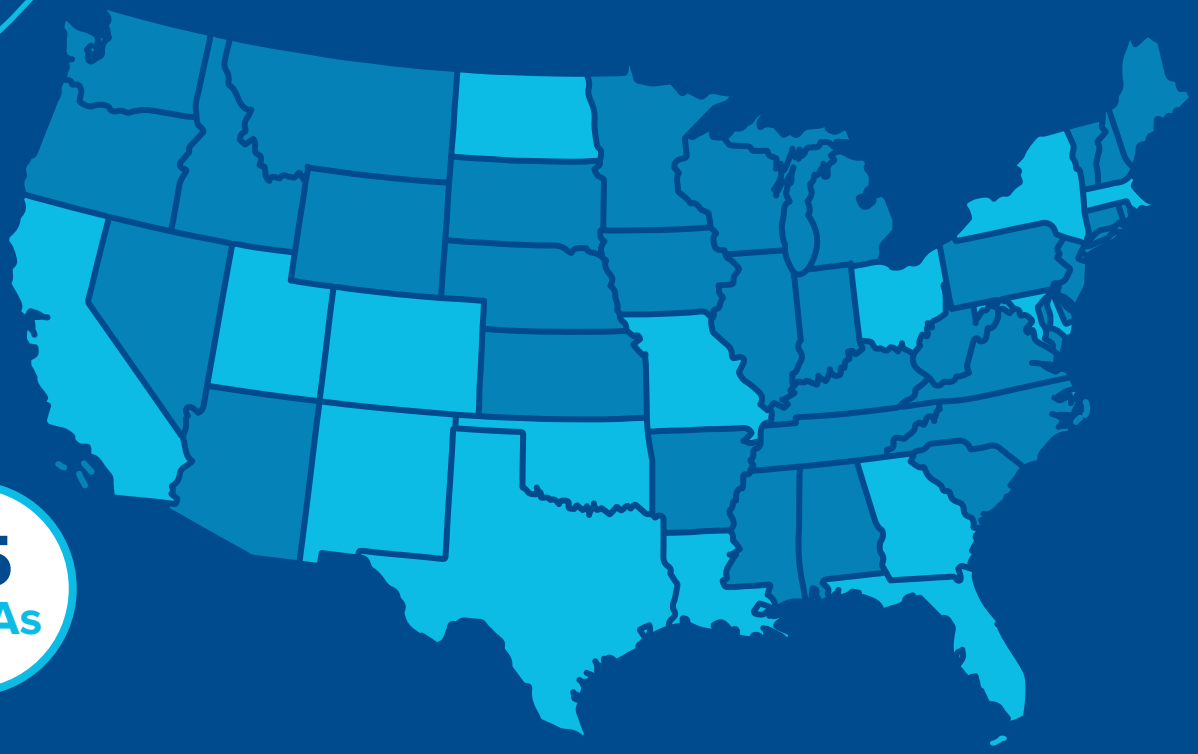
DELEGATED AUTHORITY

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 3 agreements which will be staffed to the Department of the Air Force Technology Executive Officer (DAFTEO) 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 tech 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

2023 ORTA MAP



35 ORTAs

CALIFORNIA

EDWARDS AFB
412 TW (AFTC/ENS)

LOS ANGELES AFB
SSC/SZ3-BCE

VANDERBERG AFB
SLD 30/XP

CALIFORNIA

USAFA
USAFA/DFQ

FLORIDA

EGLIN AFB
96 TW/XPT (AFTC/ENS)
AFLCMC/EB
AFRL/RW

HURLBURT FIELD
1 SOW/XP

PATRICK AFB
AFTAC/SI

TYNDALL AFB
AFCEC/CXA

GEORGIA

WARNER-ROBINS AFB
AFSC - WR-ALC

LOUISIANA

BARKSDALE AFB
AFGSC/ST

MASSACHUSETTS

HANSCOM AFB
AFLCMC/HN
(AFLCMC/HB, AFLCMC/HN, AFNWC/NC and 66 ABW)

MARYLAND

LITHICUM
DC3

VIRGINIA

ARLINGTON
AFOSR/RT

NEW MEXICO

KIRTLAND AFB
AFRL/RD
AFRL/RV

NEW YORK

ROME
AFRL/RI

NORTH DAKOTA

GRAND FORKS AFB
319 RW (319 CONS/CC)

OKLAHOMA

TINKER AFB
AFSC/EN - OC-ALC

UTAH

HILL AFB
AFSC - OO-ALC

OHIO

WRIGHT-PATT AFB
AFRL/RQ
AFRL/RX
AFRL/RY
711 HPW/XP
AFLCMC/RO
AFLCMC/XA
AFLCMC/WAC
AFLCMC/WINA
AFLCMC/EN-EZ
AFIT/CL
NASIC/XO

TEXAS

RANDOLPH / LACKLAND AFB
67 CW/XPP
688 CW/XPGX

TENNESSEE

ARNOLD AFB
AEDC (AFTC/ENS)

All of the following ORTA submissions are represented in alphabetical order and were not edited by the DAFT3 Team. ★

319 RW

Overview

(North Spark Defense Lab) NSDL is still in flegling status with it's formal commercial research agreements, but has expanded it's efforts with the Education Partnership agreement with the University of North Dakota. The North Spark Defense Lab at Grand Forks AFB, ND, is a wing-equivalent center that provides national authorities quality technical measurements to develop innovative solutions to improve processes as well as technologies to preserve our nation's security. The center comprises of rotating personnel, due to a lack of billets. Typical cadre include about 5-9 people, however, typical rotations only last about 6 months or less.

The mission of NSDL is to be the premier and gold standard example for Force Defense Innovation Laboratories by providing force enabling and force multiplying options to GFAFB, and the broader AF, through innovative advancement of effective solutions and empowering development.

Our priorities include:

- Foster a culture of innovation and build a force of pro-change
- Be visual through an advertising and messaging campaign
- Be available to customers
- Listen and collaborate
- Leverage NSDL's unique mission enhancement capabilities

Strategy

We do not have an official ORTA office, however, our lab falls under the Wing Special Agencies construct, charged with integrating and fostering R&D within AFWERX, both in terms of funding and external opportunities.

We utilize our ability to pursue long-term and short-term projects through the integration of CRADAs and EPAs. Our involvement with EPAs has gone farther than with any CRADA we have pursued, but we are looking to increase that number in the near future. Expanding the academic network we interact and do work with will be essential for long-term success. Our long term goals are to establish an internship agreement with the University of South Dakota to assist their members with their program, while gaining consistent manning to work on operational impact projects.

The Year in Review

Success Stories

We've continued our partnership with Bakkan Energy in order to develop potential green energy solutions at Grand Forks AFB.

Additionally, we expanded our first Educational Partnership Agreement with University of North Dakota - this effort will utilize Entrepreneur Students to come up with creative solutions to ou r problem sets while gaining experience in the National Security Sphere.

Marketing and Outreach Activities

We've gained access to maintain our AF.mil website, and revamped to include various projects, created a scheduling option for the space or time with the team, added sections to apply for SBIR/STTR pitch ideas, employment, or work requests. Since completing this, we also advertised events to promote STEM activities. We've also created our own marketing materials (including bookmarks, business cards, coasters, etc.) that we've placed in high traffic areas to advertise NSDL.

Barriers

We have a continuous barrier when it comes to manpower. While the Wing is gracious with their funding and support, trying to maintain steady manpower to work in the lab is difficult due to manpower shortages from AFFERGEN, other taskers, or low manning in general. As we do not have billeted positions, we base our manning on the grace of the units as well as how long their people can be spared (usually no more than 6 months), which leads to high-turnover and difficulty with continuity. We are still working to grab volunteers from various units (spread the wealth), but their mission comes first so members are recalled often. We are trying to convince leadership to assign billets to our unit.

Lessons Learned

Most lessons learned stem from administrative staffing requirements, particular from those members who are not as familiar with ORTA authorities. These lessons learned have been incorporated into the staffing process and periodic training/education sessions.

SME and technical POC identifications are key steps early in the process and become more difficult to overcome closer to execution. When we conduct SBIRs or STTRs, NSDL no longer signs as Technical Point of Contact (TPOC), unless they have true technical understanding (our feedback is not as valuable as theirs would be). We can sign up as customer or end user.

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	1	-	-
EPAs	1	-	-

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	1
Newly Executed to Small Business	2

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	1
Total EPAs w/ Colleges/Universities	1

Our long term goals are to establish an internship agreement with the University of South Dakota to assist their members with their program, while gaining consistent manning to work on operational impact projects. ★

375 AMW

Mission

Elevate is Scott Air Force Base's catalyst for the creation, development, and implementation of Airmen led products and processes in the pursuit of efficiency, effectiveness, and competitive advantage.

Focus Area

Automation

Overview

Elevate is the focal point for innovation efforts within the 375th AMW at Scott AFB. FY23 was occupied mainly by following up on existing ideas and goals. "Scott Pass," an Elevate-led, SFS automated entry gate project, was upgraded to include facial recognition technology. We demonstrated and refined our Agile Communications System project, deploying it at MOBILITY GUARDIAN 2023 and the Scott AFB Airshow. Further, we ran a case study and then orchestrated a large contract for a wing-wide peer-based emotional support system with the "Happy" corporation.

Strategy

Lt Col Ryan Szmajda acts as Elevate's leader and ORTA. This role is fulfilled by searching for partnership opportunities, researching emergent and relevant technologies, and acting as the 375th AMW/CC's advisor for innovation efforts. T2 efforts are used by the lab to leverage the facilities and experts from local businesses and universities. Near and long-term goals for the ORTA position are the same: Elevate was authorized a DAF civilian employee. Once in place, this GSU will provide continuity to the program and act as the ORTA. Hopefully, with continuity will come the opportunity to make sustained progress in working with our educational and industry partners. Elevate saw three changes in shop leadership in FY23.

The Year in Review

Success Stories

- Elevate worked through multiple regulatory barriers to implement facial recognition in our extant gate automation system.
- We successfully tested our Agile Communications System (ACS) in Indo-Pacom during MOBILITY GUARDIAN 2023
- Elevate secured funding after a successful test for Peer Emotional Support to provide proactive mental health support for 2,600 active-duty members of the 375 AMW with the "Happy" corporation.

Marketing and Outreach Activities

- Scott AFB Airshow 2023 exhibition booth
- Multiple Community engagements with local primary schools and universities

Barriers

- Elevate continues to struggle with finding a streamlined process for ATOs/ACOs

Resources, Facilities, & Equipment

Resources Utilized

- T2 education and training provided to organization

Facilities and Equipment Utilized

- 3D print lab, laser cutting capabilities, bench test equipment, 3 axis industrial grade CNC machine

Performance Measures

Types	Active Agreements	New Agreements	Amendments
EPAs	2	-	-

Federal Collaborative R&D Relationships

Total Active Educational Partnership Agreements (EPAs)	2
Total EPAs w/ Colleges/Universities	2

Elevate is Scott Air Force Base's catalyst for the creation, development, and implementation of Airmen led products and processes in the pursuit of efficiency, effectiveness, and competitive advantage. ★

412 TW

Overview

The 412th Test Wing at Edwards Air Force Base, CA 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 412TW ORTA program was assigned to the Plans and Programs XP for implementation and oversight. Per the TEO/AFRL/CC 412TW recognizes the following directive : The 412th Test Wing (412 TW), an organization of the Air Force Test Center (AFTC) of Air Force Materiel Command (AFMC), may enter into CRADAs and EPAs. The 412 TW Commander (412 TW/CC) is designated as the Reviewing Official for CRADAs and the Signatory for EPAs. The Groups within 412 TW may function as Air Force Activities for CRADA purposes. AFTC/ENS will be the office responsible for providing ORTA functionality, and AFMCLO/JAZ is designated as the servicing legal office. Formal internal polices, directives, and instructions for the 412TW ORTA program are currently being drafted although efforts to initiate EPA'S and CRADA's are underway. Initial construct and program steering will be implemented from AFI 61-301 and DoDI 5535.08.

Established in 1949 as Edwards Air Force Base, in honor of Captain Glen Edwards, it is 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 412TW 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 412TW 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 412TW 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 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.

The Year in Review

Success Stories

Dr. Chastity Whitaker, AFMC LO/JAZ, provided a wealth of information and program steering to get 412TW EPA's in immediate compliance with current legal formatting, docket tracking, and legal sufficiency feedback.

KEY TO NOTE: 412TW did not have a single active or legally implemented EPA; x11 original EPA's were derived from MOA's and all more than one year expired. As of this report, and due in no small part of Dr. Whitaker's assistance, 412 TW now has 19 EPA's and x1 CRADA assigned with legal docket numbers and under review for legal sufficiency. x8 of the x19 EPA's now have legal sufficiency notices and are currently being endorsed by AV School districts.

Barriers

There was no continuity in documentation and/ or previous ORTA program performance during the reassignment of responsibilities to the 412TW from AFTC.

Lessons Learned

1. Annual DAF3 and legal training are paramount.
2. AFMC LO/JAZ is the "Bedrock" for any emergent ORTA programs.

Resources, Facilities, & Equipment

Resources Utilized

T2 Training at Hill AFB and follow-on legal training were critical in conceptualizing how the ORTA process should be implemented and key aspects of protecting and sharing IP.

Facilities and Equipment Utilized

412TW HQs to intitiate the ORTA program

Strategy

Given the 412TW extensive test and evaluation mission and continuous engagement with commercial industry partners the 412TW will leverage Cooperative Research and Development Agreement (CRADA) to build and expand on these critical technological partnerships. Additionally, 412TW and EAFB hare home to the only Government Civilian led Department of Defense STARBASE program which is 1 of 62 DoD programs that are currently active. STARBASE Edwards is a STEM focused program that conducts 30 classes annually with eight separate and school districts in the Antelope Valley region focused on 5th grade students. Critical to STARBASE activities and outreach are Education Partnering Agreements (EPAs) that solidify these important community relationships for EAFB. In total, with the 412TW STEM program x19 EPA's are currently being processed for implementation.

First Year Outlook:

1. Establish 412TW ORTA polices and procedures by 1 MAR 24.
2. Establish 412TW interactive repository through the 412TW Sharepoint site for active CRADA's and EPA's; includes resource library, new submissions, and legal sufficiency letters.
3. Solidify and enact 19 EPA's with Antelope Valley Schools; this effort will drive the expansion of 30 additional classes (total x60 annually) for STARBASE.
4. Cultivate and record any and all current CRADA's under 412TW purview to create accurate accountability of CRADA/ IP data exchanges from FY24 and beyond.

Long Range Outlook:

Establish semi-annual training refreshers for CRADA and EPA's at EAFB for senior technologists.

Establish accurate fiscal accountability and reporting for partnering investments on all EPA's and CRADA's.

Normalize the 412TW ORTA program as a critical conduit of the 412TW mission.

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	-	1	-
EPAs	-	19	x8 of x19 EPA's under staffing

Federal Collaborative R&D Relationships

Traditional, Newly Executed (CRADAs)	1

Additional Metrics

Total EPAs w/ High Schools	11
Total EPAs w/ Grade Schools	8 ★

67 CW

Overview

67th Cyberspace Wing entered a new stage with its Technology Transfer program in Fiscal Year 2023 (FY23). As a defense laboratory, the 67 CW has a profound 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 in the United States. For the first time in a decade, the 67 CW signed an EPA with a local academic institution. 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.

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)
- 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.

The Year in Review

Barriers

CRADA champion turnover is 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.

Lessons Learned

It will take more coordination between ORTA and the units in order to more effectively leverage SBIR opportunities. ORTA believes that the future for 67 CW and SBIR is for 67 CW to proactively draft and release SBIR focus areas.

Resources, Facilities, & Equipment

Resources Utilized

Through the 67 CW EPAs our T2 professionals, faculty, instructors, and curriculum developers share best practices with local colleges, universities and high schools in efforts to improve Air Force Cyberspace Training offered in the 67 CW. Working towards identifying skill sets required to incorporate training techniques, delivery methods, and modern technology in interactive training opportunities, programs, and projects to support the overall cyber-learning environment. Improvements to Air Force Cyberspace Training could have positive impacts on USAF training and throughput, bolstering strategic and operational initiatives.

67 CW provides space and personnel in activities with regards to cybersecurity curriculum development, cybersecurity certification, and information transfer during short term visits, and Temporary Duty Assignments (TDYs).

Facilities and Equipment Utilized

Cisco Systems Inc, Citrix Systems Inc, CTERA Networks Ltd, Gigamon Inc, and SecureLogix Coorp made extensive use of the 346th Test Squadron (346 TS) facilities for test and evaluation of their products in efforts to gain access to DODIN Approved Product List. 346 TS is one of 4 testing entities across DoD that can assist companies with cybersecurity and interoperability testing for potential admission to the DODIN 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.

Strategy

67 CW ORTA strategy is to leverage the unique assets of the laboratory's Chief of Cyber Intellectual Property Law residing in the wing 67 CW's Judge Advocate (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.

Our 318th Cyberspace Operations Group (COG) executes the lion's share of all 67 CW T2 activities. With the 346th Test Squadron (346 TS) executing all APL CRADAs, all but four non-APL CRADAs, and two of our existing EPAs. 567 COG, 67 COG, and 867 COG involvement in the wing T2 program is gaining moment 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.

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	21	9	1
EPAs	3	3	-
PLAs	5	-	-

FULL METRICS

Financials

CRADA Income	$26,419

Patents

Total Active	5

Federal Licenses

Income Bearing Licenses, Total Active	5
Avg Time for Execution (months)	19
Min Time (months)	4
Max Time (months)	29

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	12
Traditional, Newly Executed (CRADAs)	12
CRADA Revenue	$264,419
Estimated CRADA Contributed Value	$36,702,285

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	3
New EPAs	3
Total Active EPAs w/ HBCUs and Minority Serving Institutions (MSIs)	1
New EPAs with HBCUs/MSIs	1
Total EPAs w/ Colleges/Universities	2
Total EPAs w/ High Schools	1

688 CW

Overview

This annual report provides an overview of the 688th Cyberspace Wing's (688 CW) technology transfer and Transition (T3) activity and provide examples of how the Wing contributes to the Department of the Air Force (DAF)'s T3 metrics.

The Office of Research and Technology Applications (ORTA) managed 10 agreements and processed 2 modifications that extended period of performance dates, modified joint work plan requirements and expectations, and revised the agreement's language as per the current CRADA Model template. The ORTA administered agreements between Booz Allen Hamilton (BAH); CA Services Limited Liability Company (LLC); City Public Service (CPS) Energy, International Business Machines Corporation (IBMC); Leidos; Noblis Incorporated (Inc.); Northrop Grumman System Corporation (NGSC); Southwest Research Institute (SwRI); Ultra Electronics Advanced Tactical Systems Inc. (Ultra ATS) and World Wide Technology (WWT) LLC. The Leidos and Noblis Inc. agreements both expired in May 2023 under agreeable terms between the 688 CW and the respective CRADA partner.

Under the Wing Optimization and Transformation Initiative, the 688 CW realigned the T3 program under the 688 CW A5/8/9 Directorate and established Innovation as one of its Lines of Effort (LOE) in the Wing Strategic Road Map. A5/8/9 begun exploring several new methods to evaluate emerging technology and cyberspace tools/solutions which present potential for addressing 688 CW existing needs or requirements to enhance our cyberspace weapon systems. These methods are proving to deliver informed information to 688 CW leadership and decision makers.

The 688 CW operates via a commitment to foster and develop value add partner relationships. We are committed to building constant and productive engagement with our local community partners, commercial industry partners, and academia while Wing Leadership stands ready to support other DoD agencies and service organizations who present justified requirements to leverage our CRADAs where benefits are realized.

Mission Statement:

America's First Cyberspace Wing…Securely Connecting the Air Force to Fly, Fight and Win!

Laboratory Description:

The 688 CW, headquartered at Joint Base San Antonio 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 5 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.

Strategy

The agreements sponsored by the ORTA with industry and academia are intended to provide a foundation of new technologies in research and development (R&D) in the functional areas previously referenced that can potentially solve technical problems and address capability gaps of the 688 CW and its forces. With that in mind and given limited resources to support agreements, we will target new collaborations to address high priority capability gaps. Existing agreements are continually re-evaluated and refocused to address the Wing's needs. The ORTA will terminate an agreement when a Collaborator's efforts no longer address areas of interest with Reviewing Official's approval.

The recent industry enhancements for evolving agreements have been in the areas of large network operations and defense and lessons learned to address network/communications engineering, intrusion discovery and forensics, malware and threat analysis techniques, network recovery, modeling and simulation, Industrial Control System (ICS), embedded systems, hardware reverse engineering, and avionics vulnerability assessment methodologies. The ORTA has also supported the use of agreements to accomplish interoperability testing of new cyber technologies.

The ORTA, headquartered at JBSA Lackland, Texas, manages the activity's T3 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.

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.

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 Collaborator 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 Year in Review

Success Stories

Broadcom (C.A. Services) CRADA:

38 ES and Broadcom (C.A. Services) have been working the last several months to modify an existing CRADA. We should see the approval in the Oct timeframe. The objective of the CRADA with Broadcom is to collaborate in the area of User Experience/Performance Monitoring to determine best tools for the Air Force toolbox. 688CW (38ES) and Broadcom will test, deploy, and update AppNeta software on a USAF network to assess capabilities to monitor networks and end-user devices, as well as validate deployment and maintenance of the software on-prem within the DoD. The timeline is 6-8 weeks, with mutual extension if needed. The results of this CRADA will directly support 38 ES with their Performance Monitoring mission.

Booz Allen Hamilton BAH CRADA:

Booz Allen Hamilton leveraged their employees within the Office of the Secretary of Defense Chief Digital and AI Office to explore options for enhanced data observability, utilization of AI and advance analytics, and implementation of intelligent data routing to address pain points within the 26th Network Operations Squadron. In March 2023, a demonstration was provided showing how an existing capability that was developed for the AF, Perceptor, could integrate with CRIBL, an industry partner that offers data observability. For this exploration, CRIBL was successfully used as an enterprise data broker to filter and route data to various source destinations like Splunk. The next step is to determine enterprise use for this capability within the AFIN.

CPS Energy CRADA:

The 346 Test Squadron (346 TS) has partnered with CPS Energy (local service provider) to leverage a Defense Advanced Research Projects Agency (DARPA) decommissioned power grid substation that will provide the physical infrastructure required for CPS Energy to jointly explore, investigate, and develop Rapid Attack Detection, Isolation and Characterization System (RADICS) initiatives and support the 318th Range Squadron (318 RANS) with further developing vulnerability discovery and enhancement of countermeasures as well as utilizing the infrastructure as a training test bed for cyberspace operators. The 346 TS performed a Cyber Vulnerability Assessment (CVA) mission for Air Fore Civil Engineering Center (AF CEC) to identify the APT (Volt Typhoon) in the Pacific AOR. After emulating the required mission set within a test range environment supported by a contractor facility near Tendall AFB, it was determined the 346 TS capabilities positively identified tactics used by this APT within critical ISC/SCADA infrastructures.

The 346 TS shared these discoveries with CPS Energy and assisted the partner with establishing situational awareness for monitoring their systems. The 346 TS provided an unclassified report containing general recommendations to the utility provider to mitigate the presence of this APT.

SwRI CRADA:

Southwest Research Institute (SwRI) and the 688 Cyberspace Wing continue efforts to explore methods for enhancing Industrial Control Systems/Supervisory Control and Data Acquisition (ICS/SCADA) cybersecurity. SwRI engineers developed an ICS/SCADA scalable testbed complete with building sensors, building controllers, network switches, and a Human Machine Interface (HMI). To showcase their penetration testing capabilities, SwRI has provided several penetration testing workshops and demonstrations for the 346 Test Squadron (346 TS) and other organizations using their ICS/SCADA testbed. Lessons learned from this effort were gathered and categorized for developing a manual intended to influence developing rules for Intrusion Detection Systems/Intrusion Prevention Systems (IDS/IPS).

Marketing and Outreach Activities

CRADA brown bag session for Commanders:

The 688 CW/A/5/8/9 hosted two brown bag sessions to introduce the Cooperative Research and Development Agreement (CRADA) and its purpose. The intent of the sessions were to educate Wing personnel on Technology Transfer and how Federal Lab designation provides for opportunities to leverage commercial industry, academia, and other government agencies allowing for enhanced tools and capabilities across the Wing. The targeted Audience was the Wing Commander and Vice, Group, and Unit Commanders. All other Wing members were extended an invitation to attend optionally.

Barriers

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. A-Staff A5/8/9 members continue to engage Units and CRADA partners to identify opportunities which can accommodate schedules and overcome existing challenges. Progress has been realized and A5/8/9 will coordinate schedule dates/times that will accommodate A-Staff members, operational units, and CRADA partners availability before the end of Q1 FY24.

Resources, Facilities, & Equipment

Resources Utilized

Human Resources:

688 Cyberspace Wing transitioned one full-time employee serving as the Wing ORTA into the Support Agreement Manager role. The ORTA role and responsibilities have been incorporated into the responsibilities of A5/8/9 Emerging Technology Evaluation as an interim ORTA who manages the Wing T3 portfolio. Other Wing members provide the required support in the areas of legal advice, cybersecurity/ communications, safety, and security subject. A new full-time Wing ORTA will on-board during Q1 FY24.

T2 Education and Training Provided to Organization and Lab Staff:

The servicing Legal Office provides CRADA 101 training for newly assigned leadership and S&Es while the T3 Specialist provides a Wing-specific program overview as needed. Additionally, Wing members may access the Wing's T3 SharePoint site to view program guidance and additional T3 training resources.

Professional Development of ORTA:

The interim ORTA attended the DAF's T3 Program Office Quarterly Workshops, 2023 Tech Transfer Foundations Course.

Facilities and Equipment Utilized

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:

Private sector does not utilize our facilities/equipment; however, they can be granted access and observe operations when approved and activities aligned with CRADA objectives.

Financials

Royalty Income	$2,941.56

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	10	-	-

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	10
Estimated CRADA Contributed Value ($)	$22,403,300.00

We are committed to building constant and productive engagement with our local community partners, commercial industry partners, and academia while Wing Leadership stands ready to support other DoD agencies and service organizations who present justified requirements to leverage our CRADAs where benefits are realized.

Clearance #96TW-2023-0117

96 TW (AFTC)

Overview

The 96th Test Wing is not a traditional lab but rather a test and evaluation center for the Department of the Air Force. Currently Egin's T3 program has limited participation and requires outreach activities to advertise the numerous possible use cases for T3 type of agreements.

For 2023, only one agreement was reviewed and coordinated for signatures - CRADA MTA between Lockheed Martin UK and AF SEEK Eagle Office (96 SK), still in Legal review to de-conflict verbiage conflict between parties (as of Oct 23).

The 96th Test Wing, Eglin AFB, Fla., is the test and evaluation center for Air Force air-delivered weapons, navigation and guidance systems, command and control systems, and Air Force Special Operations Command systems. The wing provides expert evaluation and validation of the performance of systems throughout the design, development, acquisition, and sustainment process to ensure the warfighter has technologically superior, reliable, maintainable, sustainable and safe systems. The 96th Test Wing performs developmental test and evaluation across the complete system life cycle for a wide variety of customers including: Air Force Systems Program Offices, the Air Force Research Laboratory, logistics and product centers; major commands; other DoD services and U.S. government agencies (Department of Transportation, NASA, etc.); foreign military sales; and private industry.

Additionally the wing commander serves as the installation commander, supporting Team Eglin with traditional military services as well as all the services of a small city, to include civil engineering, personnel, logistics, communications, computer, medical, security, and all other host services. Critical to the success of Eglin's mission, the 96th TW provides a myriad of base operating support functions like material resources, mobility requirements, and meeting the needs of Eglin personnel.

The Strategy

The ORTA program aligns directly with the 96th Test Wing strategy Line of Effort #4, Build a Collaborative Eglin with community, industry, and academia engagement. The Eglin ORTA has not been an active office and needs a marketing push to 96 TW technical points of contact and group leadership on the value of the T2 tools and possible use cases.

- Continuing T2 education for new ORTA and search for additional ORTA resources (personnel and funding) through AFTC.
- Seek guidance and counsel from AF T3 office to re-energize the Eglin ORTA program.
- Work potential EPA with local educational foundation - the HSU Educational Foundation.

The Year in Review

Barriers

Eglin's ORTA has one person, part time, with very limited T2 experience. Looking to bring in a back up / alternate ORTA position along with continuous education and training. Need Eglin market outreach to capture larger audience to participate in T3 efforts.

Resources, Facilities, & Equipment

Resources Utilized

- ORTA Training in Albuquerque NM, February 2023 (New ORTA)

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	1	-	-
MTAs	-	1	-

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	1

The wing provides expert evaluation and validation of the performance of systems throughout the design, development, acquisition, and sustainment process to ensure the warfighter has technologically superior, reliable, maintainable, sustainable and safe systems. ★

PA Clearance #PA-2023041

AFCEC

AFCEC approved seven new Educational Partnership Agreements (EPAs) with colleges and universities in FY23.

Overview

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 October 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.

AFCEC 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.

The Strategy

AFCEC helps develop and commercialize new leading-edge technology by partnering with other Department of Defense (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.

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.

The Year in Review

Marketing and 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. During 2023, the EPAs with the Bay County public school system allowed AFCEC to continue its involvement with the school by providing judges, proctors, and graders to the annual Invention Convention. Three local schools were recipients of new Equipment Transfer EPAs: University Academy, Oscar Patterson Academy, and Maritime Academy. Additionally, AFCEC established four other EPAs for donation of STEM equipment with Georgia State and University College in Georgia, Lee University in Tennessee, University of Findlay in Ohio, and the University of Missouri in Missouri. These seven institutions received the following equipment transfers through these EPAs:

- University Academy – One optical microscope
- Oscar Patterson Academy – Two optical microscopes
- Maritime Academy – One optical microscope

Barriers

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.

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.

Success Story

Expedient Small Asset Protection – Equipment Shelter System

The Expedient Small Asset Protection is the U.S. Air Force's newest equipment shelter system. The ESAP equipment shelters currently come in two configurations – an aircraft variant (i.e., ESAP-1) and an equipment variant (i.e., ESAP-2). Both variants can be employed in either built-up or austere environments. These systems advance Agile Combat Employment (ACE) capabilities and increases the AF force projection ability by providing protection to 4th and 5th generation aircraft and mission essential equipment.

Compared to traditional constructed protective shelters, the ESAP's pre-engineered design is deployed via a series of shipping containers and can be assembled with reduced manpower and equipment. ESAP's can be disassembled and re-positioned across the region to meet changing Combatant Command mission requirements ultimately providing the joint force commanders the fluidity to move across the theater to seize, retain, and exploit unexpected and unpredictable tactical and strategic scenarios against enemy forces and threats. The ESAP is essentially a 'protective equipment shelter/hangar in a box' designed to be used in any environment, providing protection against environmental and adversarial threats, greatly enhancing U.S. forces' capabilities to operate at higher operational tempo (OPTEMPO) in diverse locations, posturing the warfighter to rapidly respond across the spectrum of military operations.

The ESAP shelter system not only enhances our capabilities but augments the protection, resiliency, and reforming of assets post-attacks while providing agile movement in area of responsibility (AOR), magnifying construction time savings by several months by unit, and close to several hundred millions of dollars in total savings for life cycle acquisition for projected quantities to be acquired. The ESAPs, when compared to standard construction of a structure that provides similar protection, proves to be far more economical, expedient, and versatile. The overall cost to manufacture one ESAP 1 is three times less expensive than typical protective shelters.

The ESAP system's deployability is another performance attribute. The ESAP shelter system is stored and shipped in ISO containers (full and half-height), which are used in the structure. The transportability of the containers is far more cost-effective and operationally assured than the movement of mix bulk and containerized heavy construction equipment and materials, resulting in approximately a 25% reduction in logistic efforts. By having the complete system packaged in a set of containers, ESAP transportability minimizes marshalling of requirements to deployable sites, enhancing the Combatant Commander's operational flexibility, and strategic/tactical posturing.

In Jan 2023, ESAP 1 was erected in GUAM. On 24 May 2023, the center of Typhoon Mawar briefly made landfall as a Category 4-equivalent typhoon, with maximum sustained winds up to 140 mph with gusts up to 165 mph at Andersen Air Force Base on the northern tip of the island north of Guam, ripping off roofs, shredding trees, and leaving much of the remote Pacific Island without power and utilities. Overall, the ESAP shelter survived the storm with very little damage to the outer cladding proving it to be a success that provides superior protection against extreme environmental conditions. AFCEC's ESAP program has successfully supported the warfighter through the innovative design of this system.

Expedient Small Asset Protection (ESAP)

Objective: Provide a rapid deployable asset protection, minimizing logistic requirements, cost, and erection time.

Benefits:
- Transportability
- Ability to be disassembled/re-positioned across the region.
- Cost savings over typical shelters
- Can acquire as an equipment item vs a MILCON
- Provides protection against environmental and adversarial threats

Technology:
- The transportability in containers is far more cost-effective and operationally assured than movement of mix bulk and containerized heavy construction equipment and materials.
- ESAP's can be disassembled/re-positioned across the region to meet changing mission requirements providing joint force commanders fluidity move across the theater.
- ESAPs can save over 50% of the time required for the construction of a similar capable shelters.

Status:
- Currently several ESAPs have been erected in CONUS and OCONUS
- Developing guidelines for application at other DoD sites
- AFCEC is currently working to develop variant 3 that aims to meet all KPPs under the ESAP-1/ESAP-2 FRD but with a reduction in footprint and manufacturing cost, and an increase on structural capability against environmental and adversarial threats, as well as terrain adaptability

Resources, Facilities, & Equipment

Facilities and Equipment Utilized

1. Laboratory's URL that lists facilities/equipment information:

The "Documents" section of the AFCEC/CXA SharePoint website contains factsheets with descriptions of the AFCEC facilities. The site functions best when using Chrome and requires a common access card to log in:
https://portal.afcec.hedc.af.mil/CX/CXA/SitePages/Home.aspx

2. Unique Capabilities of the Laboratory:

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.

2.1 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.

2.2 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 lbs. 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.

2.3 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.

2.4 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.

2.5 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.

2.6 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.

3. 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 firefighting facilities under a current CRADA.

Resources Utilized

Human Resources:

- Two part time ORTA managers are assigned to the AFCEC/CXA ORTA.

T2 Education and Training Provided to Organization/Lab Staff:

- ORTA managers attended the AFMCLO/JAZ training on the legal aspects of technology transfer activities in 2023. The DAF ORTA Lead and Deputy Division Chief AFMCLO/JAZ, provided training on T3 Basics, DAF T2 Chain of Command, Legal Support, ORTA Roles and Responsibilities, ORTA best practices, definitions, T2 Delegated Authority, T2 Agreements (CRADAs, EPAs, etc.), and invention disclosures in 2023.

Professional Development of ORTA:

- ORTA POCs attended training VTCs and FLC events.

Incentives/Awards:

- In 2014 a local Tech Transfer Star awards program was established. The awards program will use the current civilian and military award mechanisms to recognize individuals who have significantly contributed to transferring technology or positioning technology to be transferred. A plaque will also be given to the selected award winners. In 2023, three members of AFCEC were selected for STAR awards: Mr. Karsten Lipec for his work on the Pro-all bag breaker/loader, Dr. Bridget Ashley for her work as an ORTA Manger, and David Roman Castro for his work on deploying the Expedient Small Asset Protection shelter.

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	6	-	1
EPAs	11	7	-
PLAs	2	-	-

Number of active & new agreements for any other T2 mechanisms the lab has (training affiliation agreements, software license, etc.):	22

Patent Applications:

One patent application was filed in FY23. The US Patent Application "Modifiable Hardened Pozzolanic Material" was filed with the U.S. Patent and Trademark Office on 07 April 2023. The patent protects AFCEC/CXAE's invention of self-leveling, 80+% indigenous, carbon neutral, 3D printable cement and concrete formulations. These formulations reduce the logistics burden of supplying construction and Airfield Damage Repair materials to forward and austere locations. Mortar only formulations demonstrated compressive strengths of up to 3,000 psi.

Patents

Applications Filed	1

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	6

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	11
New EPAs	7
Total Active EPAs w/ HBCUs and Minority Serving Institutions (MSIs)	1
New EPAs with HBCUs/MSIs	1
Total EPAs w/ Colleges/Universities	10
Total EPAs w/ High Schools	1

★

AFGSC

Overview

AFGSC/ST and the Cyber Innovation Center PIA enables the command's opportunity to further develop relationships with State entities, academia, and regional businesses and industries, and tap into the knowledge and technology of these entities, ultimately allowing us to transition these technologies into the Department of the Air Force. As the AFGSC Office of Research and Technology Application (ORTA), AFGSC/ST uses the PIA with Cyber Innovation Center (CIC) as a tool to facilitate Technology Transfer and Transition (T3) activities. This tool allows us to seek ways to develop innovative ideas and knowledge between AFGSC and external stakeholders which impact AFGSC's mission areas. The CIC team is comprised of the Collaborative Environment (CE) and STRIKEWERX Innovation Hub.

AFGSC/ST ORTA Mission

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

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, Federally Funded Research and Development Centers (FFRDCs), etc.

The Strategy

AFGSC/ST as the ORTA for T3 activities is aligned organizationally under the AFGSC/CD.

Mission

Airmen ALWAYS ready to provide long-range precision strike...anytime, anywhere!

Vision

Innovative leaders providing safe, secure and lethal combat-ready forces for nuclear and conventional global strike...today and tomorrow!

Focus Areas

People - Mission - Modernize – Engage

AFGSC/ST T3 partnership with the Cyber Innovation Center align near and long-term goals and strategy directly with the AFGSC Technology Focus Areas of interest.

AFGSC/ST long-term goals include the capability to:

- Build courageous problem solvers, capable of intelligent risk taking
- Compete, deter, and win against peer competitors
- Engage local community & policy makers to increase AFGSC Airmen quality of life
- Balance sustaining today's force while modernizing for tomorrow's fight
- Build a strong ecosystem of research, science, engineering, and technology experts ready to team with our command and win the fight

The Year in Review

Success Story

A Partnership Intermediary Agreement (PIA), first signed with the Cyber Innovation Center in 2013, was renewed in June 2023. Subsequent to the renewal, a new Collaborative Project Order (CPO) was signed in September 2023.

Fiscal Year 2023 technology transfer and transition (T3) projects contributed to achievements in every technical requirement of the CPO. Overall, eight collaborative projects were added, assisting with the transition of innovative technology into AFGSC programs. One project was completed, meeting or exceeding its stated objectives. The year closed with 36 projects in work. Associated expenditures for the year totaled $15,141,935. When combined with CIC partner contributions valued at $1,302,462, total T3 investments for FY23 totaled $16,444,397. Return on investment for AFGSC T3 projects FY17-23 is estimated at over $250 million.

Global Strike National Security Fellowship. The project allows undergraduate and graduate students the opportunity to gain real-world military experience, creating better candidates for future Air Force employment. Several Fellowship graduates have gone on to accept DoD and DoD-related positions. Additionally, professors gain insight into military objectives, increasing their ability to provide expertise for related future endeavors. Ten Academic year (AY) 2022-23 Fellows worked with university professors and AFGSC Project Champions to work on mission-critical objectives related to Automatic Comparison and Reporting Tool and Wall Walk Generator, A4W initiative, Striker Data Analysis Platform (SDAP), and NC3 Modeling and Simulation (NC3 M&S). Eight AY 2023-24 Fellows.

AFGSC Air Force Research Laboratory (AFRL) Scholars. This is a summer internship opportunity at Barksdale AFB, LA for undergraduate and graduate-level university students pursuing STEM degrees. Scholars work on selected projects offered by the AFGSC/ST mentor to execute during the 10–12-week summer program. In 2023, two AFRL Scholars worked on separate mission-critical projects. The first was AFGSC/A5's System Equivalence and Optimization (SEO) project designed at providing AFGSC leaders with an enhanced at-a-glance decision-making method. The second project was AFGSC/A3O's Comprehensive Readiness for Aircrew Flying Training (CRAFT) project, which uses cognitive function, physical fitness, and nutrition to maximize warfighting capabilities.

Marketing and Outreach

In FY23, 44 T3 outreach events were completed, hosting 1,424 government and non-government partners. These events all met or exceeded their respective knowledge transfer objectives. The events generated a significant local economic impact of $501,565 supporting approximately 233 jobs. Twelve of the outreach events were conducted at Secret or higher classifications. Significant unclassified events included the final Global Strike National Security Fellowship presentations and the STRIKEWERX Counter-small Unmanned Aircraft System (C-sUAS) problem definition and challenge definition workshops.

The most visible outreach has been on the LinkedIn social media platform. This platform allows engagement in the form of reactions, comments, and reposts. While the LinkedIn algorithm is evolving, the number of impressions is important as it is reaching a dedicated audience interested in developments from STRIKEWERX. Content posted to LinkedIn advertise upcoming events to bring in SMEs to participate in events like Problem Definition Workshops or engage on large projects such as Challenges. Posts also illustrate activity of STRIKEWERX as a way to engage with current and future connections. Impressions declined, which led to a decrease in reactions, comments, and reposts. However, engagement stayed high, which is empirical proof that LinkedIn's audience is engaged and interested.

Below are LinkedIn metrics for FY23:

- 1,567 reactions
- 73 comments
- 155 reposts
- 41,677 impressions
- 8.708% Engagement rate (LinkedIn says 2% is average, anything above is "excellent")

Press releases are written and published at major milestones for projects (project launch, contract award, delivery, and events). Press release metrics follow:

- 29 unique press releases published (compared to 25 published in FY22).

Video media is captured during live events (problem definition workshops, design sprints, challenge events, Spark Tank, etc.) or at major milestones for projects (project launch, contract award, delivery, demonstration). These were produced to be shared with media releases, to social media, to potential industry solution providers, to Airmen interested in STRIKEWERX/PIA projects, and for general awareness. Video media is more effective at illustrating a complex project and more easily consumed than written media, so the outreach team has increased the number of videos produced. Video metrics follow:

- 29 videos published (compared to 11 in FY22)

Barriers

Pathway to Fielding. If AFGSC desires to develop a Minimum Viable Product (MVP) to consider it for fielding, the government project champion needs to develop a funding plan no later than the problem definition workshop process. Section 803. Implementation of Section 803 of the FY22 NDAA for the acquisition of innovative commercial products or services through the use of a commercial solutions opening (CSO).

Lessons Learned

Expanded STRIKEWERX Utilization

Adding a Problem Scoping Workshop to project development improves likelihood of success for the Problem Definition Workshop, ultimately resulting in company proposals more closely aligned with the project requirements and budget.

Stakeholder Involvement

Inclusion of all project stakeholders is important to success. For AFGSC this typically means the AFMC System Program Office.

Government Project Champion Engagement

The most successful projects have had engaged government project champions assigned to the headquarters staff. In the instances where project champions were less committed, the vendors didn't get the collaborative inputs from the SMEs and the prototypes were not as useful as they could have been. Additionally, when the project champion is committed, but assigned at the wing level, there is less support and interest from the headquarters to develop and scale an MVP.

Resources, Facilities, & Equipment

Resources Utilized

- Air Force T3 Workshop, Nov 2023.
- ORTA training
- LOJAZ templates & guidance materials/training

Facilities and Equipment Utilized

HQ AFGSC Doolittle Innovation Board. The AFGSC/ST Chief Scientist is the process owner and chair of the Command's Innovation Board. The Doolittle Board is responsible for the Command's innovation program.

The STRIKEWERX website (www.strikewerx.com) contains useful information for vendors to learn the AFGSC interest areas and learn about the STRIKEWERX processes. The average view time of almost 1.5 minutes is noteworthy as the Nielson Group cites users often leave web pages in 10-20 seconds. The higher view time means users are taking the time to ingest the data on the site, which is evidenced by the "sessions" and "user engagement" metrics. The amount of page views doubled from FY22.

FY23 WEBSITE METRICS

Tracked by Google:

34,646
Page Views

9,022
Sessions
(multiple page views or interactions)

8,503
User Engagement

6,400
New Visitors
to website

1 min 29 sec
Page View Time

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	1	-	-

Number of active & new agreements for any other T2 mechanisms the lab has (training affiliation agreements, software license, etc.):	1

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	6
Estimated CRADA Contributed Value ($)	$5,800,000

FY23 LINKEDIN METRICS

1,567
Reactions

73
Comments

155
Reposts

41,677
Impressions

8.708%
Engagement Rate
2% is average, anything above is “excellent”

> “...engagement stayed high, which is empirical proof that LinkedIn’s audience is engaged and interested. ★

AFIT

Overview

The Air Force Institute of Technology (AFIT) is the Air Force's graduate school for engineering and management as well as the primary institution for technical professional continuing education. 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.

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's Dean for Research (AFIT/CZ) is designated as the Office of Research and Technology Applications (ORTA). This office has a newly hired full time engineer dedicated to the continuing success of technology transfer. The office will continue to facilitate technology transfer activities within the organization including 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.

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 (LP-CRADAs) including non-disclosure agreements (NDA) are used to share information with limited technical activities. Educational partnership agreements (EPA) 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.

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 the laboratory.

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.

The Air Force Institute of Technology, commissioned in 1919 and located at Wright-Patterson AFB Ohio, 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.

AFIT's graduate school offers 25 research-based, STEM master's degree programs, 13 Ph.D. programs, and 19 graduate certificate programs. It maintains a typical enrollment of over 650 in-residence students and about 400 students in various distance learning and non-resident programs.

The Strategy

Near Term Goals and Strategy

- The biggest strength here at AFIT is the Office of Research and Outreach, in which the ORTA resides. AFIT has streamlined the process for research within the DoD domain, and the near-term goal is to fully utilize that process to enhance AFIT Faculty knowledge that their research can affect and be affected by more than just DoD.
- Develop processes and mechanisms to enable effective and efficient execution of Agreements and other transactions.
- Promote AFIT ORTA as the first step to the innovation disclosure process.

Long Term Objectives and Strategy

- 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 the the front of the innovation disclosure process.

The Year in Review

Success Story

Diode Pumped Alkali Laser- Laser Model Toolkit

AFIT has partnered under a Phase I and recently awarded Phase II Small Business Technology Transfer (STTR) program to develop a high-fidelity model for power efficiency and beam quality of high-power Diode Pumped Alkali Laser (DPAL) and Fiber Laser. The collaboration supports development within the DoD with additional users beginning to emerge through the defense industry.

AFIT Sensor and Scene Emulation Tool (ASSET)

ASSET is a physics-based image-chain model used to generate synthetic electro-optical and infrared (EO/IR) sensor data with realistic radiometric properties, noise characteristics, and sensor artifact. Through this partnership, AFIT has received numerous Phase I and Phase II Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) awards. Additionally, through numerous information transfer agreements with small business, universities, and soon sister agencies, the end goal is to create stand-alone software that will support the targeting of advanced missile threats.

Marketing and Outreach

AFIT has entered into several MOUs and other agreements to enable projects 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.

Barriers

The ORTA cannot function with limited resources. The new full time ORTA representative was hired at the end of the second quarter of FY23. In the six months since; seventeen actions where accomplished to include completion of a complicated partially exclusive license agreement and final negotiations on a joint ownership agreement (JOA) that spanned several years. This JOA will be executed in October of 2023.

Lessons Learned

Better represent requirements for staffing, support, and expectations to management. Promote the AFIT ORTA as a means to assist with innovation and agreements.

Resources, Facilities, & Equipment

Facilities and Equipment Utilized

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
- Small Rotating Detonating Engine Research
- 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 uses tech transfer mechanisms to provide Air Force resources, knowledge, experience, labor, materials, laboratories, etc., to many organizations to develop innovative technologies, materials, systems, and algorithms. 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; and studied mechanisms to improve the detection of nuclear events.

AFIT has provided small and large businesses, non-profits, and universities with vital resources, much of which is not commercially available, while fulfilling its mission to educate graduate students, while continually pushing the advancement of science with research.

Resources Utilized

- New full-time ORTA representative attended the required Annual DAF T2 training session in May 2023
- New full-time ORTA representative attended the required Annual AFMCLO/JAZ Training for Judge Advocates in June 2023
- New full-time ORTA representative is currently enrolled in the T2U Technology Transfer Fundamentals Fall 2023 Cohort course (September - November 2023)
- ORTA provided the New Faculty Orientation incoming faculty (civilians and military) which includes and introduction to AFIT's Technology Transfer Program

> **The biggest strength here at AFIT is the Office of Research and Outreach, in which the ORTA resides.**

Financials

Royalty Income	$9,000
CRADA Income	$423,774

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	16	7	5
EPAs	4	-	-
MTAs	1	-	-
ITAs	5	4	-
NDAs	1	-	-
PLAs	3	2	-

Number of active & new agreements for any other T2 mechanisms the lab has (training affiliation agreements, software license, etc.):	4

Intellectual Property

Invention Disclosures	12
Patent Applications	9
Patents Issued	6

Patents

Disclosures Received	12
Applications Filed	9
Patents Awarded	6
Total Active Patents	41

Additional Metrics

Total Active EPAs	4
Total EPAs w/ Colleges/Universities	4
Active ITAs	5
New ITAs	4

Federal Licenses

Invention Licenses, Total Active	3
Newly Executed Invention Licenses	2
Income Bearing Licenses, Total Active	3
New Income Bearing Licenses	2
Income Bearing Exclusive, Total Active	1
Income Bearing Partially Exclusive, Total Active	2
Avg Time for Execution (months)	12
Min Time (months)	8
Max Time (months)	24
Total Income, All Active Licenses	$10,500
Income from Patent/Invention Licenses	$10,500
Earned Royalty Income, All Active Licenses	$10,500
Earned Royalty Income, Distributed to Inventors	$10,000

AFLCMC/EN & EZ

The Mission

To provide 21st century systems engineering services that greatly enhance Air Force programs' ability to deliver dominant capabilities

The Vision

To be recognized as the Systems Engineering resource of choice, providing innovative solutions that accelerate war-winning capabilities

The Strategy

Continue to look at the use of CRADAs to help deliver dominate capability to the warfighter.

> **Delivering Dominant Capabilities to the Warfighter... Whatever it Takes!**

66 ABG/PA Approved

AFLCMC/HN

Overview

This annual report highlights the the Lantern's T3 activity for 2023 including efforts to facilitate work performed by PEO C3I&N, PEO Digital, PEO NC3, Hanscom EN, and 66 ABG leveraging the CRADA and EPA mechanisms. This report also summarizes near- and long-term plans and provides metrics required by the Air Force T3 program office.

The Lantern T3 function resides within the Office of Research and Technology Applications (ORTA) in PEO C3I&N (AFLCMC/HN). Located at Hanscom AFB near Boston, MA, the Lantern is a 29k 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 120ft composite tower in support of 26 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, Federally Funded Research and Development Centers (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:

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

The Year in Review

Success Story

Yes. The Lantern Innovation Symposium with 150+ participants featuring our many partnerships, multiple AFT3 trainings for the workforce facilitated by AFRL/SP and the Hanscom Innovation Team, finalizing a new CRADA with UMass Lowell Applied Research Corporation (scheduled to be enacted in FY24), a new STEM partnership between PEO C3I&N Major General Genatempo and students and educators at Minuteman High School, and continued dialogues and technology and STEM explorations with UMass Lowell and Northeastern University.

Marketing and Outreach

Lantern Innovation Symposium was attended by 150+ visitors and provided an overview of DAFT3 mechanisms, introduction to DoD and FFRDC organizations, a Q&A panel and opportunities for attendees to interact with AFRL/SB and AFMVLO/JAZ personnel who traveled to attend the event.

The Light the Lantern Demonstration Event hosted 11 vendors in the technology areas of Zero Trust, AI & ML and augmented reality and drew 300+ attendees during the 8-hours event.

Opportunities to participate in and attend future iterations of both of these events are available through the Hanscom Air Force Base home page and LinkedIn Account.

Lessons Learned

The most significant lesson-learned in 2023 was that incoming ORTAs are greatly facilitated by access to contextual and historic interactions related to process that are often encapsulated within narrowly-addressed emails. Moving forward, a lessons learned and authoritative feedback database/list was stood up to capture such valuable information via artifact attachment and rich text entry for provision to and access by successor ORTAs. Additionally, ORTAs can greatly benefit from reviewing the annual reports submitted by other ORTAs and through interpersonal networking with other sites.

Resources, Facilities, & Equipment

Resources Utilized

On-site ORTA and legal training were leveraged by the Lantern technical and programmatic staff. AFRL/SP and AFMCLO/JAZ staff were leveraged to support Lantern Symposium and Innovation Education Event in 2023.

Facilities and Equipment Utilized

The majority of the interactions with companies and higher education occurs virtually. Campus visits to Northeastern University and UMass Lowell's Lowell campus 20 miles away and Lincoln campus less then a mile away also occurred.

Overview briefings were provided to leadership and divisions on new unique infrastructure at Northeastern University focusing on quantum computing, as well as counter small UAS.

PEO C3I&N visited Minuteman High School in May to interact with students and educators with a focus on manufacturing and 3D printing at the high school's lab space.

The 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 AF TEO memo dated 12 Oct 22.

Near-term goals include digitization of legacy agreements in preparation for DTTIS migration, standing-up internal tracking using Teams SharePoint workflows, improved metrics and analysis of year-over-year trend information and seeking ORTA mentorship.

Long-term objectives include exploring the potential to increase the use of CTAs and/or MTAs as part of larger acquisition strategy allowing programs to evaluate technology claims and planning for continuity through creation of a data management strategy and other succession documentation.

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	12	-	-
EPAs	3	-	-

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	12
Estimated CRADA Contributed Value ($)	$5,272,547

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	3	
Total EPAs w/ Colleges/Universities	2	
Total EPAs w/ High Schools	1	★

AFLCMC/RO

Overview

The Rapid Sustainment Office (RSO) was established with a sustainment-centric focus to leverage mature, new, emerging, and disruptive technologies to dramatically improve United States Air Force readiness. The RSO is organized with a non-traditional Air Force construct, based on agile principles and a short chain-of-command. The RSO pioneers innovative and cost-effective sustainment technologies and tools for the betterment of the sustainment enterprise.

The RSO was designated the 13th AFLCMC Directorate in 2020, with the vision to 'Transform the acquisition approach and sustainment enterprise vital to the world's most advanced Air Force'. The RSO focus areas include our Agile Combat Teams, Data & Digital Environments, Automation and Robotics, the RSO Lighthouse Initiative, Condition Based Maintenance, and Additive Manufacturing.

The Strategy

The RSO utilizes the ORTA role to conduct sustainment related research and development with our commercial partners by integrating their technology, typically developed with IRAD funding, and expose those technologies to our innovative pipeline for test and evaluation purposes. The T2 tools will also assist our current R&D projects to further research of the technologies developed under government contracts after they expire, serving as a bridge between contractual efforts.

The RSOs one-year strategy is to continue developing our current CRADA efforts with Saab, Sierra Nevada Corporation, Amazon, and Velo3D, with expected agreement awards by the end of the calendar year 2023. The RSO also continues to conduct business development with industry partners, looking to develop research and development agreements with those technologies that are sustainment focused.

Near term and long term goals of the RSOs use of T2 tools are to incorporate them into our innovation pipeline as an entry and bridge to our Apply, Identify, and Scale phases. Additionally, the RSO looks to expand the types of tools we are authorized to use, outside CRADA, to further strengthen our ability to pursue mature sustainment related technologies, both from industry and developed internally. ★

Clearance #AFLCMC-2023-0272

The Year in Review

Marketing and Outreach Activities

- Logistics Officer Association (LOA) Conference Booth and Presentation
- RSO Industry Day - DEC 2022

Resources, Facilities, & Equipment

Resources Utilized

- Annual ORTA Training through AFRL

Clearance #AFLCMC-2023-0267

AFLCMC/WA

Overview

The Air Force Life Cycle Management Center (AFLCMC) Fighters and Advanced Aircraft Directorate (WA) Laboratory at Wright-Patterson Air Force Base (WPAFB) has executed eleven (11) new Cooperative Research and Development Agreements (CRADAs) within Fiscal Year (FY) 23. Fifty-five percent (55%) of the CRADAs are with new organizations AFLCMC/WA had not previously worked with, allowing for a diversified portfolio of government and industry collaboration.

The WA Lab supports efforts to include development, integration, model validation, and performance testing with approximately twenty-five (25) individuals comprised mostly of engineers. The WA lab is located in Dayton, OH with a focus on buying down risk within the acquisition process by giving the government the ability to re-test, validate, and verify results from industry. The lab was commissioned in 2019.

The Strategy

The AFLCMC/WA Office of Research and Technology Application (ORTA) enables acquisition programs to buy down risks of various technologies WA is interested in procuring. Technology Transfer (T2) tools allow the ORTA to collaborate in the areas of innovative technologies, components, software, modeling, simulations, 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 bring the best of best to the forefront of the Air Force's acquisition.

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

The ORTA plans to give WA the ability to crosscheck the information flowing from Collaborators to help validate and verify results in order to better inform acquisition decisions that have multi-million, if not multi-billion, dollar impacts over decades.

The Year in Review

Success Story

AFLCMC/WA's ability to on-board new organizations into the fold to better technology and increase competition cannot be understated. Multiple collaborators have helped push AFLCMC/WA forward as we continue to look at how to get the best of best technologies for our war fighters. The most common example is through algorithm development within software capabilities.

Lessons Learned

Up to this point, our lab has not had to execute a Material Transfer Agreement (MTA). This year, our lab learned about those agreements and executed two (2) MTAs. It is important for ORTAs to stay in touch on what abilities exist and the best practices for implementing each instance. Since attending the inaugural T2 University Capstone, our ORTA has been able to better communicate with other labs in a similar situation across the DoD enterprise. Hopefully there will be other collaborative type events (but not a multi-week course) that will allow for regular feedback from new players as they gain more T2 experience.

Resources, Facilities, & Equipment

Resources Utilized

- T2 University Teaching Personnel
- T2 University Colleagues
- T2 University Lesson Material
- Technology Readiness Level (TRL) incentives
- The ability to compete with best of breed in their area of expertise

Facilities and Equipment Utilized

- The AFLCMC/WA lab infrastructure allows for validation and verification of test reports given to the government by collaborators.
- 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.

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	33	11	3
MTAs	2	2	-

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	33
Traditional, Newly Executed (CRADAs)	11
Estimated CRADA Contributed Value ($)	$24M
Limited Purpose, Total Active (MTAs, NDAs)	2

Multiple collaborators have helped push AFLCMC/WA forward as we continue to look at how to get the best of best technologies for our warfighters. ★

AFLCMC/WI

Overview

The Intelligence, Surveillance, Reconnaissance (ISR) & Special Operations Forces (SOF) Directorate's intent for Technology Transfer primarily revolves around Cooperative Research and Development Agreements (CRADAs) with industry partners whose objectives are maturing sensor 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 ISR/SOF Directorate, AFLCMC, Air Force Materiel Command, Wright-Patterson Air Force Base, Ohio plays an important role in ensuring combatant commanders have the information gathering and targeting capabilities to make informed decisions and to eliminate threats. The directorate has nearly 2,800 employees in 20 locations and leads over 200 programs. The directorate's mission is "Equip Our Warfighters to Win the Fight!" and its vision is to live up to its name as "One Team Delivering Innovative Warfighter Capabilities With Speed and Discipline!"

The Strategy

The ORTA functions as the liaison between defense industry partners and the ISR/SOF 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 5 Divisions enabling collaboration on ISR projects.

Resources, Facilities, & Equipment

Resources Utilized

- T2 Education and Training provided to organization/ lab staff

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	7	2	-

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	7
Traditional, Newly Executed (CRADAs)	2
Newly Executed to Small Business	1

"One Team Delivering Innovative Warfighter Capabilities With Speed and Discipline!"

Wright-Patterson Air Force Base, Ohio

AFLCMC/XA

Overview

XA is responsible for full spectrum capability development and development planning in the acquisition community. This includes early modeling simulation and analysis, technology maturation, and prototyping.

Provide innovative solutions to build the acquisition foundation for integrated, multi-domain war-winning capabilities.

Strategy

Incorporate technologies and solutions to support future XA technology demonstrations. This includes supporting ABMS using modern networking capabilities, communications capabilities, artificial intelligence, and data analysis from a number of sources, and processing information intelligently to support significantly improved operational decisions, and resilient and efficient force employment. It also includes exploring capabilities, within the XA mission set, that provide clear mission value and operational impact. ★

NEW ORTA

Hill Air Force Base, Utah

AFNWC/NXX

A Message from DAFT3

We are thrilled to announce an exciting new ORTA partnership with AFNWC/NXX. As we strive to continually enhance our services and expand our reach, we firmly believe that collaboration is key. Hence, we are delighted to welcome our newest ORTA on board, and we cannot wait to embark on this journey together.

While we may not have the metrics to report at this moment, we believe that actions speak louder than words. We are confident that our partnership will yield tangible results that will exceed expectations. We are committed to fostering a strong and fruitful partnership that is built on trust, open communication, and mutual respect. Together, we will overcome challenges, celebrate successes, and create a lasting impact.

Once again, we extend our warmest welcome to our new ORTA, AFNC/NXX. We are thrilled to have you on board and look forward to the incredible journey that lies ahead. Together, we will achieve greatness. ★

> **AFNWC/NXX is generating it's ORTA strategy in support of current and future ICBM needs.**

Arlington, Virginia

AFOSR

Overview

AFOSR's top priorities are

- Conduct bold, high-risk, high-reward research
- Bolster Space Force basic research
- Strengthen human talent pipeline; emphasize Historically Black Colleges and Universities/Minority Serving Institutions (HBCU/MSI) and STEM
- Enhance existing and establish new partnerships
- Accelerate the use of data analytics

Mission

A Directorate of the AFRL that Discovers, Shapes, and Champions Basic Research that profoundly impacts the future of the United State Air Force and Space Force.

About The Lab

AFOSR has 37 World-Class Subject Matter Experts managing more than 1100 domestic research projects at over 300 Universities in 50 states and 65 countries.

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.

The Year in Review

Success Stories

AFOSR Transitions Practical Data Mining to Space Operations

The Air Force Office of Scientific Research (AFOSR) has achieved a remarkable transition from Basic Research to Technology Readiness Level 6 (TRL6) in just two years with its investment in a data-mining tool. Led by Principal Investigator Dr. Sunil Aryal of Deakin University in Melbourne, Australia, the project focuses on identifying outliers within clustered data, particularly relevant for complex datasets like satellites and space debris. The approach developed by Dr. Aryal can identify objects exhibiting distinct behavior within clusters, potentially aiding in detecting nefarious activities within large groups of objects. AFOSR's investment totals $150 thousand between FY21 and FY22. This technology has rapidly transitioned to the U.S. Space Force's Space Operations Command Delta 2, currently testing the concept on space tracking datasets to identify anomalous behavior among 50,000 items.

Multiple Transitions Sprout from Basic Research Event-Based Sensor Investment

AFOSR Program Officer Dr. Geoffrey Andersen has invested $335 thousand over three grants to support the development of Event Based Sensors (EBS) for next-generation surveillance. Led by Principal Investigator Dr. Greg Cohen of Western Sydney University, these sensors read individual pixels independently as they change, enabling faster detection of changes and making them ideal for imaging from moving platforms. The sensor is being utilized on FalconNeuro, a module built by the USAF Academy and Dr. Cohen, deployed on the International Space Station since late 2021. FalconNeuro has successfully observed stratospheric lightning, imaged the ground, and detected dynamic objects, including potential missile launches over Ukraine, showcasing the sensor's capabilities in real-world scenarios. The National Reconnaissance Office (NRO) is supporting a follow-on mission called Falcon ODIN with a next-generation camera.

AFOSR-funded Stanford Scientist's Breakthrough Method Promises Sustainable Ammonia Production

Professor Richard Zare of Stanford University, funded by the Air Force Office of Scientific Research, has developed a cleaner method for producing ammonia, a critical component in fertilizers vital for global crop growth. This new process, aiming to replace the environmentally unfriendly Haber-Bosch method, requires up to 100 times less energy, produces negligible emissions, and can be performed at room temperature and atmospheric pressure.

Zare's method is scalable to smaller operations, potentially allowing farmers to create ammonia on-site, addressing supply chain issues. While demonstrated successfully in laboratory conditions, Professor Zare seeks industry partners for scaling up the process for industrial use. The global ammonia market, estimated at over $205 billion in 2022, underscores the economic significance of such advancements in agricultural technology.

AFOSR Funding Leads to NanoPattern Technologies' Next Generation Displays

Chicago-based startup NanoPattern Technologies, with support from the Air Force Office of Scientific Research (AFOSR), is advancing the next generation of high-resolution displays. Traditional displays use small dots to form images, and the density of these dots determines resolution. While current micro-LED displays are limited to monochrome or have poor resolution for three-color displays, NanoPattern Technologies has developed an innovative process using an "ink" with "quantum dots" that enables cost-effective production of high-resolution full-color displays. NanoPattern's unique process allows for a higher density of particles, resulting in superior image resolution. This breakthrough has broad applications in healthcare, diagnostics, photonics, optoelectronics, and more.

Silicon-Based Vacuum Transistors Enable Electronics in Extreme Environments

Purdue University's Prof. Saeed Mohammadi, supported by the Air Force Office of Scientific Research (AFOSR), has developed nanoscale silicon-based vacuum transistors with applications in high-power, high-frequency electronics, and harsh environments. Prof. Mohammadi's team received a $650K investment in 2018, resulting in a patented technology that operates reliably at temperatures up to 300°C and sustains high radiation, making it suitable for environments like nuclear reactors. Leveraging the speed of light in a vacuum, these transistors offer low-power, high-speed capabilities, potentially revolutionizing telecommunications and data processing.

Numericus Group Revolutionizes Digital Filter Design

The Numericus Group, supported by the Air Force Office of Scientific Research (AFOSR), has developed automatic filter design and calibration technology that could revolutionize digital filters. Digital signal filters play a crucial role in devices for signal transmission and reception, with applications ranging from compensating for signal interference to combating jamming. The Numericus Group's technology, backed by AFOSR investment, enables the automatic design of stable infinite impulse response (IIR) filters. Traditional IIR filter design is time-consuming and costly, making Numericus' innovation a game-changer. The Numeric Group's first technology transition success was making cost-effective, accurate filter design algorithms commercially available. Their second success is a Direct to Phase II SBIR focusing on applying this approach to counter signal jamming technologies, reaching Technology Readiness Level (TRL) 7.

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 several options to accomplish our plan, including a strong partnership with BRICC PIA, which hosts 50+ collaboration events with government and academia partners. Additionally, BRICC helps track intellectual property that AFOSR generates with our partners.

One-Year Objectives and Strategy:

Integrating ORTA duties in the planned Tech Transition Office. This Office will spearhead tech transition with the Department of Air Force, other DoD offices, and academia partners. Additionally, this Office will partner with BRICC PIA on training and researching tech transition opportunities on cutting-edge technologies.

Near-term goals and Strategy:

Build on recent successes in creating EPAs to partner with HBCU/MSI and other academic partners. EPAs have been an invaluable option to expand partnering with HBCUs/MSIs and local school systems.

Long-Term Objectives and Strategy:

Analyze which additional options for technology transfer AFOSR could use to accomplish the basic research mission. Additionally, AFOSR would like to partner with other ORTAs/PIAs on joint HBCU/MSI workforce development.

Resources, Facilities, & Equipment

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 and Equipment Utilized

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 sq. ft. 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.

Performance Measures

Types	Active Agreements	New Agreements	Amendments
EPAs	5	4	-

Patents

Applications Filed	143
Patents Awarded	151
Total Active Patents	2,910

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	5
New EPAs	4
Total Active EPAs w/ HBCUs and Minority Serving Institutions (MSIs)	2
Total EPAs w/ Colleges/Universities	3
Total EPAs w/ Grade Schools	2

AFRL/711 HPW

Overview

This annual report highlights the Air Force Research Laboratory (AFRL), 711th Human Performance Wing (711 HPW) Technology Transfer and Transition (T3) activity for the Fiscal Year (FY) 2023. This includes facilitating efforts to advance human performance, deliver technology to the warfighter, and commercialize 711 HPW technology when appropriate. This report also summarizes strategic plans moving forward and provides the T3 agreement metrics required by the Department of the Air Force, T3 Program Office. The 711 HPW T3 function resides within the Office of Research and Technology Applications (ORTA) in the Plans and Programs Directorate of the 711 HPW (711 HPW/XP).

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.

711 HPW is a unique combination the Human Effectiveness Directorate (RH) and the US Air Force School of Aerospace Medicine (USAFSAM).

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 DAF 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 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 (DoD) 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.

The Strategy

The 711 HPW 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. 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.

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, conferences 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.

A major goal, near- and long-term objectives, would be to transition all T3 agreements, tracking functions, and operational information to a new relational database for AF-wide T3 Agreements. The DAFT3 Program Office is spearheading this multi-year effort, which reportedly advanced to the prototype stage during FY21. The new database will allow the 711 HPW T3 Office to greatly improve its record-keeping and T3 metrics tracking and reporting functions, and provide the means for consistent, current, up-to-date, and accurate information across all T3 records including spreadsheets, existing databases, and archives. As a team, we have been working diligently on this task since the previous annual report.

The Year in Review

Success Stories

"Popular AFRL Invention Supports Joint Military Needs with Mobile Medical Documentation"
Published Aug. 30, 2023

A mobile medical documentation tool developed by Air Force Research Laboratory, or AFRL, researchers, has been selected as the joint integrated electronic health record for point-of-injury and en route care by the Joint Operational Medicine Information Systems, or JOMIS. Following this announcement at the July 2022 Defense Health Information Technology Symposium in Orlando, Florida, demand for demonstrations of the Battlefield Assisted Trauma Distributed Observation Kit, or BATDOK, increased tenfold among military agencies.

Prior to BATDOK's selection, the 711 HPW team led roughly two operational exercises per year. After the announcement, they began averaging two exercises per month. As of 2023, BATDOK, a smartphone application that replaces pen and paper records, has been provided for evaluation and testing to all the Department of Defense services, Burnett said. BATDOK has also been tested by allied forces in the United Kingdom, Morocco and Australia.

BATDOK's selection by JOMIS, a program management office within Defense Healthcare Management Systems, is a testament to the team's capability development work and testing with end users, Burnett said. JOMIS collects operational medicine requirements from the various services and provides medical information technology for military operations.

Originally started as an Air Force science and technology initiative in response to an Air Combat Command need for improved battlefield documentation, BATDOK later became a Defense Health Program initiative with funding from Air Force Medical Services. Military medics began evaluating BATDOK in 2016, and the tool deployed operationally in 2019. BATDOK captures medical documentation to include injury types and the treatment provided to the warfighter. To document their observations and actions, medical providers simply touch buttons on a smartphone.

Today's BATDOK has various modes to accommodate the medical provider's progress and the patient's needs. The team continues to develop the tool by incorporating additional requirements and even provides an updated version of the BATDOK application every two weeks.

While the BATDOK capability was developed within the 711th Human Performance Wing's Human Effectiveness Directorate, the United States Air Force School of Aerospace Medicine, or USAFSAM, also provided support. The BATDOK team engaged with USAFSAM aeromedical evacuation cadre from the schoolhouse to explore ideas and learn about medical documentation needs. The 711 HPW team said the goal of BATDOK is simple: support medical providers and help bring warfighters home.

"Missile Cancer Study Team Conducts 2nd Batch of Testing at ICBM Bases"
Published Aug. 2, 2023

The Air Force School of Aerospace Medicine sent teams to all three intercontinental ballistic missile wings to test for exposure hazards within missile alert facilities. The tests are part of the ongoing missile community cancer study. The teams gathered water and soil samples to test for radon, polychlorinated biphenyls and organic phosphates.

The team conducted additional testing to identify any hazardous conditions related to indoor air quality. Samples will identify if there are any harmful levels of carbon dioxide, carbon monoxide, ambient temperature and humidity. The next steps are to analyze the samples and fuse the data into a format that helps USAFSAM toward additional steps, if needed.

In addition to the latest assessments, the study continues to examine medical data from uniformed personnel, and from the veteran community, who have worked in or around ICBM facilities, as well as cancer registry data from the Department of Veterans' Affairs.

The initial review of ICBM facilities conducted from late February 2023 to early March 2023 found no readily discernible link between the buildings and cancer. However, the preliminary assessment recommended a deep cleaning of each launch control facility and to modify existing procedures related to personnel working within certain radio frequency boundaries. There was also a recommendation to stop burning classified materials while in the underground facility. There is no projected time-limit to the study.

"AFRL leads USSF Continuous Fitness Assessment study"
Published June 22, 2023

The Air Force Research Laboratory, or AFRL, is conducting a two-year voluntary study with Guardians to assess the use of wearable fitness devices that measure physical activity. The study, which began enrollment in May 2023, is part of the U.S. Space Force's Continuous Fitness Assessment, or CFA, line of effort.

In May 2023, Guardians received an email invitation to join the study. Those who enroll and remain active in the study will be exempt from U.S. Air Force physical fitness assessments. Following the initial announcement, the AFRL study team hosted information sessions at Wright-Patterson Air Force Base, Ohio for Guardians who pre-enrolled in the study. Study team members briefed Guardians on participation guidelines, answered questions and issued Garmin watches, the approved study device. During the study phase, participants will wear the devices, log workouts and complete monthly surveys as the AFRL team monitors select data to assess the capability.

The primary purpose of the study is to examine the long-term effects that continuous physical fitness assessment implemented via wearables has on the physical activity behaviors and performance of Guardians. This study will first explore how CFA impacts the Guardians. But then, because the study is implementing a comparison group, assessors will be able to tell if CFA is an equivalent or potentially better solution for maintaining physical readiness compared to current Air Force fit ness standards. Guardian data will be tracked on the Airman Data and Performance Tracking System, or ADAPTS, a secure platform originally developed for the special operations community that aggregates data from commercial wearable fitness trackers with customizable dashboards.

After the study, the AFRL team will analyze the results to determine the effectiveness of wearables relative to the current physical fitness tests and advise on future efforts to make wearables a permanent option.

"C-STARS gains new equipment for infectious disease readiness training"

An essential piece of equipment arrived at the Center for Sustainment of Trauma and Readiness Skills, or C-STARS, in Omaha, Nebraska, June 24, 2023. The Negatively Pressurized CONEX, or NPC, will be utilized in developing a new infectious disease air transport training course on procedures for current and future outbreaks of high-consequence infectious diseases, or HCIDs. C-STARS Omaha is a training program through the United States Air Force School of Aerospace Medicine or USAFSAM, in collaboration with the University of Nebraska Medical Center. USAFSAM is headquartered at Wright-Patterson Air Force Base in Dayton, Ohio, and is part of the Air Force Research Laboratory's 711th Human Performance Wing. The NPC will also allow the C-STARS team to train personnel on donning and doffing procedures for personal protective equipment in confined spaces and safely moving patients into and out of the unit.

The new C-STARS NPC is a modified shipping container converted into a clinical space with air handling and medical equipment to transport patients exposed to or infected by high-consequence infectious diseases, or HCIDs. The NPCs transport HCID patients on military aircraft, like C-17s, to get needed medical attention more rapidly. There is also an NPC-Lite version designed to be used on a C-130.

In 2020, AMC developed the NPC to respond to the need for more high-capacity movement of patients from deployed locations. The mission aims to move exposed or infected HCID patients while minimizing the risk to civilians, aircrew, medical attendants and the airframe.

There are NPCs located at Travis, Dover, Germany, Japan and Qatar according to Welsh. Locations where there the squadrons are most likely to use the NPCs, and there are teams trained on how to move patents.

Negatively pressurized chambers are commonly used as a method of infection control to isolate patients with contagious, airborne diseases such as measles, tuberculosis or coronavirus. The air pressure inside the chamber is kept lower than outside, preventing potentially contaminated air and other dangerous particles from escaping outside into non-contaminated areas.

Instead, the potentially contaminated air is removed with exhaust systems, using filters that clean the air before it is pumped outside and away from the healthcare facility.

"Joint teams conduct first F-22 in-flight tests for aircrew CBRN protection"
Published Nov. 3, 2022

The U.S. Air Force conducted the first in-flight vapor purge tests on the F-22 Raptor with the support of the 422nd Test and Evaluation Squadron and the 59th Test Squadron on Nellis Air Force Base from Oct. 13-21, 2022.

These tests are a continuation of the Next Generation Aircrew Protection (NGAP) program, which will ensure current and future aircrew gear and operation concepts will modernize rapidly to meet emerging threats while maximizing aircrew performance and protection.

Researchers are evaluating the time it takes to clear the cockpit of a chemical simulant during flight. They use methyl salicylate, known as wintergreen oil, which is used as flavoring agent in chewing gums and mints. This chemical simulant is safe for the pilot, yet mimics the effects and properties of known chemical warfare agents.

USAF test and evaluation personnel placed specialized testing equipment in the cockpit and on the pilot. Then the methyl salicylate was sprayed into the aircraft's engines before takeoff to measure the speed at which concentration of the chemical during flight are eliminated. With this information, researchers determined the time and conditions needed to purge a contaminant from the cockpit, enabling development of informed concepts of operation.

This collaborative effort by the Air Force's CBRN Defense Systems Branch along with the Joint Program Executive Office for CBRN Defense, the Air Force Research Laboratory's 711th Human Performance Wing and 28th Test and Evaluation Squadron is aligned to conduct evaluations across multiple DoD airframe platforms over the next few years.

Marketing and Outreach Activities

In collaboration with MilTech, an AFRL Partnership Intermediary out of Montana State University, Bozeman we completed three (3) separate case studies, available for distribution. The purpose of the case studies was to conduct a review of how Department of Defense (DoD) laboratories have supported technology transition (spin-in) through or in conjunction with the ORTA personnel, processes, and authorities. The goal of the case studies is to identify how the ORTA can be a valuable partner in the laboratories' transition efforts. Specifically, the intent was to document and share lessons learned and best practices as well as identify training, policy, etc. needs to further enable an ORTAs support for spin-in activities.

Together with the Wright Brothers Institute (WBI) – An Innovation Institute, a partnership intermediary, we worked on a Marketing Campaign which was conducted in two separate phases for the following Patent: "Method for Detection and Identification of Known and Emergent Pathogens." The purpose of the marketing campaign was to gather potential candidates to fulfill the technology's unmet need which has been limited by the small number of potential targets on a given diagnostic. As a result of the campaign, one company showed its potential and will be issued an agreement to continue further collaboration.

Additional collaboration with FedTech had been worked throughout the year for NSIN's Foundry and Forge Programs (2023), but unfortunately produced no lasting results. We plan to reconnect in 2024.

Barriers

One of the major challenges our team has been faced with over the last year has been to understand our Patent and License Portfolio. We began to evaluate this process at the beginning of FY23. Step-by-step, our team has uncovered a multitude of issues that need to be addressed for license agreements. Together, with the other TDs and AFMCLO/JAZ (legal), we have been able to redefine existing processes and/or create new processes, i.e. the issuance of default and termination letters to licensees. We have also identified the need for additional communication throughout this process with the licensees. Moving forward, we have discussed collaborating further with the other TDs to create a standardized process for 1. issuing invoice letters (potential solution), 2. receiving royalties, 3. issuing termination letters, and 4. license agreements. At this time, our team has drafted/created the templates for the default and termination process which have been approved by Legal. For our patents, a spreadsheet has been created to identify when patent maintenance fees are due and when communication needs to be had with the Wing's divisions to ensure timely payment. Lastly, a discussion needs to be had with the S&Es leadership, i.e. section, branch, division, whether or not to pay on a patent that is not being licensed.

Lessons Learned

As part of the Wing's Continuous Learning and Improving Practices (CLIP) Implementation, our team has taken the lead on executing various initiatives which have ignited a change in our T3 processes, whether it's for licenses or agreements. As we work together and talk through these situations, we are learning from one another and creating solutions for future change. Since the commencement of this program, CLIP has provided our team with the ability to think critically about our work while implementing immediate change.

One of the issues/challenges that we continue to work and overcome is increasing our knowledge in fixing the patent and license process for our S&Es.

Resources, Facilities, & Equipment

Resources Utilized

The 711 HPW ORTA is now and has been fully staffed since the beginning of 2023. The T3 team fully embraces continuous learning and training and has taken advantage of all learning and training opportunities that have been provided, to include ORTA Foundations, which is led by TechLink (a partnership intermediary) and various trainings held by DAFT3 and AFMCLO/JAZ (Legal). The information learned from these events have been incorporated into our T3 Training which is provided to all Scientists and Engineers (S&Es), to include leadership. Our training program has had a major overall since COVID and we plan to continue this training on a bi-annual basis (at least). We are also looking at other ways to keep our S&Es trained. Due to the team's hard work on this initiative, we were provided a performance award, by leadership, for our efforts. In addition, we provide training when requested. The Chief Scientist had requested a separate training on Intellectual Property which we coordinated and executed on a short timeline.

Facilities and Equipment Utilized

"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, or 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, Ohio; Baltimore, Maryland; and St. Louis, Missouri. USAFSAM is located at Wright-Patterson Air Force Base in Dayton, Ohio, and is part of the Air Force Research Laboratory's 711th Human Performance Wing.

"Biotech"

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 #1 asset – our Airmen and Guardians. Their 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.

"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.

https://www.afrl.af.mil/711HPW/

"The 711 HPW accomplishes its mission through distinct but complementary mission units and an integrated staff located at Wright-Patterson Air Force Base, OH.

Financials

Royalty Income	$82,470.10
CRADA Income	$4,767.02

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	41	10	2
EPAs	22	3	-
CTAs	1	-	-
MTAs	12	3	-
ITAs	86	15	1
NDAs	8	3	-
PLAs	30	-	-

Number of active & new agreements for any other T2 mechanisms the lab has (training affiliation agreements, software license, etc.):	49	DSA 7; ELA 1; FAA 1; ILA 1; JOA 2; PAA 2; SLA 4; TAA 21; TLA 9; TTA 1

Federal Licenses

Invention Licenses, Total Active	1
Income Bearing Licenses, Total Active	36
Income Bearing Exclusive, Total Active	6
Income Bearing Partially Exclusive, Total Active	2
Income Bearing Non-Exclusive, Total Active	28
Other Licenses, Total Active	13
Total Income, All Active Licenses	$92,470.10
Income from Patent/Invention Licenses	$60,470.10
Earned Royalty Income, All Active Licenses	$82,470.10
Earned Royalty Income, Distributed to Inventors	$77,735.05

Software

Total Active Software Licenses	4
Royalty Bearing Software Licenses	4
Received Royalty from License ($)	$32,000

Authorities Used

Section 801 of Public Law 113-66 (2014 National Defense Authorization Act)

Intellectual Property

Invention Disclosures	6
Patent Applications	20
Patents Issued	8

Patents

Disclosures Received	6
Applications Filed	20
Patents Awarded	8
Total Active Patents	85

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	41
Traditional, Newly Executed (CRADAs)	10
Total Active CRADAs w/ HBCUs and Minority Serving Institutions (MSIs)	1
New CRADAs w/ HBCUs and Minority Serving Institutions (MSIs)	1
Estimated CRADA Contributed Value ($)	$45,947,970
Limited Purpose, Total Active (MTAs, NDAs)	20
Limited Purpose, Newly Executed	6

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	22
New EPAs	3
Total Active EPAs w/ HBCUs and Minority Serving Institutions (MSIs)	2
Total EPAs w/ Colleges/Universities	21
Total EPAs w/ High Schools	1
Active ITAs	86
New ITAs	15
Active CTAs	1

AFRL/RI

Overview

With advancements being made at a staggering pace around the globe in air, space and cyberspace, General Arnold's words ring as true today as they did when he wrote them over seven decades ago. In order to stay ahead of our adversaries, the Air Force must evolve at a rapid pace and press hard to advance our technological capabilities. As one of the nine Air Force Research Laboratory technical directorates, the Information Directorate serves as the information technology leader for Air Force Research Laboratory and the Air Force. The Directorate plays a critical role in building the command, control, communications, computers, intelligence (C4I) and cyber capabilities for the future by providing information superiority for the Air Force across the air, space, and cyber domains. The Information Directorate's initiatives directly support our current National Defense and Air Force Science and Technology Strategies, and will continue to answer the critical needs and priorities of the Department of Defense, Air Force, and Nation.

The Information Directorate technical plan is developed by core technical competency teams based on the Information Directorate's Strategic Plan. This plan is guided by the National Defense Strategy, Air Force Science and Technology Strategy, and Air Force Research Laboratory Strategic Vision. Core technical competencies are composed of division scientists and engineers positioned to execute the Information Directorate's Strategic Plan, and knowledgeable in a core technical competency's application to the guiding strategies and vision.

The four core technical competencies for the Information Directorate are:

- Processing and Exploitation (PEX)
- Connectivity and Dissemination (CAD)
- Autonomy, Command and Control, and Decision Support (AC2)
- Cyber Science and Technology (CYB)

The Information Directorate began as the Griffiss Air Force Base established in 1942. The Base was transitioned to the Rome Air Development Center (RADC) in 1951, then in 1991 became Rome Laboratory. After the Base Realignment and Closure Commission (BRAC) in 1995, the remaining site became what it is known as today, the Air Force Research Laboratory, Information Directorate. While the Information Directorate is the proper name of the laboratory, locals and employees often still affectionately refer to the site as "Rome Labs".

Strategy

The AFRL/RI ORTA facilitates and enables this mission by working with academia, industry, small business, state, local, and federal Governments to identify Spin-In and Spin-Out technologies that can both benefit the AFRL mission as well as move technology from lab to market meeting global and national challenges. Through Technology Transfer Agreements, AFRL/RI provides access to state-of-the-art facilities that include fully equipped Quantum and Neuromorphic Computing Laboratories as well as access to highly specialized data sets and world leading Subject Matter Experts.

Four Core Technical Competencies

1. Processing and Exploitation (PEX)
2. Connectivity and Dissemination (CAD)
3. Autonomy, Command and Control, and Decision Support (AC2)
4. Cyber Science and Technology (CYB)

Resources, Facilities, & Equipment

Resources Utilized

AFRL/RI uses it's 2 PIAs (Griffiss Institute and NYSTEC) to enable local, national, and global partnerships to increase the likelihood of success in the conduct of science and engineering activities to promote the transfer or exchange of technology with state and local governments, academia, industry, and other agencies; which promotes collaborating with Industry, Academia, and Student Internships to build future Scientists and Engineers and which provides for the availability of a non-federal environment to facilitate the informal movement of information, knowledge, and skills through person-to-person interaction.

Facilities and Equipment Utilized

AFRL/RI uses the Innovare Advancement Center (IAC) enabled by our PIA with the Griffiss Institute. The IAC is a 150,000 sq ft "open innovation" space that enables collisions between the greater research community and the DAF with and outside the fence approach. The IAC contains specialized labs for quantum and neuromorphic computing.

> **The Information Directorate serves as the information technology leader for Air Force Research Laboratory and the Air Force.**

The Year in Review

Success Stories

AFRL/RI hosted the the fifth installment of Quantum for International Workshop (Q4I) held June 27-29, 2023. This year saw record setting international participation with over nine nations, 26 speakers, and 156 attendees. 70 companies and industry representatives attended along with 31 higher education attendees. Attendee feedback was at an all time high, for example this quote from a Canadian attendee "Having a Congressman, CEOs of quantum companies, Air Force Directors, Academic researchers, NASA, and other agency representatives coming together to talk about opportunities and challenges of the field was invaluable.

Helping Upstate Science + Technology Leaders + Entrepreneurs (HUSTLE) Defense Accelerator doubled in size in its second year. Nine companies participated, and five ended up winning investments from New York State of at least $50,000 with $450,000 handed out overall. The program piloted a new 2 track model to better support the needs of pre-seed and also seed stage defense dual-use technology companies. Highlights include cohort companies being awarded SBIRs during the program, IP licensure from AFRL-RI, and earned follow on private investment, with numerous other accolades at trade shows and international forums since the program ended. Two startups immediately relocated to Rome, NY (from NYC and Baltimore) because of how impressed they were with the Innovare Advancement Center (IAC) and connections they were making with AFRL-RI.

Barriers

AFRL/RI is working with AFRL/SPT/T3 to figure out how to resolve royalty payments owed by companies that were not honoring their PLA milestone payments because their company never made any commercial sales. A few of the LLCs never paid their New York State annual fee and considered their company closed for business however, they never terminated the PLAs they had with AFRL/RI.

Any royalties that were sent to AFRL/RI are unaccessible by AFRL finance, so we don't have an accurate account of how much royalty income was made in FY23.

International efforts:

AFRL/RI sent an international CRADA package to SAF/IAPC for approval to work with Oxford University on May 8th and have not heard back yet.

AFRL/RI is working an international CTA package and following the flowchart and steps of an international CRADA. We have not found any other TDs that have completed an international CTA so we could run into obstacles.

Financials

CTA Income	$1,310,349

Intellectual Property

Invention Disclosures	8
Patent Applications	9
Patents Issued	3

Software

Total Active Software Licenses	3
Royalty Bearing Software Licenses	3
Authorities Used	801

Federal Licenses

Invention Licenses, Total Active	3
Income Bearing Licenses, Total Active	16
New Income Bearing Licenses	4
Income Bearing Exclusive, Total Active	8
Income Bearing Partially Exclusive, Total Active	2
Income Bearing Non-Exclusive, Total Active	6
Avg Time for Execution (months)	4
Min Time (months)	3
Max Time (months)	5
Other Licenses, Total Active	3

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	106	36	5 new
EPAs	121	12	-
CTAs	13	2	2 new; 3 active
MTAs	1	1	-
ITAs	1	1	-
NDAs	9	3	-
PLAs	16	4	-

Patents

Disclosures Received	8
Applications Filed	9
Patents Awarded	3
Total Active Patents	19

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	96
Traditional, Newly Executed (CRADAs)	32
Newly Executed to Small Business	16
Estimated CRADA Contributed Value ($)	$2,275,685,392.40
Limited Purpose, Total Active (MTAs, NDAs)	7
Limited Purpose, Newly Executed	3

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	121
New EPAs	13
Total Active EPAs w/ HBCUs and Minority Serving Institutions (MSIs)	39
New EPAs with HBCUs/MSIs	5
Total EPAs w/ Colleges/Universities	111
Total EPAs w/ High Schools	4
Total EPAs w/ Grade Schools	4
Active ITAs	4
New ITAs	1
Active CTAs	4
New CTAs	2

Through Technology Transfer Agreements, AFRL/RI provides access to state-of-the-art facilities that include fully equipped Quantum and Neuromorphic Computing Laboratories as well as access to highly specialized data sets and world leading Subject Matter Experts. ★

AFRL/RQ

Overview

FY23 was another strong year for AFRL/RQ. While volume mostly remained the same, AFRL/RQ continued to see significant activity in the technology transfer space. The laboratory began to shift additional focus to digital transformation to improve efficiency and maximize utilization. In addition, AFRL/RQ executed several critical new partnerships, supported significant industry efforts that resulted in noteworthy income streams, and remained a leader and champion for technology transfer across the DoD and federal government.

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, Ohio, and supplemented by additional personnel and research facilities located at Edwards Research Site, Edwards Air Force Base, California, and Arnold Air Force Base, Tullahoma, Tennessee.

Technology Focus Areas - Among the technologies in development in the Aerospace Systems Directorate are aviation technology, non-propulsive power production and energy conversion, engines, propulsion, novel fuels, scramjet engines, unmanned vehicles, hypersonic vehicles, collision avoidance, and aircraft energy optimization.

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

The Strategy

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.

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

Objective – Explore opportunities to expand personnel support by continuing technology transfer training
Strategy – Continue to utilize digital delivery while also identifying additional employees to expand existing capability and reduce external support reliance

Objective – More accurately identify constraints to improve efficiency and advocate for resources
Strategy – Utilize digital tools to identify bottlenecks and streamline strategic decision making

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 expertise (SME) inputs to further develop strategic guidance

The Year in Review

Success Stories

The AFRL/RQ saw many successful partnerships take place due to consistent and enthusiastic utilization of technology transfer authorities. Several examples are provided but are not considered necessarily more valuable than others that may not have been included. AFRL/RQ has applied technology transfer across many technology spaces and continues to explore new strategic approaches to being successful.

Success Story 1 - AFRL/RQ successfully formed a critical partnership with a large industrial partner to utilize unique government-developed manufacturing technology with critical Air Force applications. The newly defined partnership will secure the critical capability and provide income to the Air Force for many years.

Success Story 2 - Developed new partnership to support ongoing effort with significant national defense implications related to autonomy, collaborative platforms, and hypersonics. Establishing the partnership showed renewed commitment to previous and recent successes while fostering an environment for a higher probability of new success. The technology of interest is a critical future capability with importance for national security.

Success Story 3 - The lab successfully supported an AF civilian as they transitioned to becoming a small business owner and subsequently licensed AF technology to support their small business. Additionally, the small business was able to utilize unique Air Force capabilities to perform commercialization activities and provide revenue to the lab through a commercial test agreement.

Success Story 4 - The AFRL/RQ ORTA lead was recognized as the Best in the Midwest Region by the Federal Lab Consortium for FY23. This was due to consistent community involvement utilizing subject matter expertise, high volume of technology transfer activity, and wide-ranging applications of T2 authorities. All of these were accomplished while under-resourced which further highlighted the achievement.

Marketing and Outreach Activities

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. The AFRL/RQ ORTA is currently supporting a geographically separated, locally led initiative to instantiate a partnering shop for outreach at Edwards AFB by providing guidance, education, and digital presence as required. 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.

Barriers

AFRL/RQ continues to have significant constraints due to under-staffing and barriers remain consistent with previous years. There is a desire to expand technology transfer capabilities within the lab through education, marketing, and strategic partnership development. These objectives are becoming increasingly more important and core technology transfer activities are becoming critical considerations for R&D programs. The AFRL/RQ ORTA remains focused on inserting T2 capabilities in early research considerations but is forced to make difficult trade off decisions between competing priorities due to staffing limits. AFRL/RQ must continue to rely too heavily on external resources to support necessary T2 activity. Recently identified resource availability will limit future T2 growth and successful transfer and transition potential. AFRL/RQ technologies continue to be under-marketed, under-licensed, and potentially under-disclosed.

Lessons Learned

The AFRL/RQ ORTA believes that the current state of activity has nearly reached maximum support capability. This was most evident after recent training sessions which resulted in increased inquiry but limited capacity to engage all opportunities equally. Since the lab has rebounded from COVID-19 impacts, it has become clear that the current ability to support growing T2 utilization is limited by personnel availability. Successfully growing the lab's T2 activities, even in support of renewed strategic understanding, will likely require more personnel or more capable digital solutions. A combination of both is recommended.

Resources, Facilities, & Equipment

Facilities and Equipment Utilized

Laboratory's URL that lists facilities/equipment information: *https://www.afrl.af.mil/RQ/*

There are many unique capabilities within the Aerospace Systems Directorate.

These include but are not limited to:

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 lb thrust
- 13 Solid Rocket Motor Pads to 10,000,000 lb thrust
- Altitude Facilities from milli-pound to 60,000 lb 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

Resources Utilized

Human Resources – The AFRL/RQ ORTA is currently staffed by one (1) full-time civilian

T2 Education and Training Provided to Organization/Lab Staff – the AFRL/RQ ORTA has provided ad hoc training by request and developed on demand briefings covering high-level technology transfer topics of general interest and high frequency

Professional Development of ORTA – AFRL/RQ ORTA has attended various technology transfer community development opportunities and remains ready to participate in any meaningful professional events that would enhance T2 capabilities

Incentives/Awards – AFRL/RQ continues to be committed to incentivizing the invention disclosure process and supports all royalty & licensing activity expected by policy. The Directorate rewards all government inventors with Notable Achievement Awards of $300 for new invention disclosures. In addition, AFRL/RQ maintains an annual award dedicated to technology transfer.

Financials

Royalty Income	$138,540.00
CRADA Income	$1,567,800.12
CTA Income	$5,390,770.44
Royalty Income	$1,608.39
Other T2 Resources	$105,000

**Estimated*

Intellectual Property

Invention Disclosures	18
Patent Applications	38
Patents Issued	13

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	29	9	-
EPAs	26	3	-
CTAs	3	4	-
MTAs	6	2	-
ITAs	693	129	Includes MOU-ITAs
NDAs	9	9	-
PLAs	9	1	-

Number of active & new agreements for any other T2 mechanisms the lab has (training affiliation agreements, software license, etc.):	1

Patents

Disclosures Received	18	Patents Awarded	13
Applications Filed	38	Total Active Patents	126

Federal Licenses

Invention Licenses, Total Active	6
Newly Executed Invention Licenses	1
Income Bearing Licenses, Total Active	6
New Income Bearing Licenses	1
Income Bearing Partially Exclusive, Total Active	3
Income Bearing Non-Exclusive, Total Active	2
Avg Time for Execution (months)	6
Min Time (months)	6
Max Time (months)	6
Other Licenses, Total Active	1
Total Income, All Active Licenses ($)	$138,540.00
Income from Patent/Invention Licenses ($)	$138,540.00
Total Income, All Active Licenses ($)	$138,540.00
Total Income, All Active Licenses ($)	$76,409.50

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	29
Traditional, Newly Executed (CRADAs)	9
Newly Executed to Small Business	6
CRADA Revenue ($)	$1,567,800.12
Estimated CRADA Contributed Value ($)	$53,099,000.00
Limited Purpose, Total Active (MTAs, NDAs)	15
Limited Purpose, Newly Executed	11

Software

Total Active Software Licenses	1
Royalty Bearing Software Licenses	1
Authorities Used	801
Received Royalty from License ($)	$125,000.00

> FY23 was another strong year for AFRL/RQ. While volume mostly remained the same, AFRL/RQ continued to see significant activity in the technology transfer space.

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	26
New EPAs	3
Total Active EPAs w/ HBCUs and Minority Serving Institutions (MSIs)	2
New EPAs with HBCUs/MSIs	0
Total EPAs w/ Colleges/Universities	25
Total EPAs w/ High Schools	1
Total EPAs w/ Grade Schools	0
Active ITAs	693
New ITAs	129
Active CTAs	3
New CTAs	4
CTA Income ($)	$5,390,770.44 ★

AFRL/RD & RV

Overview

The United States Air Force Research Laboratory's Directed Energy and Space Vehicles (AFRL RD & RV) Directorates located at Kirtland Air Force Base (KAFB), Albuquerque, New Mexico jointly fund and operate the Technology Engagement Branch office. The Technology Engagement Office includes the operation of the Office of Research and Technology Applications (ORTA) to improve both technology transfer and science, technology, engineering, and math (STEM) outreach. Specifically, the Technology Engagement Office is chartered to enhance the laboratory's core mission capabilities through strategic partnerships developed to provide support and innovation to the warfighter.

Technology Engagement is supported through Partnership Intermediary Agreements (PIAs) with the New Mexico Institute of Mining and Technology (NM Tech), New Mexico Trade Alliance, Catalyst Campus for Technology Innovation, and New Space Nexus. These intermediaries support the ORTA in the facilitation of tech transfer agreements, technology commercialization, intellectual property, and marketing efforts for AFRL RD & RV.

In FY23, the office implemented new techniques for connecting scientists and engineers with industry and academic partners including improved marketing and outreach to companies and improved in-reach to let AFRL RD & RV staff know about the benefits of technology transfer. The office strengthened relationships between the laboratory, state and local governments, academia, and industry, through initiatives like the Q-Station collaboration facility and Space Tech Cohort, University Tech Collider, Hyperspace Challenge andCatalyst Space Accelerators (collectively known as the Space Force Accelerator Program), Ignite incubator, and the 5th Annual AFRL Innovation Awards.

AFRL/RD: AFRL's Directed Energy Directorate is the Department of the Air Force's 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/RV: 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, 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.

The 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 Department of the Air Force (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: Tech 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 & 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 tech 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 tech 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 tech 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 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.

Specifically, the Technology Engagement Office is chartered to enhance the laboratory's core mission capabilities through strategic partnerships developed to provide support and innovation to the warfighter.

The Year in Review

Success Stories

International CRADA between AFRL and Indian Startups: The tech transfer team, through the PIA with the New Mexico Institute of Technology, facilitated the development and execution of the Space Force's first International Cooperative Research and Development Agreement (CRADA). The agreement is with the Indian start-ups 114 AI (a Catalyst Space Accelerator alum) and 3rdiTech. Both companies will work with General Atomics to co-develop components using cutting edge technologies in AI and semiconductors respectively. The agreement was highlighted at a White House Press Briefing (22-June) in light of the Indian PM Modi's visit to the White House.

AFRL Innovation Awards recognize excellence in tech transfer: The Air Force Research Laboratory's Directed Energy Directorate and Space Vehicles Directorate held a 2023 Innovation Awards ceremony in Albuquerque, in Dec, 2023, marking the sixth annual ceremony. The event was created to recognize and inspire the laboratory's inventors and collaborators who develop technologies in support of the nation's defense and whose research promotes the transfer of technology to partners, academia and the private sector. The 2023 AFRL Innovation Award ceremony honored eight individual scientists and engineers, support workforce members and one team, with acknowledgements going to the noteworthy accomplishments of more than 20 other inventors.

AFRL/University of Arizona Tech Collider: The University Tech Collider Working Group (UTCWG) held a collider at the University of New Mexico's Science and Tech Park Rotunda, in Albuquerque, New Mexico, on April 13-14, 2023. The event was hosted in partnership with New Mexico Institute of Technology-Southwest Innovation Alliance and the University of Arizona. The two-day event featured scientific presentations and AFRL tours seeking to improve knowledge of career opportunities for University of Arizona students, advanced technological development in the state of Arizona and expanded science, technology, engineering and math, or STEM, education outreach initiatives. The Tech Collider also addressed critical needs for information sharing and collaboration between university partners and AFRL. Over 40 participants from AFRL's Space Vehicles Directorate, Directed Energy Directorate, University of Arizona and others met to address critical needs for information sharing and collaboration between university partners and AFRL.

2023 HyperspaceChallenge Partnership Accelerator: The Air Force Research Laboratory partnered with CNM Ingenuity, or CNMI, the economic development arm of Central New Mexico Community College, to launch the 2023 Hyperspace Challenge Accelerator, now in it's sixth year. This year, in support of the Space Rapid Capabilities Office (Space RCO), 6 companies, including 3 internationally based, are participating to determine product-mission fit for capabilities being sought by the Space RCO pertaining to Autonomy, Maneuverability, and Situational Awareness. The accelerator concludes with an Accelerator Week in Albuquerque, New Mexico, Nov. 1-3 at the Q-Station collaboration facility, where the companies will participate in intensive interactions with the Space RCO, Space Systems Command, and AFRL to assess company products for use in USSF missions. This year's cohort is an evolution of the Hyperspace Challenge that theTechnology Engagement Office began in 2018, through the PIA with New Mexico Tech, with the goal of discovering promising commercial technology for National Security Space purposes and has garnered attention several media outlets including Space News (*https://spacenews.com/startups-from-four-nations-join-2023-hyperspace-challenge/*). More than 150 participants from space technology, small businesses, academia, government, investors and others from the space community took part in the 2022 Hyperspace Summit. To date, the Hyperspace Challenge has worked with 38 government problem sponsors and 61 companies & universities enabling $419M in follow-on funding from government contracts and $185M from VC investment.

Q Station and the Space Tech Cohort: Serves as the primary collaboration center for the Directed Energy Directorate and Space Vehicles Directorate to engage with the public. The facility is co-managed by New Mexico Tech and the New Mexico Trade Alliance through their partnership intermediary agreements. The facility enables government, businesses, academia and organizations to collaborate, create and innovate. The Q-Station hosted over 46 events in 2023 including the inaugural Space Regulatory Bootcamp. Beginning in 2022, the New Mexico Trade Alliance launched the Space Tech Cohort for small business and start-up companies to grow their business and help connect them to potential government opportunities. Since its inception the program has worked with 11 companies (5 alone in 2023) in the year-long cohort. Company outcomes include $4.65M in SBIR awards, $400K in private investment, 5 inter-cohort commercial partnerships, and $1.25M+ in non-cohort SBIR or commercial contract activity.

Local coverage
(https://www.bizjournals.com/albuquerque/inno/stories/news/2022/12/06/q-station-five-companies-space-tech-cohort-2023.html)

Catalyst Space Accelerator: The Catalyst Campus for Technology Innovation (CCTI) based in Colorado Springs, CO serves as the home of the Catalyst Space Accelerator, a program to discover and determine product-mission fit for nontraditional companies. The end goal is to boost the growth of relevant technologies for DAF purposes and quickly determine which are self-sustainable in a market-driven economy. Cohorts of 8 nontraditional companies are selected to participate in a semi-in-residence 10 week program at the Catalyst Campus in Spring and Fall. The 2023 cohorts focused on discovering promising technologies to enable Defensive Cyber Operations for Space and AI/ML for Space and Maritime applications, the latter co-sponsored by the Naval Information Warfare Center Pacific. From 2018 thru 2023, the Catalyst accelerator supported 12 total cohorts, cultivated 94 total alumni companies, and contributed to the creation of 1,348 jobs. Accelerator alumni companies obtained $284M in follow-on funding from federal and non-federal government sources and $243.1M in private investment. *Local Colorado coverage:*
(https://www.fox21news.com/business/press-releases/globenewswire/8751924/eight-companies-join-catalyst-accelerators-defensive-cyber-operations-for-space-cohort/)

New Space Ignitor: The Ignitor, the direct outflow of the successful Space Force Accelerators and Q-Station Space Tech program, concluded it's first year activity. Established by the Tech Engagement Office through a PIA with the non-profit NewSpace Nexus under a Congressional Add, the Ignitor "incubates" participating companies exhibiting promising mission fit through limited technology readiness level assessment and advancement activities that include interactions with AFRL experts, Space Systems Command (SSC) and Space RCO personnel, and technology and manufacturing advisement from the Southwestern technology community including Sandia, Los Alamos, CNM Ingenuity and the NM Manufacturing Extension Partnership. So far, 23 companies have participated enabling $17.7 million in government contracts or investments. The ignitor has been covered by Space News and local TV
(https://www.krqe.com/nm-frontiers/how-newspace-nexuss-ignitor-program-is-making-space-safe-from-debris/)

NSF Engines Grant Finalist: The Space Valley Coalition, a private sector collaboration between the New Mexico Partnership Intermediaries serving AFRL's Tech Engagement Office in New Mexico, and other New Mexico organizations, is 1 of 16 finalist for the $160M NSF Engines grant. More coverage here:
(https://www.krqe.com/news/space-news/new-mexico-space-valley-selected-as-finalist-for-national-science-competition/)

STEM Outreach & Workforce Development: AFRL STEM outreach and engagement activities serve as a significant driving force in cultivating a robust technical workforce for the DoD and Department of the Air Force. AFRL's STEM Academy in New Mexico seeks to raise student interest in, and knowledge about, STEM by providing hands-on, minds-on STEM outreach programs and projects that engage students, especially those underserved and underrepresented in STEM fields, and teachers in the application of STEM content in context and introduce connections to STEM careers. In 2022, approximately 2,800 students were engaged across five different focused mission areas (or programs) with 14% participating in multiple missions. The students are drawn from diverse backgrounds with 73% identifying as minority and 47% female.

Marketing and Outreach Activities

Mailing/Targeted Campaigns (IP portfolio): Via the PIA with NM Tech and sub awardees UNM and NMSU , facilitates partnerships with other state or federal organizations and other educational institutions on technology expansions or tech transfer/transition opportunities to enhance and meet strategic objectives for long or near term project needs for AFRL RD & RV. Through technology marketing efforts, one of the objectives is to increase commercialization of AFRL 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 AFRL RD & RV. Some of these efforts include continuing discussions with companies who are initially interested in certain technology focus areas. In FY 22-23, ten (10) technologies were identified with over 280 companies and technology synergies through market research. Of the 280 companies 40 companies are interested in collaborating with AFRL RD & RV and in the process of communication.

AFRL RD & RV Public Affairs Published Nationwide Story Metrics: Press releases are distributed electronically throughout AFRL and are sent to more than 300 external news outlets, resulting in additional media outlet stories and subject matter expert (SME) interview requests and/or follow-on media queries. News releases report on the Space Vehicles and Directed Energy Directorates' technology milestones, personnel, collaborations and accomplishments. News releases spread the word and promote the research and development AFRL is doing, in support of national defense and promote opportunities for collaboration, with industry and academia. In addition, they promote esprit de corps within the workforce, giving recognition to the SMEs for the important work they are performing for the nation's security, thereby enhancing self-esteem and productivity. Recruiting Scientists and engineers is a benefit to an aggressive media posture that demonstrates AFRL is on the cutting edge of technology and an important place to work. In FY 22-23, there were 57 media pickups for Space Vehicles stories and 27 media pick-ups for Directed Energy stories.

Barriers

Barriers are the following: 1) The new Delegation of Signature Authority Letter dated 12 October 2022 which directs that only the Directors of AFRL RD and RV can sign tech transfer agreements has slowed the pace in fully executing agreements from approximately 2 weeks to months in many cases.. (For instance when a Director goes TDY, leave, etc. This is especially detrimental for CRADAs which retain a clause that should the Reviewing Official not sign within 30 days with no memo of record, then the CRADA is automatically effective at the Division signature. To overcome this challenge, the Tech Engagement Office is working with the RV and RD DAG to expedite and is considering CRADA sign-off at the Division level. 2) The review of invention disclosures and conversions into Patents has been a perennial problem due to limitations with legal bandwidth. To overcome this, the Tech Engagement Office, working with DAFT3PO intends to address this obstacle via the new centralized legal review process as a part of the new DTTIS workflow and will be working with the RV and RD Chief Scientists to review and prioritize inventions for processing.

Resources, Facilities, & Equipment

Facilities and Equipment Utilized

Unique Labs and facilities are being utilized at AFRL RD & RV through CRADAs and CTAs.

- 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 of these facilities being used by industry on the technical approach is to determine the radiation degradation of visible and infrared (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 focal plane array 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.

Resources Utilized

Department of the Air Force Technology Transition and Transfer Workshop: supported the coordination and attended the Department of the Air Force, or DAF, held the 2022 DAF Technology Transition and Transfer, or T3, Workshop in San Antonio, Texas Nov. 1-2, 2022. The event served as an opportunity for the T3 Community, composed of government officials and Partnership Intermediary Agreement, or PIA, teams, to discuss current issues, network, plan and develop strategies, discuss best practices and receive training to advance the T3 mission. The T3 Workshop is an annual event under the leadership of the Air Force Technology and Transition Office within the AFRL Small Business Office. Attendees included 65 government personnel, 36 PIA members and 15 other contractors for a total of 116 individuals.

Patent Workshop (13 Dec 2022): conducted a Patent Workshop to provide an overview of IP Disclosure Forms, Process, POCs to review forms. Attended by 11 participants from AFRL RD & RV. Presenters included tech transfer professionals and local government attorney.

Lunch & Learn EPAs (26 Sep 2023): Lunch & Learns are a series of voluntary meetings, training sessions, or presentations that take place during lunch. They bring together people from across our AFRL community and are designed to provide an informal atmosphere to collaborate and learn. Topic areas will focus on technology transfer processes and tech engagement opportunities with industry, academia, and nonprofits.

Branch/Div Trainings FY22-23 (Sep 2023): the Tech Transfer & Transition team discussed goals for this year's AFRL Outreach and Division Presentations in relation to Tech Transfer Agreements, IP, Commercialization, Marketing and other AFRL/RDOX Branch programs. Four overviews of inreach to the Division Chiefs, Chief Scientists, S&Es, and other Program and Business Managers. Since 2018, there have been 44 in-reach presentations conducted to inform the workforce of tech transfer opportunities and processes.

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).

Financials

Royalty Income	$52,419.00
CRADA Income	$3,313,679.00
CTA Income	$5,390,770.44
Royalty Income	$1,319,400.00

Intellectual Property

Invention Disclosures	4
Patent Applications	41
Patents Issued	12

Patents

Disclosures Received	4
Applications Filed	41
Patents Awarded	12
Total Active Patents	63

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	24
Total Active CRADAs w/ HBCUs and Minority Serving Institutions (MSIs	3
New CRADAs w/ HBCUs and Minority Serving Institutions (MSIs)	1
CRADA Revenue ($)	$3,313,679.00
Estimated CRADA Contributed Value ($)	$1,417,650,818.00
Limited Purpose, Total Active (MTAs, NDAs)	16
Limited Purpose, Newly Executed	5

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	56	10	2
EPAs	46	1	2
CTAs	10	1	2
MTAs	5	1	-
ITAs	3	-	-
NDAs	31	3	-
PLAs	7	-	-

Federal Licenses

Invention Licenses, Total Active	7
Newly Executed Invention Licenses	0
Income Bearing Licenses, Total Active	7
Income Bearing Exclusive, Total Active	5
Income Bearing Partially Exclusive, Total Active	0
Income Bearing Non-Exclusive, Total Active	2
Avg Time for Execution (months)	3
Min Time (months)	2
Max Time (months)	30
Licenses Terminated for Cause	0 (working on non payments from 2 licenses)
Total Income, All Active Licenses ($)	$52,419.00
Income from Patent/Invention Licenses ($)	$52,419.00
Total Income, All Active Licenses ($)	$24,182.20
Total Income, All Active Licenses ($)	$24,128.20

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	46
New EPAs	1
Total Active EPAs w/ HBCUs and Minority Serving Institutions (MSIs)	10
New EPAs with HBCUs/MSIs	0
Total EPAs w/ Colleges/Universities	26
Total EPAs w/ High Schools	4
Total EPAs w/ Grade Schools	23
Active ITAs	3
New ITAs	0
Active CTAs	10
New CTAs	1
CTA Income ($)	$1,319,400.00

AFRL/RW

Overview

The Mission of the United States Air Force is to Fly, Fight, and Win our nation's wars...from Contingency Operations and Irregular Warfare to Major Combat Operations. The men and women of the Munitions Directorate lead an AFRL wide weapons Science and Technology (S&T) enterprise to deliver the best solutions to our Air Force's toughest challenges, both current and future. The Munitions Directorate must communicate extensively with operational commands to understand the future warfighter environment and deliver capabilities needed for victory in any future conflict.

The Munitions Directorate must provide the technological breakthroughs for air delivered armament, create affordable war winning effects, deliverable with exceptional precision and speed, against ground, sea or air targets in all weather conditions, day or night, in permissive or contested environments. Tomorrow's weapons need not only to be survivable in high threat environments but linked to Command and Control (C2) and Intelligence, Surveillance, and Reconnaissance (ISR) for robust targeting and synergistic effects. An enterprise approach provides the best opportunity for the Munitions Directorate to succeed at this challenge. Accordingly, the Munitions Directorate collaborates with our service labs, defense and national labs and agencies, international partners, industry and academia to leverage every S&T dollar we invest. Partnering with industry ensures we shape the relevant technologies to enable the next generation of fighter, bomber, and Remote Piloted Aircraft (RPA) and optimize the capability potential of our newest Combat Air Force (CAF) aircraft. We must lead this enterprise to ensure innovative, game-changing and affordable capability solutions are fielded in a timely manner.

This business report communicates the impact of the Munitions Directorate Technology Transfer (T2) program and how the Laboratory leverages T2 to meet the needs of the warfighter. RW continues to pursue high-quality substantial agreements and relationships that align directly with the Air Force mission. The Munitions Directorate Technology Transfer program ensures our T2 engagement aligns with our corporate investment strategy and strategic alliances. The Office of Research and Technology Transfer (ORTA) objective is to strategically utilize T2 processes and mechanisms to build partnerships between the Laboratory, state and local governments, academia, private industry and other federal agencies. This report reflects the accomplishments and activities of the past fiscal year and a roadmap for future initiatives.

The Mission

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

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 Air Force Research Laboratory Munitions Directorate (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 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, AFDD, and 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.

The 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 AFRL HQ 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

Marketing and Outreach Activities

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.

Barriers

The prior 5 years have shown a tremendous growth in RW intellectual property nearly tripling our invention disclosures, expanding our CRADA agreements & after not having any license agreements for over a decade we currently have 3 potential royalty bearing license agreements. However, the impact of COVID 19, changes in leadership, and a re-shifting of priorities within the directorate disrupted our innovative output in terms of new invention disclosures. However, the Munitions Directorate has completed a reorganization this year with a restructuring of the S&T areas, including a new focus on key technology areas, which has led to a rebound in our new invention disclosures. Continued outreach and education will be needed to reengage our S&T workforce to get back into the lab and start creating new inventions and requesting CRADAs with outside companies.

Resources, Facilities, & Equipment

Resources Utilized

Human Resources

The ORTA office has not seen an increase in the number of human resources during the past 5 years and has been at a disadvantage the past 3 years due to a lack of technology transfer personnel at our PIA, the Doolittle Institute. However, the Doolittle Institute has hired a new Technology Transfer manager this year and they have been in place and working for all of this fiscal year. The ORTA office currently has 1 government employee and 1 support contractor. The previous support contractor retired and there was a bit of a delay but we now have a full time support contractor in place.

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 8-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 $95,000 in incentive awards since the implementation of the policy.

Facilities and Equipment Utilized

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, Florida. 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.

Financials

CTA Income	$232,081

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	24	3	12
EPAs	5	3	1
CTAs	1	1	-
MTAs	3	3	-
NDAs	28	28	-
PLAs	3	-	-

Intellectual Property

Invention Disclosures	7
Patent Applications	6
Patents Issued	8

Patents

Disclosures Received	7
Applications Filed	6
Patents Awarded	8
Total Active Patents	45

Federal Licenses

Invention Licenses, Total Active	3
Newly Executed Invention Licenses	0
Income Bearing Licenses, Total Active	3
Income Bearing Exclusive, Total Active	3
Avg Time for Execution (months)	5
Min Time (months)	2
Max Time (months)	12

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	55
Traditional, Newly Executed (CRADAs)	34
Newly Executed to Small Business	6
Estimated CRADA Contributed Value ($)	$36,190,000
Limited Purpose, Total Active (MTAs, NDAs)	32
Limited Purpose, Newly Executed	32

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	5
New EPAs	3
Total EPAs w/ Colleges/Universities	3
Active CTAs	1
New CTAs	1
CTA Income ($)	$232,081

> The men and women of the Munitions Directorate lead an AFRL wide weapons Science and Technology (S&T) enterprise to deliver the best solutions to our Air Force's toughest challenges, both current and future. ★

AFRL/RX

Overview

This report provides an overview of the Materials and Manufacturing Directorate AFRL/RX Office of Research and Technology Applications (ORTA), also known as the Technical Transfer (T2) office, during FY2023 and provides some information on how that activity provides support to DoD.

Collaborative relationships with other agencies and organizations continue to be the key to successfully leveraging resources in order to accomplish AFRL/RX research. The most common, flexible way for AFRL/RX to work with industry and academia (and vice versa) is through collaborative R&D agreements. FY23 was another exceptional year for establishing agreements to enable new partnerships.

The AFRL/RX T2 ORTA provided T2 support on a daily basis. We continued to engage with regional initiatives, outside partners, and worked closely with our partnership intermediaries to establish new collaborations and to protect, market, and transfer our Intellectual Property.

In the coming year, AFRL/RX plans to expand on this year's successes and continually strengthen its Technology Transfer program. One focus in particular is to continue collecting past due royalty income from Patent License Agreements. This requires an audit of each agreement and using the proper legal authority to ensure collection. AFRL/RX is committed to understanding and supporting the Air Force T3 Office with any new initiatives in FY24.

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.

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

- *Discover* - Identify cutting edge scientific phenomena
- *Develop* - Reduce the risk to implement new technologies
- *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 US industry capacity to meet DAF demand/requirements
- *Deploy* - Transition war-winning technologies to DoD operators

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 diversify 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.

The Year in Review

Success Stories

USAF partners with GM Defense to successfully power aircraft with Electric Ground Power Unit (work from CRADA):
https://www.afrl.af.mil/News/Article-Display/Article/3548392/usaf-partners-with-gm-defense-to-successfully-power-aircraft-with-electric-grou/

LATEST AFRL PATENT HELPS THE WARFIGHTER TAKE A LOAD OFF SAFELY:
https://www.aft3.af.mil/Success-Stories/Article/3498805/latest-afrl-patent-helps-the-warfighter-take-a-load-off-safely/

Marketing and Outreach Activities

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

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, Facilities, & Equipment

Resources Utilized

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

Facilities and Equipment Utilized

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)

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	79	39	-
EPAs	26	5	-
MTAs	1	-	-
ITAs	3	1	-
NDAs	13	13	-
PLAs	12	1	-

Patents

Disclosures Received	13
Applications Filed	36
Patents Awarded	16
Total Active Patents	147

Financials

Royalty Income	$41,000
CRADA Income	$740,112

Intellectual Property

Invention Disclosures	13
Patent Applications	36
Patents Issued	16

Federal Licenses

Invention Licenses, Total Active	12
Newly Executed Invention Licenses	1
Income Bearing Licenses, Total Active	12
New Income Bearing Licenses	1
Income Bearing Licenses, Total Active	4
Income Bearing Partially Exclusive, Total Active	6
Income Bearing Non-Exclusive, Total Active	2
Avg Time for Execution (months)	4
Min Time (months)	2
Max Time (months)	8
Licenses Terminated for Cause	1
Total Income, All Active Licenses ($)	$41,000
Income from Patent/Invention Licenses ($)	$41,000
Earned Royalty Income, All Active Licenses ($)	$41,000
Earned Royalty Income, Distributed to Inventors ($)	$24,248

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	66
Traditional, Newly Executed (CRADAs)	26
Newly Executed to Small Business	4
Total Active CRADAs w/ HBCUs and Minority Serving Institutions (MSIs)	1
New CRADAs w/ HBCUs and Minority Serving Institutions (MSIs)	1
CRADA Revenue ($)	$740,112
Estimated CRADA Contributed Value ($)	$5,132,780
Limited Purpose, Total Active (MTAs, NDAs)	14
Limited Purpose, Newly Executed	13

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	26
New EPAs	5
Total Active EPAs w/ HBCUs and Minority Serving Institutions (MSIs)	2
Total EPAs w/ Colleges/Universities	26
Active ITAs	3
New ITAs	1

> 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. ★

AFRL/RY

Overview

The Sensors Directorate has continued to be a innovation leader by generating 11 new invention disclosures in sensor, sense making, and spectrum warfare technologies. In addition, we've been able to nearly double the number of active patent license agreements from all previous years combined, and establish multiple research and development partnerships through T2 mechanisms. These tech transfer successes have been accomplished despite the turn-over of key personnel in our ORTA, and multiple changes to AFRL/RY organizational structure and planning process.

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 tech 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

Success Story

One of our favorite success stories of the year involved a former RY Officer, who invented technology while in service that helps airdrop and semi-autonomously control personal watercraft for combat rescue operations. Upon exiting the military last spring, our office helped his new company, Shark Rescue Systems, acquire three licenses for his previous inventions to kick-start his civilian entrepreneurial career.

Marketing and Outreach

We worked with both Tech Link and Wright Brothers Institute to market a few PIA-selected technologies online and through industry-peer networks.

Barriers

The largest obstacle this year was dealing with a decline in the maintenance of "background" responsibilities for the ORTA due to new personnel, under-staffing and previous policy decisions. An effort has been made to surface the known deficiencies and provide tools and automation to help eliminate bottlenecks and gaps during inevitable personnel turnover in the future.

Resources, Facilities, & Equipment

Resources Utilized

- FLC National Conference, DAFT3 Office ORTA Training

Facilities and Equipment Utilized

- Bldg 600 Complex at WPAFB

Financials

Royalty Income	$23,920.26
T2 Expenses	$1500.00

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	24	4	5
EPAs	7	3	-
MTAs	5	2	-
ITAs	14	4	-
NDAs	3	1	-
PLAs	9	4	-

Intellectual Property

Invention Disclosures	11
Patent Applications	42
Patents Issued	18

Patents

Disclosures Received	11
Applications Filed	42
Patents Awarded	18
Total Active Patents	89

Federal Licenses

Invention Licenses, Total Active	9
Newly Executed Invention Licenses	4
Income Bearing Licenses, Total Active	9
New Income Bearing Licenses	4
Income Bearing Licenses, Total Active	1
Income Bearing Partially Exclusive, Total Active	3
Income Bearing Non-Exclusive, Total Active	5
Avg Time for Execution (months)	6
Min Time (months)	4
Max Time (months)	12
Licenses Terminated for Cause	-
Total Income, All Active Licenses ($)	$26,920.26
Income from Patent/Invention Licenses ($)	$26,920.26
Earned Royalty Income, All Active Licenses ($)	$23,920.26
Earned Royalty Income, Distributed to Inventors ($)	$15,810.13

Software

Total Active Software Licenses	4
New Software Licenses	3

Authorities Used

10 U.S.C. § 4892(a)(1)

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	7
New EPAs	3
Total EPAs w/ Colleges/Universities	6
Total EPAs w/ High Schools	1
Total EPAs w/ Grade Schools	0
Active ITAs	14
New ITAs	4

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	24
Traditional, Newly Executed (CRADAs)	4
Newly Executed to Small Business	3
Total Active CRADAs w/ HBCUs and Minority Serving Institutions (MSIs)	1
Estimated CRADA Contributed Value ($)	$20,317,000
Limited Purpose, Total Active (MTAs, NDAs)	8
Limited Purpose, Newly Executed	3

★

Clearance #PA-2023-0030

AFSC/EN

Mission

Provide Sustainment and Logistics readiness to deliver combat power for America. Technology Transfer is a key enabler of AFSC Goal 3 to "Modernize the Sustainment Enterprise."

Overview

The AFSC ORTA has successfully managed Technology Transfer agreements and patents. In FY23, We accomplished the following:

- Assigned a new ORTA PM, Tommy Le
- Published AFI 61-301 AFSCI supplement outlining AFSC responsibilities for T2.
- Hosted biweekly Tech Transfer meetings to help manage AFSC agreements with coordinators (Leads) from Tinker, Hill and Robins AFBs.
- Hosted Lunch & Learn sessions to educate S&Es on Tech Transfer.

Description of organization/laboratory: AFSC is not a traditional laboratory but rather a Technical Activity that engages in Technology Transfer activities to support our Mission and accelerate/modernize repair technologies. AFSC is comprised of three Air Logistic Complexes (ALCs); one each at Tinker AFB, Robins AFB and Hill AFB; Supply Chain Wings (SCWs); and Air Base Wings (ABWs) at each of the three geographic locations.

These organizations have over 5000 scientists and engineers with responsibilities for ensuring quality, speed, cost-effectiveness and safety of depot and supply chain processes. This responsibility affords numerous opportunities for technology transfer and patent applications. For additional information on the organizations in AFSC see: *https://www.afsc.af.mil/Units/*

Geographic location: Warner Robins AFB - Georgia, Ogden AFB - Utah, and Tinker AFB - Oklahoma.

Technology Focus Areas: AFSC's technology is focused on areas that support improved repair and manufacturing capability. AFSC/EN has identified the following focus areas in the AFSC technology roadmap: Metallization, Composites, Advanced Manufacturing, Augmented Reality/Virtual Reality, Fluid Distribution Systems, Industry 4.0 & Smart Depots, Robotics & Automation, Machine Learning/Artificial Intelligence, Manufacturing, Electronics, Data Fabric, Nondestructive Evaluation / Inspection, ESOH, Metrology, Corrosion, Information Technology, Sustainment Enterprise Data Science, Software, Facilities, Energy.

Strategy

Technology Transfer is a key enabler of AFSC Goal 3 to "Modernize the Sustainment Enterprise." The T2 activities were reported each month in FY23 to the AFSC Engineering Directorate AFSC/EN as part of the AFSC/EN performance review. This practice will be restarted in FY24.

In FY23, AFSC/EN on-boarded a new AFSC ORTA PM and AFSC EN director, the AFSC Reviewing Official. As such our goal was to train these personnel in managing T2 efforts. In addition, we set a goal of publishing an AFSC supplement to AFI 61-301. AFSC ORTA established a goal to re-start Lunch & Learn sessions on T2 topics available to all AFSC personnel. All these goals were met.

For FY24, AFSC will continue Lunch & Learn session and establish T2 Coordinators at each base.

Resources, Facilities, & Equipment

Resources Utilized

- T3 Program Office visited Tinker AFB and provided training
- AFSC ORTA took ORTA training from University of Montana
- LOJAZ supported AFSC organizations on filling out the patent application

Facilities and Equipment Utilized

- OC-ALC and OU EPA: *https://www.tinker.af.mil/News/Article-Display/Article/2273974/oc-alc-teams-up-with-ou-on-educational-partnership-agreement/*
- OC-ALC and OSU CRADA *https://www.tinker.af.mil/News/Article-Display/Article/2273974/oc-alc-teams-up-with-ou-on-educational-partnership-agreement/*

The Year in Review

Success Stories

Success Story #1 - WR-ALC (Patent)

This year, one patent was granted. Eric Fowler is an inventor who works at WR-ALC from Robin AFB. He has recognized employees in various industries, such as the aerospace industry, will at times, have to perform tasks in confined spaces. For example, aircrew member will have to enter aircraft fuel tanks and perform maintenance or repairs inside the fuel tanks. Typically, aircraft fuel tanks will have a small opening for him to access the interior of the fuel tank. Entering and exiting through the opening is very difficult. Mr. Fowler came up with an idea that is called Ergonomic Method for working in confined work spaces. This invention provides the ergonomic work methods to support structures for working in small work spaces. The aircrew member or worker can adjust the height of the structure support to fit with his needs while performing tasks, he can even sit down or stand up on the top of structure.

Success Story #2 - AFSC/SW

SuperMicro was referred to us by the United States Space Force Space Systems Command Special Projects. A particular space system was concerned about using SuperMicro as a supplier due to a media report stating SuperMicro possessed major issues with their supply chain that allowed Chinese parasitic parts into their supply chain, which compromised their products and provided a back door into their systems. 309 SWEG was introduced to the supply supplier via the Space Force and a Cooperative Research and Development Agreements was established to provide a comprehensive analysis of their supply chain in the areas of software, firmware, and hardware. As a result, 309 SWEG provided Special Projects with a Supply Chain report that dived much deeper than open-source reporting or intelligence reports evidencing the concerns were unfounded. The report alleviated many of Special Projects' technical fears regarding SuperMicro's supply chain, which cleared SuperMicro for use within Special Projects. This benefitted Special Projects because SuperMicro possesses some of the technical capabilities required that no other supplier possessed consequently avoiding the expensive of reworking the contract. Our report has been well received with Space Force and we have given several briefings on our findings to both Special Projects and other Space Force entities.

Success Story #3 - OC-ALC

TINKER AIR FORCE BASE, Okla. --
The Oklahoma City Air Logistics Complex signed a cooperative research and development agreement with Oklahoma State University in a ceremony held Tinker AFB, Feb. 16, 2023. The CRADA will partner OC-ALC and OSU's College of Engineering, Architecture and Technology on the development of E-Drill technology for use in aircraft maintenance methods. "This partnership supports research that will help improve maintenance operations in the depot to better advance readiness in the Air Force," said Maj. Gen. Jeff King, Oklahoma City Air Logistics Complex commander.

The agreement explores the E-Drill process parameters, equipment, configurations, and all variables necessary to validate and verify the technology to resolve many common issues with standard manual fastener removal, and can potentially result in more reliable, repeatable results. The E-Drill will also contribute to the furtherance of STEM outreach efforts by giving students access to cutting-edge research tools.

"Our graduate and undergraduate students benefit from understanding the engineering challenges facing the Air Force in sustaining aircraft and engines," said Dr. Kurt Rouser, assistant professor in the School of Mechanical and Aerospace engineering. "This opportunity will enhance a pipeline of talent uniquely prepared for the aerospace maintenance, repair and overhaul industry that has a national hub situated at the crossroads here in Oklahoma."

The Oklahoma City Air Logistics Complex's ongoing support and involvement with the educational community continues to encourage, influence, and heighten scientific development for future engineers and artisans. Media coverage on the respective benefits to the AF, the educational community, and the state of Oklahoma resulting from the CRADA signing broadcasted on PBS, April 14, 2023.

Marketing and Outreach Activities

Yes, ORTA hosted 3 Lunch and Learn (L&L) sessions. Over 110 S&Es attended each session. This is the opportunity to educate S&Es to get familiar with Tech Transfer. Our S&Es asked great questions. With the support from LOJAZ, we were able to answer the legal questions. There were requests to initiate Tech Transfer Agreements including patent applications.

We also included an article in AFSC SET Newsletter on a recent patent was granted this year.

Lessons Learned

- T3 Program Office visited Tinker AFB and provided training
- AFSC ORTA took ORTA training from University of Montana
- LOJAZ supported AFSC organizations on filling out the patent applications

Financials

CRADA Income	$595,000

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	2	1	-
EPAs	22	2	-
PLAs	1	-	-

Intellectual Property

Invention Disclosures	43
Patent Applications	14
Patents Issued	1

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	2
Traditional, Newly Executed (CRADAs)	14
Estimated CRADA Contributed Value	$595,000

Patents

Disclosures Received	43
Applications Filed	14
Patents Awarded	1
Total Active Patents	1

Additional Metrics

Total Active EPAs	22
New EPAs	2

> These organizations have over 5000 scientists and engineers with responsibilities for ensuring quality, speed, cost-effectiveness and safety of depot and supply chain processes. ★

Cleared by AFTAC PA

AFTAC

AIR FORCE TECHNICAL APPLICATIONS CENTER

Overview

2023 represents AFTAC's successful expansion of outreach and R&D agreements since receiving a formal designation for ORTA authority in February 2022. By expanding our ORTA vehicles with four universities, we've established key strategic relationships in terms of R&D, student involvement, and mission advocacy. These relationships are laying foundations for early onset R&D efforts, workforce development, and key networking opportunities.

The Air Force Technical Applications Center at Patrick Space Force Base, Florida, is a wing-equivalent center that provides national authorities quality technical measurements to monitor nuclear treaty compliance, and develops advanced proliferation detection technologies to preserve our nation's security. The center comprises two groups, eight squadrons, 10 detachments, and six operating locations to monitor nuclear event detection and compliance.

AFTAC operates and maintains the U.S. Atomic Energy Detection System, using scientific means to obtain and evaluate technical data on nuclear treaty monitoring and compliance to signatory foreign government nations.

Strategy

Our ORTA office falls under the "Strategic Integration" directorate, charged with integrating and fostering R&D within AFTAC, both in terms of funding and external opportunities.

The ORTA acts a force multiplier to obtain R&D resources for the Center since most resources are for the operational mission. By leveraging strategic relationships with academia, the ORTA is uniquely placed to act as a gatekeeper for relevant, early-onset, R&D for mission needs.

ORTA has met its short term goals by expanding the academic network we interact and do work with. Our long term goals are to establish "Student to Scientist" pipelines with these universities.

The Year in Review

Success Stories

Yes, we've entered into a third successive agreement with a key partner, Florida Tech (based out of Melbourne, FL) for key efforts on AI/ML developments and infrasound-related projects that support the Nuclear Treaty Monitoring Mission.

Additionally, we entered into our first Educational Partnership Agreement with University of Colorado, Colorado Springs - this effort will train students on mass spectrometry, laying groundwork for relevant and needed workforce development.

Project Successes - Laboratory processes and phenomena were identified that confirmed various hypothesis. Multiple papers were also published by collaborator partners as part of some of their larger research efforts.

Marketing and Outreach Activities

We've grown our internal marketing via relevant working groups and publishing recent signings with our unit's Public Affairs office.

https://www.16af.af.mil/Newsroom/Article/3237346/aftac-partners-with-florida-tech-for-third-research-agreement/

Lessons Learned

Most lessons learned stem from administrative staffing requirements, particular from those members who are not as familiar with ORTA authorities. These lessons learned have been incorporated into the staffing process and periodic training/education sessions.

SME and technical POC identifications are key steps early in the process and become more difficult to overcome closer to execution.

Resources, Facilities, & Equipment

Resources Utilized

- T2 Education and Training - Provided to staff and CRADA contributors
- Security Training - Industrial Security and OPSEC Topics provided for CRADA partners
- Travel Funds for ORTA Training - AFRL facilitated in New Mexico
- Legal Council - Development of various agreements and ethics consults for contributing members

Facilities and Equipment Utilized

- N/A - Contributions were largely subject matter expertise, analysis, evaluation, and access to key data sets to be provided to the collaborator.
- Computing resources at AFTAC were used.

2023 represents AFTAC's successful expansion of outreach and R&D agreements since receiving a formal designation for ORTA authority in February 2022.

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	3	1	1 (USAF CRADA # 22-299-AFTAC-01)
EPAs	1	1	-

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	3
Traditional, Newly Executed (CRADAs)	1
Estimated CRADA Contributed Value ($)	$220,000

Additional Metrics

Total EPAs	1
New EPAs	1

★

Clearance #PAO-2509

DC3

DOD CYBER CRIME CENTER

Overview

The DC3 Office of Research and Technology Applications (ORTA) develops Cooperative Research and Development Agreements (CRADAs) and Education Partnership Agreements (EPAs) that provide DoD, DC3, and industry the opportunity to exchange technologies benefiting the warfighter. While DC3 does not have a specific ORTA Strategic Plan, the DC3 Strategic Plan highlights specific goals and objectives that expand the DC3 Technology Transfer & Transition (T3) outreach with commercial industry, academia, and Research, Development, Test, and Evaluation (RDT&E) centers. The DC3 Strategic Plan also seeks to expand our partnerships with academia and industry related to building DC3 RDT&E branding and intellectual property protection. The DC3 ORTA is essential for advancing digital and multimedia (D/MM) forensics capabilities within the DoD. The authority to enter into CRADAs and EPAs allows DC3 to collaborate with industry and academia on D/MM forensics standards, processes, and capabilities that can be leveraged for DoD as the most efficient and effective means. DC3 consults with multiple private sector companies on the 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.

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: DC3 is among the largest accredited D/MM 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 the Digital Forensics and Cybersecurity fields. DC3 is also the DoD Center of Excellence for D/MM forensics and a technical analysis center to improve DoD mission assurance, enhance warfighter capability, and expand D/MM forensics capabilities through an RDT&E program.

DC3 operates along five core lines of business that contribute to advancing D/MM forensics and cyber analytic capabilities for the DoD:

- D/MM Forensics Laboratory Services
- Cyber Training
- Vulnerability Sharing
- Technical Solutions
- Cyber Analytics

DC3 Technical Solutions Development (TSD) is the DC3 RDT&E function lead to advance D/MM forensics technology and provide superior technical solutions.

Geographic location: 911 Elkridge Landing Road, Linthicum, Maryland

Technology Focus Areas: DoD Directive 5505.13E specifies DC3's responsibilities 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

The Strategy

DC3 does not have a specific ORTA Strategic Plan; however, during FY23, DC3 hired a new Senior Technical Leader who will develop a new academic engagement plan to facilitate and advance specific goals and objectives--currently highlighted in our Strategic Plan--that proactively expand our T3 outreach with commercial industry, academia, and R&D centers.

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 D/MM forensics standards, processes, and capabilities that can be leveraged for DoD as the most efficient and effective means.

How T3 Tools are a part of the laboratory strategic planning: T3 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 T3 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 facilitates the ability 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 FY23 involving private industry and academia has contributed to an extensive list of potential opportunities for T3 collaboration.

Long Term Objectives and Strategy: Build more partnerships that allow DC3 to expand additional resources to stakeholders and other customers. This can 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 Partner Engagements.
- Enhancing the DC3 mission by developing new partnerships, and increasing and improving support to current partners.
- Incorporating small business awareness, outreach, and support into the DC3 mission through CRADAs.

The Year in Review

Success Stories

DC3 Vulnerability Disclosure Program (VDP) partnered with the National Security Innovation Network Capstone program to enlist the help of George Mason University students to analyze top lessons learned from a pilot program to address scalability of vulnerability disclosure for the size and needs of the Defense Industrial Base. Specific details and full story can be found on DC3 govdelivery:
https://content.govdelivery.com/bulletins/gd/USDODDC3-3624cf7?wgt_ref=USDODDC3_WIDGET_2

Marketing and Outreach Activities

DC3, working in concert with MITRE, traveled to Louisiana State University (LSU) in Baton Rouge, Louisiana to engage with Professor, Dr. Ibrahim Baggili for the purpose of academic engagement. DC3 previously collaborated with Dr. Baggili in his faculty role during his tenure at the University of New Haven. The intent of this engagement was to reestablish contact with Dr. Baggili and allow that relationship to develop additional relationships with other cybersecurity faculty as well as meet LSU students studying for careers in cybersecurity and forensics. This engagement allowed DC3 to share its mission and capabilities with faculty and students to identify potential areas for future collaboration.

Through the DC3 Vulnerability Disclosure Program (VDP), collaborated with Northeastern University (NU) to continue supporting two National Science Foundation Grants to study vulnerability disclosure programs and the organizational foundation of cybersecurity which directly supports the focus of the Federal Cybersecurity Research and Development Strategic Plan on improving effective and efficient organizational risk management strategies for cybersecurity. In FY23, VDP leadership and NU representatives conducted quarterly collaboration sessions to answer questions encountered during the initial testing and evaluation activities as outlined in USAF CRADA-MTA NUMBER: 22-174-DC3-01. The sessions allowed the researchers to conduct verbal interviews on VDP operations.

Resources, Facilities, & Equipment

Resources Utilized

Two DC3 ORTA Action Officers successfully completed the Tech Transfer Foundations (formerly ORTA Foundations) online training course.

The DC3 ORTA attended the FY23 DAF Tech Transfer ORTA Training in San Antonio. The DC3 ORTA also attended an academic outreach conference in Huntsville, AL and engaged with academia which include: Auburn University, University of Alabama, Mississippi State University, and the University of California, San Diego on a number of academia topics to identify areas for potential collaboration related to data analytics, digital forensics, and intern opportunities.

Facilities and Equipment Utilized

Laboratory's URL that lists facilities/equipment information: *https://www.dc3.mil/tools*

Unique Capabilities of the Laboratory: As far as traditional 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 criminal law enforcement and DoD 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.

Examples of how some of these facilities/equipment are used by the private sector through CRADAs, test agreements, etc.: None at this time, but the new DC3 Senior Technical Leader is developing a plan to expand our private sector and academic outreach.

Financials

T2 Expenses	$3,692

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	1	-	-
EPAs	10	1	-
MTAs	1	-	-
NDAs	3	-	-

Number of active & new agreements for any other T2 mechanisms the lab has (training affiliation agreements, software license, etc.):	1

Patents

Total Active Patents	1

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	1
Limited Purpose, Total Active (MTAs, NDAs)	4

Software

Total Active Software Licenses	1
New Software Licenses	1

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	20
New EPAs	1
Total EPAs w/ Colleges/Universities	20 ★

Clearance #23-07-NASIC-1420

NASIC

Overview

Since January 12, 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 (DAFTEO).

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 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.

Strategy

NASIC plans to educate the NASIC Support Agreement Manager (SAM)/T2 POC, Senior Leaders, and analysts on the benefits of establishing T2 agreements with industry companies and educational institutions. The efforts of T2 agreements can assist NASIC analysts in meeting mission requirements for the warfighter. NASIC FY24 goal is to enter into at least 2 new CRADAs.

The Year in Review

Success Story

Through the CRADAs, we've been able to meet multiple times over the course of the year and engage on highly technical issues across multiple topics related to fighter engine development. These conversations have both highlighted threat capabilities and key technologies that should be protected as well as advanced the Intel Community's understanding of capabilities/technologies of adversary systems directly improving our all-source and engineering analysis capabilities.

NASIC used CRADAs to execute 3 visits to contractor facilities in FY23. These trips allowed NASIC analysts to interface directly with industry experts and see firsthand assembly lines and test facilities. NASIC and industry partners also met during the 2022 Air Threat Week at NASIC to discuss CRADA issues and accomplishments. Additionally, 5 visits from industry experts to NASIC fostered collaboration with analysts, which improved confidence in NASIC assessments and refined direction for analytic efforts to support the warfighter and DoD Acquisition. Industry partners benefit by using NASIC intelligence to direct their independent research and development projects for next generation systems.

Lessons Learned

Additional analysts were added to the CRADA management team to better accommodate the 5 CRADAs run by the Aircraft Analysis Squadron at NASIC. This helps reduce response time, eases visit planning, and gives more time back to the analysts for their primary responsibilities.

Resources, Facilities, & Equipment

Resources Utilized

- Professional development of ORTA

Financials

T2 Expenses	$5,000

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	7	-	-
EPAs	1	-	-

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	7
Estimated CRADA Contributed Value ($)	$50,000

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	1
Total EPAs w/ Colleges/Universities	1

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. ★

SLD 30

Overview

SLD 30 Really does not operate in a Laboratory setting, as we are an operational installation. We do have a few Educational Partnership Agreements (EPA) with California Universities, local school district and a non-profit that we operate under.

Vision – The Enduring Range of Choice for Current and Future Launch and Test Customers

Mission – Provide Robust, Relevant, and Efficient Range and Spaceport Capabilities for the Nation

Strategy

Our only strategy at this time under ORTA is to continue our EPAs and find new organizations under our STEM Outreach to form more EPAs.

Resources, Facilities, & Equipment

Resources Utilized

- Primarily Human Resources through our EPAs.

Performance Measures

Types	Active Agreements	New Agreements	Amendments
EPAs	4	-	-

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	4	
Total Active EPAs w/ HBCUs and Minority Serving Institutions (MSIs)	1	
Total EPAs w/ Colleges/Universities	2	
Total EPAs w/ Grade Schools	1	★

USAFA/DFQ

Overview

The Annual Plan for FY23 contains an overview of efforts used to enhance Technology Transfer at the United States Air Force Academy (USAFA). In June of this year AFMD12 formalized USAFA's responsibility to conduct research that supports the Academic Mission. Research at the USAFA supports the warfighter, aids in Technology Transfer, encourages faculty development and enhances cadet education. Cadets are the primary reason that USAFA exists, and no research project is complete without them. Research in laboratories that can lead to solving real-world problems teaches cadets to think critically and respond decisively in complex, uncertain environments.

The Air Force Office of Scientific Research funded the creation of the Academy's first research center in 1963. The Frank J. Seiler Research Laboratory included the Aeronautics Research Center, the Chemistry Research Center and the LORC. The original Seiler Lab closed in 1995, but the original three research centers in chemistry, aeronautics and lasers have been reinforced by the addition of new centers and institutes.

Now representing focus in areas from warfighter effectiveness to hypersonic vehicle simulation, research at the USAFA reflects the evolving needs of the Air Force and a more technology-driven world. Hundreds of companies are drawn to the state-of-the-art facilities, the internationally known faculty and some of the best and brightest students in the nation. The USAFA research program is valued at $40 million for externally funded research, internal faculty contribution and external in-kind funding.

Strategy

In July of 2023 the new Associate Dean of Research, Col Daniel Finkelstein, started his tenure in the Office of Research.

The Office of Research's Vision going forward is:

1. Define Research for our Academy by facilitating cadet education and growth, faculty development, solving the Air Force, Space Force, and our Nation's problems.
2. Evolve Research Office to support research as a core requirement for USAFA education (IAW AFMD12).

The Vision will be executed by increasing staffing. This year the DFQR T2 ORTA PM and Research Outreach PM were converted to Government Scheduled Civilian positions. The Research Budget Team has employed 3 more contractors and has filled 3 of 4 GS positions.

With an increase in staffing DFQR aims to improve processes that are sustainable and create predictability of workflow that is impervious to minor disruptions.

Now representing focus in areas from warfighter effectiveness to hypersonic vehicle simulation, research at the USAFA reflects the evolving needs of the Air Force and a more technology-driven world.

The Year in Review

Success Stories

1. The United States Air Force Academy (USAFA) was issued it's 52nd Patent on 18 July 2023. Patent Number US 11,702,202 B1 was awarded to Dr. Michael Anderson, Director of the Department of Mechanical Engineering Capstone Design Program. Capt Zachary Froembling (USAFA Class of 2018) is listed as a co-inventor for his support in the invention of a multi-arm expansion system, method, and apparatus for a Unmanned Aerial Vehicle (UAV). This patent was issued in addition to Dr. Anderson's Patent US 11,390,382 B1 (the 48th patent issued to USAFA on 19 July 2022), which is the larger "Delivery System for UAVs." Four other cadets from the Class of 2018 (Benjamin Stark; Jeffrey Burnett; Tyler Copien; Candice Roberts) are credited as co-inventors on Patent 11,390,382.
2. Patent Number US 11,519,698 B1 (USAFA's 49th Patent) was awarded to Dr. Ryan Burke (Professor of Military and Strategic Studies) and Capt Hayley Weir (Class of 2017) for their invention of a soft anti-ballistic composite gel that has the ability to enhance body armor when inserted into certain materials. The USAFA Office of Research is assisting this team in exploring CTA opportunities.

Marketing and Outreach Activities

1. Nearly 800 submissions for publication approval were received by the USAFA Office of Research during the 22-23 Academic Year. Peer-reviewed journal articles, books and book chapters, conference/symposium presentations, and various other publication mediums were cleared for release to the public. The publications produced by USAFA faculty and cadet researchers have reached audiences around the world.
2. 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.

Lessons Learned

Most lessons learned stem from administrative staffing requirements, particular from those members who are not as familiar with ORTA authorities. These lessons learned have been incorporated into the staffing process and periodic training/education sessions. SME and technical POC identifications are key steps early in the process and become more difficult to overcome closer to execution.

Resources, Facilities, & Equipment

Resources Utilized

- In March of 2023 the DFQR T2 PM attended ORTA training in El Segundo, CA.
- The T2 PM references the T2 Handbook in helping USAFA Researchers with T2 mechanisms.

Facilities and Equipment Utilized

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 (3ft x 3 ft) and is capable of reaching speeds of approximately half the speed of sound (Mach 0.5 - 550 ft/s or 165 m/s). 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 – Boulder (Cooperative Institute for Research in Environmental Sciences), the Air Force Office of Scientific Research (AFOSR/RTA1), US Army Combat Capabilities Development Command – Soldier Center (DEVCOM-SC), the Office of Naval Research (ONR Code 351), and the DoD Test Resource Management Center (DoD TRMC).

Trisonic Wind Tunnel

This facility is a blowdown tunnel capable of speeds across subsonic, transonic and supersonic regimes. Flow speeds from Mach 0.2 to Mach 4.5 are achieved in a 1ft x 1ft test section. Unit Reynolds numbers range from approximately 10M/ft to 36M/ft although not all Reynolds numbers are achievable at all Mach numbers). Experiments conducted in this facility are primarily in support of applied aerodynamics for aerospace vehicle and weapons systems. Diagnostics include static force/

moment measurements, surface pressure measurements, and high-speed Schlieren photography. This facility should be undergoing a substantial upgrade over the next year, which will modernize the tunnel control system and improve the model positioning system in order to expand the envelope of aerodynamic characterizations.

In the past year, this facility has supported work for a number of partners, including: the Air Force Research Laboratory (AFRL/RW and AFRL/RQ), the Missile Defense Agency (MDA), Radian Aerospace, the DoD Test Resource Management Center (DoD TRMC), the Edison Grant (AFRL and USAF Chief Scientist's Office), Rutgers University and the Republic of Korea Agency for Defense Development.

Mach 6 Ludwieg Tube

This facility is a shock-tube style tunnel capable of reaching Mach 6 with unit Reynolds numbers of 0.75M/ft to 9M/ft. Experiments are conducted in a 1.5 ft diameter test section with excellent visual access to support optical diagnostics to include infrared thermography and high-speed Schlieren photography. Run times are only ~100 msec, so high speed data acquisition systems are employed to ensure appropriate measurement fidelity. Experiments in this facility are typically associated with fundamental flow physics associated with the behavior of turbulent boundary layers at hypersonic speeds.

In the past year, this facility has supported work for a number of partners, including: the Hypersonic Vehicle Simulation Institute (DoD High Performance Computing Modernization Program – DoD HPCMP), the University Consortium of Applied Hypersonics (DoD Joint Hypersonics Transition Office – JHTO UCAH), Lockheed Martin Aeronautics, the Air Force Office of Scientific Research (AFOSR/AOARD) and Arnold Engineering Development Complex (AEDC – 716th Test Squadron).

Combustion Shock Tube

This facility is a shock-tube capable of studying the chemical kinetics of combustion. The shock tube operates by pressurizing a driver section with an inert gas (such as helium) and a driven section with the air/fuel mixture to be studied. A diaphragm placed between the two sections ruptures when the pressure imbalance reaches a critical level, sending a shock wave down the tunnel, raising the temperature and pressure of the fuel/air mixture to levels appropriate for the initiation of combustion. Advanced optical diagnostics are used to observe the ensuing combustion reaction, from which chemical kinetics can be discerned. Capable of operating from sub-atmospheric pressures up to 60 atmospheres, the shock tube allows the study of fuels across a wide range of conditionals relevant to Air Force applications.

In the past year, this facility has supported work for partners to include: the Air Force Office of Scientific Research AFSOR/RTA1), the Air Force Research Laboratory (AFRL/RQH) and the Office of Naval Research (ONR Code 351).

Small Uncrewed Aerial Systems

While not specifically a "facility," the Aeronautics Research Center maintains a robust capability to design, build, fly, and experiment with small uncrewed aerial systems. All aspects of sUAS development are explored, from characterizing/validating aircraft performance, to enabling new flight mechanics and control capabilities, to demonstrating complex mission execution. A team of test pilots, engineers, and technicians provide the requisite expertise to support sUAS operations across the spectrum from requirements-based design to coordinated flight experiments.

In the past year, this capability has supported work for partners to include: the Office of Naval Research (Code 351), Lockheed Martin Aeronautics, Sunlight Aerospace, and the Air Force Research Laboratory (AFRL/RQV).

The High Performance Computing Research Center (HPCRC) houses a 512 core compute cluster that we use for various research activities:

AFRL Rocket Cargo Vanguard support development of computational methods to allow for control surface deflections to achieve vehicle stability and control Computational Fluid Dynamics (CFD) simulations of vehicle aerodynamics during descend and deceleration.

Hypersonic Vehicle Simulation Institute (DoD HPCMP HVSI) and University Consortium of Applied Hypersonics (UCAH) development of computational methods for hypersonic flows to include real gas effects, fluid-structure interactions (FSI), and fluid-thermal structure interactions (FTSI) testing of turbulence models in hypersonic flowssimulations of jet injection into hypersonic flows around vehicles AFOSR MOA supported collaboration with Sandia National Laboratory hypersonic flow around a cone with a flexible section to investigate FTSI and comparison with SNL experimental data.

In addition, we maintain a significant number of high-performance workstations for simulation pre- and post-processing, including research in virtual reality visualization of scientific datasets.

Note that in addition to these local resources, we also maintain a high-speed network connection to DoD High Performance Computing Modernization Program (HPCMP) resources for simulations that exceed our local capabilities.
The Department of Astronautics features a Class 10,000 clean room, LDS Shaker System, and aThermotron S-16-8200 thermal chamber.

The LDS and Thermotron is used to evaluate spacecraft components' ability to survive launch and on orbit environments. The clean room is used to integrate satellites including FalconSAT-X, which will launch this fall.

Financials

CRADA Income

$524,294.07 *(reimbursed)*
$36,832.00 *(IDC)*

T2 Expenses **$63,517.00**

Performance Measures

Types	Active Agreements	New Agreements	Amendments
CRADAs	80	21	5
EPAs	2	2	-
CTAs	3	-	-
ITAs	2	2	-
NDAs	2	2	-
PLAs	4	-	-

Number of active & new agreements for any other T2 mechanisms the lab has (training affiliation agreements, software license, etc.): **1 TAA**

Intellectual Property

Invention Disclosures 6

Patent Applications 10

Patents Issued 3

Patents

Disclosures Received 6

Applications Filed 10

Patents Awarded 3

Total Active Patents 41

Federal Licenses

Invention Licenses, Total Active	5
Income Bearing Licenses, Total Active	4
Income Bearing Licenses, Total Active	3
Income Bearing Partially Exclusive, Total Active	1
Income Bearing Non-Exclusive, Total Active	-
Avg Time for Execution (months)	3
Min Time (months)	2
Max Time (months)	12

Federal Collaborative R&D Relationships

Traditional, Total Active (CRADAs)	80
Traditional, Newly Executed (CRADAs)	21
Newly Executed to Small Business	12
Total Active CRADAs w/ HBCUs and Minority Serving Institutions (MSIs)	1
New CRADAs w/ HBCUs and Minority Serving Institutions (MSIs)	1
CRADA Revenue ($)	$39,832.00 (IDC)
Estimated CRADA Contributed Value ($)	$526,126.00
Limited Purpose, Total Active (MTAs, NDAs)	2
Limited Purpose, Newly Executed	2

Additional Metrics

Total Active Educational Partnership Agreements (EPAs)	2
New EPAs	2
Total EPAs w/ Colleges/Universities	1
Total EPAs w/ High Schools	1
Total EPAs w/ Grade Schools	0
Active ITAs	2
New ITAs	2
Active CTAs	3
CTA Income ($)	$63,517.00

With an increase in staffing, DFQR aims to improve processes that are sustainable and create predictability of workflow that is impervious to minor disruptions. ★

SC/BC

Overview

FY23 was a successful year for Industry Outreach and CRADA development at Space Systems Command Space, Space Domain Awareness and Combat Power, and Battle Management Command and Control (SSC/SZ-BC). The SSC/SZ-BC program is designed to understand the "art of the possible" and to build better relations with industry to strengthen SSC space acquisitions. Over the course of the year, SSC/SZ-BC established new NDA-CRADAs with leading edge, non-traditional space industry partners. Some of these relationships lead to collaborators joining the new "SSC Front Door" industry engagement group, and others partners submitted to the SSC/SZ-BC FreeSol Broad Agency Announcement (BAA). The team was active with SpaceWERX (i.e. the USSF SBIR program) and Reverse Industry Days, where industry had one-on-one meetings with SSC leaders. SSC/SZ-BC, in cooperation with the SAIC, El Segundo, hosted one of the Office of Research and Technology Applications (ORTA) training sessions.

Laboratory Mission Statement – Develop, build, train, and equip United States Space Force (USSF) with advanced space systems to win engagements with hostile countries.

Description of organization/laboratory – SSC is comprised of five Program Executive Offices (PEOs). SSC/SZ-BC comprises two PEOs: 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/SZE-BCE) is responsible for managing the T2 and CRADA program across SSC/SZ-BC. SSC/SZ-BC is the only organization at SSC that has "Delegation of Authority to Enter into CRADAs" by DAFTEO; SSC/SZE-BCE is the Office of Research and Technology Application (ORTA) for SSC/SZ-BC.

Geographic location – SSC is located at Los Angeles Air Force Base, El Segundo, CA.

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, technology R&D.

The Year in Review

Success Stories

Facilitated the introduction and integration of CRADA partners to the SSC Warfighter Integration Office and "Space Safari." Space Safari responds to high-priority, urgent space needs by rapidly acquiring, integrating and executing missions in support requirements and combatant commander needs. These introductions boosted the portfolio of leading-edge technologies for rapid reaction capabilities to space threats.

Established multiple NDA-CRADAs that support revolutionary digital engineering and cyber security. These models represent every characteristic of a complex product or system that is to be developed. NDA-CRADA partner, Tectonic Labs' core product offering, Prxy, employs a unique approach to protecting software source code. Prxy has applications for software anti-reverse engineering, software and hardware anti-tamper, anti-counterfeiting, trusted computing, and secure communications.

Marketing and Outreach Activities

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 OTRA 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.

Year of Commission – The SSC/SZ-BC ORTA was established in 2018. Although the name has changed several times over the years, SSC, as currently named, has existed for over thirty years.

The Strategy

How ORTA fits into Lab Organization and Mission – SSC/SZE-BCE is the singular facility at SSC with the legal authority to manage T2 for SSC/SZ-BC.

How T2 Tools are a part of the lab strategic planning – SSC/SZE-BCE works together with all PEOs to integrate new space technologies into the future acquisitions cycle.

One Year Objectives and Strategy – Integrate technologies into the SSC Combined Capabilities Teams (CCT). The CCTs represent the integration of SSC needs and requirements with technology development. Additional objectives: (1) advancing and expanding "SSC Front Door" - the one stop shop for industry to interface with SSC; (2) developing the "SSC Front Door" classified adjunct.

https://www.ssc.spaceforce.mil/Connect-With-Us/Space-Systems-Command-Front-Door

Near Term Goals and Strategy – Refine processes between branches and divisions to maximize T3 value.

Long Term Objectives and Strategy – Create a paradigm that integrates T3 into the SSC Front Door process and across directorates.

Resources, Facilities, & Equipment

Resources Utilized

Human Resources – Two personnel (One government, One SETA) are the core of the T2 program. We also get support from our AFRL liaison that is co-located with our team. All branch members are routinely briefed on T2 activities.

Professional Development of ORTA – Government lead and SETA support person participated in ORTA training provided by AFRL T2 staff. Both individuals are the key personnel providing information, briefings, and training to SSC/SZ-BC personnel as required and field questions/provide reports for questions from O-7 for all T2 issues.

Facilities and Equipment Utilized

Unique Capabilities of the Laboratory – SSC has five Program Executive Offices (PEOs) – Space Domain Awareness (SDA) and Combat Power (SSC/SZ), Battle Management Command and Control (BMC2) (SSC/BC), Space Sensing (SSC/SN), Military Communications and Position, Navigation, and Timing (SSC/CG), and the Space Integration Office (SSC/BZ). SSC is the singular agency in USSF chartered to develop, train, field, and equip the warfare fighter for space dominance.

Federal Collaborative R&D Relationships

Limited Purpose, Total Active (MTAs, NDAs)	**19**
Limited Purpose, Newly Executed	**9**

Performance Measures

Types	Active Agreements	New Agreements	Amendments	
NDAs	19	9	-	★

ANNUAL REPORT ACRONYMS

The following acronyms are used throughout the Department of the Air Force Technology Transfer and Transition (DAFT3) Annual Report.

#

67 CW	67th Cyber Wing
96 TW	96th Test Wing
319 RW	319th Reconnaissance Wing
375 AMW	375th Mobility Wing
412 TW	412th Test Wing
688 CW	688th Cyber Wing
711 HPW	711th Human Performance Wing

A

ACS	Agile Communications System
AEDC	Arnold Engineering Development Complex
AETC	Air Education Training Command
AFCEC	Air Force Civil Engineering Center
AFGSC	Office of the Chief Scientist
AFI	Air Force Instruction
AFIT	Air Force Institute of Technology
AFLCMC	Air Force Life Cycle Management Center
AFLCMC/EN-EZ	Engineering and Technical Engineering Services Directorate
AFLCMC/HB	Digital Directorate
AFLCMC/HN	Command, Control, Communications, Intelligence and Networks Directorate
AFLCMC/RO	Rapid Sustainment Office
AFLCMC/WA	Advanced Aircraft Division
AFLCMC/WI	Intelligence, Surveillance and Reconnaissance Directorate
AFLCMC/XA	Architecture and Integration Directorate
AFMC	Air Force Materiel Command
AFMCLO/JAZ	Air Force Materiel Command Intellectual Property Legal Office
AFNWC	Air Force Nuclear Weapons Center
AFOSR	Air Force Office of Scientific Research
AFRL	Air Force Research Laboratory
AFRL/AFOSR	Air Force Research Laboratory Air Force Office of Scientific Research
AFRL/NM	
AFRL/RD-RV	Air Force Research Laboratory's Space Vehicles Directorate Directed Energy Directorate
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 Education Training Command
AFRL/SB	Air Force Research Laboratory's Strategic Partnership Directorate
AFSC	Air Force Sustainment Center
AFSOC	Air Force Special Operations Command
AFTAC	Air Force Technical Applications Center
AFTC/ENS	Air Force Test Center Engineering and Technical Management
AFWERX	Air Force Work Project
APEX	Academic Partnership Engagement Experiment

B

BRICC	Basic Research Innovation Collaboration Center

C

CCTI	Catalyst Campus for Technology Innovation
CE	Collaborative Environment
CFSCC	Combined Force Space Component Command
CNMI	Central New Mexico Community College Ingenuity Incorporated
COVID-19	Coronavirus Disease
CRADA	Cooperative Research and Development Agreement
CTA	Commercial Test Agreement
CWC	Chemical Weapons Convention

D

DAF	Department of the Air Force
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
DC3	Department of Defense Cyber Crime Center
DoD	Department of Defense
DTTIS	Defense Technology Transfer Information System

E

EAFB	Edwards Air Force Base
EPA	Educational Partnership Agreement

F

FY	Fiscal Year

G

GOTS	Government-Off-the-Shelf

H

HBCUs	Historically Black Colleges & Universities

I

IP	Intellectual Property
ISR	Intelligence, Surveillance, & Reconnaissance
ITA	Information Transfer Agreement

J

K

L

LPC	Limited Purpose CRADAs

M

MTA	Material Transfer Agreement

N

NASA	National Aeronautics and Space Administration
NASIC	National Air and Space Intel Center

NSIN	National Security Innovation Network
NTTS	NASA Technology Transfer System
NYSTEC	New York State Technology Enterprise Corporation

O

OMB	Office of Management & Budget
ORTA	Office of Research and Technology Applications
OSD	Office of the Secretary of Defense

P

PEO	Program Executive Officer
PI	Partnership Intermediaries
PIA	Partnership Intermediary Agreement
PLA	Patent License Agreement

Q

R

R&D	Research and Development
RDT&E	Research, Development, Test & Evaluation

S

S&Es	Scientists and Engineers
SAF/AQR	Deputy Assistant Secretary of the Air Force for Science, Technology and Engineering
SAF/IA	
SBIR	Small Business Innovation Research
SETA	Systems Engineering and Technical Assistance
SLD 30	Space Launch Delta 30
SME	Subject Matter Experts
Space RCO	Space Rapid Capabilities Office
SSZ/SC-BC	Space Systems Command Delegate
S&T	Science & Technology
STEM	Science, Technology, Engineering, and Mathematics
STTR	Small Business Innovation Research

T

T2	Technology Transfer
T3	Technology Transfer and Transition
TEO	Technology Executive Officer
TRL	Technology Readiness Level

U

USAF	United States Air Force
USAFA	United States Air Force Academy
USAFSAM	United States air Force School of Aerospace Medicine
USSF	United States Space Force
UTCWG	University Tech Collider Working Group

V

W

WBI	Wright Brothers Institute
WPAFB	Wright-Patterson Air Force Base

X

Y

Z