DEPARTMENT OF THE AIR FORCE

TECHNOLOGY TRANSFER & TRANSITION

ANNUAL REPORT 2022

There are a variety of ways to partner with us, and we take a creative approach to exploring collaborative possibilities, and long term alliances. Whether our expertise is most useful as an extension of your own research and development efforts, or the possibility of discovering something through collaborative research exists, we have the flexibility to be the kind of partner you need.

PARTNERING WITH A SHARED VISION

CONTENTS

MESSAGE FROM THE PROGRAM DIRECTOR JOSEPH GORDON

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 (DAF T3) Annual Report, which highlights DAFT3PO activities. The FY22 report demonstrates how the DAF T3 Office and 37 other DAF organizational activities, both Air Force and Space Force, have been successful in technology transfer activities.

As I look back at my time as tenure as Program Director of the Department of the Air Force Technology Transfer and Transition Program Office (DAFT3PO), I am proud to see how far we've come. However, I recognize the opportunity of how much further this program can go.

When I left the Pentagon to accept this position in 2018, Technology Transfer was the lowest-funded program among my options. Not only were we lacking funding, but we also lacked a cohesive database as well as direction. It became the opposite of what I thought I would have to do to improve and run the program. Even the expansion of our royalty program has proven to be challenging on a continual basis. It is like changing a flat tire while the car is still moving, because we're having to fix things while monitoring the processes at the same time. That's not easy to do. However, both the royalties and the technology transfer and transition programs continue to grow exponentially.

From the beginning we identified seven critical areas to drive and maintain innovation in supporting the Department of the Air Force and its mission:

1. Policy – Identify regulatory impediments and administrative improvements in federal technology transfer/ transition policies and practices;
2. Communication – Improve marketing and use of social media;
3. Training – Build an entrepreneurial focused Research and Development (R&D) workforce;
4. Tools – Support innovative tools and services for technology transfer/transition;
5. Partnerships – Effectively leverage other government agencies, industry and academia;
6. Innovation – Improve technology scouting and continue Innovation discovery events; and
7. Metrics – Monitor overall effectiveness of the Department of the Air Force Technology Transfer and Transition (T3) Program and understand R&D trends and benchmarks

Aside from the seven areas identified within the program, there were three objectives we absolutely had to achieve:

1. Get core funding,
2. Establish a database, and
3. Put the right technology transfer and transition team together.

Having achieved the first two objectives earlier, I now believe I have the right team in place. I'm not only talking about getting the right people on the bus but getting the right people in the right seats. That was instrumental. We went from three positions – including my position – to increasing to seven government employees and five support staff contractors. We also added a team for the Defense Technology Transfer Information System (DTTIS) database. This achievement is significant and paramount to assuring we get this product completed for the entire technology transfer community.

Today the program is intrinsically focused on linking technology to the marketplace. We're talking about working with academia and industry outside the gate. I see technology transfer activities continuing to grow and I sincerely believe the new database will be our saving grace in the future. It won't be long before all of the Department of Defense (DoD) realizes its significance to the point of adopting it, especially when they realize it's relatively free to utilize.

As I leave the program my message to all the technology transfer professionals is to continue to let their supervisors know how important this program is. We're only scratching the surface of all the opportunities through this program. There's so much more we can do with technology transfer.

Many times I've said, if I can describe my job within the technology transfer program, the one word is "faithful." My parting thoughts for everyone on the team is to be faithful to technology transfer. That's our mission, no matter how big or small. We're talking about the Warfighter. The only reason I come to work is because of the warfighter. There are people out there right now putting their lives on the line for us. The biggest thing we can do is to make the fight unfair. That's what's important to me.

PROGRAM STRATEGY

The mission of the Department of the Air Force Technology Transfer and Transition Program Office (DAFT3PO) 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 DAFT3PO encourages the private sector to use their technologies along with Air Force and Space Force technologies through T2 mechanisms. The DAF benefits by working with companies having knowledge and expertise in the technological areas of interest. According to 15 USC §3710, "It is the responsibility of the Federal Government to ensure the full use of the results of the nation's federal investment in Research and Development (R&D)."

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.

The DAFT3PO accomplishes this mission through the following:

- 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 technology transfer;
- Leveraging partnerships to stimulate local, regional, and national economic development

Key Objectives for the DAFT3PO

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

Strategy to Obtain Objectives

The DAFT3PO has begun the process of updating policy documentation while enhancing strategies to accelerate tech 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 will begin the process to update and improve AFI 61-301 in FY23 to continue streamlining processes.

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 FY22, electronic payment information was relocated towards the beginning of all license agreements.

This group will continue to work to improve the clarity of agreements with assistance from TechLink in FY23. Once the group has completed updating Patent License Agreements (PLAs), their attentions will turn to Educational Partnership Agreements (EPAs).

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 FY22; successfully scheduling three events for FY23 in Niceville, Florida, Dayton, Ohio, and San Antonio, Texas with several more remaining in the planning stages. These training events are coordinated in conjunction with AFMCLO/JAZ attorneys to ensure proper procedures are thoroughly detailed and opportunities for improvement are identified.

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 FY22. Initial operational capability is on schedule for FY23.

LEADERSHIP

The Deputy Assistant Secretary of the Air Force for Science, Technology and Engineering (SAF/AQR) is the Office of Primary Responsibility for the DAF T3 program and is responsible for establishing its objectives consistent with Air Force research priorities.

The Department of the Air Force Technology Executive Officer (DAF TEO) is responsible for program management of the DAF T3 Program.

The DAF T3 Director, appointed by the DAF TEO, is responsible for accomplishing the objectives of the Program, as well as directing, coordinating, and implementing all guidance and procedures related thereto.

The DAF T3PO resides in the Air Force Research Laboratory Small Business Office at Wright-Patterson Air Force Base (WPAFB), Ohio.

KRISTEN BALDWIN

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

OFFICE OF THE ASST SECRETARY OF THE DEPARTMENT OF THE AIR FORCE FOR ACQUISITION

Pentagon

DR. YVETTE WEBER

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

OFFICE OF THE ASST SECRETARY OF THE DEPARTMENT OF THE AIR FORCE FOR ACQUISITION

Pentagon

BENJAMIN PHILLIPS

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

OFFICE OF THE ASST SECRETARY OF THE DEPARTMENT OF THE AIR FORCE FOR ACQUISITION

Pentagon

MAJ GEN HEATHER L. PRINGLE

Air Force Research Laboratory Commander

AIR FORCE TECHNOLOGY EXECUTIVE OFFICER

WPAFB

BRIAN MCJILTON

Small Business Directorate Director

AIR FORCE RESEARCH LABORATORY

WPAFB

JOSEPH GORDON

Air Force Technology Transfer and Transition Director

AIR FORCE RESEARCH LABORATORY

WPAFB

Director Gordon's T3 Journey: a RETJOSPECTIVE

Mr. Joseph (JoGo) Gordon began his career as a research student at Johnson Space Center in Houston, Texas in 1985. Working in the Biomedical and Electric Antennas Divisions, he never thought he'd one day become a program director, overseeing an organization responsible for supporting nearly 7,000 jobs and contributing more than $800 million in added value of economic impact. Looking back, now at the end of a long and esteemed career, Mr. Gordon can appreciate the lessons he's learned throughout that journey.

"If I could talk to myself from 1985, I would tell myself to enjoy the ride, take your faith with you to work every day, and say less in meetings," he said with a smile. "I'm certainly not the same person I was back then. The experience and confidence have grown tremendously. I never thought I would be in this position. I was shocked when I was named a team lead for the first time while at the Air Force Research Lab (AFRL) Munitions Directorate at Eglin Air Force Base in 1995. Then I became a branch chief in 2000 and kept getting promoted and I couldn't believe it. I've been a supervisor for over 24 years."

Though, earlier in his career, he didn't see himself as a leader, Joseph has said he embraced his supervisory roles because of his love for people. He added learning to trust and depend on his team has been very rewarding to him.

Mr. Gordon took over as the DAFT3PO Director in 2018 after serving three years as Science & Technology (S&T) Division Chief at the Pentagon in Washington, D.C. for what he thought would be a serene final assignment before retirement. But the role proved to be more difficult than he expected.

"While I enjoyed my work at the Pentagon, I had to step away to be closer to my family. That's when I took this position. This was the last job I wanted, and I deliberately took this job for peace of mind," Joseph recalled. "(But) If I hadn't gone to certain places earlier in my career, there is no way I could do this job. If I hadn't been a technical director at headquarters with the Air Force Materiel Command (AFMC) and a division chief, I would be shivering every time there was a Congressional inquiry. All of my previous positions have served me well throughout my career."

Of all the various stops over the course of his career, Mr. Gordon says Technology Transfer is his favorite job because of what he was able to achieve in the five years he was here.

"The reason being of all the processes we've put in place here as well as all the accomplishments of my team. I've never had so many accomplishments in one job. As Program Director of Technology Transfer and Transition, I've been able to get a sufficient budget, increase the number of government and contractor employees, and build a complete database among other things. That's why this was the best job I've had because I really got to make a difference."

Still, Mr. Gordon says the daunting task of getting valuable technology into the hands of those who need it most shall remain the biggest challenge – and among the biggest disappointments – he's experienced during his career. Various roadblocks ranging from budgetary to communication issues have slowed the process as he sees it.

"It's still incredibly difficult to get products to the warfighter; (due to) the acquisition process. At the end of the day, our end metric is what we do for the warfighter. These people are putting their lives on the line for us. It's not always a matter of who has the best technology but a question of who knows how to best navigate the system/processes to get new solutions/capabilities for the warfighter," he said.

However, Mr. Gordon will retire satisfied with how far the DAFT3PO has come, but says he'll miss a lot about the job. "I'm going to miss it the day after I leave. I'll miss this job, the good people I've worked with, and my team for the rest of my life. When I first started my career, I was very self-assured. I'm leaving now very humbled and appreciative," he said.

Upon leaving, Mr. Gordon has a simple recommendation for whomever takes over as the next program director: "Take care of your people first and they will take care of you. Please listen to your team."

LEGAL SERVICES

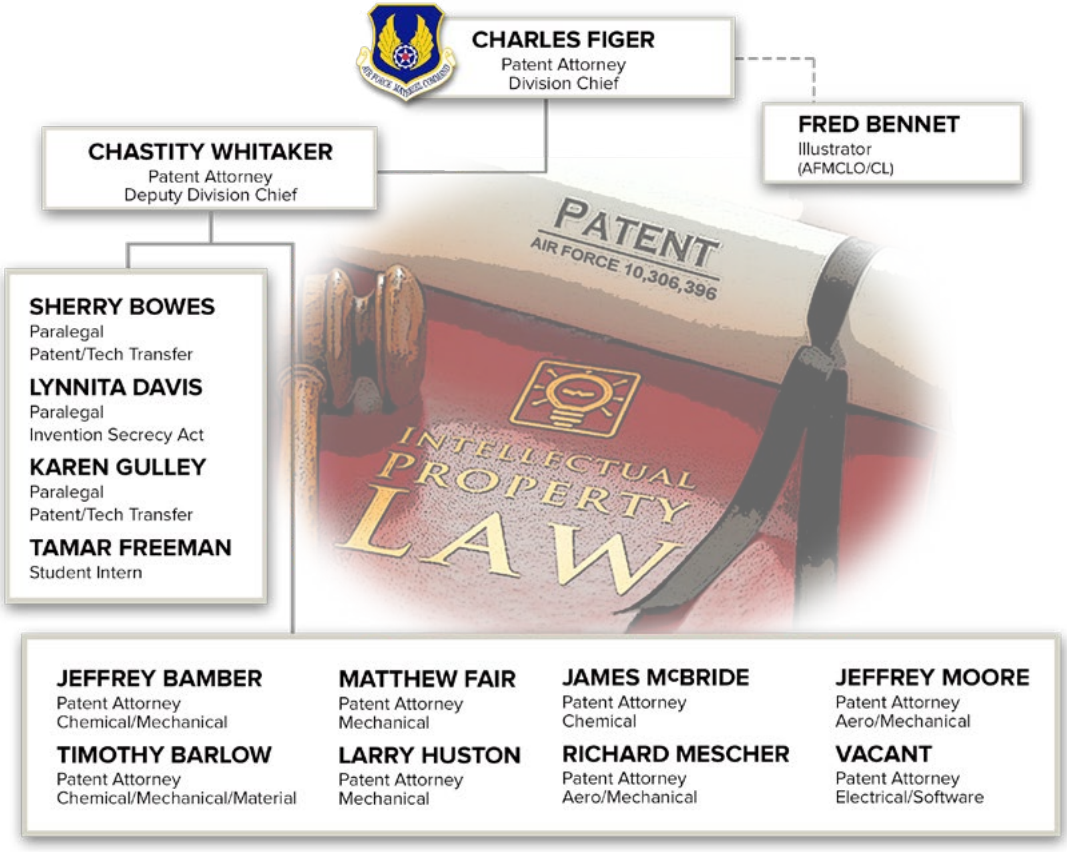
INTELLECTUAL PROPERTY LAW DIVISION

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 DAF T3 mission in several ways. As the servicing legal office to most Air Force designated laboratories, attorneys provide legal reviews of all types of 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.



DAF T3 PROGRAM OFFICE

The Department of the Air Force Technology Transfer and Transition Program Office (DAFT3PO), under Director Joseph Gordon, operates under the Air Force Research Laboratory's Small Business Office (AFRL/SB). The AFRL/SB Director is Mr. Brian McJilton and its Deputy Director is Mr. Bruce Miller.

The office manages and supports many 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 office also handles delegations, as granted by the TEO, and makes determinations of new ORTAs and Delegated Authority requests, all of which are coordinated with the Air Force Materiel Command (AFMC) Intellectual Property Legal Office (LO/JAZ). The DAFT3PO also supervises 17 Partnership Intermediaries (PI) and provides Partnership Intermediary Agreement (PIA) Training. Additionally, DAF T3 oversees and issues patent royalty disbursements, outreach efforts, technology scouting, technology transfer awards, social media presence, publishing success stories, and calculating metrics.

The premier effort by this office 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. The deployment of DTTIS is anticipated in mid FY23. All of these areas have detailed write-ups throughout this report.

Finally, the DAFT3PO is responsible for updating Air Force Instruction (AFI) 61-301, as necessary, and publishing the T3 Handbook.

DEFENSE TECHNOLOGY TRANSFER INFORMATION SYSTEM

As previously mentioned in the FY21 report, the DAFT3 program 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 DAFT3 program 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 DAF T3 office, 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 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 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

DTTIS

DEFENSE TECHNOLOGY TRANSFER INFORMATION SYSTEM

- 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 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).

Currently, the development team is establishing Cloud One Test, Integration, and Production environments for DTTIS to support limited testing. Initial operational capability is on schedule for FY23. Once fully implemented, DTTIS is projected to provide an annual $6.25M cost savings across the DAF by automating and streamlining T3 activities.

TECHNOLOGY TRANSFER AWARDS

AIR FORCE EXCELLENCE IN TECHNOLOGY TRANSFER

In FY22, the DAFT3PO revamped their awards program to align with the Office of the Secretary of Defense (OSD) and pivoted from a quarterly award recognition process to annual award acknowledgements. The annual awards program recognizes outstanding contributions to T2. The T3 Air Force Excellence in Technology Transfer Award focuses on the accomplishments of individual employees and teams whose work enhanced or improved T2 within their organization and throughout the DAF. Nominees may be either civilian or military personnel within the DAF who were involved in a T2 effort in some capacity. Such personnel may include scientists, engineers, managers, and T2 professionals. Award winners -- with the exception of non-government contractors -- advance to the OSD level. The recipients were honored at the Annual Technology Transfer and Transition Workshop held in San Antonio, Texas in November 2022.

Delegation Team

Rachel Bankowitz, Sharon Barker, Jim Ingram, Jack Owsley and Chastity Whitaker

The DAF T2 Agreements team, led and advised by Air Force Materiel Command Legal Office, Intellectual Property Law Division (AFMCLO/JAZ), reviewed and accessed 52 different organizations, analyzing agreements, frequency of those agreements, and staffing among other metrics to determine signature authority. At the completion of this extensive eight-month process, the team found many of the delegations were rendered obsolete due to reorganization, deactivation, or had simply never been used and were otherwise unnecessary. They then drafted an updated delegation letter and presented it to DAF Technology Executive Officer Maj Gen Heather Pringle who praised the team for their hard work before signing it on October 12, 2022. This brought the total number of delegations to 37, further helping to streamline innovation within the program.

Josh Laravie

Mr. Laravie of the Air Force Research Laboratory Aerospace Systems Technical Directorate (AFRL/RQ) has excelled in his duties at Wright-Patterson AFB in support of the United States Air Force and the Technology Transfer mission as directed by Congress. While operating in an everchanging environment with diminished staffing, he solely supported the Aerospace System Directorate roughly 1,200 scientists and engineers with technology transfer and intellectual property considerations. In addition to these primary duties, he served as the lead for other partnership activities in the organization, including domestic government support agreements and was the Senior International Focal Point (SIFP). During the past year, Mr. Laravie was instrumental in maintaining and promoting new and effective uses for technology transfer agreements. Specifically, he supported a team in developing language and processes to allow for access and application of Air Force software packages in new cloud-based environments. This effort expands the Air Force's ability to distribute critical software and enables the use of evolving technology domains.

Bill Loux

Mr. Loux was instrumental in helping organize and facilitate Office of Research & Technology Application (ORTA) training at the Air Force Research Laboratory Munitions Directorate (AFRL/RW) at Elgin AFB during FY22 for this fall. Before coming to the Munitions Directorate as an ORTA in 2018, he served for 14 years as a technology commercialization consultant and was a director of business development for 11 years prior to that. **Mr. Loux has made educating scientists and engineers (S & Es) on the importance of protecting intellectual property one of his primary goals.** He has also placed an emphasis on helping S&Es find commercial applications for their research.

Fred Geohagan

Mr. Geohagan spent nearly 22 years serving the DAF on active duty as a superintendent working in information management before becoming a support contractor as an acquisition project specialist for the Air Force Research Laboratory Munitions Technical Directorate for the last 30. He was also very supportive in assisting to help organize and facilitate ORTA training at the AFRL Munitions Directorate at Elgin AFB during FY22 for this fall.

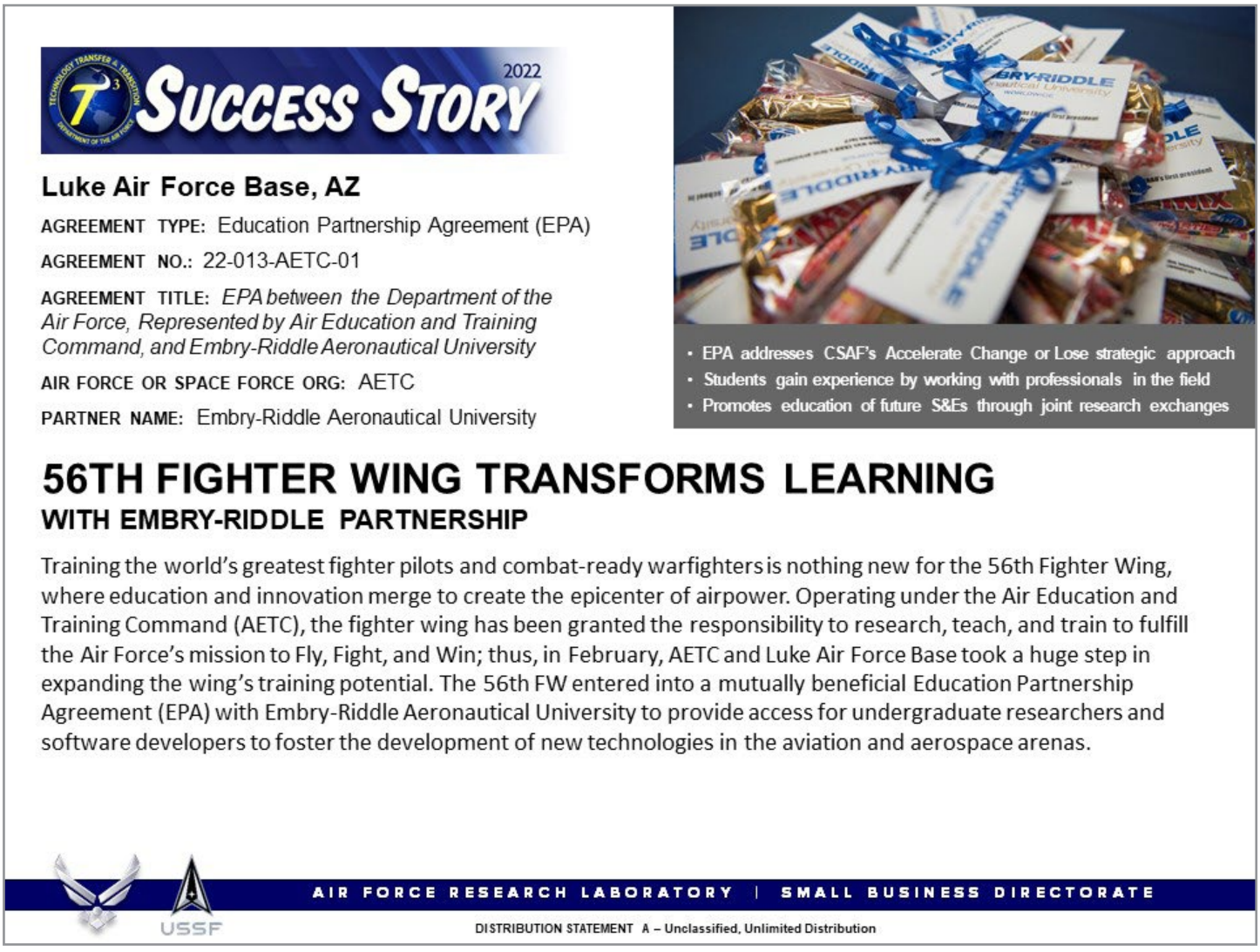
Steve Colenzo
Mr. Colenzo is an ORTA at the Air Force Research Laboratory Information Technical Directorate (AFRL/RI) and manages both the Griffiss Institute and the New York State Technology Enterprise Corporation partnership intermediaries. He has also been instrumental in coordinating events while driving innovation and sales for the technology transfer program. Prior to his current role, Mr. Colenzo worked for 19 years as a lead program manager for the AFRL.

Col. William Mamourieh
Col. Mamourieh was responsible for standing up delegated authority status at both the Air Education Training Command (AETC) and later the Air Force Training Applications Center (AFTAC). He has also been instrumental in his assistance to the AFRL Small Business (SB) Regional Hub and to the DAFT3PO Director. Col. Mamourieh is a former GovLoop NextGen Public Service Innovator of the Year Award winner (2020).

59th Medical Wing
Dr. Beth Dress, Joseph Lynch, David Sharon, Dr. Jesus Silvas, Dr. Scott Walter, and Dr. James Weissman
This organization has produced numerous medical CRADAs, EPAs, and inventions to better serve the warfighter. While still under the DAF, the 59TH Medical Wing (MDW) was highly active in technology transfer activities and among the most frequent contributors to the DAFT3PO.

IN THE NEWS

One of the legal requirements of the Office of Research and Technology Applications (ORTA) is to provide and disseminate information on federally owned or originated products, processes, and services having potential application to State and local governments and to private industry. One of the ways the DAFT3PO meets this requirement is utilizing success stories, which highlights and shares news and pertinent information on our website and social media outlets. Using these published articles, the technology community is informed of topics ranging from approved partnership agreements to collaboration opportunities and intellectual property licensing availabilities.



T3 SUCCESS STORY 2022

Luke Air Force Base, AZ

AGREEMENT TYPE: Education Partnership Agreement (EPA)

AGREEMENT NO.: 22-013-AETC-01

AGREEMENT TITLE: *EPA between the Department of the Air Force, Represented by Air Education and Training Command, and Embry-Riddle Aeronautical University*

AIR FORCE OR SPACE FORCE ORG: AETC

PARTNER NAME: Embry-Riddle Aeronautical University

- EPA addresses CSAF's Accelerate Change or Lose strategic approach
- Students gain experience by working with professionals in the field
- Promotes education of future S&Es through joint research exchanges

56TH FIGHTER WING TRANSFORMS LEARNING WITH EMBRY-RIDDLE PARTNERSHIP

Training the world's greatest fighter pilots and combat-ready warfighters is nothing new for the 56th Fighter Wing, where education and innovation merge to create the epicenter of airpower. Operating under the Air Education and Training Command (AETC), the fighter wing has been granted the responsibility to research, teach, and train to fulfill the Air Force's mission to Fly, Fight, and Win; thus, in February, AETC and Luke Air Force Base took a huge step in expanding the wing's training potential. The 56th FW entered into a mutually beneficial Education Partnership Agreement (EPA) with Embry-Riddle Aeronautical University to provide access for undergraduate researchers and software developers to foster the development of new technologies in the aviation and aerospace arenas.

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DISTRIBUTION STATEMENT A – Unclassified, Unlimited Distribution

For the full story go to https://www.aft3.af.mil/Success-Stories/

IN THE NEWS

SUCCESS STORY 2022

Kessler Air Force Base, MS

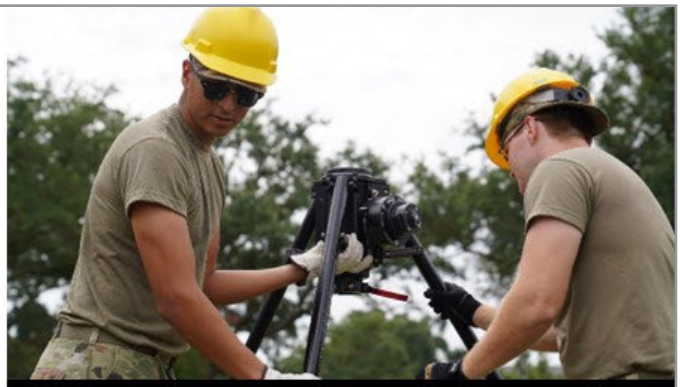
AGREEMENT TYPE: Cooperative Research and Development Agreement (CRADA)

AGREEMENT NO.: 220815-6-A9-CRADA

AGREEMENT TITLE: *CRADA between the Department of the Air Force, Represented by 338th Training Squadron, and University of Central Florida*

AIR FORCE OR SPACE FORCE ORG: AETC

PARTNER NAME: Florida Interactive Entertainment Academy



- Gamification cost effectively modernizes education and training
- Students learn in an interactive and immersive way
- Increases information sharing and networking opportunities

388TH TRAINING SQUADRON SEIZES THEIR WINDOW OF OPPORTUNITY

Following the Air Force Chief of Staff Gen. Charles Q. Brown's Accelerate Change or Lose strategic approach, the Joint Warfighting Concept focuses on moving forward with digital, low cost, high tech, warfighting capabilities. The 338th Training Squadron's Cooperative Research and Development Agreement with the University of Central Florida allows the unit to work with graduate students at the Florida Interactive Entertainment Academy, UCF's Master of Science in Interactive Entertainment program.

The 338th Training Squadron's Cooperative Research and Development Agreement with the University of Central Florida allows the unit to work with graduate students at the Florida Interactive Entertainment Academy, UCF's Master of Science in Interactive Entertainment program

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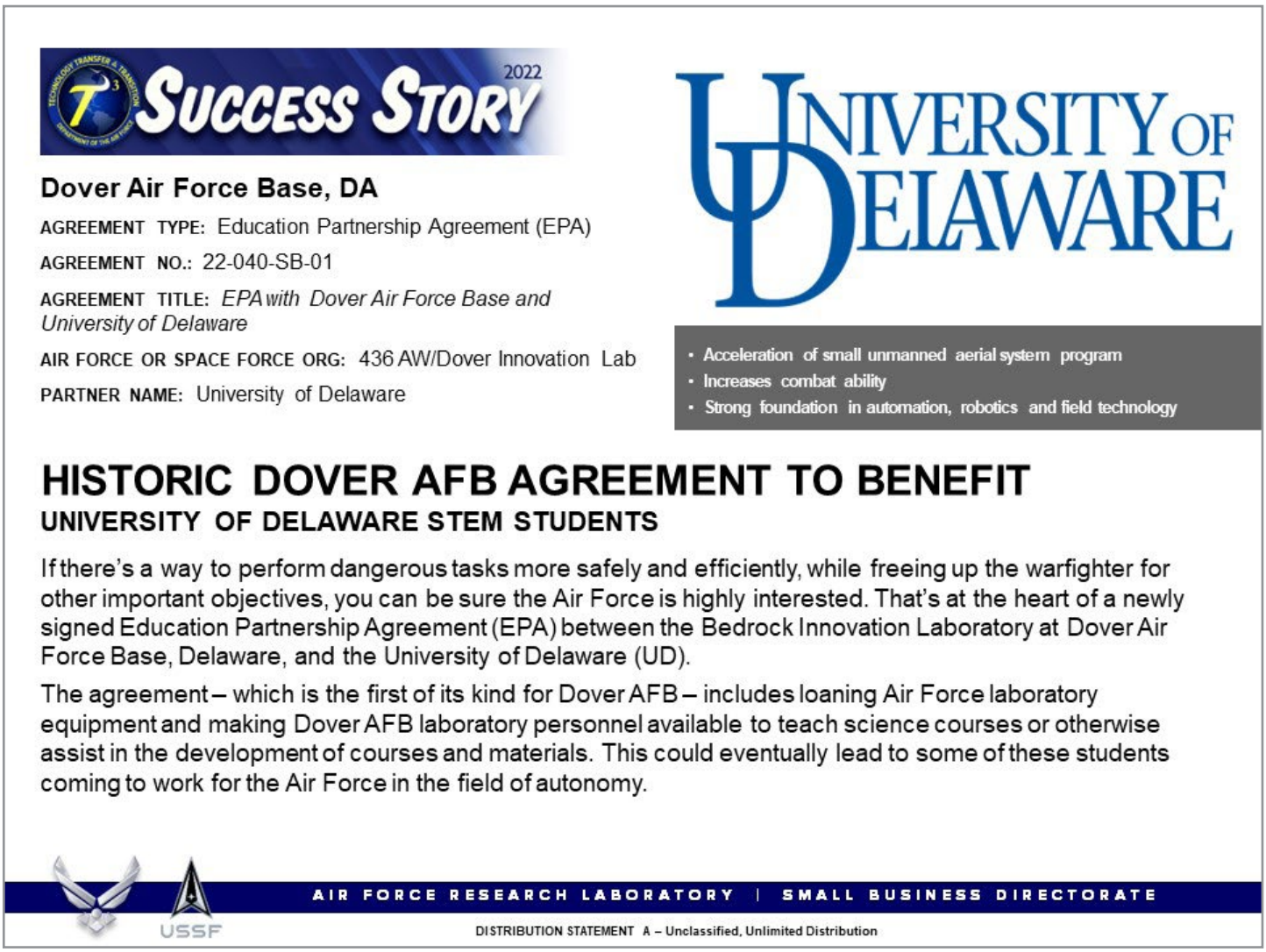
IN THE NEWS



T3 SUCCESS STORY 2022

Dover Air Force Base, DA

AGREEMENT TYPE: Education Partnership Agreement (EPA)

AGREEMENT NO.: 22-040-SB-01

AGREEMENT TITLE: *EPA with Dover Air Force Base and University of Delaware*

AIR FORCE OR SPACE FORCE ORG: 436 AW/Dover Innovation Lab

PARTNER NAME: University of Delaware

UNIVERSITY OF DELAWARE

- Acceleration of small unmanned aerial system program
- Increases combat ability
- Strong foundation in automation, robotics and field technology

HISTORIC DOVER AFB AGREEMENT TO BENEFIT UNIVERSITY OF DELAWARE STEM STUDENTS

If there's a way to perform dangerous tasks more safely and efficiently, while freeing up the warfighter for other important objectives, you can be sure the Air Force is highly interested. That's at the heart of a newly signed Education Partnership Agreement (EPA) between the Bedrock Innovation Laboratory at Dover Air Force Base, Delaware, and the University of Delaware (UD).

The agreement – which is the first of its kind for Dover AFB – includes loaning Air Force laboratory equipment and making Dover AFB laboratory personnel available to teach science courses or otherwise assist in the development of courses and materials. This could eventually lead to some of these students coming to work for the Air Force in the field of autonomy.

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MARKETING & COMMUNICATIONS

DAF T3 WEBSITE

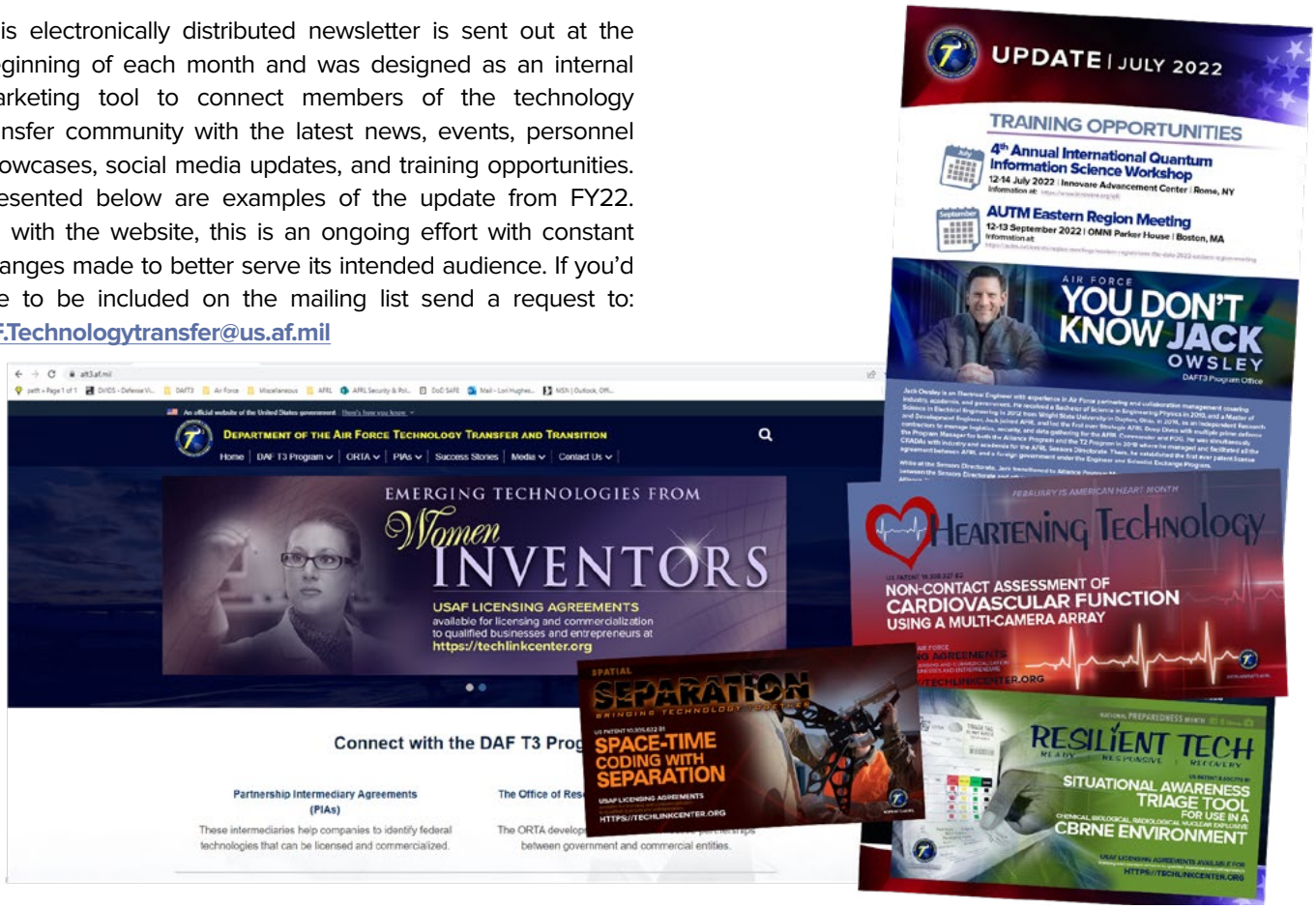
The program office's primary hub for all information related to technology transfer and transition is located at **https://www.aft3.af.mil.** This site features a number of useful tools, including access to the DAF T3 Handbook, partnership agreement mechanisms, and the latest news from the technology transfer community. More than 35,000 people visited the website in FY22, which is a more than four percent increase from FY21. Aside from the United States, the second and third most visitors to the page resided in Germany and India, respectively. The webpage is fluid in that information is constantly being added to better reflect the needs of the DAF and technology transfer professionals. It can be accessed on both government and commercial servers via computer and mobile devices. The DAFT3PO began a review of the current site in FY22 and will be making updates to better inform the technology transfer community in FY23.

DAF T3 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. Presented below are examples of the update from FY22. 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 DAF T3 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. DAFT3PO's intent was to assist entities interested in DAF technology to connect and transfer cutting-edge patents to their company for product development. Sixty-nine technologies were ultimately highlighted throughout the year under this initiative. Capitalizing on these efforts in FY23, the office will create a complete marketing spotlight on DAF innovators who are awarded patents, featuring their technology on the DAF T3 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.



MARKETING & COMMUNICATIONS

SOCIAL MEDIA

The DAF T3 social media program continues to grow steadily since its inception just two 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 Twitter pages have experienced the most significant growth.

LinkedIn

The majority of the followers for this channel for FY22 identify as working within the defense industry in business development, with engineering and information technology being tied for second. This suggests the site is attracting the right backgrounds to the technology transfer program. The channel welcomed more than 200 new followers, making steady gains each week.

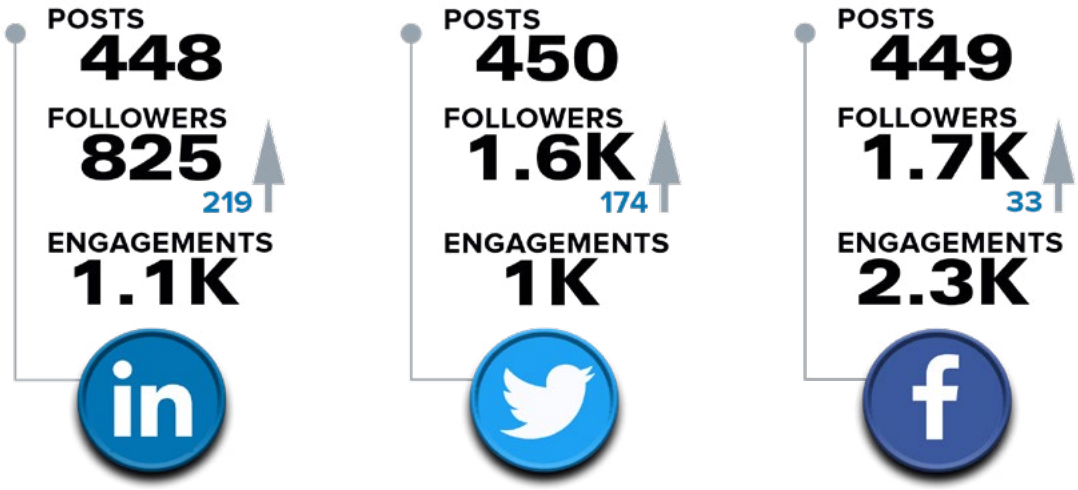
The industry standard for ideal engagement parentage of posts made is anything above two percent. This channel exceeded that mark, peaking at more than eight percent.

Twitter

Twitter discontinued its analytics features in January of 2020, greatly limiting the information regarding postings and followers. However, the site welcomed more than 170 new followers in FY22, passing the 1,600 mark in August.

Facebook

As with Twitter, Facebook has greatly limited the analytics features they once offered. However, it was discovered most of the new followers for this channel originated from the United States, while new followers from outside the country dropped from the previous fiscal year.



EVENTS

MEETINGS AND TRAINING

Coordinating training opportunities has been crucial to the success and overall performance of the Technology Transfer program. The DAFT3PO further emphasized the importance of these opportunities in FY22. Though COVID continued to hamper travel plans, the program was successful in coordinating training opportunities during the most recent fiscal year.

The DAFT3PO organized four separate events, to include three individual ORTA training sessions, with the first taking place in Dayton, Ohio April 7, 2022. These sessions are tailored to provide valuable information for new ORTAs while offering experienced ORTAs the opportunity enhance their knowledge as well as share their experience with others. The courses cover the agreements – Cooperative Research & Development Agreements (CRADAs), Educational Partnership Agreements (EPAs), Commercial Test Agreements (CTAs), Information Transfer Agreements (ITAs), Material Transfer Agreements (MTAs), Patent License Agreements (PLAs), Software License Agreements (SLAs), and Non-Disclosure Agreements (NDAs)– as well as methods to support technology transfer opportunities, supporting S&Es, and remaining in compliance with DoD and service-specific policies. The DAFT3PO also held a virtual quarterly meeting on July 22, 2022. Attendees were introduced to new Department of the Air Force Office of Research and Technology Applications (DAF ORTA) Lead Jack Owsley and provided the latest information and trends on topics regarding royalties, collections, the Defense Technology Transfer Information System (DTTIS), as well as a presentation from the Air Force Materiel Command Legal Office, Intellectual Property Law Division (AFMCLO/JAZ).

Three additional ORTA training events were also coordinated during FY22. Elgin Air Force Base in Florida was selected to host a one-day event on October 19, 2022. One-day trainings were also planned for October 25, 2022 in Dayton, Ohio, and on November 3, 2022 in San Antonio.

The DAF T3 Annual Workshop was scheduled for November 1-2, 2022 in San Antonio, Texas. The workshop serves as a highly valuable opportunity for technology transfer professionals to discuss current issues, network, plan, and develop strategies to further advance the DAF T3 mission. Program Director Joseph Gordon was scheduled to serve as the host with various speakers presenting from the technology transfer community. The workshop agenda included presentations covering United States Space Force Tech Connect, Air Force Work Project (AFWERX), DTTIS, Partnership Intermediary Agreement (PIA) policy and training, and the presentation of quarterly awards.

DAFT3PO event planning is ongoing for FY23, pending any potential travel restrictions.

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, DoD agencies, federal laboratories, and other entities based on customer needs.

The challenges of COVID have significantly impacted tech scouting efforts, which typically involve traveling the country to various events to meet and network with technology professionals. The 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.”

PARTNERSHIP INTERMEDIARIES

The DAFT3PO currently manages four Partnership Intermediaries (PIs). TechLink and MilTech are sponsored by the Office of the Secretary of Defense, in conjunction with Montana State University, and are managed by Ms. Tricia Randall. The Wright Brothers Institute (WBI), which is managed by Mr. Terry Cunningham, and a joint effort PI of the Parallax Advanced Research (PAR) and Academic Partnership Engagement Experiment (APEX), managed by Ms. Randall and Mr. Justin Earley, are sponsored solely by the Air Force.

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 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.

Information contained herein has been submitted by each organization and included verbatim.

LOCATIONS

PARTNERSHIP INTERMEDIARIES

DoD PIA

Website: https://www.montana.edu/miltech/

The MilTech Partnership Intermediary, established in 2004 as a collaboration between Montana State University and the Office of the Secretary of Defense Technology Transfer office, has a mission to improve the transition of critical and innovative technology to the US Warfighter, with an emphasis on leveraging small, non-traditional vendors. Primary focus areas include technology scouting, product design and prototyping assistance, requirements generation, improved investment planning, manufacturing expertise, and supply chain identification and qualification.

MilTech has completed over 580 plus projects for over 190 plus customers from all DoD Services, OSD, Joint and Special Programs. Over 50 plus Field User Evaluations or Human Factors Exercises have been supported for all DoD Services, ensuring that the end user's needs are addressed in new technology development. Over 470 plus non-traditional vendors were qualified and actively engaged in these projects and many of these have joined the Defense Industrial Base on a more permanent basis.

In FY22, MilTech managed over 76 projects for DoD customers, transitioned 7 technologies to active DoD use, significantly advanced the TRL and provided evaluation samples for 32 technologies in development, implemented 8 improved DoD evaluation or sustainment processes and addressed 19 technology research and horizon scanning challenges.

MilTech maintains a significant STEM program with over 15 active MSU students involved in real, hands-on projects for the Army, Navy, Air Force and Marine Corps. Montana State University is the only university-based Mentor active in the Air Force Mentor/Protégé program, where MilTech manages three Mentor companies to increase their capabilities in support of critical Air Force operations.

The following are highlights of six of the active FY22 MilTech projects and an update to one project from FY21:

- **Air Force Medical Readiness Agency (AFMRA)**
  MilTech put together a team of experts in the FDA approval process, technology assessments, and medical devices. For each technology, we perform directed interviews with the inventors or developers to determine the technology readiness level. Risks are also evaluated to determine if the technology is on track to get FDA approval, can be manufactured affordably, and has a commercial market.

- **Combat Eyewear**
  MilTech assisted with technology scouting to identify industry partners that might be interested in submitting eyewear for the Authorized Protective Eyewear List (APEL) update. Natick will perform testing on the eyewear options to determine which ones meet Program Executive Office (PEO) Soldier's ballistic requirements. Requirements specific to the new categories will be developed in partnership with PEO Soldier and industry, then tested at Natick.

- **PRU-70 Armored Survival Vest**
  MilTech assisted with modifying the technical data package to reflect design changes, conducting armor fit checks, and supporting sample manufacture to prepare for large-scale production. We partnered with industry to create the samples for the environmental and user testing. We sent the modified patterns and drawings to vendors, which they used to create samples. This makes it possible to validate the patterns on a manufacturing floor, and to confirm that the technical data package was correct. Additionally, we assisted our industry partners in sourcing some of the raw materials and hardware for the samples. At the end of the project, NAVAIR had an updated PRU-70 design and a validated technical data package to move forward with procurement.

- **PuckBoard**
  A PuckBoard is a digital version of the traditional whiteboard that provides planning for flight operations. PuckBoard makes flight planning faster, more adaptable, and reduces time and funds spent on resolving complex issues. MilTech was asked to assist with evaluating the benefits of the agile software development approach and compare the development of PuckBoard in an agile framework to the traditional third-party contractor, waterfall-development cycle. The final report captured the unique concepts and methodologies used to develop PuckBoard. It also highlighted guidelines on implementation, potential risks, and agile benefits over traditional development. PuckBoard's development by uniformed personnel means that it costs substantially less than third-party development. In addition, the DoD owns the software, which will avoid ongoing third-party maintenance charges, as well as costly change orders over time.

- **Pylon Stand**
  The 52nd Fighter Wing Innovation and Transformation Office asked MilTech to assist with formalizing the modification and identifying potential vendors for parts to support a conceptual sketch to make handling pylons safer. Pylons attach to the bottom of aircraft wings, such as an F-16 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. MilTech partnered with industry to modify the stand to make it cost-effective and easy to manufacture. Within a year from when the 52nd Fighter Wing first contacted MilTech, they will have an updated pylon stand for evaluation.

- **Range Plates Interstitial**
  Last year, the Joint PEO Armaments & Ammunition, working with Army Research Lab (ARL) tasked MilTech with conducting a market survey to find manufacturers of silicon carbide ceramic armor and aramid armor, who were willing to engage in an R&D effort. MilTech acted as the intermediary between vendors and ARL, disseminating information and clarification to all engaged manufacturers, and working to make sure that everyone was on the same page. At the end of

the process, JPEO A&A and ARL will have a validated technical data package for producing standardized range plates, and a list of vendors who can manufacture them.

PROJECT UPDATE

- **TPS-75 Tactical Radar Maintenance Support**
  The TPS-75 is a tactical radar with a range of 250 miles that is used to detect threat aircraft in hostile environments and assist friendly aircraft in engagements with unknown or hostile aircraft. It is a portable radar that can be loaded in a truck or cargo plane and moved to areas of contested air space. It was designed in the 1960s and has been in service since the 1970s.

  The TPS-75 Program Office in the Air Force Sustainment Center asked MilTech to find potential industry partners for the most critical parts needed to keep the system running.

  In 2022, MilTech assisted with updating three priorities:
  - the latching relay
  - tilt sensor
  - flow meter test set.

  Industry partners modified the latching relay by adding an extra resistor to resolve a system-reset issue. All three parts have passed military qualification testing and are waiting on paperwork to be certified for use in the radar.

  MilTech is now assisting with the rest of the Program Office's list of parts. For each part, we find a vendor who is producing it, or help qualify one who can. Sometimes industry partners have to engage in reverse engineering to get the existing fit and function from modern parts, before we can look for a manufacturer.

  More recently, the program office asked us to assist with finding potential vendors for five circuit card assemblies. We will scout for industry partners who can manufacture a modified circuit board using modern components, that recreates the performance of the existing circuit cards. The updated boards won't look the same, because technology has advanced, but they will maintain current fit and function. Projects like this usually require us to engage with nontraditional vendors who are interested in doing custom work for the Air Force.

  The updated parts work better, improve capability, are more sustainable, and can be manufactured more easily, so the Air Force will be able to sustain the radars longer and more efficiently.

  TPS-75 is the only mobile ground-based sensor the Air Force has. It provides air picture in-theater to help air combatant commanders to make decisions and conduct air defense operations. We can have an entire deployed radar package anywhere in the world in 24 hours. It's an important resource for national security and these parts will help us keep it running.

DoD PIA

Website: https://www.techlinkcenter.org/

The TechLink program was initiated on August 1, 1999, under a Memorandum of Understanding (currently MOU No. FA8650-15-3-9350) between the Air Force and the TechLink Center at Montana State University (MSU). The overriding objective of the program is to increase DoD's overall successes in technology transfer (T2) and transition, with a particular focus on marketing DoD patented inventions to US industry and facilitating license agreements between DoD laboratories and US companies.

This report covers the 2022 federal fiscal year from October 1, 2021, through September 30, 2022, and focuses on activities for TechLink's core DoD-related technology transfer activities (CPO-1).

TechLink Metric-related Accomplishments

During FY22, despite the disruption caused by the COVID-19 pandemic, TechLink facilitated a total of 73 metric-related agreements between DoD and industry. This included 32 Tier I agreements, 33 Tier II agreements, and 8 Tier III agreements. The breakdown of total agreements by DoD component was Air Force, 19; Navy, 23; Army, 29; and independent agencies, 1 (National Security Agency (NSA).

Goals and accomplishments for FY22 were the following:

1) GOAL: 35 Tier I Metric Agreements between DoD and the private sector. These Tier I agreements include patent, biological, and invention license agreements, trademark license agreements if stand-alone and funded, and DoD SBIR Phase III contracts.

ACCOMPLISHMENTS: TechLink facilitated a total of 32 Tier I metric agreements, all license agreements. The breakdown for Tier I agreements by DoD component was Air Force, 13; Navy, 11; and Army, 8.

2) GOAL: 35 Tier II Metric Agreements between DoD labs and industry or other partners. These Tier II agreements include CRADAs, EPAs, trademark license agreements if associated with other license agreements, commercial evaluation license agreements, joint ownership agreements, test service and similar agreements if greater than $5,000 in value, copyright license agreements, MOUs or MOAs for cooperative work, and DoD SBIR Phase II contracts.

ACCOMPLISHMENTS: TechLink facilitated a total of 33 Tier II partnerships. These include 19 CRADAs, 6 commercial evaluation license agreements, 1 engineering services agreement, 1 education partnership agreement, 3 SBIR phase II contracts, and an education partnership agreement. The breakdown for Tier II agreements by DoD component was Air Force, 5; Navy, 9; Army, 18; and NSA, 1.

3) GOAL: 10 Tier III Metric Agreements. These Tier III agreements include limited-purpose CRADAs, material transfer agreements or material transfer CRADAs, government purpose or research license agreements, license amendments, and test service and similar agreements if less than $5,000 in value.

ACCOMPLISHMENTS: TechLink facilitated a total of eight Tier III agreements, including six limited-purpose CRADAs, a CRADA Amendment, and a MilTech collaboration project. Many of the LP CRADAs are expected to lead to license agreements. The breakdown for Tier III agreements by DoD component was Air Force, 1; Army, 3; and Navy, 4.

4) GOAL: As Many Co-Metrics with Other PIAs as Possible.

ACCOMPLISHMENTS: TechLink achieved one co-metric with other PIAs, a collaboration project with MilTech, a companion DoD national partnership intermediary at Montana State University, Bozeman.

5) GOAL: As many Technology Transfer Agreements as Possible with "New" DoD Labs—DoD labs with which TechLink has not previously worked or with which it has not facilitated agreements for over five years.

ACCOMPLISHMENTS: TechLink completed one technology transfer agreement with a "new" DoD lab. This was a non-exclusive license agreement with Direct Kinetic Solutions in El Paso, TX and DEVCOM ARL Aberdeen, Adelphi, MD.

Other Major TechLink Accomplishments FY22

In addition to its metric-related accomplishments, other major TechLink accomplishments included the following:

Economic Impact Study of Air Force CRADAs

In October 2021, TechLink published a comprehensive economic impact study of Air Force CRADAs. This study examined the outcomes and impacts of 1,263 CRADAs established by Air Force labs with 886 companies between 2000 and 2020. The study team conducted a rigorous survey of the companies with Air Force CRADAs to determine the total sales of new products and services resulting from these CRADAs. Sales categories examined included 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 companies surveyed collectively attributed $10.7 billion in sales of goods, services, and research contracts to these agreements. The team subsequently estimated the economic ripple effects of these sales using the IMPLAN model. These estimates define the indirect and induced effects of these sales on the national economy in terms of total economic output, value added, employment, labor income, and tax revenue. The total economy-wide output was estimated at $31.3 billion. There were a reported $4.3 billion in transition (military) sales, and CRADA partners received $3.2 billion in follow-on funding, representing significant bolstering of the Defense Industrial Base. IMPLAN estimated employment impacts to be 138,890 jobs with average compensation of $76,306, approximately 50 percent higher than the median U.S. wage in 2021. TechLink promoted the report via our social media channels and made it available here: https://techlinkcenter.org/economic-impact-reports.

DoD Licensing Economic Impact and a companion TechologyLink focused return on investment assessment (fourth iterations)

TechLink completed and published the fourth iterations of DoD licensing and TechLink economic assessments in FY22. DoD's licensing efforts since 2000 have returned over $5 billion in sales of new products to the U.S. military and spurred $32.3 billion in total sales of new products and services across the country. TechLink specific efforts (since 1999) included $9.82 million in total economic impact, a $3 billion increase since the 2018 study, and $1.7 billion in sales back to U.S. military. TechLink promoted the reports via our social media channels and made them available here: https://techlinkcenter.org/economic-impact-reports.

T2 University

TechLink designed, built, and launched the ORTA Foundations course, the first offering from the newly formed TechLink Technology Transfer University (T2U). The course provided a cohesive foundational training experience for those new to the ORTA profession. Fifteen lessons target various aspects of the innovation workflow, from before invention disclosure through protection, partnering, and beyond. The course also focuses on interactions with key stakeholder groups, including lab scientists and engineers, legal counsel, external partners, and lab management. The course featured four live webinar sessions and a two-day in-person capstone experience to further synthesize learning and provide valuable networking opportunities. The initial cohort included more than 75 participants and is helping to satisfy one of the most pressing unmet needs across DoD T2: ORTA training. TechLink worked very closely with Sabra Tomb, Esq (DAF civilian) and her Laboratory Quality Enhancement Program Technology Transfer (LQEP-T2) Professional Development and Training working group leads to ensure course content completeness.

Marketing, News and the Partnership Journey

TechLink's efforts to identify, deliver, and enable qualified partners rose to new heights and included adding new categories to our TechLink News channel to allow audiences to more easily navigate different types of information, and may be found here: https://techlinkcenter.org/news

FY22 marketing stats:

- Website pages view: 670,993;
- 2.75 million impressions (the number of times TechLink's T2 messaging was put in front of people digital before getting to our website - 2.75 million people have had the opportunity to see our message)
- Site visits: 183,000
- Technology views: 235,510
- News published: 98
- Newsletter subscribers: 696 new, 3,534 total
- Technology summaries: 149 new, 1,762 total
- Inquires from website: 1,404
- 1,500 Leads = Website form submission, contacts made at events, targeted email responses, etc.

TechLink Partnership Ecosystem: Growth and Development

TechLink created new partner discovery and industry prospecting processes that have enhanced the way we engage industry. New partner channels increase innovation activity, information sharing and technology opportunity discovery between industry and the DOD laboratory ecosystem; connecting networks of stakeholders focused on technology transfer and aligning business opportunities via DOD IP Portfolio

T2 Impact Model

The DoD T2 Impact Model project was nearly completed in FY22 and is on-track to be delivered to OSD in FY23. The project has created a logic model by carefully analyzing the current DoD technology transfer system, diagnosing its shortcomings, and developing a new, improved and wholistic T2 approach. The project focused on all key stages of the T2 continuum, from initial DoD lab research and development to the ultimate outcomes and impacts of T2-related products. The new model, along with the recommendations and metrics to help DoD implement it, is expected to substantially increase DoD T2's impacts on the defense mission and national economy.

DoD SBIR/STTR Transition Study and Follow-on Analysis

TechLink finished a multi-year effort for the OSD Small Business Office which included: Transition analysis, clustered success stories, detailed program analysis of the Commercial Readiness Program (CRP), a new approach to Commercial Achievement Index (CAI), and analysis other SBIR data based on data collected by the National Security Innovation Network (NSIN).

Organizational Restructure

TechLink created new business units, cross functional support teams and T2 service teams in order to improve process efficiencies and people effectiveness by empowering designated staff leadership for each line of operation.

National Award submissions

TechLink wrote the following FY22 FLC awards: T2 Excellence (AMRDC - ECTemp, iHATT); T2 Innovation of the Year (NRL – trade secret license with SUNY); Rookie of the Year (AFRL RQSP's Josh Laravie); Outstanding T2 Professional (DEVCOM CBC); and two (2) Linsteadt Award nominations!

TechLink Software Engineering and Analysis

The TechLink Software Engineering and Analysis Laboratory (TSEAL) provides a valuable, hands-on research experience to MSU students and was fully funded by DoD sponsors again this year. This unique activity engages MSU computer science students and faculty in ensuring fielded Department of Defense facility maintenance software programs are functional, reliable, and secure. TSEAL enables MSU undergrads and graduate students to gain practical, real-world experience developing cutting-edge software while covering a major part of their MSU education through paid internships.

Navy T2 Program Lead Support

Assisted/assisting the Department of the Navy with End of Year reporting, specialty writing assignments and other projects.

AIR FORCE PIA

ACADEMIC PARTNERSHIP ENGAGEMENT EXPERIMENT (APEX)

Website: https://apex-innovates.org/

Who We Are

Our team is comprised of serial entrepreneurs, retired military members, scientists, academic researchers and former United States Department of Defense executive leaders. Our standard for excellence is built on the diversity of our backgrounds that have afforded us deep understanding of the importance of the APEX mission that supports the United States Air Force Science & Technology Strategy.

What We Do

We cultivate innovation by expanding the American research enterprise for the USAF. We do this by engaging and collaborating with innovators across academia, industry and the DoD who possess capabilities of interest to the USAF; utilizing data analytics to identify transformational operational defense solutions in academia, industry and government sectors; providing high-touch coaching for business startups and proposals; and engaging with DoD programs to connect universities, businesses and government entities in a way that moves defense technology from discovery to reality.

AIR FORCE PIA

BASIC RESEARCH INNOVATION COLLABORATION CENTER (BRICC)

Website: https://briccdc.com/

Who We Are

BRICC provides collaborative environments and data analytic services that support AFOSR's mission to discover, shape, and champion basic research that profoundly impacts the future Air Force.

What We Do

The BRICC specializes in data-driven approaches to quantitatively assess global S&T communities, research and technology trends, and innovation capacity. Our data analytics provide strategies and insights that empower AFOSR's collaborative discovery, technology transition and technology transfer (T2), and S&E workforce development efforts.

AIR FORCE PIA

CATALYST CAMPUS

Website: https://www.catalystcampus.org/

Who We Are

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 through public private partnerships.

Our Vision is to be a Mission Focused Collaboration and Innovation Ecosystem for Private Industry, Academia, Government, and Allies by Serving as a Trusted Agnostic Partner to Accelerate Solutions for the Execution of the National Defense Strategy, Advancement of Civil Programs, and Economic Development of Communities.

We are currently located in Colorado Springs, CO, Ogden, UT, and College Park, MD. We are expanding nationwide with the goal of six-ten total locations by 2026.

What We Do

Catalyst Campus provides a neutral environment where the Department of Defense and other agencies can integrate organizations and technologies from multiple companies as needs and threats emerge in a variety of sectors to include aerospace, defense and homeland security, space, cybersecurity, information technology and other advanced technologies.

We offer the Catalyst Accelerator Program, an immersive learning environment, the Catalyst Dojo, Lab Space, Office and Coworking Space, Virtual Offices, Event Space, Software Factory Incubation, Digital Engineering Environment, support to USAFA's AFCyberworx, and STTR Partnerships. We have multiple PIAs and contract vehicles that provide maximum flexibility for our customers.

AIR FORCE PIA

CYBER INNOVATION CENTER (CIC)

Who We Are

Since 2013, the Cyber Innovation Center through its Partnership Intermediary Agreement with the Air Force Global Strike Command Office of the Chief Scientist, provides the Command with a persistent technology transfer, technology transition, and innovation resource. CIC is dedicated to promoting research, education, technological innovation and fostering collaborative and strategic alliances between governmental agencies, private industry, and academic institutions.

Website: https://cyberinnovationcenter.org
Website: https://www.collaborativeenvironment.org
Website: https://www.strikewerx.com/

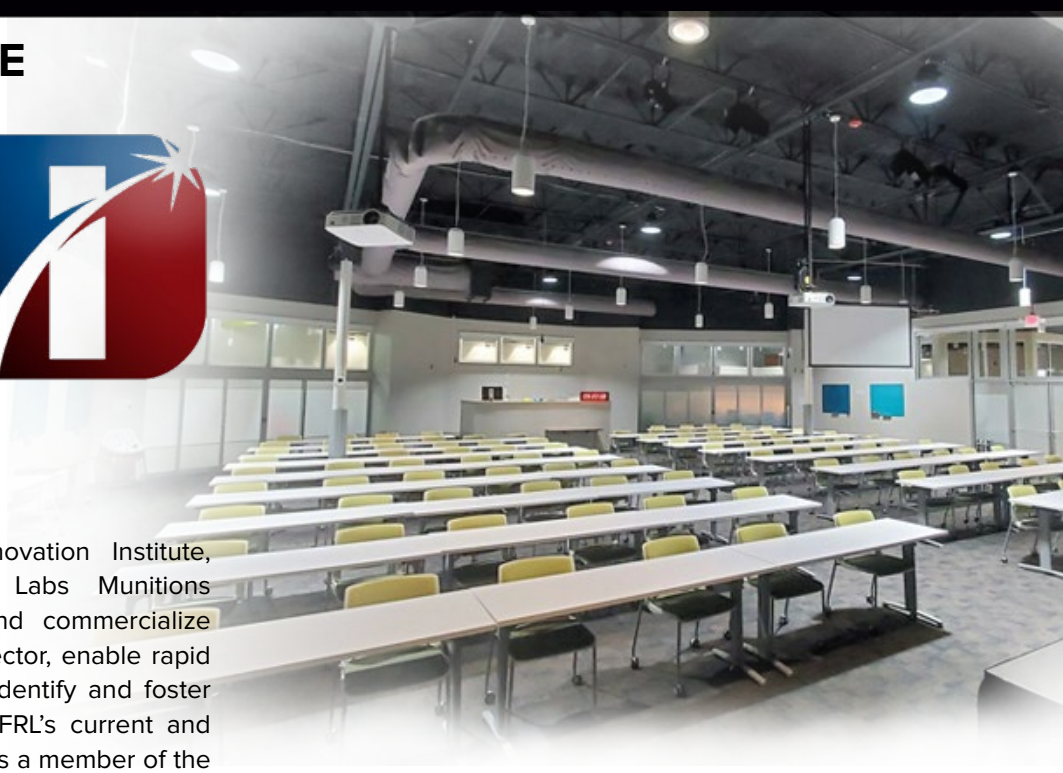
What We Do

- **COLLABORATIVE ENVIRONMENT**
  The Collaborative Environment operates the PIA to rapidly create solutions that directly benefit the warfighter and aid in revitalizing the Air Force nuclear enterprise. CE's role is to further AFGSC's mission and capabilities by fostering innovation and collaboration between academia, business, industry, and government to meet its technology challenges via a cost-effective, scalable, and agile approach to challenges and opportunities. Industry and academia partnerships have seen advancements in software and data analysis, coding education, and delivery of new training technology.

- **STRIKEWERX**
  With collaboration space in the heart of the Ark-La-Tex and proximity to Barksdale Air Force Base, STRIKEWERX is the CE innovation hub, an arm of the AFGSC Office of the Chief Scientist. It connects people and resources across government, industry, and academia to solve the Command's most difficult problems. STRIKEWERX design sprints, challenges, and workshops have yielded new training prototypes, solutions for Airmen that save manhours and equipment, and new alerting badge technology. The results of these efforts are direct savings of $4 Million dollars per year and indirect savings of $200+ Million in future acquisition.

AIR FORCE PIA

DOOLITTLE INSTITUTE



Who We Are

The Doolittle Institute, an AFRL Innovation Institute, supports the Air Force Research Labs Munitions Directorate by working to license and commercialize AFRL/RW technologies in the private sector, enable rapid technology delivery to the warfighter, identify and foster new R&D partnerships and develop AFRL's current and future workforce. The Doolittle Institute is a member of the Defensewerx Family.

What We Do

The Doolittle Institute, an AFRL Innovation Institute, supports the Air Force Research Labs Munitions Directorate by working to license and commercialize AFRL/RW technologies in the private sector through technology transfer, enable rapid technology delivery to the warfighter via technology transition, identify and foster new R&D partnerships through innovation and collaboration, and develop AFRL's current and future workforce.

Website: https://doolittleinstitute.org

AIR FORCE PIA

EXPLORA LEARNING CENTER

Who We Are

Explora is an innovative experiential learning center in Albuquerque, New Mexico with a mission to create opportunities for inspirational discovery and the joy of lifelong learning through interactive experiences in science, technology, engineering, and math (STEM). We address our mission by providing exhibit activities and project-based learning programs that illuminate basic concepts in STEM for people of all ages statewide. Explora's work is organized around a Cradle through Career STEAM Learning Strategic Focus, which was co-developed with the community to engage, educate, and employ students in STEM.

What We Do

Together with our network of over 90 partners, we provide direct assistance in the form of STEM education and engagement via outreach statewide and through visits to our 50,000-square-foot science center and children's museum in Albuquerque, NM.

X Studio at Explora is an innovative STEM education and workforce development center, providing access to high-quality STEM experiences and professional-grade design and fabrication equipment and tools. We focus on improving educational and career opportunities for middle school, high school, and early college students, with an intentional focus on improving access and opportunity for low-income and teens of color. Programs immerse students in real-world work-based learning programs, as well as introduce students to pathway opportunities to New Mexico's STEM workforce, with an emphasis on developing workforce skills that reflect the needs of STEM employers.

Website: https://www.explora.us/

Explora has an established teacher professional development program, reaching over 600 teachers each year. These workshops are not done in isolation: our professional development strategy includes providing teachers with kits of materials and opportunities to collaborate and network with each other, as well as with STEM professionals.

AIR FORCE PIA

GRIFFISS INSTITUTE

Who We Are

The Griffiss Institute (GI) was established in 2002, by the State of New York, as an independent 501(c)(3) entity governed by a Board of Directors. The primary role of the GI is to advocate and facilitate the co-operation of private industry, academia, and the Air Force Research Laboratory Information Directorate (AFRL/RI), in developing solutions to critical cyber security problems. Another prime role is to build upon technologies under development at the AFRL/RI to further strengthen our nation's security.

We enable open innovation between government agencies, academic institutions, and industry partners to advance our national security and economic competitiveness. By connecting diverse teams and technologies at our home in the Innovare Advancement Center within New York's Mohawk Valley, we provide access to government personnel, resources, state-of-the-art technologies, and specialized equipment not available elsewhere.

What We Do

Technology Transfer -

The GI achieves technology transfer by facilitating cooperative research and development agreements (CRADAs) with private industry and other federally funded laboratories, commercial test agreements (CTAs) with customers requesting assistance in product validation/verification, and educational partnership agreements (EPAs) with universities.

Workforce Education and Training Programs -

Professional development through training programs for laboratory personnel in software development and program management certification.

Science, Technology, Engineering and Mathematics (STEM) Education -

The GI is focused on a multitude of community outreach activities. The Information Directorate has previously received the prestigious Federal Laboratory Consortium for Technology Transfer National STEM Award based upon the teaming of the GI and AFRL/RI workforce.

Website: https://www.griffissinstitute.org
Website: https://www.innovare.org/

AIR FORCE PIA

MGMWERX

Who We Are
MGMWERX was created under a Partnership Intermediary Agreement between DEFENSEWERX and the Air Force Research Laboratory to align with the education initiatives of Air University.

We augment Air University programs to enhance production of high-quality, innovative research and ideas that span issues of importance to the Air Force. This can includes: doctrine, strategies, capability needs, operational concepts, training, education, and science and technology.

With a central downtown Montgomery, Alabama location, MGMWERX provides Air University with a direct connection to diverse ideas and innovations that exist outside of the military. As part of the DEFENSEWERX ecosystem, MGMWERX has access to nationwide resources and brings these external connections to Air University creating the routine collision of ideas and fostering an engine for innovation of huge proportions. Through MGMWERX, Air University students are exposed to a broad cross-section of industry, academia, as well as non-traditional commercial partners, to be better prepared to deal with an uncertain future.

At the MGMWERX facility, people and organizations experience innovation and collaboration in unique ways through experimentation with emerging tools, processes, and methods to get innovation to the warfighter faster.

Website: https://mgmwerx.org/

What We Do
MGMWERX is constantly assessing the landscape in the areas of defense, innovation, and adult education. Our awareness of the latest technologies allows us to scout the most promising technologists for concepts, prototypes, or commercially available technologies that can be leveraged as solutions for the warfighter.

Using research and development agreements, contracts, competitions, public-private partnerships, and other tools, MGMWERX can address Air Force innovation challenges while helping grow the circle of entrepreneurs and investors interested in working the strategic and technical challenges associated with maintaining U.S. national security.

AIR FORCE PIA

NEW MEXICO INTERNATIONAL TRADE ALLIANCE

Website: https://www.nmtradealliance.org/

Who We Are

The New Mexico Trade Alliance is an Economic Development Organization in Albuquerque, New Mexico. In addition to serving as the State of New Mexico's official international trade partner providing export assistance programs to the state's small businesses, the Trade Alliance is proud to manage AFRL's New Mexico economic and workforce development initiatives.

What We Do

The Trade Alliance, operating under the brand "Q Station," setup and operates a space and directed energy convening hub and incubator in Albuquerque's historic Nob Hill neighborhood. In addition to working to accelerate the space and directed energy ecosystems in New Mexico, Q Station incubates 6 space technology companies in its facility. Using the Q Station facility as a convening location, the Trade Alliance also works on behalf of AFRL to increase and strengthen relationships with key stakeholders in New Mexico, such as other space related organizations and industry, institutes of higher education, and local and state governments. The Trade Alliance is also proud to promote careers in STEM by organizing New Mexico's STEM Signing Day, STEMYs Award Ceremony, Super STEM Saturday, and a citywide STEM Scavenger Hunt. AFRL, through support from the Trade Alliance, is making a difference in New Mexico!

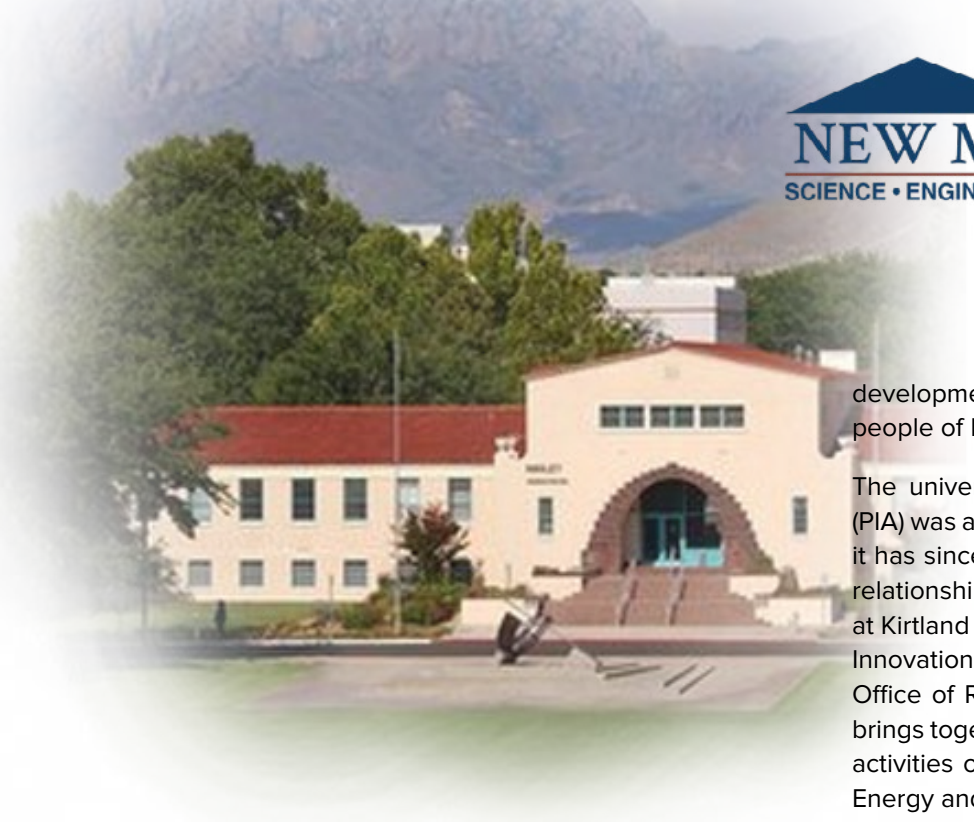
The following is a sample of great press from the last year highlighting the success of the Trade Alliance's PIA initiatives:

- The Trade Alliance is awarded a $750,000 Economic Development Administration (EDA) SPRINT Grant to support the development and programming for a new space and directed energy technology incubator in Albuquerque, New Mexico. https://eda.gov/oie/sprint/2021/new-mexico-trade-alliance.htm
- The Trade Alliance opens Q Station, a first of its kind incubator and convening location for New Mexico's space and directed energy technology industries. https://www.abqjournal.com/2383119/hub-for-space-directed-energy-lands-in-nob-hill.html?fbclid=IwAR0w2sT6VoypKhTSQFfUtkofYBlBSZFhptpCRJ7-J3KIMgKreB6C-n53ksI
- Q Station welcomes its first Soft Landing Cohort. Six space technology companies are working out of Q Station for a year with access to an a la carte list of resources ranging from marketing and PR to capital raising strategies in partnership with Q Station partners. https://www.qstation.tech/cohort
- The Trade Alliance, along with other PIA partners NewSpace New Mexico and Central New Mexico Community College, and SpacePort America (New Mexico State Government) successfully advanced to the final round of the EDA's Build Back Better Grant Challenge. If awarded, vertical rocket launch infrastructure at the SpacePort and a new space center in Albuquerque are on the horizon. https://www.abqjournal.com/2455159/nm-vying-for-200m-for-space-tech-industries.html

The Trade Alliance and Q Station are recognized as an important catalyst bringing AFRL's New Mexico based PIAs together, effectively organizing and driving forward New Mexico's space industry. https://www.abqjournal.com/2455513/addressing-a-niche-opportunity-ex-*Who We*

AIR FORCE PIA

NEW MEXICO TECHNOLOGY UNIVERSITY



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

Who We Are
Founded in 1889 as the New Mexico School of Mines, the university changed its name in 1951, to the New Mexico Institute of Mining and Technology (New Mexico Tech). Based in Socorro, New Mexico the university serves the state and beyond through education, research, and service, focused in science, technology, engineering, and mathematics. Involved faculty educate a diverse student body in rigorous and collaborative programs, preparing scientists and engineers for the future.

New Mexico Tech's innovative and interdisciplinary research expands the reach of humanity's knowledge and capabilities. Researchers, faculty, and students work together to solve real world problems. The institution's economic development and technology transfer benefit the economy of the state and create opportunities for success. It serves the public through applied research, professional development, and teacher education, benefitting the people of New Mexico and the Nation.

The university's first partnership intermediary agreement (PIA) was awarded on September 5, 1995. For over 27 years it has since successfully maintained a strong collaborative relationship with the Air Force Research Laboratory (AFRL) at Kirtland Air Force Base. In October 2022, the Southwest Innovation Alliance was established as a center within the Office of Research at New Mexico Tech. This new center brings together the technology transfer and STEM outreach activities of the PIA into one unit supporting the Directed Energy and Space Vehicles Directorates.

What We Do
The Southwest Innovation Alliance supports AFRL in New Mexico in five strategic areas of partnership.

- Intellectual Property and Agreements
- Innovation Discovery, Training, and Market Research
- Collaborative Spaces
- Economic Development
- STEM Education and Workforce Pipeline

The Southwest Innovation Alliance is pleased to partner with a wide range of constituent groups throughout the region to advance the mission of AFRL. Through subaward agreements the alliance has established collaborations with Albuquerque Hispano Chamber of Commerce (AHCNM), Central NM Community College Ingenuity, Inc. (CNMI), Explora Science Center and Children's Museum (EXP), New Mexico State University (NMSU), University of New Mexico (UNM), University of Texas at El Paso (UTEP), University of Texas at San Antonio (UTSA), UNM Rainforest Innovations (UNMRI). Through these relationships the alliance has broadened both its capabilities and enhanced its impact in delivering exception service to AFRL.

AIR FORCE PIA

NEWSPACE NEW MEXICO

Website: https://newspacenm.org/

Who We Are

NewSpace New Mexico 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 powered in partnership with AFRL, stakeholders gain access to collaborative workspaces, programming, resources, and services that provide a more direct route to greater profitability. With access to community, navigation and co-innovation services, innovators at small to large companies can develop and commercialize their products and solutions faster in a collaborative environment that increases market impact.

What We Do

NewSpace New Mexico is the only space organization that focuses on uniting and igniting the industry by bringing stakeholders together and providing space companies with resources and services that accelerate product development from concept to prototype to sales. Through Unite & Ignite Space, stakeholders can move from concept to product to sales faster with a support system of collaborative workspaces, programming, equipment, and testing, prototyping and navigation services.

Products, Programs and Services Offered:

- NewSpace Alliance: There are over 230 organizations in the national NewSpace Alliance which builds knowledge and strengthens networks through participation in ongoing opportunities to learn, share and engage with space professionals across industry, government, and academia. It is free to join and NewSpace Alliance members can attend monthly tech talks, industry webinars, networking events, industry forums and our nationally-recognized State of the Space Industrial Base conference.
- NewSpace Ignitor: Space companies can apply to this incubator-like program to move from concept to product to sales faster with services that focus on prototype development and customer introductions. Participating companies improve readiness levels and accelerate product development with needs and technology assessments, tailored navigation plans, tech-to-market business services and access to equipment, co-innovation workspaces and workforce. They grow capital and revenue faster with access to programming, demonstration events, funding opportunities and direct connections to customer contracts.
- Co-Innovation Workspaces: Space companies can work at the NewSpace Launchpad, an 8,700 square foot facility that is the only work environment in Albuquerque located outside the fence that provides access to shared work and lab spaces, capital equipment for prototyping, testing, small-sat manufacturing, and conference room space. The co-innovation environment also provides resources for early demonstrations and opportunities for working with students and the government.
- Pathways to the Stars (Coming in 2023!): Access to workforce will become easier with a larger, more diverse space-ready talent pool. Pathways to the Stars will grow the space industry talent pipeline with programming, mentoring, experiential learning, and career connection services spanning K-12 to early career, with industry involvement and special attention given to reaching minority populations. Multiple educational partners will provide learning and curriculum, and connection services will connect students to jobs and careers. We invite you to participate and inspire students to become part of the space workforce of the future!

AIR FORCE PIA

NEW YORK STATE TECHNOLOGY ENTERPRISE CORPORATION (NYSTEC)

NYSTEC
YOUR INDEPENDENT TECHNOLOGY ADVISOR

Website: https://www.nystec.com/

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

Utilize 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 early-stage startup incubation, acceleration, 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.

AIR FORCE PIA

RESEARCH TRIANGLE INSTITUTE (RTI INTERNATIONAL)

Who We Are

RTI International is an independent, nonprofit research institute dedicated to improving the human condition. Our vision is to address the world's most critical problems with science-based solutions in pursuit of a better future. Clients rely on us to answer questions that demand an objective and multidisciplinary approach—one that integrates expertise across the social and laboratory sciences, engineering, and international development.

What We Do

We deliver independent, objective, and scientifically rigorous research, development, and technical services to support projects around the world. With renowned experts, state-of-the-art facilities, and proven approaches, we apply our capabilities across key practice areas that intersect with the needs of our clients—including government agencies, academia, foundations, global NGOs, and commercial companies. We are committed to the highest standards of scientific integrity, impartiality, and objectivity.

Website: https://rtiinnovationadvisors.org/

AIR FORCE PIA

WRIGHT BROTHERS INSTITUTE (WBI)

Who We Are

Wright Brothers Institute (WBI) enables the defense community to build tomorrow's future force by reducing frustrating, time-consuming barriers. Founded in 2002, Wright Brothers Institute 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. From early problem exploration, to final end-user application WBI has been the Air Force Research Laboratory's first stop for 20 years.

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

What We Do

WBI helps organizations discover new capability development pathways through collaborative facilitation, experimental environments, education & training, and industry outreach. We use those discoveries to develop and manage early-stage efforts under various agreements types and funding sources. WBI delivers strategic solutions alongside research and insights to guide technology and product development.

Before investing time, money, and resources, WBI's 'End-to-End' philosophy helps you make smarter choices that accelerate defense capability and product development. We do this by uncovering new pathways that convert concepts into capabilities, reducing funding barriers. We provide customers with more flexibility by building agile and diverse teams, only limited by your imagination. Our project management helps customers sustain momentum to keep the project moving toward tangible results.

At WBI, our networks provide value. From small businesses to large government agencies, WBI connects problem owners with solution providers. Our network of experts means that solution providers often become our next customer.

These functions allow WBI to market the world-class research and development produced at the Air Force Research Laboratory and other federal labs to partners in industry and academia in order to facilitate technology transfer and transition outcomes.

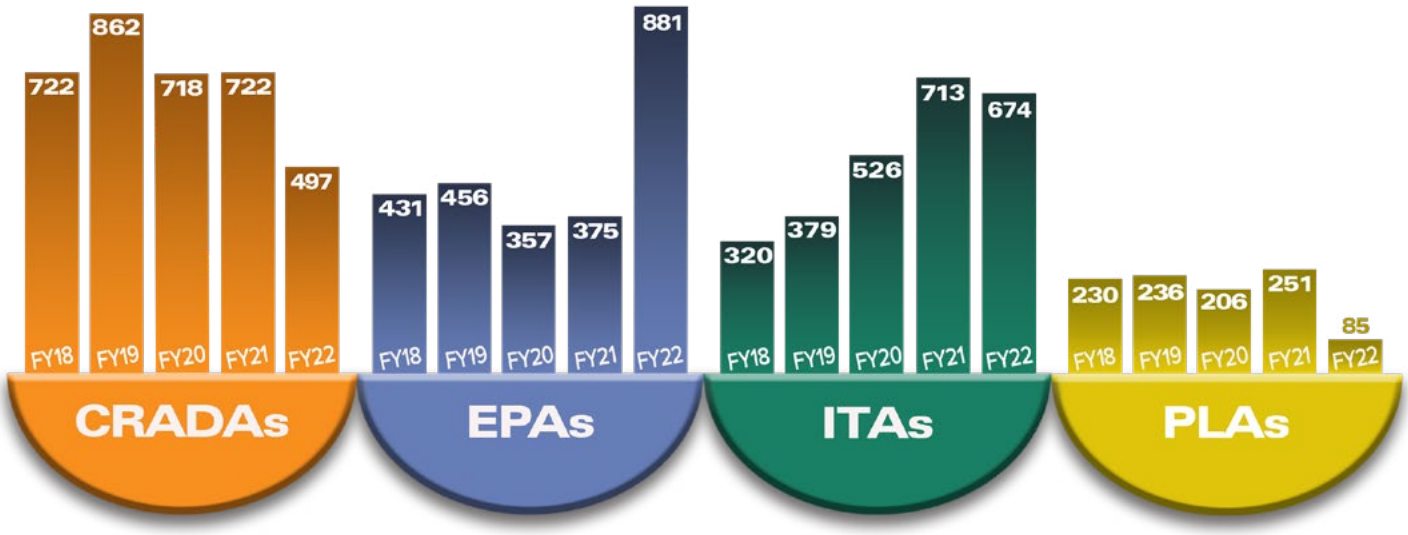
AIR FORCE METRICS

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.

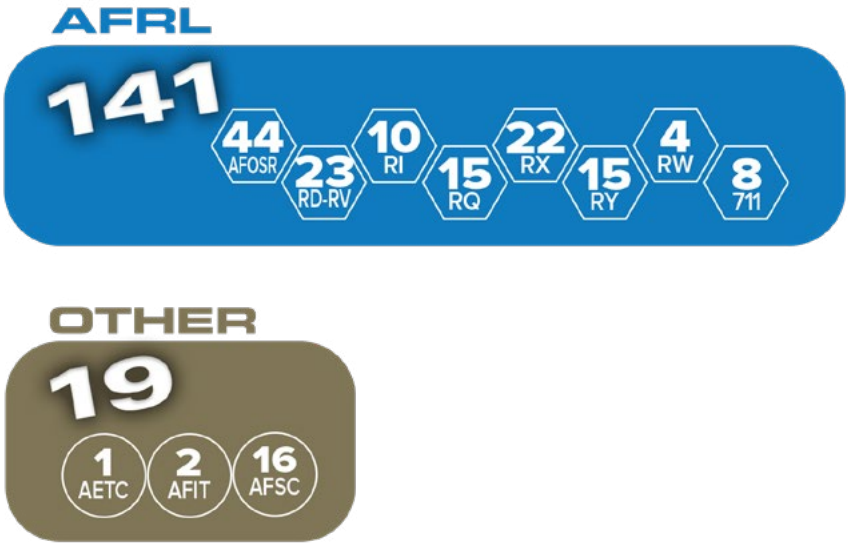
Technology transfer activities are not spontaneous events. Inventions typically require years of research effort before they are disclosed. A review of a patent application may take several years before the patent is awarded. It may also take years to license a Federal patent or form the collaborative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

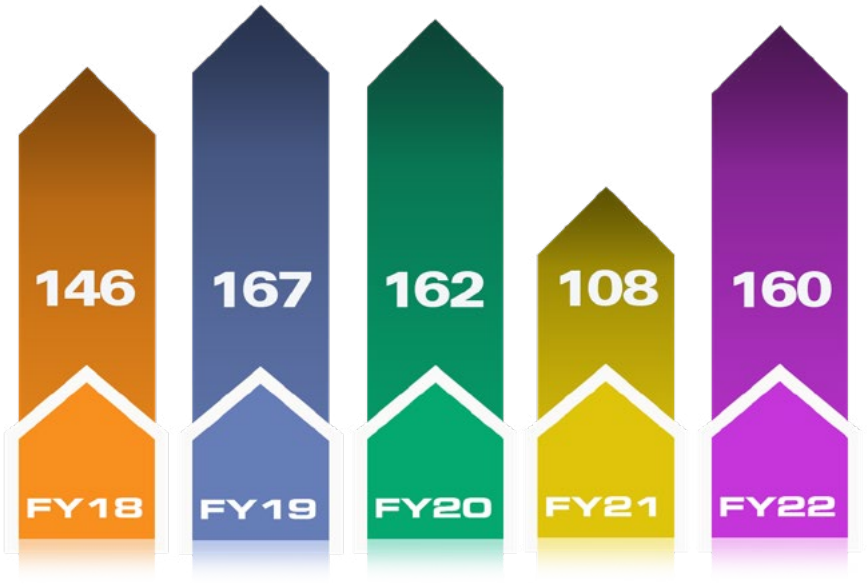


AIR FORCE METRICS

INVENTION DISCLOSURES RECEIVED



FISCAL YEAR TRENDS



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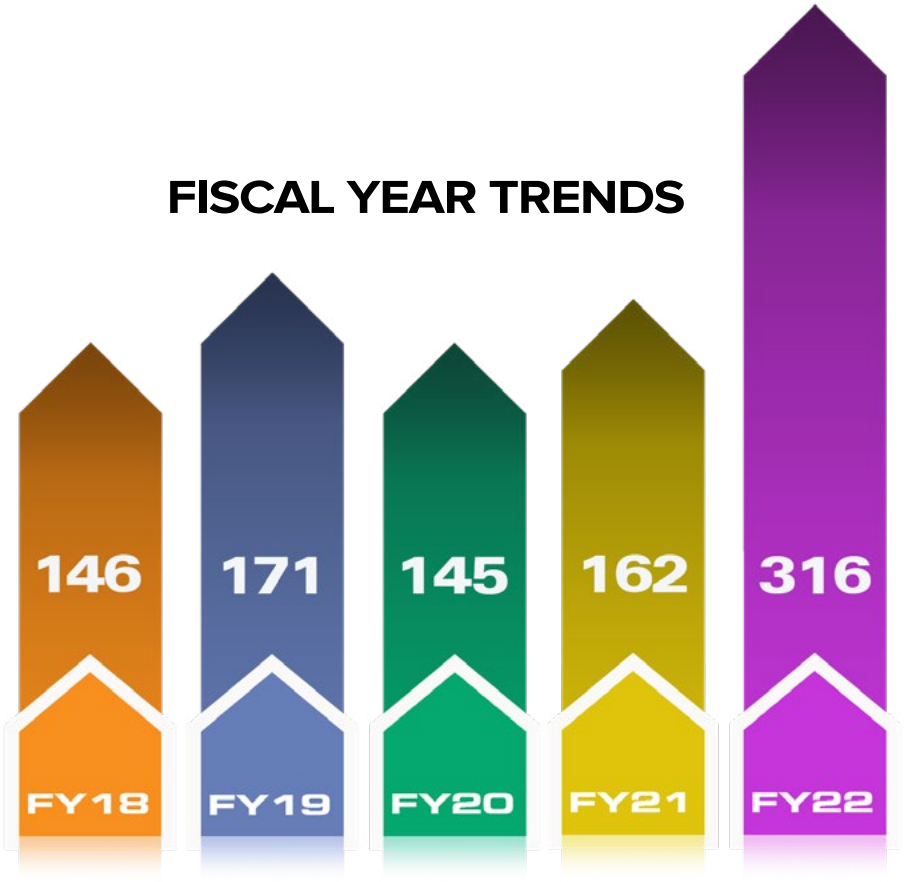
AIR FORCE METRICS

APPLICATIONS FILED

FISCAL YEAR TRENDS



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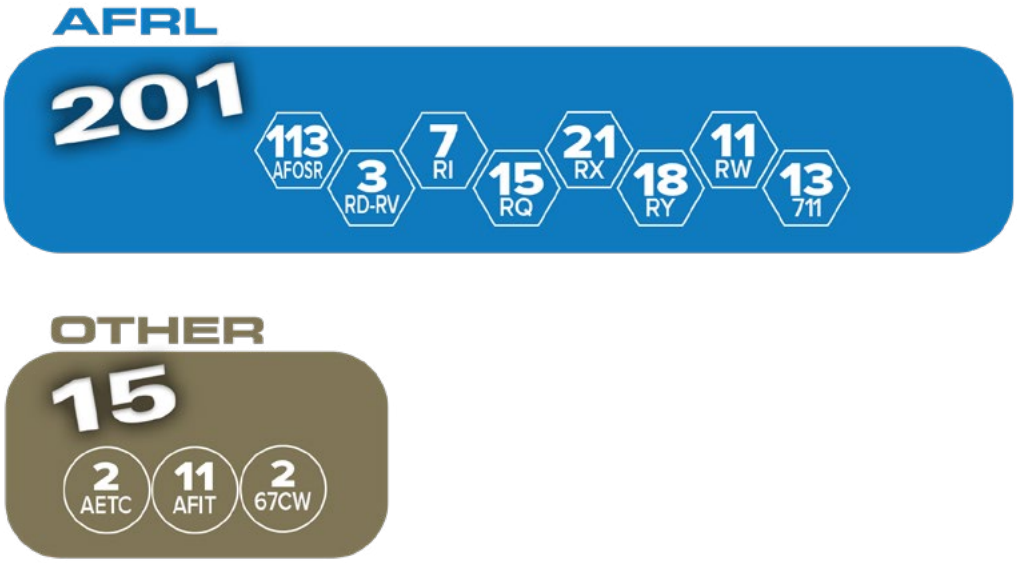
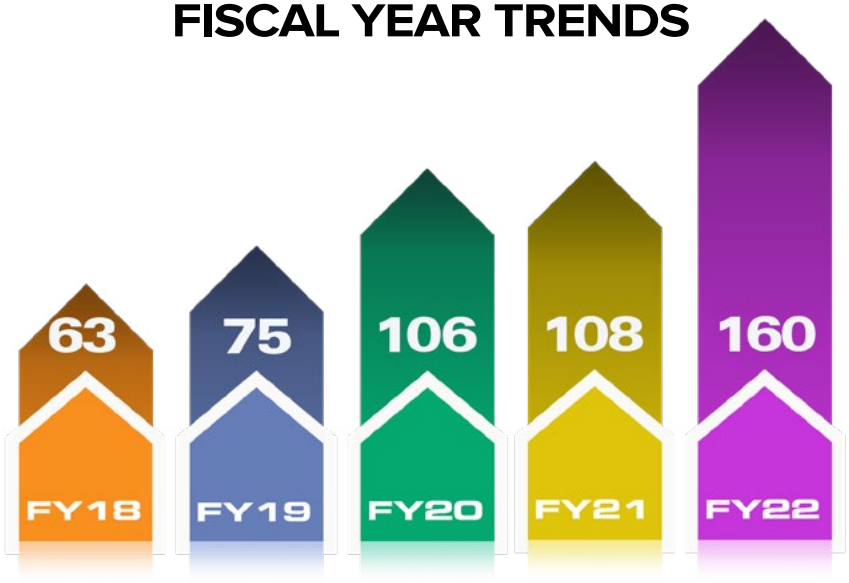
AIR FORCE METRICS

PATENTS ISSUED



FISCAL YEAR TRENDS



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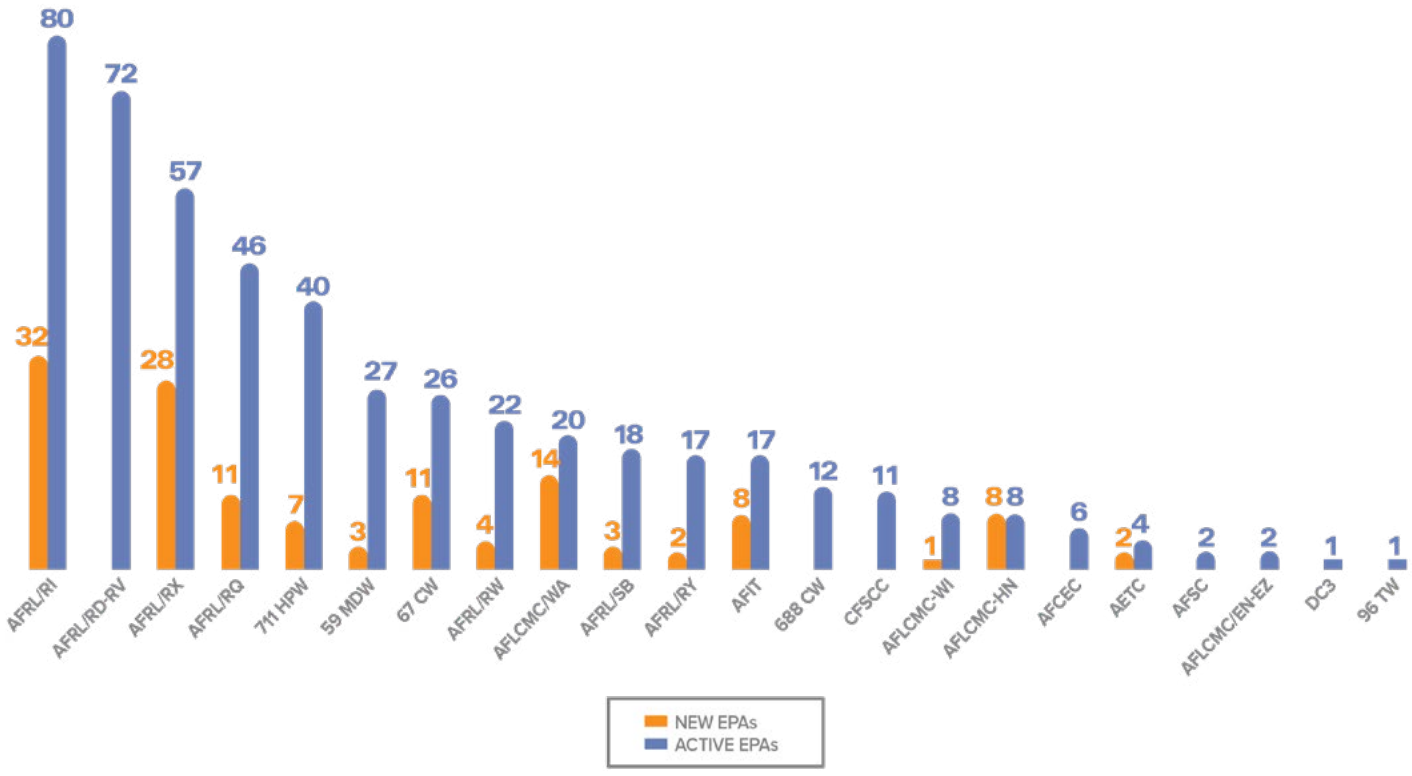
AIR FORCE METRICS

COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS



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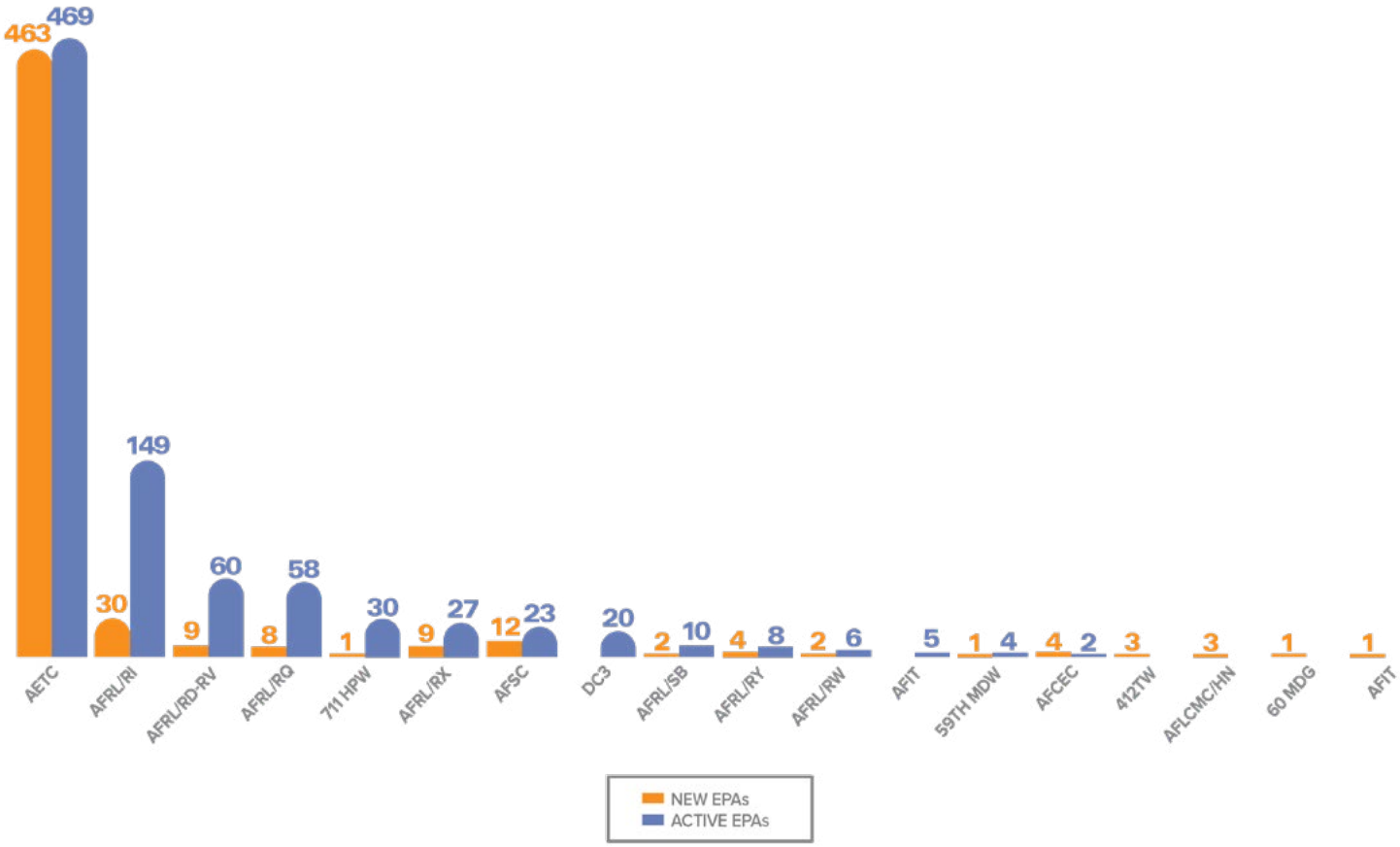
AIR FORCE METRICS

EDUCATION PARTNERSHIP AGREEMENTS



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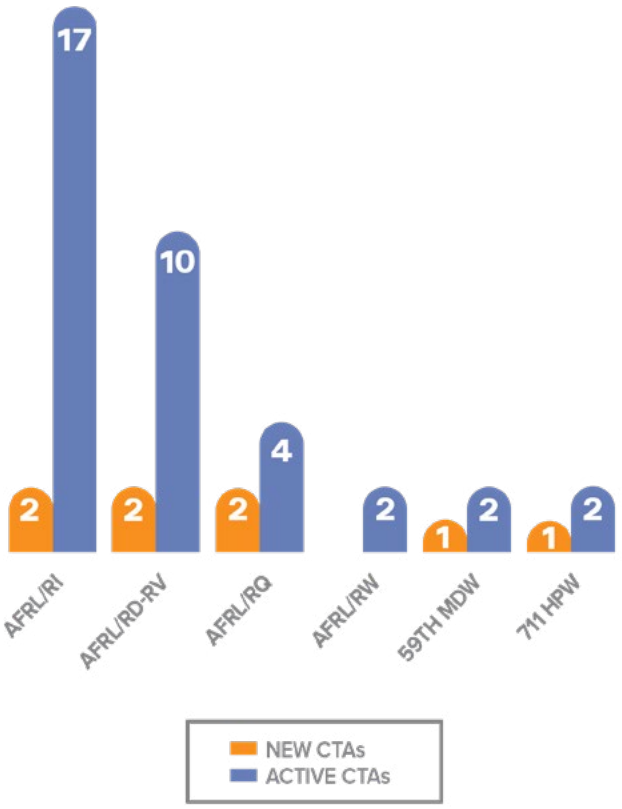
COMMERCIAL TEST AGREEMENTS



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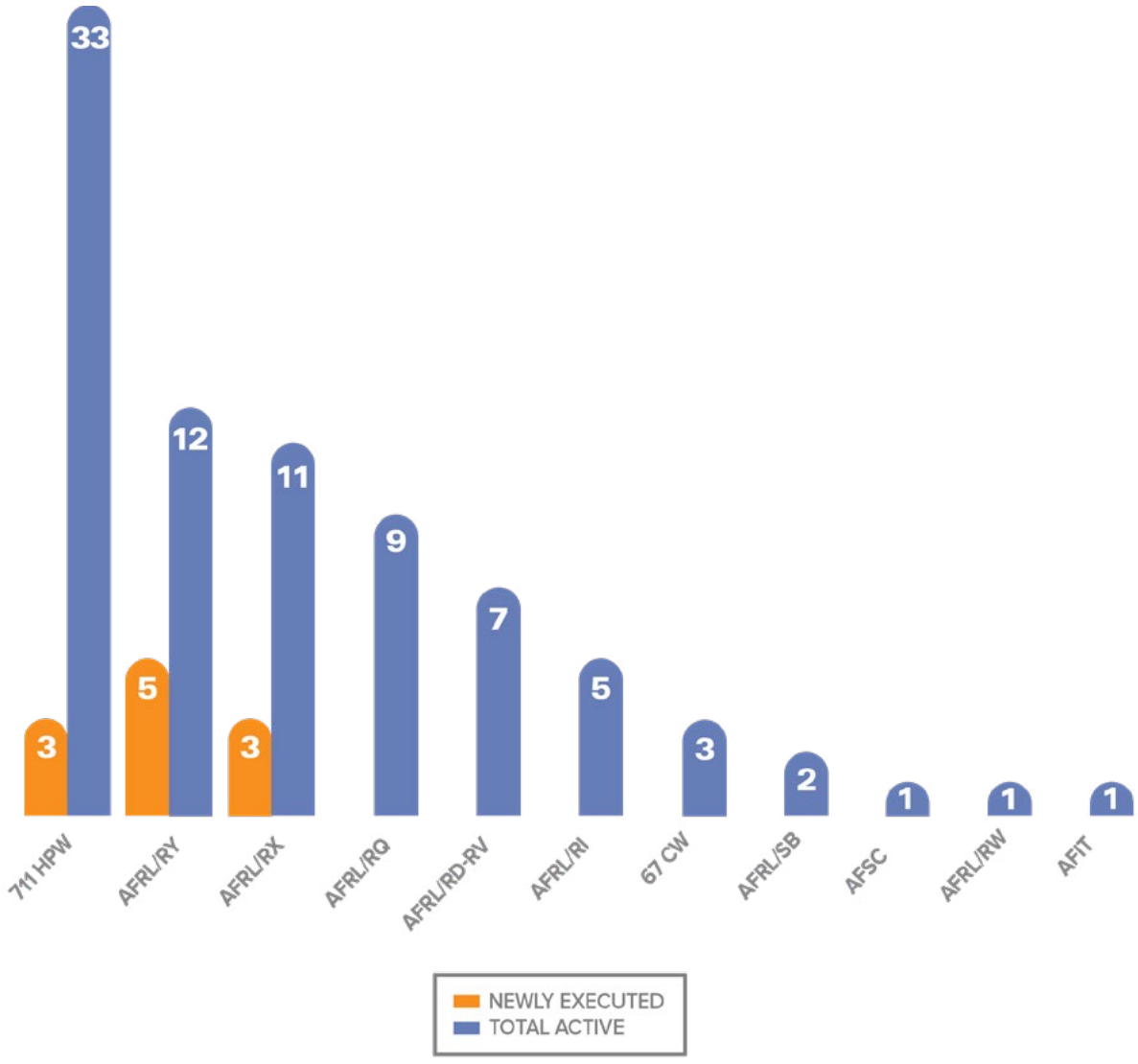
AIR FORCE METRICS

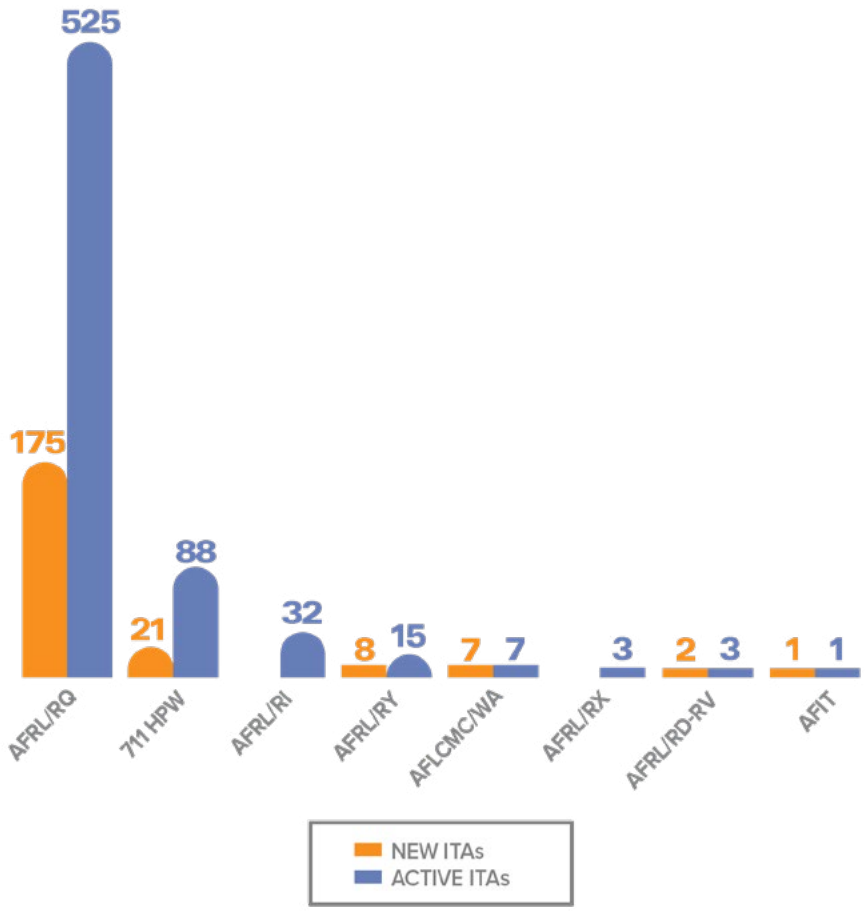
PATENT LICENSE AGREEMENTS



Acronym listing is located at the back of the report.

AIR FORCE METRICS

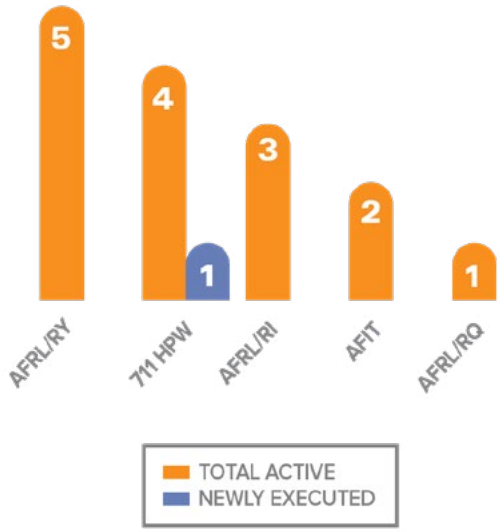
INFORMATION TECHNOLOGY AGREEMENTS



Acronym listing is located at the back of the report.

AIR FORCE METRICS

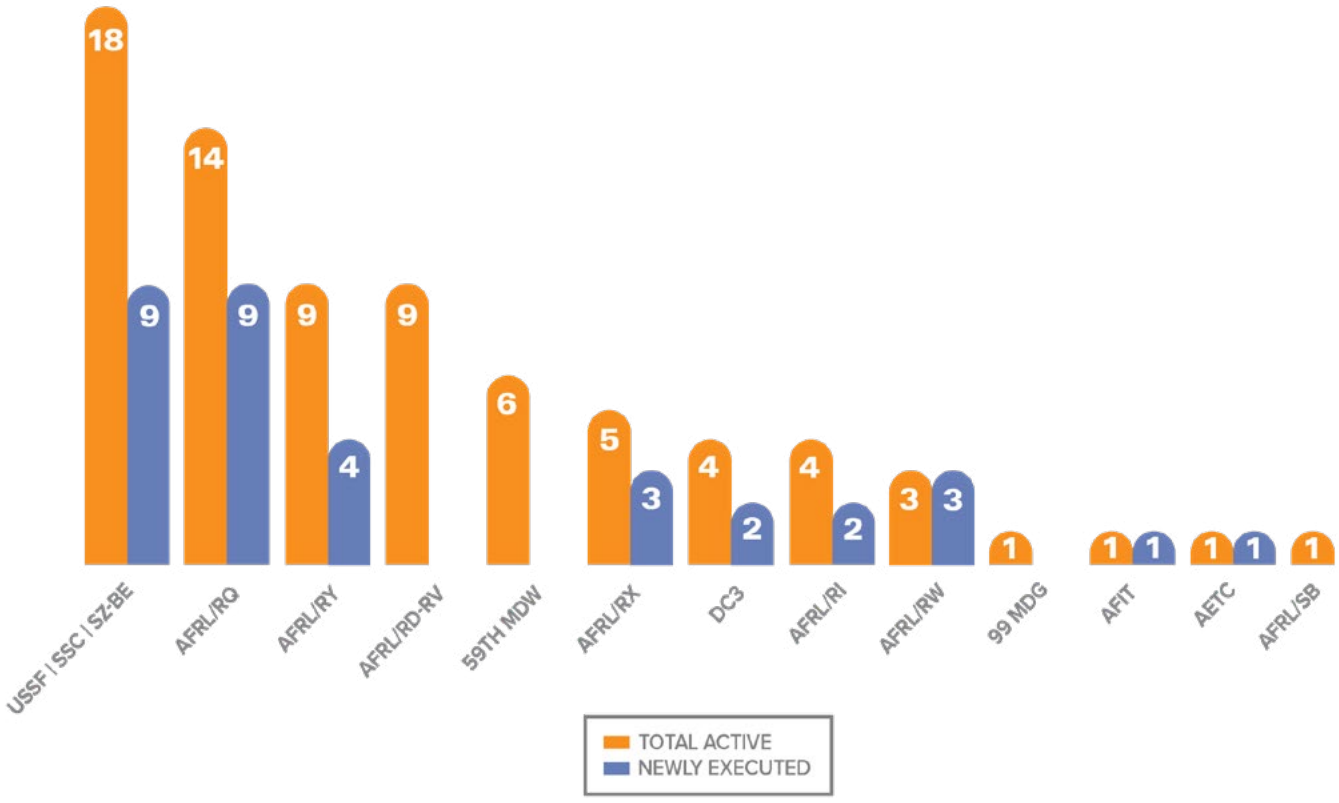
SOFTWARE LICENSE AGREEMENTS



Acronym listing is located at the back of the report.

AIR FORCE METRICS

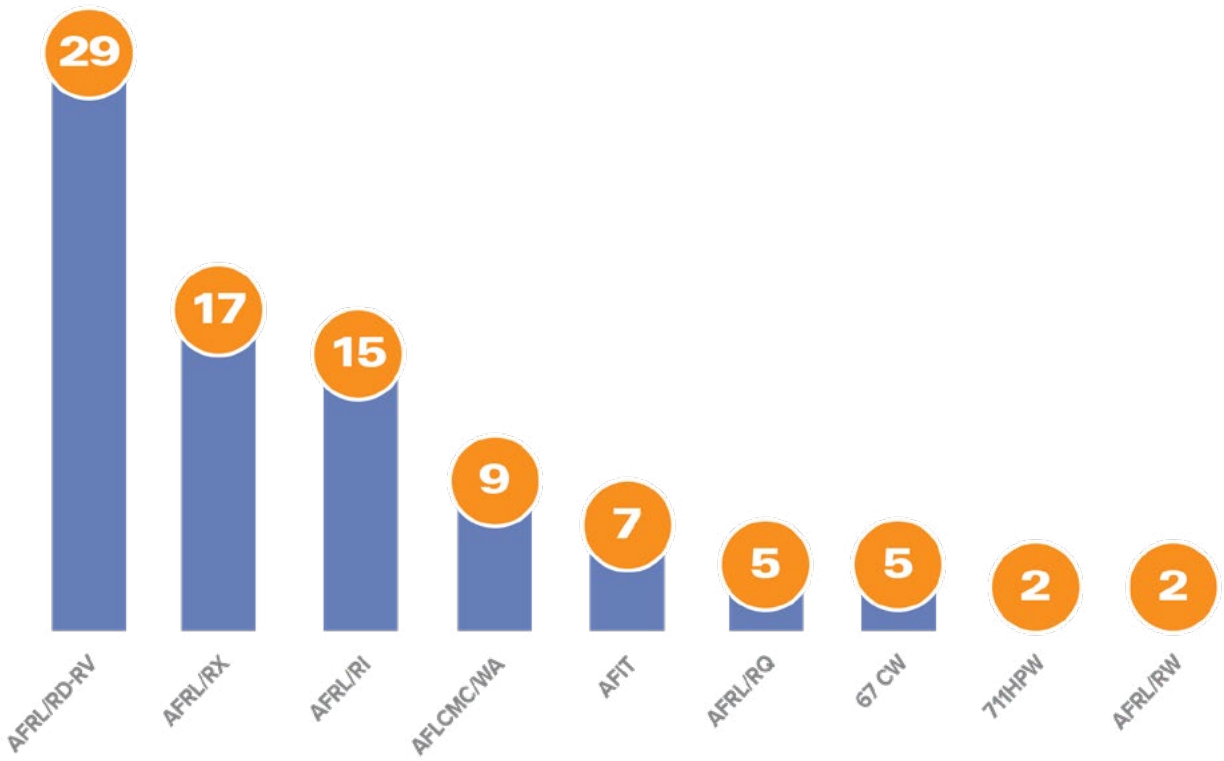
LIMITED PURPOSE CRADAS



Acronym listing is located at the back of the report.

AIR FORCE METRICS

NEW COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS WITH SMALL BUSINESS



Acronym listing is located at the back of the report.

AIR FORCE METRICS

ESTIMATED COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS CONTRIBUTED VALUE

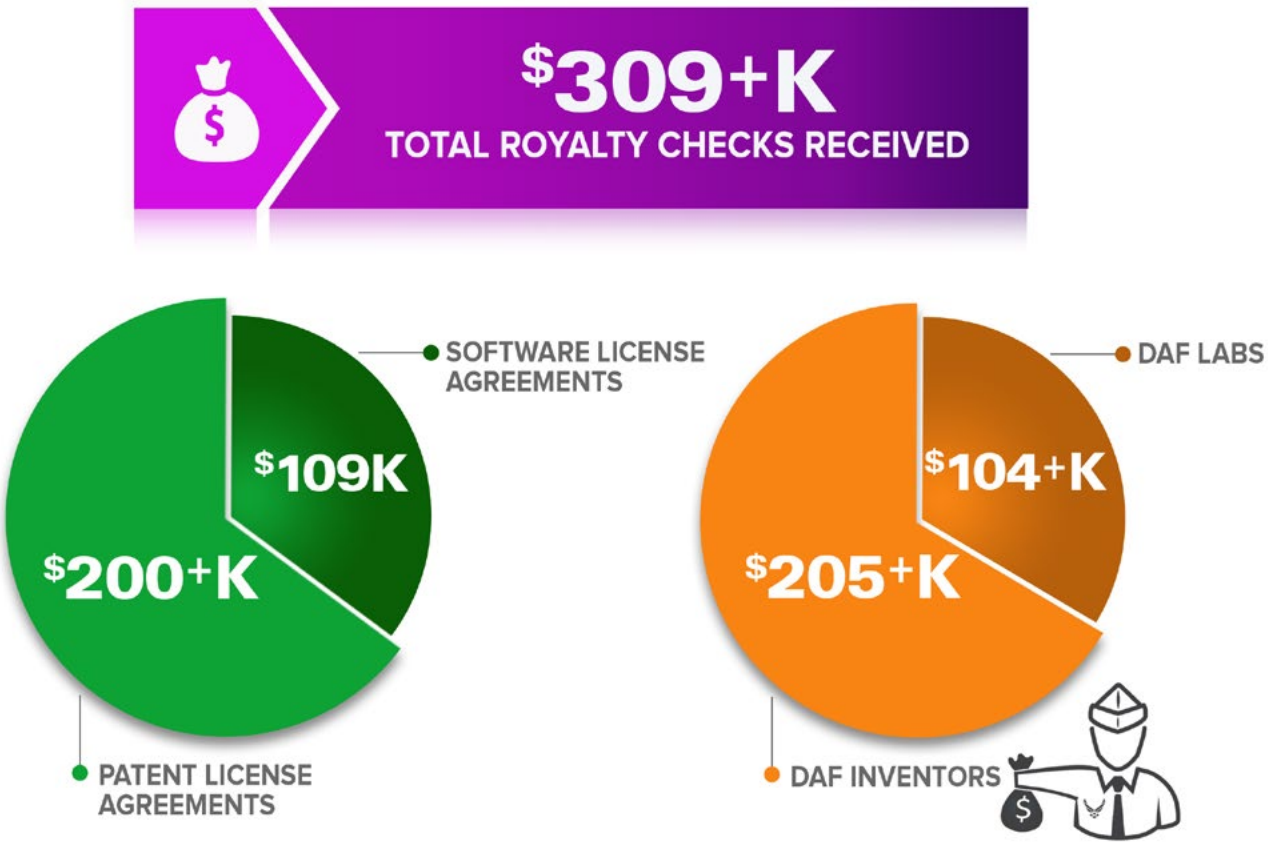
AFRL/RI	$369+M
AETC	$75+M
67 CW	$43+M
AFRL/RW	$31+M
AFRL/RX	$24+M
711 HPW	$20+M
688 CW	$12+M
AFRL/RY	$3+M
AFRL/RQ	$2+M
CFSCC	$894+K
AFSC	$521+K
AFIT	$348+K
DC3	$11+K

Acronym listing is located at the back of the report.

ROYALTIES

As authorized by 15 U.S.C. § 3710, Utilization of Federal Technology; 35 U.S.C. § 207, Domestic and Foreign Protection of Federally-Owned Inventions (k); 35 U.S.C. § 209, Licensing Federally-Owned Inventions (l); Section 801 of Public Law 113-66, 2014 National Defense Authorization Act (NDAA), and in accordance with mandates in the AFI 61-301, the Department of the Air Force (DAF) has established a uniform policy for the distribution of royalties for Patent License Agreements (PLAs) and Software License Agreements (SLAs). Additional guidance from the DAF Technology Executive Officer (TEO) in 2018 eliminated anomalies to ensure even distribution of royalties. As a result, each DAF inventor who assigns interest in their invention to the United States Government receives the first $2,000.00 and 50 percent of the remainder of all royalties received from any single license in the same fiscal year. Any remaining royalty funds are disbursed to the DAF lab or technical activity where the invention originated.

The DAFT3PO office has been delegated authority by the DAF to manage and process all DAF royalty payments. The office has a full-time project manager to track and facilitate these payments, which are subsequently reviewed by the Intellectual Property Law Division of the Air Force Materiel Command Law Office (AFMCLO/JAZ) and disbursed through the Air Force Research Laboratory's Financial Management Directorate (AFRL/FZAO) and Defense Finance Accounting Services (DFAS). In FY22, the T3 office received $309,943.36 in royalty checks for executed PLAs and SLAs, approximately $200,000 and $109,000, respectively. Of the received amount, $205,569.71 was paid to DAF inventors and $104,373.65 was disbursed across DAF laboratories and technical activities.



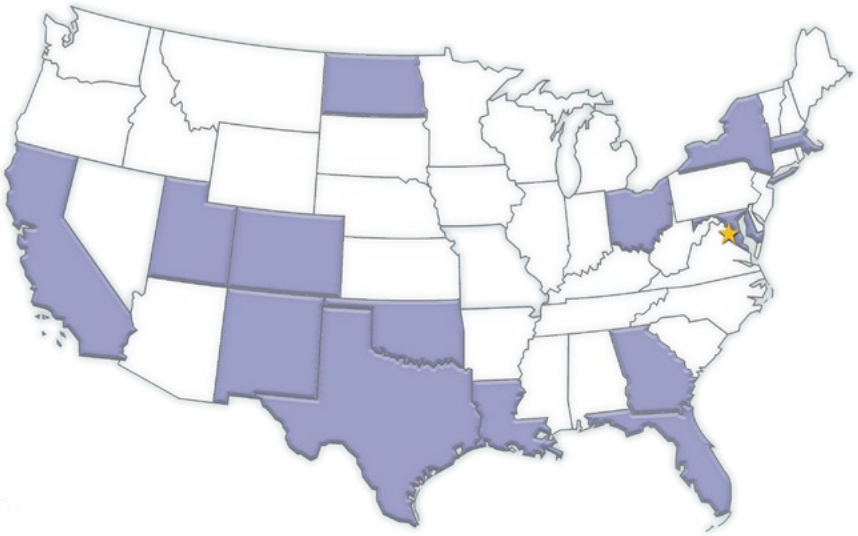
ORTA INFORMATION

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 R&D and 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.

ORTA MAP



CALIFORNIA
EDWARDS AFB
AFTC/ENS
412 TENG/CL

LOS ANGELES AFB
SMC/BCE
SMC/ECX
SMC/SZE

VANDERBERG AFB
60 MDG/SGSE

COLORADO
USAFA
USAFA/DFRO

FLORIDA
EGLIN AFB
96 TW/XPT
AFRL/RW
AFSOC/1SOW

TYNDALL AFB
AFCEC/CXAE

GEORGIA
WARNER-ROBINS AFB
AFSC

LOUISIANA
BARKSDALE AFB
AFGSC/ST

MASSACHUSETTS
HANSCOM AFB
AFLCMC/HN-HB
AFLCMC/HNIX
AFNWC/NC
66TH ABW

MARYLAND
JB ANDREWS
SPARK X CELL
DC3

NEW MEXICO
KIRTLAND AFB
AFRL/RD
AFRL/RV

NEW YORK
ROME
AFRL/RI

NORTH DAKOTA
GRAND FORKS AFB
319 RW

OHIO
WRIGHT-PATT AFB
AFRL/RC
AFRL/RQ
AFRL/RX
AFRL/RY
711 HPW/USAFSAM
AFLCMC/RO
AFLCMC/XZ
AFLCMC/WAC
AFLCMC/WINA
AFLCMC/EN-EZ
AFIT
NASIC

OKLAHOMA
TINKER AFB
AFSC

TEXAS
RANDOLPH/LACKLAND AFB
AETC/A9
67 CW/XPP
688 CW/XPGX

UTAH
HILL AFB
AFSC
75 ABW/SCPT

WASHINGTON DC
AFOSR
AFOSR/RT

Denotes locations where the DAF T3 Program Office at Wright-Patterson AFB serves as the ORTA
Denotes locations where the T3 office at Tinker AFB serves as the ORTA

The Office of Research and Technology Applications (ORTA) is the essential focal point for collaborations between federal laboratories and the outside world. ORTAs promote their lab's technologies, expertise, capabilities, and facilities in order to attract non-federal partners for research and development (R&D) and T2 partnerships. Their responsibility is multifaceted, which requires its specialists to serve as information brokers, liaisons to industry and academia, deal makers, and contract administrators.

ORTA MAP*

DELEGATED AUTHORITY

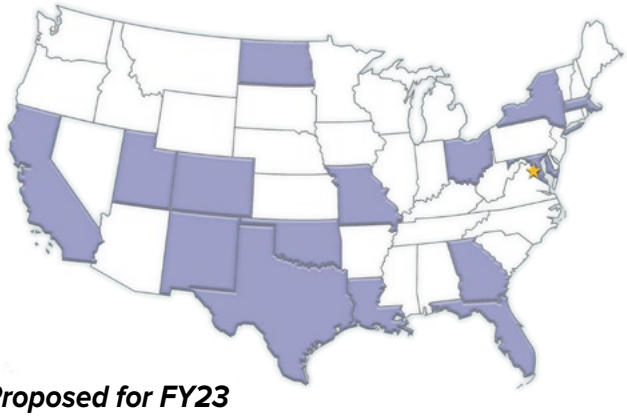
In FY22, the DAFT3PO successfully completed a monumental effort to better drive innovation, maintain integrity of the program and streamline Technology Transfer innovation.

The DAF Technology Executive Officer (TEO), Maj Gen Heather Pringle, tasked the team to perform an extensive audit of DAF organizations and labs regarding designation of defense laboratories and delegated signature authority as it pertains to Technology Transfer activities. The Delegation Team, led and advised by Air Force Materiel Command Legal Office, Intellectual Property Law Division (AFMCLO/JAZ), began the process in February.

The team reviewed and accessed all organizations that had previously been given delegated signature authority by analyzing organizational structure and mission, reviewing agreements completed, frequency of those agreements, and staffing among other metrics before arriving at their decisions on an individual basis. At the completion of this extensive process, the team found many of the delegations were rendered obsolete due to reorganization, deactivation, change of mission or had simply never been used and were otherwise unnecessary. These decisions were not made lightly, with the team utilizing their corporate knowledge of each laboratory and their technology transfer needs and capabilities.

The DAFT3PO Delegation Team next contacted every organization/lab with their findings and intended recommendations to Gen Pringle. Meetings were held with each organization over the next several months to discuss their decisions and listen to any feedback. Upon completion of these meetings, the team drafted an updated delegation letter with their recommendations to be reviewed by Gen Pringle.

The updated letter rescinded all previous delegations, recommending delegated signature authorities be reduced from 52 to 37. This letter was completed and presented to Gen Pringle who praised the team for their hard work before signing it on 12 October 2022, completing the eight-month project.



Proposed for FY23

CALIFORNIA
EDWARDS AFB
412 TW (AFTC/ENS)
LOS ANGELES AFB
SSC/SZ3-BCE
VANDERBERG AFB
SLD 30/XP

COLORADO
USAFA
USAFA/DFQ

FLORIDA
EGLIN AFB
96 TW/XPT (AFTC/ENS)
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

NEW MEXICO
KIRTLAND AFB
AFRL/RD
AFRL/RV

NEW YORK
ROME
AFRL/RI

NORTH DAKOTA
GRAND FORKS AFB
319 RW (319 CONS/CC)

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

OKLAHOMA
TINKER AFB
AFSC/EN - OC-ALC

TENNESSEE
ARNOLD AFB
AEDC (AFTC/ENS)

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

UTAH
HILL AFB
AFSC - OO-ALC

VIRGINIA
ARLINGTON
AFOSR/RT

2022

59TH MEDICAL WING SCIENCE AND TECHNOLOGY DELEGATE

Organization/Laboratory

1.0. Executive Summary

The Office of Research and Technology Applications (ORTA), 59th Medical Wing, Science and Technology (59 MDW/ST) in San Antonio, Texas, consists of Dr. Scott Walter (Director), Mr. James Weissmann (ORTA Manager), Mr. David Sharon, Dr. Jesus Silvas, and Dr. Beth Drees. The quality and success of the 59 MDW/ST ORTA team, and their technology transfer (T2) and transition (T3) processes were recognized by their selection as the Federal Laboratory Consortium (FLC) for Technology Transfer 2021 Regional Partnership Award in support of the collaborative research for the Mid-Continent Region. The 59 MDW/ST research program was granted review and approval (signature) by the Air Force Technology Executive Officer (AFTEO) and delegated to the 59 MDW/CC to create and/or modify technology transition agreements such as Cooperative Research and Development Agreements (CRADAs), Educational Partnership Agreements (EPAs), Commercial Test Agreements (CTAs), and Patent Licensing Agreements (PLAs). This authority enabled the 59 MDW/ST ORTA team to rapidly create, coordinate, and establish standardized agreement processes, reducing the time from previous organizational arrangements; enabling the ORTA team to focus on supporting the customer's mission. Moreover, the 59 MDW ORTA's management of multiple T3 processes, creates a "one-stop-shop" for supporting over 200 clinical researchers at over 57 research sites. This includes universities, small businesses, start-ups, and non-profits, opening a multitude of research avenues for military scientists and clinicians. The number of research agreements and the value of these agreements continues to increase, which has greatly reduced the Department of Defense (DoD) medical research costs by leveraging partnership investments. The current estimated research value of all agreements in the 59 MDW/ST portfolio is approximately $55.7M.

2.0. Organization/Laboratory Overview:

2.1. Laboratory Mission Statement: the mission of the 59 MDW/ST is to support medical research by facilitating collaboration and supporting the transfer and transition of medical technologies and knowledge to commercial and fielded capabilities.

2.2. Description of organization/laboratory: the 59th Medical Wing Chief Scientist's Office, 59MDW/ST provides strategic leadership, scientific, technical, bio-statistical, research regulatory compliance, and program management guidance support for clinical investigations, studies, and translational research conducted by investigators and their collaborators. Studies performed under the 59 MDW/ST address unique scientific/military medical needs of the 59 MDW, Defense Health Agency (DHA), United States Air Force (USAF), Air Force Medical Service (AFMS), joint medical R&D community, and the Department of Defense (DoD). The conglomerate of specialized expertise housed within a single department enables researchers to exploit new knowledge while developing, evaluating, and integrating applications of innovative technologies. Outcomes from collaborative research provide the very best warfighter treatment in pre-hospital conditions, patient-centered care with in-and-out-patient clinics, maintaining and restoring warfighter and beneficiary health, and building warrior medics to address present and future mission challenges. The ST office supports clinical researchers at over 70 sites worldwide. Authority for 59 MDW clinical research is granted generally by 10 USC §2358. More specifically, authority is provided through DOD Directive 6200.04, Force Health Protection, which states, "The Department of Defense shall pursue scientific and technological advancements to improve and protect the health of the force through medical research, development, clinical investigations, technology insertion, and appropriate acquisition strategies."

2.3. Geographic location: JBSA-Lackland and San Antonio-based DoD facilities in Texas

2.4. Technology Focus Areas: the 59 MDW/ST ORTA focuses on providing essential T2 and T3 capabilities to establish research partnerships that provide warfighters, especially medics, with optimized and state-of-the-art medical knowledge, technologies, and capabilities required to execute and accomplish operational missions, save lives, and optimize the health of service members in austere environments.

2.5. Year of Commission: the 59 MDW/ST established the Office of Research and Technology Applications (ORTA) in 2017 to provide researchers and principal investigators with Technology Transfer (T2) and Transition (T3) information, support, assistance, management, and execution of research agreements. The establishment of the ORTA enhanced the promotion and availability of rapid fielding/application of enhanced medical knowledge and medical products by U.S. military operations and forces.

3.0. Strategy/Plan of the ORTA

3.1. How ORTA fits into Lab Organization and Mission: the ORTA office provides researchers with the support needed to (1) establish collaborative agreements with other research and development organizations including government, non-profit, academia, and industry; (2) file invention disclosures and patents to secure intellectual property (IP) for licensing ideas to commercial developers; and (3) work with industry and the DHA Legal Office to facilitate patent submissions, interactions, and licensing for product development, commercial sales, and royalties.

3.2. How T2 Tools are a part of the laboratory's strategic plan: establishment of CRADAs and other T2 agreements fosters partnerships, reduces research costs, reduces project risk, increases collaboration, and maximizes expert support and infusion of new ideas for research endeavors.

3.3. One-Year Objectives and Strategy: the 59 MDW is actively working to transition from USAF oversight and legal support for R&D agreements to DHA oversight, policy direction, and legal support. We are also seeking Review and Approval authority for our 59 MDW/ST office to streamline review and approval timelines and cut execution delays of T2 agreements.

3.4. Near-Term Goals and Strategy: the 59 MDW/ST ORTA is continuing to support researchers and their ability to complete T2 agreements and registration of Intellectual Property (IP) as judiciously as possible using the DHA, United States Army Medical Research and Development Command (USAMRDC) and other legal means as the USAF LOJAZ office will discontinue support as of 1 Jan 2023. Moreover, the ORTA office is seeking to develop and implement process improvements to streamline the drafting, review, and approval processes by at least 1-2 months from start to execution.

3.5. Long-Term Objectives and Strategy: to become the USAF premier T3 ORTA office, handling all USAF medical research facilities, collaborative efforts in the drafting and execution of T2 agreements, and IP evaluation/patent processing.

4.0. Year in Review

4.1. Success Stories (Successful transfer of technologies, the establishment of innovative policy at the lab that facilitates T2, etc.) Please include a short description below and a quad chart for each success story on the provided template.

4.1.1. Success Story #1: University of Virginia (UVA) – through 5 active CRADAs with the UVAs Center for Addiction and Prevention Research, this collaboration focuses on conducting health promotion research, which offers many advantages including improving military readiness and physical health. Analyses performed with alcohol, weight, sleep, and tobacco interventions allow policy-relevant predictive models to improve retention and save valuable personnel (and potentially health care) resources. Besides improved readiness, the benefits of these multiple collaborations is enhanced command awareness of Active-Duty health risk behaviors which can potentially lead to a decrease in excess care utilizations and/or expenditures such as physician care visits, pharmaceutical costs, and long-term health care expenses.

4.1.2. Success Story #2: John Hopkins University – a clinical validation of a portable biosensor device to determine the sensitivity and specificity in differentiating bacterial from viral infection with an ultimate aim to conduct a small-scale pilot validation clinical trial identifying the type, frequency, and seasonal fluctuations of respiratory viruses circulating among Basic Military Trainees. The benefit of a deployable, hand-held device that can be used by minimally trained military personnel for the rapid and accurate detection of respiratory pathogens in pre-hospital or austere environments will lead to early identification of the infected, pre-symptomatic, and/or asymptomatic individuals, thereby allowing timely implementation of mitigation strategies or therapeutic interventions.

4.1.3. Success Story #3: Advanced Exposures, Diagnostics, Interventions, and Biosecurity Program (AEGIS) – the AEGIS Program has formed extensive collaborations with local state, and national research groups for a combined total of 6 active T2 agreements for the understanding of the fundamental mechanisms of neurological and brain injury. Through the application of advanced in vitro models for emerging neurological exposure injuries and dysfunctions, advancement of clinical impactful modeling of blast and blunt exposures through bio-fidelic phantoms, and a greater understanding of the neurophysiological basis of brain health and operational cognitive performance this novel approach for diagnosis and treatment of blast trauma can provide mechanistic insight into common neurological injuries in warfighters.

4.1.4. Success Story #4: Texas Woman's University – a collaborative effort focused on Cerebral Cortex Organoids to develop and analyze unique organoids and organ-on-a-chip technologies to study the neurophysiological effects resulting from unconventional exposure modalities that include, but are not limited to, blast and direct energy exposures. The potential benefit is to provide understanding of the nature of neuronal and other associated ties damages in response to blast, directed energy, and other unconventional exposures. Additionally, the development of innovative and unique human-based organoids and organ-on-a-chip technologies for evaluation of the exposure parameters of injury modalities can lead to technology (blood-brain-barrier and cerebral cortex) and technology advances such as scalability and reproducibility.

4.1.5. Success Story # 5: Biomeme, Inc. – a CRADA was executed to evaluate the Commercial Off The Shelf (COTS) Biomeme System (Franklin three9) by the 59 MDW Center for Advanced Molecular Detection (CAMD) for a new

indication/detection of the novel Coronavirus (SARS-CoV-2) via a portable detection system as well as analytical performance evaluation with multiple specimen types and collection devices in the population and environment to implement epidemiological guidance on Joint Base San Antonio-Lackland, Texas. Operational utility assessment will be performed to test the efficacy of the COTS system in support of public health mission readiness.

4.2. Marketing and Outreach Activities: The ORTA office is actively seeking marketing and outreach strategies to promote research investigations of the 59 MDW/ST. To this end, a successful joint San Antonio Military Medical Industry Day (MMID) was held on 19 Apr 2022 with the San Antonio Economic Development Corporation (SAEDC), San Antonio Economic Development Department (SAEDD), Naval Medical Research Unit-San Antonio (NAMRU-SA), and United States Army Institute of Surgical Research (USAISR) involvement including 3 preparatory webinars to educate attendees on working with the military. This event attracted over 250 participants and was well received by the San Antonio scientific community. Moreover, the ORTA office provided two sessions of annual T3 training for ST researchers, and Clinician Scientist Investigator Opportunity Network (CSION) research fellows in Aug, Sep, and Oct. To streamline communication with the ORTA staff, digital QR codes were created and embedded within an updated informational pamphlet. To correlate with digital updates to the ORTA office, a promotional video and website updates are currently in production.

4.3. Lessons Learned: flexibility in support and execution of our T2 agreements processes and the willingness of our DHA stakeholders to assist in any way they can is needed to make sure our T2 agreement processes continue to be supported as we make the transition from USAF to DHA oversight/support.

4.4. Barriers/problems faced, how they were overcome, and things you would do differently in the future: the transition to DHA has meant the loss of USAF LOJAZ legal support but also opened doors for increased support by MRDC, DHA, and streamlined processes, as previously mentioned.

5.0. Resources

5.1. Human Resources

5.1.1. Dr. Scott Walter, Director, Tech Transfer, and Transition, Director
5.1.2. Mr. James Weissmann, T3 (ORTA) Manager
5.1.3. Mr. Joe Lynch, Project Manager
5.1.4. Dr. Beth Drees, Intellectual Property (IP), Patent, and Licensing Manager
5.1.5. Mr. David Sharon, Sr. Scientific Manager for ORTA
5.1.6. Dr. Jesus Silvas, Sr. Scientific Manager for ORTA

5.2. T2 Education and Training Provided to Organization/Lab Staff: the 59 MDW/ST ORTA provides annual training in-person or virtual for clinicians, medical principal/key investigators, researchers, and project/program managers to offer insight into how to (1) collaborate with academia, industry, and others via research agreements; (2) interface with medical product vendors, use of Non-Disclosure Agreements (NDAs); (3) convert ideas into patents and licensing agreements for fielding new capabilities; (4) offer an overview of medical Small Business Research (SBIR) & Small Business Technology Transfer (STTR) programs,

processes, and considerations; and (5) provide awareness of Food and Drug Administration (FDA) regulatory requirements.

5.3. Professional Development of ORTA: the 59 MDW/ST ORTA staff is currently enrolled in the ORTA Foundations course sponsored by TechLink and Montana State University, September-November 2022. Our office also has an annual subscription to Tech Transfer Central which is a one-stop source for information, news, products, and services for T2 and intellectual property professionals. It includes access to training webinars and other T2 resources.

5.4. Incentives/Awards: The 59 MDW/ST ORTA was the recipient of the Federal Laboratory Consortium (FLC) for Technology Transfer 2021 Regional Partnership Award in support of collaborative research for the Mid-Continent Region.

6.0. Financial

6.1. Royalty Income: $0
6.2. CRADA Income: $0
6.3. CTA Income: $0
6.4. T2 Expenses (excluding salaries – e.g., conferences, publications, training)
6.5. Other T2 Resources- e.g., interns, marketing funds

7.0. Facilities/Equipment

7.1. Laboratory's URL that lists facilities/equipment information: https://www.59mdw.af.mil/Units/Chief-Scientist-ST/

7.2. Unique Capabilities of the Laboratory:

7.2.1. **59th Medical Wing Clinical Investigations and Research Support (CIRS).** The CIRS is government-owned and resides in the San Antonio Military Health (SAMHS). In the San Antonio basin are the Battlefield Health and Trauma Research Institute and the San Antonio Military Medical Center. The CIRS has a core facility available for blood and sample analysis. The CIRS is a world-class clinical investigation and training facility located on the Wilford Hall Ambulatory Surgical Center campus at Joint Base San Antonio-Lackland. CIRS is equipped with state-of-the-art sterile surgical theaters. These suites are well equipped with modern surgical equipment including anesthesia, physiological telemetry with centralized data capture and storage, fluoroscopy and x-ray, hematology, and molecular biology support.

7.2.2. **59th Medical Wing AEGIS/Hearing Center of Excellence (HCoE) Molecular Laboratory.** This molecular lab is a 1,500 sq. ft. facility located within the 59 MDWs Hearing Center of Excellence (HCoE). The HCoE laboratory is outfitted with (2) Class II biological safety cabinets (BSCs) used in the aseptic handling of cells and biomaterials. Both BSCs are intended for everyday cell culture and for development of novel organoids. Additionally, temperature controlled, carbon dioxide (CO_2) incubators for standard eukaryotic cell culture and maintenance, freezers, and liquid nitrogen storage for long-term cryopreservation of multiple cell types are also housed within the HCoE. There are several analytical and validation tools, including a Becton Dickinson (BD) Cytoflex flow cytometry cell

analyzer, a ProteinSimple ELLA automated multiplex ELISA assay system, ProteinSimple JESS automated western blot system, RT-PCR QuantStudio 7 flex, Miltenyi MacsQuant 10, and Molecular Devices high-throughput GenePix array system. Additionally, the laboratory is outfitted with a Microelectrode Array (MEA) system from Harvard Biosciences along with a dedicated CO_2 incubator for extended culture of exposure organoids and other cell cultures with real-time neuroelectrical output. Additionally, the HCoE will house an LSM900 Zeiss laser-scanning confocal microscope with multi-photon capabilities that can scan to a depth of up to 1 cm.

7.2.3. **Center for Advanced Molecular Detection (CAMD).** The CAMD is a specialized research unit that conducts biomedical and bioengineering research focused on precision care, molecular diagnostics, and regenerative medicine. Research endeavors include translating "omic" biomarker discovery into diagnostic tests associated with susceptibility and resistance to disease and injury, and operational assessment of diagnostic technology. Additionally, the CAMD supports studies that blend innovative bioengineering solutions such as machine learning to improve sensitivity and specificity for disease detection with molecular assays. The CAMD works collaboratively with internal and external researchers to translate novel concepts and technologies into materiel solutions and knowledge products. This work aims to increase diagnostic efficiencies and reduce costs for better medical decision making that translates into enhanced warfighter readiness.

7.2.4. **Clinician Scientist Investigator Opportunity Network (CSION).** The CSION program develops those active-duty clinicians who have a passion/talent for synthesizing promising discovery into practical application into the next generation of gifted clinician-scientists. The 59 MDW Chief Scientist agreed to sponsor this effort being in line with the 59 MDW/ST Vision, "To grow medical leaders". The program is unique in that it is 1) Tri-service, 2) Corps neutral, 3) has no service obligation, and 4) focused on research mission rather than degree granting. The pipeline a CSION fellow creates is tailored for the needs of the military mission rather than personal gain. With no service obligation, motivated members are offered a non-financial incentive to remain in a career tract specifically designed to retain research-focused medical academicians within the military. The program is supported by the 59MDW Office of the Chief Scientist, Science & Technology (ST) and all of their partners with the United States Army Institute of Surgical Research (USAISR), San Antonio Military Health System (SAMHS), SAUSHEC and Naval Medical Research Unit San Antonio (NAMRU-SA) to provide mentors willing to train and mentor clinician scientists in all areas of (DHP RDT&E) programmatic research.

7.3. Examples of how some of this facilities/equipment are used by the private sector through CRADAs, test agreements, etc. (See Section 4.1, Success stories). No private sector use at this time.

8.0. Performance Measures

8.1. Overall Trends

8.1.1. CRADAs

Active Agreements: 32

New Agreements:

Amendments: 11

8.1.2. EPAs
Active: 6
New: 3

8.1.3. CTAs
Active: 0
New: 0

8.1.4. MTAs
Active: 12
New: 8

8.1.5. ITAs
Active: 0
New: 0

8.1.6. NDAs
Active: 2
New: 2

8.1.7. PLAs
Active: 1
New: 0

8.1.8. Please list the number of active & new agreements for any other T2 mechanisms your lab has (training affiliation agreements, software license, etc.): 2 JOAs

8.1.9. Intellectual Property
Invention Disclosures: 2
Patent Applications: 7
Patents Issued: 0

5 ACTIVE CRADAs, UNIVERSITY OF VIRGINIA

Nov 2022

Objective: Conducting health promotion research offers many advantages, including improving military readiness and physical health. Analyses performed with alcohol, weight, sleep and tobacco interventions allow policy-relevant predictive models to improve retention and save valuable personnel (and potentially health care) resources.

Benefits: Improved Readiness. Enhanced Command awareness of AD Health Risk Behaviors. Decreased excess care utilization/expenditures (physician office visits, pharmacy, long term health care costs).

Long Term Benefits:

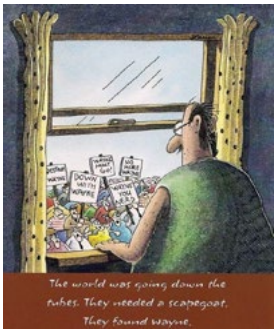
- Benefit to USAF is actionable data that can lead to more effective prevention policies around alcohol use, tobacco use, sleep health and weight gain prevention in the Air Force and DoD and, ultimately, to healthier military populations
- Two NIH Grant awards in 2022 and 24 peer-reviewed publications since 2018 -- *see bibliography
- Interventions for Airmen are rigorously tested for effectiveness, to save countless disability adjusted life years – a healthier Air Force. Available for AF use later

Broad Impact

- UVA Prevention efforts associated with 16% reduction of alcohol related incidents in Tech Trng, saving $Ms in personnel costs for USAF
- Continued preventive interventions for alcohol misuse to over 200K Airmen in Training
- Recently awarded $7M in research grants from NIH to further study weight gain prevention and prevention of alcohol misuse
- Data Sharing Agreements with DHA support cost and health outcome analyses re: weight gain in pregnancy

University of VA Contact:

Dr. G. Wayne Talcott
gwt3a@Virginia.edu



Contact Info:

Mr. James Weissmann, MS, DHA
59 MDW/ST ORTA Manager
james.w.Weissmann.civ@health.mil

A Novel portable Biosensor Device for Detecting Respiratory Pathogens in Military Personnel

Nov 2022

Objective: Clinical validation of a portable biosensor device to determine the sensitivity and specificity in differentiating bacterial from viral infection. Moreover, ultimate aim is to conduct a small-scale pilot validation clinical trial identifying the type, frequency and seasonal fluctuations of respiratory viruses circulating in Basic Military Trainees.

Benefits: A deployable, hand-held device that can be used by minimally trained military personnel for the rapid and accurate detection of respiratory pathogens in pre-hospital or austere environments.

Technology: Portable Test Strip Reader

- Technology consists of two components:
  - Disposable Cartridge: Contains five modules for saliva sample application and processing
  - Reader: Reads test chip and generates result.
- Technology Advantages:
  - Multiplex capability: can test any pathogen of interest upon target validation.
  - Suitable for testing a diverse range of biological specimens.
  - Scalability Production.
  - Ideal for austere military environment.

Status:

- Collaborating with Johns Hopkins University: Dr. Sam Das, (443) 287-0168
- TRL/MRL: TRL3
- CRADA Docket No. 21-138-59MDW-C22012

Broad Impact and Long Term-Benefits:

- Seeking funding to pursue validation and FDA approval of our testing device.
- Approval will provide technology world-wide at very low cost.
- Increased surveillance of respiratory pathogens.
- Greatest health impact on developing countries.

Technology Contact:

Dr. Susana Asin
susana.n.asin.civ@health.mil

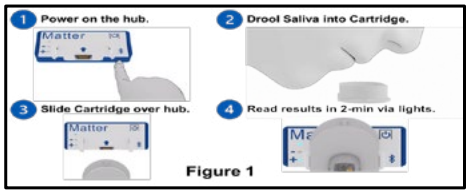


Figure 1

Contact Info:

Mr. James Weissmann, MS, DHA
59 MDW/ST ORTA Manager
james.w.Weissmann.civ@health.mil

Advanced Exposures Diagnostics, Interventions, and Biosecurity Program (AEGIS)-6 Active Support Agreements

Nov 2022

Objective:

- Understanding of the fundamental mechanisms of neurologic and brain injury.
- Application of advanced in vitro models for emerging neurological exposure injuries and dysfunctions.
- Advancement of clinical impactful modeling of blast and blunt exposures through bio-fidelic phantoms.
- Understanding the neurophysiologic basis of brain health and operational cognitive performance.

Benefits: Provide mechanistic insight into common neurological injuries in warfighters.

Long Term Benefits:

- Novel approaches for diagnosis and treatment of blast trauma
- 8-peer reviewed publications between 2021 and 2022
- Development of innovative research tools for detection of brain damage and assessment of neurological impacts on Airmen quality of life.

Broad Impact:

The AEGIS program has formed extensive collaborations with local, state, and national research groups:

- Texas Woman's University
- Geneva Foundation
- Michigan State University
- University of Texas at San Antonio
- New Mexico Tech
- University of Pittsburgh
- University of Arkansas
- University of North Dakota
- University of Washington
- Uniformed Services University
- Henry Jackson Foundation
- Federal Aviation Administration

AEGIS Contact:

LtCol Adam M. Willis, MD, PhD
adam.m.willis@health.mil

Contact Info:

Mr. James Weissmann, MS, DHA
59 MDW/ST ORTA Manager
james.w.Weissmann.civ@health.mil

Two-Material Phantom With Motion Tracers

Cerebral Cortex Organoids

Nov 2022

Objective: Develop and analyze unique organoids and organ-on-a-chip technologies for the study of neurophysiological effects resulting from unconventional exposure modalities that include, but are not limited to, blast and direct energy exposures.

Benefits: Provide understanding of the nature of neuronal and other associated tissue damages in response to blast, directed energy, and other unconventional exposures. Additionally, develop innovative and unique human-based organoids and organ-on-a-chip technologies for evaluation of the exposure parameters of injury modalities.

Technology:

Neuronal Organoids and Organ-on-a-Chip

- Technology:
  - Blood-Brain-Barrier
  - Cerebral Cortex
- Technology Advantages:
  - Blast modeling can be recapitulated *in vitro* without the need of an animal model.
  - Suitable for protein and genome analysis.
  - Scalability and reproducibility.

Status:

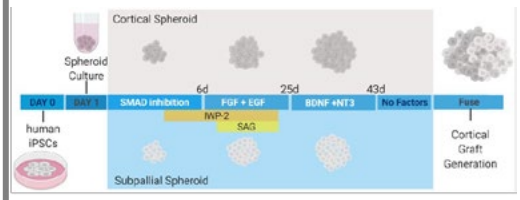
- Collaborating with Texas Women's University: Dr. Zane Lybrand, (940) 898-2192
- CRADA Docket No. 21-322-59MDW-C22002

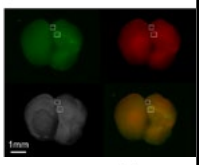
Broad Impact and Long Term-Benefits:

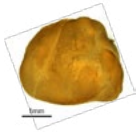
- Develop innovative strategies for the treatment and mitigation of unconventional exposure to blast induced neurological injuries.
- Improve the standard of care for wound care and treatment of neurological injuries.

Technology Contact:

Dr. Tony Yuan
tony.yuan.civ@health.mil







Contact Info:

Mr. James Weissmann, MS, DHA
59 MDW/ST ORTA Manager
james.w.Weissmann.civ@health.mil

Coronavirus Detection on the Biomeme System

Nov 2022

Objective: The COTS Biomeme system (Franklin three9) will be evaluated for a new indication - detection of the novel Coronavirus (SARS-CoV-2) plus analytical performance with multiple specimen types and collection devices.

Benefits: The COTS Biomeme system will be evaluated for a new indication at the 59MDW Center for Advanced Molecular Detection as a method for detecting Coronavirus in the population and environment to implement epidemiological guidance on Joint Base San Antonio, Lackland.

Technology: Portable Test Strip Reader

- Sample extraction using an RNA Prep Cartridge.
- Go-Strips, specific for SARS-CoV-2.
- Technology Advantages:
  - Mobile, no lab required.
  - Multiplexed viral genome targets.

Status:

Collaborating with Biomeme, Inc.

- TRL/MRL: 8/9
- CRADA Docket No. 20-250-59MDW-C21015

Broad Impact and Long Term-Benefits:

- Biomeme has been successfully fielded for commercial applications of a wide variety of pathogen identification assays. Operational utility assessment using an MTF-based assessment will be performed to test efficacy the COTS Biomeme System for detection of the Coronavirus in support of public health mission readiness.

Technology Contact:

Alexander Burdette, PhD
alexander.j.burdette2.civ@health.mil
Lisa Lott, PhD
lisa.lott.ctr@health.mil

Biomeme Franklin™

Contact Info:

Mr. James Weissmann, MS, DHA
59 MDW/ST ORTA Manager
james.w.Weissmann.civ@health.mil

2022

81ST MEDICAL GROUP DELEGATE

Organization/Laboratory

1.0 Executive Summary

2.0 Organization/Laboratory Overview:

- 2.1 Laboratory Mission Statement: The mission of the DHA Clinical Investigations Program is to facilitate research and training to support Graduate Health Sciences Education and other allied health programs of the Military Services, to further enhance patient care in the MHS, and to contribute to medical readiness solutions.
- 2.2 Description of organization/laboratory: DHA Clinical Investigation Program (CIP)
- 2.3 Geographic location: Keesler AFB, Biloxi, MS
- 2.4 Technology Focus Areas: CIPs do not have permanent technology focuses. They are a support function to provide research capabilities for the local Graduate Health Sciences Education as well as the Medical Group staff as necessary. Projects are primarily short-term efforts of limited scope.
- 2.5 Year of Commission: Unknown. Keesler's CIP has been at its present location since 1979, but the AF CIP program was commissioned in 1984.

3.0 Strategy/Plan of the ORTA

- 3.1 How ORTA fits into Lab Organization and Mission: It is not part of the core mission of the CIP to drive studies that would require ORTA, but route MDG staff on the ORTA track and assist with technical development and administrative processes as needed.
- 3.2 How T2 Tools are a part of the lab strategic planning: T2 Tools are not part of the CIP's main mission.
- 3.3 One Year Objectives and Strategy: support the technical development and administrative processes of MDG staff as needed.
- 3.4 Near Term Goals and Strategy: support the technical development and administrative processes of MDG staff as needed.
- 3.5 Long Term Objectives and Strategy: support the technical development and administrative processes of MDG staff as needed.

4.0 Year in Review

- 4.1 Success Stories (Successful transfer of technologies, establishment of innovative policy at lab that facilitates T2, etc.) Please include a short description below and a quad chart for each success story on the provided template.
  - 4.1.1 Success Story #1: None. University of Kentucky CRADA in progress but not completed.
- 4.2 Marketing and Outreach Activities: None.
- 4.3 Lessons Learned: None.
- 4.4 Barriers/problems faced, how they were overcome, things you would do differently in the future: protracted turn-around times with collaborator legal offices.

5.0 Resources

- 5.1 Human Resources: 1 contractor to support ORTA functions as an additional duty.
- 5.2 T2 Education and Training Provided to Organization/Lab Staff: one-on-one guidance as requested/needed for individual projects.
- 5.3 Professional Development of ORTA: unknown.
- 5.4 Incentives/Awards: none.

6.0 Financial

- 6.1 Royalty Income: none.
- 6.2 CRADA Income none.

6.3 CTA Income none.
6.4 T2 Expenses (excluding salaries – e.g., conferences, publications, training): none.
6.5 Other T2 Resources- e.g., interns, marketing funds: none.

7.0 Facilities/Equipment

7.1 Laboratory's URL that lists facilities/equipment information: none.
7.2 Unique Capabilities of the Laboratory: none.
7.3 Examples of how some of these facilities/equipment are used by the private sector through CRADAs, test agreements etc.: the CIP and its equipment is not utilized by the private sector.

8.0 Performance Measures

8.1 Overall Trends

8.1.1 CRADAs
Active Agreements: None.
New Agreements: None.
Amendments: None.

8.1.2 EPAs
Active: 12 Dec 19 agreement for equipment loan to the University of KY
New: Replace existing loan EPA with a donation agreement.

8.1.3 CTAs
Active: None.
New: None.

8.1.4 MTAs
Active: None.
New: None.

8.1.5 ITAs
Active: None.
New: None.

8.1.6 NDAs
Active: None.
New: None.

8.1.7 PLAs
Active: None.
New: None.

8.1.8 Please list the number of active & new agreements for any other T2 mechanisms your lab has (training affiliation agreements, software license, etc.): None.

8.1.9 Intellectual Property
Invention Disclosures: None.
Patent Applications: Docket #: AFD-1467P; USPTO Serial # 62/449,205; Filing Date: 23-Jan-17; Title: Porcine Immune Modulation Model "PIMM"
Patents Issued: 10,729,650 - Skin-Punch Biopsy and Wound-Debridement Training Model

EPA Equipment Loan Agreement between Keesler Medical Center and University of Kentucky

26 Oct 2022

Objective:

Background and contributing factors that led to effort:

- The local dental residency program transferred to the 59 MDW and only took some of their lab equipment.
- The AF Dental Program Consultant retired and moved to UK, but maintained support with the AF Dental Program.

T2 Barriers addressed: Securing agreement between the AF and UK legal offices on EPA template format/content.

Description of T2 Facilitator:

- Collaboration with non-DoD entity to improve T2 within the AF.

Organizational Impact:

- **Collaborators:** Keesler Medical Center & UK.
- **How the specific project or organization benefited from the effort:** UK has provided data and assistance for AF Dental GME.
- **Effects of the T2 facilitator at the local level:** provided additional space and utilities for equipment to support the local Keesler GME programs.

Contact Info: Dr. Suizhao Wang, 228-376-4127

Broad Impact and Long Term Benefits:

- Awards or commendations: None.
- Benefits to other DoD labs: None.
- Benefits to warfighter:
  - Equipment is being utilized versus destroyed
  - The CIP gained space and capabilities to support local requirements
  - Dental GME provided continued support for training/providing dentists for the AF
  - Improved warfighter readiness by ensuring state of the art/optimal dental treatments are provided
- Effect on ways DoD does business with small businesses, primes, universities, etc: N/A.

2022

99TH MEDICAL GROUP

DEPARTMENT OF MEDICAL EDUCATION

DELEGATE

FY22 Annual Technology Transfer Report

99 MDG/DME

Executive Summary

1.0 Executive Summary

The 99MDG/DME was recognized as a defense laboratory for Technology Transfer purposes and approved to enter into CRADAs, EPAs and CTAs in June of 2018. Since that time 3 CRADAs have been executed. These CRADAs have provided the means to further research and eventually technology transfer as the program grows and matures and acquires more resources in order to facilitate a robust technology transfer program.

The recognition of the 99MDG/DME as a defense laboratory for Technology Transfer purposes was critical in enhancing the mission of the Clinical Investigation Program (CIP) at the 99MDG/DME. Prior to this designation it was difficult to get a CRADA executed, which decreased the effectiveness of the CIP and hampered several collaborations. Since recognition as a T2 laboratory, the CRADA partnerships have increased the funding available for Graduate Medical Education Research. In FY19 an integrative medicine clinic was established through the support from CRADA partners. This clinic has continued to grow in FY22 and is testing multiple integrative medicine modalities. The aim is to determine what techniques and technologies work to restore whole health within a military population and assist with development, acquisition and transition of these to military medical practice through clinical and implementation trials, education of medical personnel and pragmatic treatment of patients.

2.0 Organization/Laboratory overview

2.1 Laboratory Mission Statement

The 99MDG/DME laboratory provides T2 services to the Clinical Investigation Program to further its mission in supporting Graduate Medical Education research.

2.2 Description of organization/laboratory

The 99MDG/DME laboratory is located within the Mike O'Callaghan Military Medical Center. The laboratory supports Graduate Medical Education (GME) research at the medical center and also participates in the Regional CIP program providing regulatory and study management services to Eglin AFB, FL and Scott AFB, IL, and helping them build their research programs. The laboratory also supports the research of the integrative medicine clinic, which also supports graduate medical education training and research.

2.3 Geographic location

The 99MDG/DME laboratory is located at the Mike O'Callaghan Military Medical Center on Nellis AFB near Las Vegas, Nevada and is housed under the 99MDG/DME.

2.4 Technology Focus Areas

The laboratory conducts development and testing of integrative medicine modalities to determine what techniques and technologies work to restore whole health within a military population.

2.5 Year of Commission:

The 99MDG/DME laboratory was established in 2018. As a new Laboratory the 99MDG/DME has focused mainly on establishing CRADAs with non-profit and educational institutions in collaborative research initiated clinical research protocols.

3.0 Strategy/Plan of the ORTA

3.1 Near Term Goals and Strategy

As research expands in the area of alternatives for pain management, the 99MDG/DME is looking to leverage the existing partnerships to provide opportunities to collaborate on inventions or testing of innovative treatments/devices for pain management. Through the National Foundation for Integrative Medicine CRADA, the partnership is also looking to add to the modalities already being tested. This will hopefully provide treatments for other hard-to-treat medical conditions that traditionally result in long-term opioid usage and chronic pain without an alternative pain solution.

In addition, Techlink has a new training course through Montana State University that our ORTA will attend in FY23 to further the education of the ORTA. This education will help increase the ORTA activities including identifying potential invention disclosures and patent opportunities.

3.2 Long Term Objectives and Strategy

The 99MDG/DME CIP currently supports 7 Graduate Medical education programs, 4 sponsored programs and 3 civilian sponsored programs. There are preliminary discussions to add 4-6 combined civilian/military residency programs in the next few years. With the increase in Graduate Medical Education the opportunity for clinical research in many different areas increases. The civilian sponsored programs opens many avenues for educational partnership agreements with the civilian institutions that sponsor the residency programs and also with the local colleges and universities in the area.

The CIP, as a Regional CIP program has 39 studies currently in progress or draft. The residents/staff present their research at various conferences throughout the year and also publish in various research journals both within and outside of the military health system and outside. The 99MDG is becoming an integrative medicine hub within the Air Force. This is due in part to a CRADA National Foundation for Integrative Medicine that provides integrative medicine research collaboration to Nellis providers.

In addition, the new integrative medicine clinic continues to develop new research protocols and develop new treatment approaches in order to keep our warfighters in ready status. The technologies that are tested through the CRADA and found to be effective are able to be procured for the facility in the treatment of the Airman .

Performance Measures

	INTELLECTUAL PROPERTY	FY-22	FY-21	FY-20	FY-19
1	Invention Disclosures Received				
2	Total Patent Applications Filed				
3	U.S.				
4	Foreign				
5	Total PCT Applications Filed				
6	Total Patents Issued				
7	U.S.				
8	Foreign				

	LICENSES	FY-22	FY-21	FY-20	FY-19
9	Invention Licenses, Total Active				
10	New Invention Licenses				
11	New Invention Licenses Granted to Small Businesses				
12	Income Bearing Licenses, Total Active				
13	New Income Bearing Licenses				
14	Exclusive, Total Active				
15	Partially-Exclusive, Total Active				
16	Non-Exclusive, Total Active				
17	Other Licenses, Total Active				
18	New Other Licenses				
19	New Other Licenses Granted to Small Businesses				
20	Elapsed Amount of Time for Granting Invention Licenses				
21	Average (months)				
22	Minimum (months)				
23	Maximum (months)				
24	Licenses Terminated for Cause				

	CRADAs	FY-22	FY-21	FY-20	FY-19
25	Total Active CRADAs	1	2	2	2
26	New CRADAs	0	0	0	0
27	Active CRADAs Involving Small Businesses				
28	CRADAs with Foreign Entities				

29	CRADA Income	502,500	402,500	$266,459	
30	Estimated CRADA Contributed Value	2.5M	934,500	600,000	
31	Total Active Material Transfer Agreements (MTAs)				
32	New MTAs				
33	Total Non-Disclosure Agreements				

	OTHER T2 Metrics	FY-21	FY-20	FY-19	FY-18
34	Total Active Commercial Test Agreements (CTAs)				
35	New CTAs				
36	CTA Income				
37	Total Active Information Transfer Agreements (ITAs)				
38	New ITAs				
39	Total Active Education Partnership Agreements (EPAs)				
40	New EPAs				
41	Total Active EPAs with HBCUs and Minority Serving Institutions				
42	Total Active EPAs with Grade Schools				
43	Total Active EPAs with High Schools				
44	Total Active EPAs with Colleges/Universities				
45	Total Software Licenses Executed				

2022

AIR EDUCATION AND TRAINING COMMAND DELEGATE

FY22 Annual Technology Transfer Report
AETC's Transformational Education and Training Applications (ATETA)

Executive Summary

The FY22 annual report highlights progress, status, and challenges of Air Education and Training Command's Transformational Education and Training Applications (ATETA) and provides the organizational strategic plan, metrics, and ongoing efforts taken in support of the third year of laboratory.

In FY22, ATETA was a recognized defense laboratory, with delegated authority to review and approve Cooperative Research and Development Agreements (CRADAs), Education Partnership Agreements (EPAs), Commercial Test Agreements (CTAs), Patent License Agreements (PLAs), Information Transfer Agreements (ITAs) and Section 801 authority agreements with non-federal partners to extend AETC's abilities to identify and pursue innovative opportunities. Under the leadership of Laboratory Director, Colonel Thomas F. Wegner, ATETA continued to grow and gain recognition as a strategically aligned asset in the HQ AETC/A9, Analysis and Innovation Directorate, providing its agreement capacity as a tool for innovation. During this period, outreach efforts have resulted in progress on ongoing efforts, objectives, and the formation of one CRADA and one EPA with additional efforts in negotiation.

ATETA enables partnerships to execute research, studies, analysis, and demonstrations through T2 agreements to facilitate the AETC mission to recruit, train, and educate exceptional Airmen. Additionally, the ATETA enables integration and implementation of creative and disruptive technology found in the National Security Innovation Base (NSIB) through creation of mutually beneficial relationships. The ORTA links technology, mission, and marketplace by providing a means to infuse ideas, concepts, and learning science lessons from across the NSIB into AETC's multiple mission sets. These connections continue to enable innovation and are instrumental in informing US citizens of the opportunities and capabilities that exist within the USAF further linking the service to the citizenry.

ATETA focuses on initiating and establishing relationships through technology transfer agreements to solve technology gaps and take advantage of cutting-edge advancements supporting AETC Strategic Action Priorities (Figure 1). ATETA enhances communication and provides an administrative bridge between industry including small business, non-traditional companies, newly developed innovation companies, academia, and HQ AETC stakeholders.

Figure 1: AETC Strategic Action Plan

ATETA vision links technology with the mission and market helping the USAF by:
- Bridging warfighter capability needs
- Assessing Commercial-Off the Shelf technologies
- Leveraging nation's investment in scientific and technology capabilities
- Developing future workforce
- Collaborating to advance research
- Gaining insight into market, needs and trends

FY 2022 Activities

In ATETA's fourth year, the team further refined its operational program of developing relationships with community and partners. The lab focused on messaging capabilities, relationship management, standardizing processes, and metrics. The team continues to monitor and measure performance aligned with meeting the AETC Commander's priorities. Successes under these technology transfer agreements this last year framed the commands knowledge of industry capabilities and shaped future of force development requirements across the command. These standardized processes allowed ATETA to rapidly place T2 agreements across the command and demonstrate return on investment from the limited resources (Figure 2).

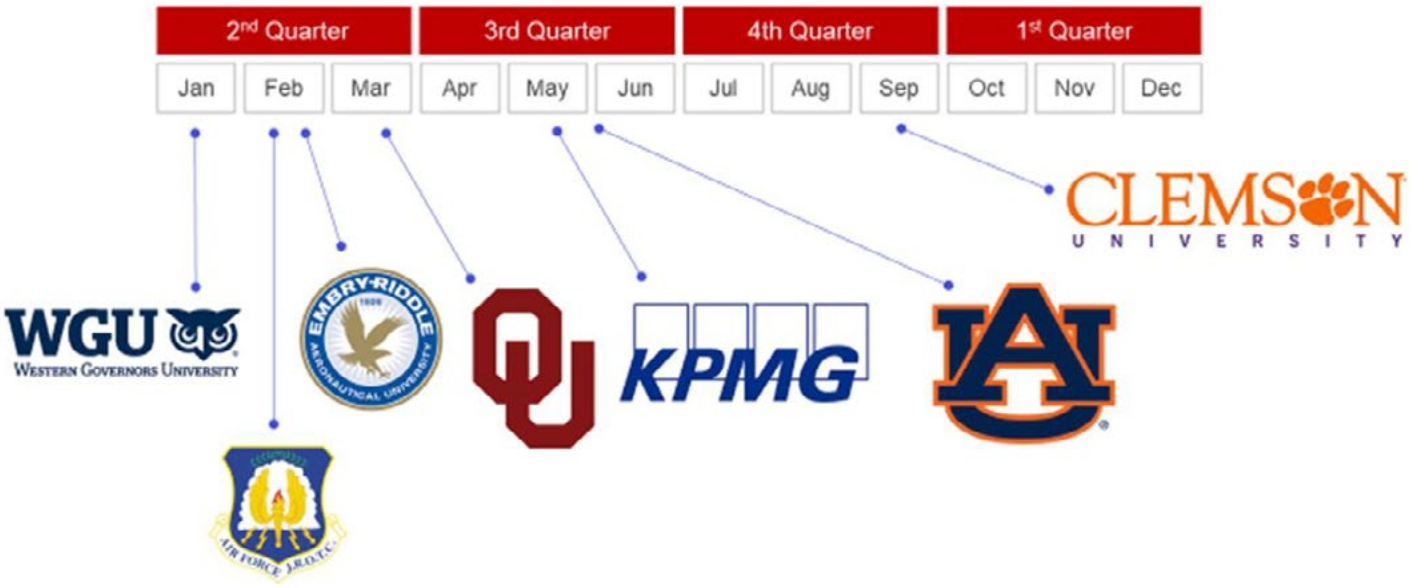


Figure 2: New FY22 T2 Agreements

In FY22 ATETA partnered with AFRL New Mexico to use their Partnership Intermediary Agreement (PIA) with New Mexico Tech University and University of Texas San Antonio to support the AETC innovation ecosystem using Tech Transfer. The PIA activities may include:

- patent and intellectual property (IP) management
- technology and market research
- collaboration spaces
- technology showcases and events
- prize competitions
- RDT&E collaborations and agreements
- prototyping and manufacturing capabilities
- STEM education and workforce development
- support for Small Business Innovation Research (SBIR) and (STTR) programs
- business incubation

Successes

Outreach and training efforts this year solidified ATETA presence as a premiere avenue to support command innovation. The ORTA provided presentations at the AETC Innovation Summit, ForceCon 22, AFWERX Spark, several division and branch focused training sessions, and the AETC Strategic Action Priorities briefings. These presentations informed innovators, innovation cells, potential partners, and leadership across the command of the potential of using T2 to enhance their innovation efforts.

ATETA pursued opportunities, where applicable, to meet AETC's mission and Strategic Action Priorities based on the operational approach. ATETA's lines of efforts include:

- Policy – identifying impediments & administrative improvements in T2 policy & practices
- Training – building & developing an intrapreneurial/extrapreneurial focus in the workforce
- Tools – providing acquisition subject matter expertise across the full spectrum of T2s
- Partnerships – effectively leveraging services, government agencies, industry, labs & academia
- Innovation – improving and building an ecosystem & continue innovation discovery events
- Metrics – monitoring the overall program effectiveness & understanding R&D

Success Stories

Keesler | 338 TRS seizes their window of opportunity

Following the Air Force Chief of Staff Gen Charles Q. Brown's Accelerate Change or Lose strategic approach, the Joint Warfighting Concept focuses on moving forward with digital, low cost, high tech, warfighting capabilities.

The 338th Training Squadron's Cooperative Research and Development Agreement with the University of Central Florida (UCF) allows the unit to work with graduate students at the Florida Interactive Entertainment Academy (FIEA), UCF's Master of Science in Interactive Entertainment program.

As a part of their capstone projects, FIEA students partner with a community organization to create a game or simulation directly supporting that organization's mission. This process, called gamification, is becoming increasingly used in educational settings and allows students to learn in an interactive and immersive way.

"We now have a formal vehicle for information exchange, training, development and advancements with a nationally recognized leader in cyber academia," said Glenn Dennison, 338 TRS training development element chief. "That's one of the biggest reasons why we decided to

partner with UCF, because of what they bring to our mission and fight when it comes to training our students."

Partnerships like this play an important role in force development by allowing squadrons to bring ideas for student training to life.

"Working with the military simulation community gives our FIEA students the unique opportunity to see the real-world applications of gamification software," said Erik Sand, UCF FIEA director of strategic partnerships. "We are excited to be a part of developing new technologies and continuing to share the latest technology."

Gamification also allows the training squadron to cost effectively modernize education and training by eliminating the added expense of purchasing surplus materials for students to practice with.

From year to year, the 338 TRS's project proposals submitted to the FIEA program vary depending on mission requirements. Dennison and his team look across the existing curriculum to find out where their students could benefit from gamification.

The 338 TRS specializes in training students in two main pipelines, Network Systems Operations and Radio Frequency Transmissions and supports several other supplemental courses. Last year, FIEA developed a custom computer game that the 338 TRS used to teach students the big picture of how to build, patch and activate key parts of cables and ports.

"Each student we spoke to said that the game helped them understand and learn how to build the cables a lot faster," said Dennison. "When they moved to the next lesson, they saw it all come together."

The partnership has allowed for increased information sharing and networking opportunities for both parties.

Embry Riddle Aeronautical University and the 56 FW EPA

Training the world's greatest fighter pilots and combat-ready warfighters is nothing new for the 56th Fighter Wing, where education and innovation merge to create the epicenter of airpower.

Operating under AETC, the fighter wing has been granted the responsibility to research, teach, and train to fulfill the Air Force's mission to Fly, Fight, and Win; thus, in Feb 22, AETC and Luke AFB took a huge step in expanding the wing's training potential.

The 56 FW entered into a mutually beneficial Education Partnership Agreement (EPA) with Embry-Riddle Aeronautical University to provide access for undergraduate researchers and software developers to foster the development of new technologies in the aviation and aerospace arenas.

Embry-Riddle, whose Worldwide Campus has been working with military members since 1970, has been a staple for Luke's Airmen looking to earn undergraduate certifications and a number of degrees for years. Now, with this partnership, Embry-Riddle will offer students the ability to produce deliverables and train in a real-world environment alongside the military.

According to Abby Boggs, AETC Defense Lab Technology Transfer Manager at Joint Base San Antonio-Randolph, Texas, the EPA enables AETC to promote the education of future scientists and engineers, while enhancing and broadening the professional and technical career development of its personnel through joint research exchanges.

Much of the emerging technologies that will determine our future are no longer created or funded by the Department of Defense, according to Air Force Chief of Staff Gen Charles Q. Brown's Accelerate Change or Lose strategic approach, meaning innovation, partnership, collaboration, and reducing cost and risk are integral to achieving the Air Force mission.

Boggs revealed this EPA addresses Gen Brown's strategy by providing information exchanges and research projects in the areas of data management and transfer, electromagnetic spectrum and advanced communications, software development, and machine learning. Other technologies include augmented and mixed reality, artificial intelligence, and autonomous mobility.

The partnership Boggs and her office structured aligns with the Air Force Science and Technology Strategy's element of investing in science and technology with partners to integrate existing capabilities and mature technologies into innovative, affordable, and sustainable solutions.

Overseeing this five-year agreement with Embry-Riddle is Capt Wesley Reid, a 56 FW instructor pilot and Innovation Spark Cell lead.

"We got started in February with the objective of pairing Embry-Riddle's academic expertise to our wing's problem sets," Reid said. "The first projects in this five-year agreement will involve students assisting with the digitization of a squadron recall roster. Later, students will help work to further develop tools and applications such as an airspace scheduling tool, an aircraft hydraulic maintenance inventory tracking tool, a fighter aircraft launch and recovery tool, and an application to track real-time information for ground transportation."

As projects become available, Reid believes the ability for the students to gain experience with projects, reports, and presentations by working directly with professionals is one that cannot be replicated in a classroom.

“When problems or innovative ideas arise, we are able to source students and experts in the field to create novel solutions. The students will work through the faculty mentors and Undergraduate Research Institute for reporting process and delivery,” he added.

Looking forward, Reid envisions the mutual benefits as building blocks for both the military and educational institutions as a whole, with student experiences opening the aperture on a potential military career after graduation.

“This partnership really will provide students with hands-on experience on projects aligned with their degree programs and will expose them to Air Force life in general to see if the military might be a career direction they want to go in,” Reid said. “The students will also get to build networking opportunities within and across programs.”

“Academics in operations research, software development, or mechanical engineering can help us develop kaizen within our processes,” Reid concluded. Kaizen, the philosophical term in Japanese business meaning “change for the better”, accurately depicts the focus of this EPA as the 56 FW and Embry-Riddle partner on this five-year innovative journey.

2 AF, Clemson and USSF EPA

Deliberate development of Airmen and Guardians to ensure they have the attributes required to compete, deter and win in a contested environment is critical to USAF Chief of Staff Gen Charles. Q. Brown Jr’s Accelerate Change or Lose strategy.

To that end, a team from 2d Air Force has been working with Clemson University in a mutually beneficial educational partnership agreement as part of an effort to assist the USSF with the deliberate development, education and training of space professionals.

“This partnership allows us to understand more about the Department of the Air Force’s human capital development,” said Dr. Brian Davis, 2 AF’s chief training officer and the partnership’s

outgoing facilitator. "This includes improved recruiting, selection, education and training of joint space operators. The long-term benefits include a better understanding of the relationship between undergraduate education, performance in technical training and ultimately, success in the career field."

As part of the partnership, the Air Force exchanged graduate score information with Clemson on students completing Officer Undergraduate Space Training (OUST) course, while AFPC provides other data, such as demographics, major, etc., for the research project.

"Our objective since entering the EPA has been the research of undergraduate experiences that best develop high-performing space operators, while also learning more about whether or not science, technology, engineering and math (STEM) degrees have the propensity to ensure success in their undergraduate technical training," Davis said. "Expanding on that, if STEM degrees do ensure success, to what degree can that success be measured? Can officers without STEM degrees be successful in OUST? Those are the questions we hope to answer."

One of the potential benefits of learning more about STEM degree efficacy and success for the DAF is the potential increase in the recruiting pool for a field that currently mandates a STEM degree for entry, Davis said.

"These types of partnerships are invaluable to the military," Davis said. "Enhanced collaboration and relationships with civilian educational institutions allow both of us to take the lessons learned and apply findings from the Air Force to a broader context."

In the case of this partnerships, Clemson researchers could possibly question the efficacy of STEM requirements on success if other attributes can point to success in a STEM field, Davis said.

For now, the partnership has been extended, with the USSF serving as lead now that the OUST course has transferred to the USSF.

AF JROTC Equipment Donations

Working with HQ Air Force Junior ROTC at Maxwell AFB, AL and Mr. Charles Figer, Patent Attorney from the Intellectual Property Division of AFMC's Legal Office (AFMCLO/JAZ), ATETA was able to utilize the EPA authority to donate computer equipment to over 460 high schools across all 50 states to encourage and enhance the study of STEM.

Near Term Goals

In a 'big to small" approach ATETA will continue to focus on opportunities to enable AETC's priorities which are aligned underneath the Department of Defense and Department of the Air Force priorities.

ATETA's efforts focus on AETC's command wide vision and desired outcomes that support Air Force, DoD, and national military strategies.

The AETC SAP identifies four Command priorities to ensure unity of purpose and establish a common understanding of the command's direction and alignment with DAF and OSD priorities:

- Advance Force Development
- Enhance Lethality and Readiness
- Transform the Way We Learn
- Cultivate an Environment of Excellence

ATETA will continue to focus on engagements internally within AETC and externally with industry and academia to support and find opportunities to transition NSIB technologies into AETC through T2 agreements. Additionally, ATETA supports moving technologies developed in AETC to the commercial market.

Long Term Goals

ATETA will employ technology transfer partnerships and collaboration as a force multiplier as well as continue to transform how AETC partners with NSIB and expand strategic relationships to achieve long-term strategic objectives. Additionally, ATETA will continue revolutionizing the force development paradigm that meet the needs of a more challenging and dynamic national security environment. Next, identify and employ opportunities presented by innovation proactively and collaboratively so AETC stays abreast of the opportunities. Our desired end state will achieve:

1. An integrated network of recruiters, trainers, educators and stakeholders that are focused on revolutionizing force development so our Airmen remain the world's most dominant warfighters.
2. A command full of learning experts who collaborate with operational units and individual Airmen to maximize their institutional and lifelong learning needs.

3. An agile and flexible force development construct that exists to monitor and adjust Airmen's knowledge and skills to fulfill current and future USAF requirements.

Performance Measures

INTELLECTUAL PROPERTY	FY19	FY20	FY21	FY22
Invention Disclosures Received	0	0	0	1
Total Patent Applications Filed	2	0	2	1
Total Patents Issued	0	0	1	2

CRADAs	FY19	FY20	FY21	FY22
Total Active CRADAs	2	5	8	5
New CRADAs	4	3	1	3
Active CRADAs Involving Small Businesses	1	0	1	0
Estimated CRADA Contributed Value	$175M	$67M	$89M	$75M

OTHER T2 Metrics	FY19	FY20	FY21	FY22
Total Active Education Partnership Agreements (EPAs)	3	8	8	469
New EPAs	3	5	1	463
Total Active EPAs with HBCUs and Minority Serving Institutions	2	7	7	4
Total Active EPAs with Colleges/Universities	3	8	9	9

2022

AIR FORCE CIVIL ENGINEERING CENTER DELEGATE

FY22 Annual Technology Transfer and Transition (T3) Report
Air Force Civil Engineer Center (AFCEC)

1.0 Executive Summary

AFCEC approved two new Educational Partnership Agreements (EPAs) with colleges and universities in FY22.

2.0 AFCEC Laboratory Overview

2.1 Laboratory Mission: AFCEC's Mission Statement is to "Provide Civil Engineering expertise and services…strengthening installations and enhancing combat." AFCEC was established under Program Action Directive (PAD) 12-03 dated 26 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.

2.2 Description of AFCEC: 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.

2.3 Geographic location: AFCEC Research, Development, Test and Evaluation (RDT&E) activities and facilities are located at Tyndall AFB, FL under the Readiness Directorate (AFCEC/CX).

2.4 Technology Focus Areas:

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

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

2.4.3. Airbase Protection: Research, develop and transition technologies for hardening and protecting airfield infrastructure from munitions attack, UXO and aircraft, equipment & infrastructure fires. (1) Airfield Protection: RDT&E that addresses ballistic protection, explosive effects, forced entry protection, and mitigation of damage due to explosive and environmental threats in order to improve the survivability of fixed and expeditionary airbase assets. (2) Fire and Emergency Services: RDT&E of materials, systems, technologies and processes to enhance Air Force firefighter emergency response.

2.4.4. Energy & Utilities: RDT&E in advanced energy & utilities for expeditionary applications resulting in the reduction of fossil fuel consumption and logistic tails required to maintain operations in forward operating bases.

2.5 Year of Commission: AFCEC was established 26 October 2012 to implement an enterprise-wide civil engineer transformation. This action included assuming the RDT&E mission that was formerly at AFRL/RXQ. The new Office of Research and Technology Applications (ORTA) for AFCEC stood up mid-2013. Authority for AFCEC to approve Cooperative Research and Development Agreements (CRADAs) was granted 15 October 2013. The delegation authority to enter into Educational Partnership Agreements (EPAs), Patent License Agreements (PLAs), and Partnership Intermediary Agreements (PIAs) was granted to AFCEC 25 March 2014.

3.0 Strategy/Plan of the ORTA

3.1 How ORTA fits into Lab Organization and Mission: AFCEC helps develop and commercialize new leading-edge technology by partnering with other Department of Defense (DoD), 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.

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

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

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

3.5 Long Term Objectives and Strategy: Expand AFCEC agreement partnerships to new agencies and industry partners.

4.0 Year in Review

4.1 Success stories: Success stories are in the appendices.

4.2. 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 2022 EPAs with the Bay County public school system, AFCEC continued its involvement by providing judges, proctors, and graders to the annual Invention Convention. The EPAs with Gulf Coast State College and University of Idaho also continued. Two new Equipment Transfer EPAs with University Academy and Oscar Patterson Academy were accomplished, allowing for the transfer of one optical microscope to University Academy and two optical microscopes to Oscar Patterson Academy for STEM student use. Also, several CRADAs were extended providing additional time to complete the established objectives.

4.3. 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.

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

5.0 Resources

5.1. Human Resources: Two part time ORTAs are assigned to the AFCEC/CXA ORTA.

5.2 T2 Education and Training Provided to Organization/Lab Staff: TechLink provided training on how they can support AFCEC with technology transfer activities in August 2022.

5.3 Professional Development of ORTA: ORTA POCs attended training VTCs and FLC events.

5.4 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 2022, three members of AFCEC were selected for STAR awards: Mr. Kevin Wise for deploying the Expedient Small Asset Protection shelters, Dr. Robert Diltz for his work on the Expedient and Expeditionary Airfield Damage Repair Joint Capability Technology Demonstrations, and Dr. Jeff Owens for his work in civil engineering materials research.

6.0 Financial

6.1 Royalty Income: None

6.2 CRADA Income: None

6.3 CTA Income: None.

6.4 T2 Expenses: None

6.5 Other T2 Resources- e.g., interns, marketing funds: None

7.0 Facilities/Equipment

7.1 Laboratory's URL that lists facilities/equipment information: The "Documents" section of the AFCEC/CXA SharePoint website contains fact sheets with descriptions of the AFCEC facilities. The site functions best when using Chrome:
https://portal.afcec.hedc.af.mil/CX/CXA/SitePages/Home.aspx

7.2 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.

7.2.1 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.

7.2.2 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. required to make craters for repair research work. Development of customized equipment to simulate aircraft wheel loading and C-130 transportable pavement repair equipment that can be used in deployed locations. Capability to perform on-site pavements materials research at pavements test pad and in-house testing laboratories.

7.2.3 Blast and Ballistic—AFCEC has a 54-acre infrastructure hardening technologies blast range with full instrumentation, data acquisition, and visualization to assess blast effects approved for 2,000 lbs TNT net explosive weight. AFCEC also has a Material Testing System 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-highspeed 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.

7.2.4 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.

7.2.5 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.

7.2.6 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.

7.3 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.

8.0 Performance Measures

8.1 Overall Trends

8.1.1 CRADAs
Active Agreements: 6
New Agreements:
Amendments: 1

8.1.2 Education Partnership Agreement (EPAs)
Active: 4
New: None

8.1.3 Commercial Test Agreement (CTAs)
Active: None
New: None

8.1.4 Material Transfer Agreement (MTAs)
Active: None
New: None

8.1.5 Information Transfer Agreement (ITAs)
Active: None
New: None

8.1.6 Non-Disclosure Agreements (NDAs)
Active: None
New: None

8.1.7 PLAs
Active: 2
New: None

8.1.8 Number of active & new agreements for any other T2 mechanisms your lab has (training affiliation agreements, software license, etc.):
Other Active Agreements: 22
Other New agreements: 1

8.1.9 Intellectual Property:

Invention Disclosures: None.

Patent Applications: One patent was filed in FY22. A joint submission between Battelle and the Air Force wherein Battelle has agreed to shoulder the costs and responsibility of submission. A joint ownership agreement is in draft. The patent is for cementitious formulations comprised primarily of indigenous materials wherein the rheology/flow is tailorable. The tailored rheology allows for self-leveling and also 3D printable formulations. The controlled rheology, indigenous nature, and the 3D printable aspects are the novelty.

Patents Issued: None.

Appendix A: Success Stories

The environmental and human health concerns due to perfluoro- and polyfluoroalkyl substances (PFAS) are exhaustively documented in technical and commercial literature. The manufacture and uses of PFAS in products are decreasing, but past applications affected systems and sites that that used the products. The DoD is making concerted and proactive changes to minimize and then eliminate potential risk for past and current use of products containing PFAS. For example, the Air Force controls disposal of PFAS-containing materials as hazardous waste, using stringent drinking-water standards as threshold concentration for regulating disposal. A common source of PFAS is fire suppression foam, the aqueous film forming foams (AFFF) contain mixtures of PFAS which were widely used for emergency response and firefighter training. Consequently, residues of AFFF are present throughout fire training pits and storage ponds, any water introduced to system (including rainfall), becomes part of the HazMat waste stream, and must be disposed accordingly. Decreasing the volume of this wastewater, reduces the disposal costs proportionally.

AFCEC scientists and engineers have established and operated an industrial-scale prototype system to concentrate the complex waste stream at the Tyndall AFB firefighter training and test site. Using a solid-phase adsorption system and a propane-fueled thermal evaporator, the PFAS is concentrated on the adsorptive media and in the evaporator brine. The team reduced the hazardous waste volume that must be disposed off-site to <2% of original volume. The on-site management approach has eliminated >1.3 million gallons of PFAS-containing effluent. The combined operating costs including–fuel, consumables, and waste disposal (e.g., concentrated effluent, adsorbent media, and maintenance materials)–are approximately $0.50 per gallon, a great savings compared to present contracted disposal costs of the dilute surplus (ca. $2.75 per gallon) using the Defense Logistics Agency disposal processes.

The operation to date effectively eliminated surplus contaminated water collected at the Tyndall AFB site. The systems and methodology established in the work are applicable at similar installations and civilian training sites. Commercial thermal evaporators are available with a range of throughput capacities that use various fuels or electric heaters to evaporate the wastewater. The size and type of evaporators can be selected to match availability and needs at each site. Depending on volume and regional disposal costs, the savings for an operation may be significant.

One note to emphasize is the importance of pretreating the feedstock prior to evaporation. High levels of suspended materials or solutes reduce evaporator efficiency and can foul the operation. The bulk of the surplus volume to date at the Tyndall site came from rainwater collected during the period when fire suppression foam use was limited. More recently as the system volume deceased, and our operations resumed, the feedstock was more concentrated, amplifying the importance of pre-treatment. As an added note, the complex mixture and concentrations of surfactants used in the new PFAS-free fire suppression foams pose distinct challenges for processing the wastewater through the pre-treatment and evaporator stages. This complexity issue will be addressed going forward at the Tyndall site and must be addressed at any other operation that chooses to apply the technology.

Thermal Evaporation for Reduction of AFFF Waste Stream

Objective: Minimize logistic and disposal costs associated with effluent from firefighter training sites

Benefits:

- Sustain firefighter training and technology development–maintain warfighter readiness
- Responsible environmental stewardship–materials contained and managed
- Decreased management and disposal expenses

Technology:

- Develop processes for adsorption of contaminants from firefighter training operations effluent – Use industrial wastewater evaporator to minimize bulk volume of resulting waste stream
- Exploring additional technologies to eliminate wastewater

Status:

- Water Evaporator Systems used at operational site since November 2020 – >1.3 million gallons of surplus wastewater eliminated
  → >$2.5 million saved vs. commercial disposal using Defense Logistics Agency processes
- TRL-8 waste water evaporator
- Developing guidelines for application at other DoD sites
- Exploring other technologies such as small business CRADA–Natural fibers for waste stream filtration

Pond containing wastewater

Evaporator contained inside building

17 Oct 2022

2022

AIR FORCE GLOBAL STRIKE COMMAND DELEGATE

AFGSC, Office of the Chief Scientist (ST)

1.0 Executive Summary

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 CIC as a tool to facilitate Technology Transfer and Transition (T3) activities. This tool allows us to seek way 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. The PIA was originally commissioned in 2013 with renewal actions in progress to occur in 2023.

2.0 Organization/Laboratory Overview:

HQ AFGSC is located at Barksdale AFB, Louisiana. AFGSC/ST, Chief Scientist, is the innovation and new technology process owner and lead OPR for the AFGSC Innovation Board (IB); this board is responsible for administration and oversight of AFGSC's Innovation Engine, the command's innovation program. The AFGSC's Innovation Engine process provides a deliberate, flexible, agile, and adaptive mechanism to capture, assess, select, support, and advocate development of ideas that hold great promise to advance mission capability, readiness, lethality, and other desired outcomes. AFGSC/ST's mission and vision focuses on inspiring innovation at all levels to address challenges and close command gaps.

The AFGSC Chief Scientist serves as the lead advisor to the AFGSC/CC on Scientific and Technological issues. Additionally, AFGSC/ST advises the AFGSC/CC on innovative solutions related to AFGSC core area programs as well as providing emerging technological solutions to the AFGSC/CC and associated Directorate Staff. AFGSC/ST's technology focus areas are:

- Machine learning/artificial intelligence (AI)
- Data analytics
- Decision tools
- Advanced learning technologies
- Affordable digital twin
- High-altitude Electromagnetic Pulse (HEMP) hardening
- Advances in power technologies
- Advanced materials and advanced manufacturing technologies for small batch production
- Advances in augmented reality (AR), virtual reality (VR) & mixed reality (MR)
- Affordable/mobile physical security
- Software automation
- Human Factors
- Counter-small Unmanned Aircraft Systems (C-sUAS)

3.0 Strategy/Plan of the ORTA

AFGSC/ST as the ORTA for T2 activities is aligned organizationally under the AFGSC/CD. AFGSC's Mission, Vision Statement, and Focus Areas are:

- 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!
- Our Focus Areas: People - Mission - Modernize – Engage

AFGSC/ST T2 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
- Advise on the most critical and emergent technological solutions for the nuclear and conventional missions
- Provide rapid prototyping, technology transfer/transition assistance and technology expertise to fix gaps and challenges

4.0 Year in Review

Fiscal year 2022 (FY22) proved to be the greatest year of technology transfer and transition accomplishment to date for the AFGSC/ST and the CIC's Partner Intermediary (PI) lead, the CE. Together, the AFGSC/ST and CE team were successful in achieving the Collaborative Project Order objective of fostering innovation and collaboration for Air Force Global Strike Command's technology challenges and opportunities.

The CE team added both capability and capacity this year. The Data Analytics and Development team stood out in its contributions to several extremely challenging problems by encouraging new solutions and engaging various expertise resources. The team fielded models and databases at the Unclassified and Classified levels for the Portfolio Data Engineering Platform, Nuclear Command, Control, and Communications modernization, and Robotic Process Automation. The augmented reality/virtual reality trainer projects have increased Collaborative Environment knowledge of how Airmen learn and the latest industry capabilities. Finally, the addition of a fourth project manager brought new capacity to the team to handle the increased number of projects.

Since October 2021, 18 collaborative projects were added, bringing the total number of active projects for the year to 36—the highest to date. Twelve projects were completed with each meeting its stated objectives. FY22 technology transfer and transition projects contributed to achievements in every technical requirement of the Collaborative Project Order. Associated expenditures and investments for the year totaled $9,082,254.

STRIKEWERX reached its annual challenge event capacity in managing three concurrent problem challenges for AFGSC. Three design sprints were facilitated in FY22 with the capacity to conduct five

annually. STRIKEWERX conducted eight Fusion events and will continue to target monthly opportunities for such events in FY23.

A record number of 72 technology transfer and transition events were completed, hosting 1,419 government and non-government partners at the Cyber Innovation Center. These structured forum events all met or exceeded their respective knowledge transfer objectives. The events generated a significant local economic impact of $484,888 supporting more than 168 direct and indirect jobs.

We have many successes to date since 2013. Since 2017, the command has received additional congressional add funding to enhance the planning and management of its strategic mission. This annual increase in funding has enabled the command to modernize its Nuclear Enterprise and alleviate challenges quickly using state of the art, innovative solutions. The PIA allows us to outpace both state and non-state actors by accelerating change and speed. The AFGSC PIA allowed us to establish the command's first Innovation Hub, STRIKEWERX. Innovation hubs such as these listed not only build strong and innovative, defense ecosystems but tap into leading edge, non-traditional defense partners who are focused directly on leveraging technology to maximize innovation efforts throughout the department. This team of government, academia, and industry are able to outline rapid development-to-fielding strategy, intended specifically to try out new tech fast, fail fast, learn, improve and deliver to the command's warfighter.

Success Stories:

- B-52 Brake Repair Jig Minimum Viable Product (MVP) was Fielded
- 100 Vaccine Storage Bins 3D printed and delivered to the field for testing/use
- Transporter Erector Jack Slot Cover: Fielding
- A-Circuit Mixed Reality Trainer: Fielded
- Field Level Aircraft Scheduler (FLASH): Completed MVP – transitioned to HAF/A4 dev
- NC3 Architecture M&S: Deployed IL7 prototype
- Unfunded Requirements Software: Working ATO to field with AFGSC/FM
- B-52 tow bar: Demo'd Prototype – driving SPO solution and PoR
- Striker Airman Coders: 11 Graduates
- Design Warfare Innovation Course: 81 Graduates
- Data Strikers: 111 Strikers Enrolled increasing data science skillsets
- Robotic Process Automation Roadshow: 25 Grads
- Global Strike National Security Fellows: 21 Fellows participated to date
- Long-range Communication for B-52:
  Prototype demo on B-52 in Jun 2022
- Air Crew Alerting Communicator:
  Demo'd Prototype (wearable) – informing PoR acquisition
- Common Risk Picture (data analytics): Version 1 roll-out completed
- Modernization Assessment Database: Deployed IL7 prototype

Marketing and Outreach Activities

The CIC, in support of the AFGSC/ST PIA, substantially increased its public outreach in 2022. We have made a concerted effort to increase awareness of the "STRIKEWERX" brand and the projects we are accomplishing. Increased awareness increases the number of vendors interested in working on AFGSC problems, and with an increase in number comes competition and an increase in quality. Some outreach event highlights include:

- CIC Hosted 72 Tech Transfer Events connecting 1,419 Gov't, Industry, Academia Partners
- STRIKEWERX Connected w/ 91 Non-traditional Vendors
- 5 Design Sprints
- 3 AFWERX-style Challenges
- 8 FUSION Events

The most successful outreach has been on the LinkedIn social media platform. The large number of reactions shows not only are we reaching people who are interested, they are reacting favorably to the posts. We use the posts to advertise upcoming events and increase attendance. As a specific example we didn't know of an industry partner for the B-52 ejection seat survival kit design sprint, and our LinkedIn post was shared by a follower, and one of her contacts worked in the parachute industry and brought his and another company to the sprint to support us, providing invaluable subject matter expertise.

Below are our LinkedIn metrics:

- 1,909 reactions
- 116 comments
- 199 reposts
- 72,082 impressions

PIA related websites also contains useful information for vendors to learn the AFGSC interest areas and learn about our processes. We'll work towards more website views in FY23 but we're very happy with the average page view time. According to the Nielson Group, users often leave web pages in 10-20 seconds. With our view time of almost two minutes, viewers are taking time to ingest the information on our site. Website metrics are below (these state are tracked by Google, and were provided to PIC by web host, Ruby Shore Software)

- 15,525 page views
- 13,313 unique page views (pageviews that are generated by the same user during the same session)
- 1:52 average page view time
- 8,589 Entrances (number of times that the first event in a session occurred on a page or screen) include but are not limited to:

5.0 Resources

The AFGSC/ST office is comprised of eight personnel. The AFGSC/ST PIA with the Cyber Innovation Center enables the employment of 22 personnel.

6.0 Financial

AFGSC/ST only retains one T2 agreement currently. There are no financial or funding income to report.

7.0 Facilities/Equipment

AFGSC/ST PIA and MOU allows for government use of collaborative space, facilities and innovation hub. This space is monitored and controlled to ensure only technology transfer, PIA related activities are only allowed within the government space. The PIA enables AFGSC/ST the ability to have access to adequate facilities, space, materials, equipment, and support to host a maximum of 350 people in a variety of CE and STRIKEWERX spaces. The PIA enables the CE to support AFGSC/ST in computer and

communications access, audio/video equipment for presentations to include microphones for the speaker(s), audience member participation, and individual microphones for a senior member head table for collaborative, technology transfer/transition related events. Additionally, the CIC PIA space enables TS/SCI space to support large group meetings with a maximum seating capacity of 200 personnel. Within a non-secure environment, provide public-accessible space and capabilities for STRIKEWERX.

8.0 Performance Measures

7.1 Overall Trends: None to report at this time.

Portfolio Data Engineering Platform (PDEP)

15 Nov 22

Objective:

- Create an AFGSC data science platform & data warehouse for informing decisions and conducting data science projects

Benefits:

- Programmatic decision support across portfolio
- Increased AFGSC effectiveness & spending efficiency
- Ability for data-based research projects with potential impacts throughout AFGSC

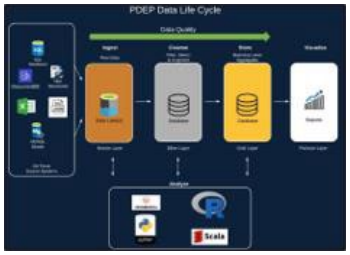
Technology:

- Using a common data picture from many enterprise-wide databases, decision-makers will be able to visualize concepts, assess risk, and propose defendable courses of action to expedite the decision-making process

Status:

- Established on Envision platform at IL-4 and IL-6
- Increment 1 capability (Aircraft data, engineering, metrics, and visualizations) delivered
- Increment 2 capability (personnel data) in development

Picture of Technology



Contact Info:

- Leah Hart

Global Strike National Security Fellowship Program

15 Nov 22

Objective:

- Provide local university students and professors to further AFGSC research and development objectives in a year-long Fellowship program.

Benefits:

- Significant progress to AFGSC mission-based initiatives
- Local students to gain real-world military experience making them better candidates for future Air Force employment
- Military based work experience improving future opportunities for AFGSC and contractor partnerships

Technology:

- Utilize students and professors to advance AFGSC mission-essential objectives in selected Focus Areas

Status:

- Currently executing Year III of the Fellowship Program (June 2022-May 2023)
- 5 graduate and 5 undergraduate students are working with 6 professors
- Fellows are partnered with A3, A4W, A4M, A5, and A9

Picture of Technology

Contact Info:

- Leah Hart

Striker Airmen Coder (SAC) Program

15 Nov 22

Objective:

- Train Airmen in computer coding and data analytics while working various software and data projects

Benefits:

- Software products developed with positive impact to AFGSC's strategic mission
- Airmen gain coding experience for future innovative technical solutions in their squadrons
- Airmen gain industry experience as developers

Technology:

- Partner with industry to develop software in support of AFGSC and train Airmen in coding and data analytics skills for use in their career fields.

Status:

- 3 Cohorts complete with 16 Airmen and 8 local students
- 8 software products developed
- Currently executing Cohort IV
  - 5 Airmen participants
  - Expands the program into data analytics

Picture of Technology

Contact Info:

- Leah Hart

PRAP Tracking System

15 Nov 22

Objective:

- Develop a software solution to track/monitor Personnel Reliability and Assurance Program (PRAP) status of 500+ personnel (Minot), document incoming and outgoing personnel notifications, and provide real-time visibility to outside agencies and work centers based on tiered permissions

Benefits:

- Uniformly govern the PRAP program across the Command allowing necessary agencies and personnel to accurately administer consistent, precise and timely oversight of their nuclear and postured mission

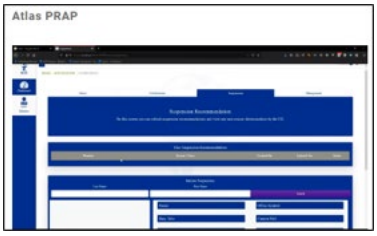
Technology:

- Utilize advanced software development means to integrate different PRAP tracking systems

Status:

- A PRAP tracking system has been developed (Atlas)
- Working with Platform1 to house the software and Envision for the data

Picture of Technology



Contact Info:

- Leah Hart

A5P Data, M&S, and Analysis Innovation

15 Nov 22

Objective:

- Improve Innovation capability development with data, modeling & Sim, and analysis for A5 Nuclear Deterrence Operations (NDO).

Benefits:

- Provide near real-time interactive NDO architecture and visuals to enable previously unachieved qualitative analysis and operational awareness.

Technology:

- Utilize a virtual environment to accurately depict the complex NDO components and system function

Status:

- Stakeholder: AFGSC/A5P
- Deployed with unclassified information in government approved cloud solution at impact level 2 & standalone classified environments.
- Delivered 1st iteration composed of two components.
- Next: 2nd version to include improvements and additional components.

Picture of Technology

Contact Info:

- Leah Hart

Virtual Collaborative Environment

15 Nov 22

Objective:

- Build gov cloud development environments which support impact level (IL) 2, 6, and above to be used by PIA projects

Benefits:

- Provide cost efficient development environments for all ST approved projects utilizing Agile software and solution development

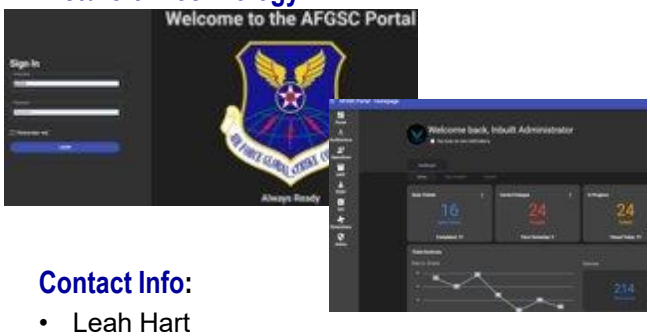
Technology:

- Utilize government approved cloud service providers (ex: Azure and AWS) to build development environments to support storage, computation, and analysis by PIA projects

Status:

- Established at IL2 and IL6
- Fully implemented agile continuous integration/continuous deployment software release pipeline.
- Next: deploy at higher impact levels

Picture of Technology



Contact Info:

- Leah Hart

A-Circuit

15 Nov 22

Objective:

- Develop advanced training for AFGSC SF personnel changing combination on vital locks
- Reduce number of A-circuit lockouts

Benefits:

- Save up to 160 manhours and $20K per incorrect combination change prevented
- Improved training and feedback to instructors and SF personnel

Technology:

- Augmented reality trainer including procedures to change combination and several training and testing modes
- A-Circuit Combination Change Trainer

Status:

- 3 Prototypes delivered to missile wings
  - Including mobile applications
- Project completed
- SPO & AFGSC Weapons System Team developing fielding plan

Picture of Technology

Contact Info:

- Leah Hart

ROTC Cadet Training Success

15 Nov 22

Objective:

- Promote science and research among underrepresented communities and developing workforce.

Benefits:

- 8-week summer program for ROTC cadets to work on selected project(s) offered by the CIC
- Cadets will gain valuable experiences and technical focus under the mentorship of CIC program leads.
- AFGSC will benefit from Cadet's involvement with continuous development on assigned projects.

Technology:

- Research and development assistance for Striker Airman Coders project and the CIC Development Team.

Status:

- One cadet participated in Summer '22
- Planning on implementing in Summer '23 with more cadets

Picture of Technology

Contact Info:

- Leah Hart

AFGSC/FM Unfunded Request Prioritization

15 Nov 22

Objective:

- Develop a tool to maintain consistent, readily available, and standardize scoring process of unfunded requests to AFGSC/FM

Benefits:

- Enable collection of UFRs from multiple Command entities and levels, interactive scoring and rating of UFRs and historical data analysis of UFRs

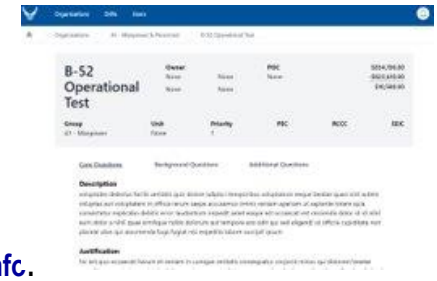
Technology:

- Utilize proven software developer to create the solution utilizing Agile software development methods

Status:

- Stakeholder: AFGSC/FM
- Delivered proof-of-concept solution at IL2
- Next: Deploy at IL4

Picture of Technology



Contact Infc.

- Leah Hart

A5P Digital Engineering Pathfinder

15 Nov 22

Objective:

- Support A5P Capability Improvement Program with a partner with expertise in Model Based Systems Engineering (MBSE) and System Modeling Language (SysML) to build digital models which will be utilized to support capability planning

Benefits:

- Streamline A5P capability development process with MBSE models that can quickly be combined and modeled which will identify gaps and improvements

Technology:

- Testing suit of digital mission engineering products to build capability planning digital models

Status:

- Stakeholder: AFGSC/A5P
- Reached IOC August 2022
- Completing 1st evaluation of Command PE software
- Next: Expanding computer system technology to enable additional research

Picture of Technology

Contact Info:

- Leah Hart

Emergency Aircrew Alerting

15 Nov 22

Objective:

- Conduct market research and develop capabilities to possibly field in the Global Aircrew Strategic Network Terminal Increment Two (GASNT Inc 2) program of record, replacing two 40+ year old aircrew alerting systems

Benefits:

- Enabled Air Force rapid acquisition to reduce cost estimate of GASNT Inc 2 cost by $200M, provided new technologies government didn't know existed, increased competition, and faster development and fielding
- Two of eight finalists (GDMS, Monaco) selected for fielding. Monaco was an unknown prior to STRIKEWERX challenge

Technology:

- Use "internet of things," edge processing, and new circuit board designs to reduce the size of aircrew alerting device, make them more cyber secure, and less susceptible to electronic jamming

Status:

- Stakeholder: AFGSC/A5C
- Executed challenge process resulting in 3 winners from 50+ submissions
- Completed 2 or 3 phases of prototype development resulting in 1 solution being tested for consideration into the program of record.
- Beginning Phase 3 of development with OUSD R&E funding

Picture of Technology

Contact Info:

- Leah Hart

B-52 Air Refueling Simulator

15 Nov 22

Objective:

- Develop a lightweight, small simulator with augmented reality goggles to teach B-52 pilots how to air refuel

Benefits:

- Reduce flight hours required to train pilots, lower fuel costs, and less wear and tear on the sixty-year-old B-52 airframes and KC-135 tankers

Technology:

- Utilize vendors with expertise in Realistic augmented reality goggles, digital modeling, and flying simulators to develop solution

Status:

- Stakeholder: AFGSC/A3T
- Executed challenge process resulting in 2 winners from 100+ submissions.
- Completed "fly-off" competition resulting in both prototypes usage to train pilots how to air refuel.
- Supporting SBIR phase III effort to finalize development of air refueling sim software.

Picture of Technology

Contact Info:

- Leah Hart

Robotic Process Automation (RPA) Center of Excellence

15 Nov 22

Objective:

- Accept and Prioritize requests for RPAs
- Develop RPAs
- Maintain developed RPAs until transitioned to AFGSC
- Educate Airmen on skills to develop RPAs

Benefits:

- Removal of manual, repetitive, high-volume tasks
- Creation of a new, digital workforce allowing people to focus on higher-value work requiring cognitive skills
- Significant time and financial savings for AFGSC

Technology:

- Providing innovative, efficient, scalable, and customer-centric tools and capabilities that allow AFGSC to focus on high value, mission-driven tasks while also promoting more sophisticated business practices

Status:

- Stakeholder: AFGSC/ST
- Roadshow for F.E. Warren completed 24-28 Oct
- Next Roadshow: Whiteman 9-13 January

Picture of Technology

Contact Info:

- Leah Hart

Senior Design Projects

15 Nov 22

Objective:

- Utilize college/university senior capstone design programs to provide innovative solutions to AFGSC challenges.

Benefits:

- New design that improves mobility and ease of use.
- Exposure of AFGSC culture and challenges to students.
- Provide AFGSC innovative solutions and insight from previously unutilized student resources.

Technology:

- Utilize engineering students completing their senior design course to develop a new design for the drag parachute stand.

Status:

- Stakeholder: AFGSC/ST
- Completed: B-52 tow bar project by La Tech Senior Design Team.
- Current: B-52 parachute stand redesign in process. La Tech Senior design team is currently working with SME's on creation of new prototype.

Picture of Technology

Contact Info:

- Leah Hart

Global Strike AFRL Scholars

15 Nov 22

Objective:

- Support one AFRL Scholar at BAFB for Summer '22

Benefits:

- 12-week internship program to allow AFRL Scholars an opportunity to complete research-based project
- Gain valuable hand-on learning experience under AFRL scientist and engineers' mentorship

Technology:

- Utilize technical projects in STEM fields that develop systems, concepts and technologies to enhance the Air Force's information capabilities

Status:

- Supported one Scholar in Summer '22
  - Worked for AFGSC/A5
  - Developed model simulation monitoring/controls
  - Simulated traffic flow monitoring system to allow data-informed decision making
- Will support more Scholars in Summer '23

Picture of Technology

Contact Info:

- Leah Hart

Transporter Erector (TE) Jack Stand Covers

15 Nov 22

Objective:

- Prevent Airmen from having to clean frozen precipitation and debris at missile launch facilities

Benefits:

- Prevent debris from entering TE Jack Stand slot
- Cut maintenance time 90%, eliminating up to 3 hrs per site cleaning TE slot prior to missile install/removal in -50F extreme weather
- Save 360+ man-hours/yr and Quality of Life during inclement weather

Technology:

- Design Sprint at STRIKEWERX using additive manufacturing in rapid prototyping and Computer Aided Design to analyze designs

Status:

- Developed two prototype designs (Fall 20)
- Built/tested each design (Sep 21-Feb 22)
- Scaled across all launch facilities, 940 items (Feb – Jun 22)

Picture of Technology

Contact Info:

- Leah Hart

Data Science Consulting

15 Nov 22

Objective:

- Provide data science consultation to aid AFGSC in improving its use of data and associated culture
- Perform data audit, develop AFGSC Data Strategy, and Data Strategy Implementation Plan

Benefits:

- Improved guidance, policy, and understanding of data and its uses within AFGSC
- Guidance on data science strategy, direction, and opportunity

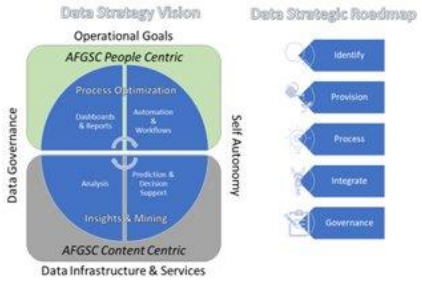
Technology:

- N/A

Status:

- Finalized first data audit and summary reports
- Developed and delivered first AFGSC Data Strategy
- Data Strategy Implementation Plan in development

Picture of Technology



Contact Info:

- Leah Hart

2022

AIR FORCE INSTITUTE OF TECHNOLOGY

DELEGATE

Organization/Laboratory

1.0 Executive Summary

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.

The newly organized AFIT's Dean for Research (AFIT/CZ) is designated as the Office of Research and Technology Applications (ORTA). This 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 (LPCRADAs) including non-disclosure agreements (NDA) are used to share information with limited technical activities. Educational partnership agreements enable and encourage Science, Technology, Engineering & Math (STEM) education, loan or transfer of equipment and enhance educational opportunities for AFIT students as well as students of 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 and most recently its first income bearing software licensing agreement.

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.

2.0 Organization/Laboratory Overview:

2.1 Laboratory Mission Statement - Educate our Total Force military and civilian defense professionals to innovatively accomplish the deterrence and warfighting missions of the U.S. Air and Space Forces … today and tomorrow.

2.2 Description of organization/laboratory - The Air Force Institute of Technology is the Department of the Air Force's leader for advanced, multi-disciplinary academic education, as well as its institution for technical professional continuing education.

2.3 Geographic location – located on Wright-Patterson AFB OH.

2.4 Technology Focus Areas - AFIT offers 27 research-based, STEM master's degree programs, 14 Ph.D. programs, and 15 graduate certificate programs. It maintains a typical enrollment of over 700 in-residence students and about 400 students in various non-resident programs.

2.5 Year of Commission -1919

3.0 Strategy/Plan of the ORTA

3.1 ORTA Lab Organization and Mission

- AFIT's ORTA reported to the Graduate School (AFIT/EN) through FY22. In early FY23 AFIT's ORTA will begin reporting to AFIT's Chancellor with the expectation that it will have a broader impact for all five schools of the institute.
- AFIT's ORTA continue to promote and facilitate technology transfer processes and activities by assisting AFIT faculty to establish and formalize collaborations with non-federal research partners;
- Provide T^3 "New Faculty" presentations;
- Facilitate annual Faculty Development workshops for patents and copyrights;
- Continue to collect and analyze data of research and development projects;
- Continue to use AFMCLO/JAZ website for technology transfer and patent information;
- Develop and provide customized reports to AFIT leadership, Air University and AETC technology transfer activities for AFIT as requested; and,
- Respond to T^3 internal and external requests for information, contacts, status, etc.

3.2 T2 Tools used for strategic planning

- Provides fundamental mechanisms for formalizing collaborations with 'outside-the-fence' small to large businesses; these collaborations often rely on CRADAs to provide needed support for AFIT research efforts;
- EPAs provide a flexible mechanism for AFIT to work with educational institutions by providing access to off campus courses, symposiums, lectures, etc.
- Opportunities for participating in cutting research often depends upon formal T2 partnerships developed over time.

3.3 One Year Objectives and Strategy

- Fill the open GS-12 position to facilitate, manage and grow T3 activities;
- Provide necessary informal and formal training for the incoming hire to perform the duties;
- Introduce and encourage the incoming hire to local T3 office personnel and activities on and off base; and,
- Adjust staff support as necessary to meet changing T3 workload;
- Make the ORTA, T3 mechanisms, and T3 activities an integral part of the Research and Sponsored Programs Office (AFIT/CZ) activities;
- Make better use of TechLink assistance to prepare licensing agreements;
- Make available and maintain current agreement templates and information on the intranet.

3.4 Near Term Goals and Strategy

- Use AFIT's transition from '@AFIT.edu' to '@us.af.mil' Explore and encourage T^3 opportunities with current and potential partners;
- Actively encourage AFIT leadership and faculty to establish formal relationships with non-federal organizations increasing T^3 opportunities;
- Promote T^3 with use of software licensing arrangements to educational and commercial partners;
- Develop mechanisms to enable execution of Cooperative Agreements and Other Transactions.

3.5 Long Term Objectives and Strategy

- Explore and suggest 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.

4.0 Year in Review

4.1 Success Stories

4.1.1 **UAV Positioning Experimentation Project (UPEP)**

This agreement supported AFIT's in-house UAV fleet and visual odometry measurement technologies by combining with ENSCO's Ranging Radio Technology. ENSCO provide equipment, technology and experience during the project; AFIT built smart cable interface to connect the ranging radio with an Air Force estimation/logging system and conducted flight tests and collected data for positioning. Each partner benefitted from resources provided by the other to advance the technology.

4.1.2 Solar Panel for Prompt Detection and Identification of Nuclear Detonations

This important project provided researchers hands-on experience with modeling and detecting nuclear effects. This effort provided AFIT with $180K in funding during the three-year effort that generated four peer-reviewed journal publications, one conference paper, one PhD dissertation, six oral presentations at symposia and a poster presentation while supporting three Faculty, three Research Staff, three Post-Docs, and five Graduate Students.

4.2 Marketing and Outreach Activities

AFIT has entered into several MOUs and other agreements to enable projects to participate in and benefit from partnerships active in hypersonics research and high performance computing. AFIT's ORTA is actively seeking new partnerships to expand opportunities with commercial entities, universities other government offices.

4.3 Lessons Learned

Better represent requirements for staffing, support, and expectations to management.

4.4 Barriers/problems faced, how they were overcome, things you would do differently in the future

The ORTA cannot function with minimal resources. With changeover of personnel and the inability to post and fill technology transfer positions, AFIT's progress was less than hoped. AFIT expects to fill T2 openings in the second quarter of FY23; provide training for the new personnel and make advances in all areas of technology transfer.

5.0 Resources

5.1 Human Resources – AFIT has an approved GS-12 position to manage and assist with T3 activities that has been unmanned (<10%FTE) for FY22 resulting from delays of hiring actions and an AETC mandate limiting manpower to 92% of authorized levels. Hiring actions now underway to fill the position.

5.2 T2 Education and Training Provided to Organization/Lab Staff - none

5.3 Professional Development of ORTA- none

5.4 Incentives/Awards- none

6.0 Financial

6.1 Royalty Income $1,500 on one patent license, $1000 from an 801 SW License & NDA.

6.2 CRADA Income $801,439 in FY22

6.3 CTA Income -none

6.4 T2 Expenses (excluding salaries – e.g., conferences, publications, training) -none

6.5 Other T2 Resources- e.g., interns, marketing funds -none

7.0 Facilities/Equipment

7.1 Laboratory's URL that lists facilities/equipment information: www.afit.edu

7.2 Unique Capabilities of the Laboratory (short list):

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

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

AFIT uses T2 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 for launch; studied mechanisms to improve the detection of nuclear events to name a few.

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.

8.0 Performance Measures

8.1 Overall Trends

8.1.1 CRADAs

Active Agreements:	17
New Agreements:	7
Amendments:	6

8.1.2 EPAs

Active:	5
New:	0

8.1.3 CTAs

Active:	0
New:	0

8.1.4 MTAs

Active:	1
New:	1

8.1.5 ITAs

Active:	1
New:	1

8.1.6 NDAs

Active:	0
New:	0

8.1.7 PLAs

Active:	1
New:	1

8.1.8 Please list the number of active & new agreements for any other T2 mechanisms your lab has (training affiliation agreements, software license, etc.)

Software Licenses

Active:	2
New:	0

8.1.9 Intellectual Property

Invention Disclosures:	2
Patent Applications:	3
Patents Issued:	11

UAV Positioning Experimentation Project (UPEP)

Objective:

- Use non-GPS sensors to improve navigation

Benefits:

- Access to partner's ranging radio interface and expertise
- Characterize ranging measurements impact on navigation

Technology:

- Show feasibility of combining visual odometry and RF ranging to provide 3D UAV positioning solutions Describe technology in layman's terms.
- Name: UAV Positioning Project

Status:

- ENSCO Inc.
- USAF CRADA No. 16-AFIT-22 (ongoing)

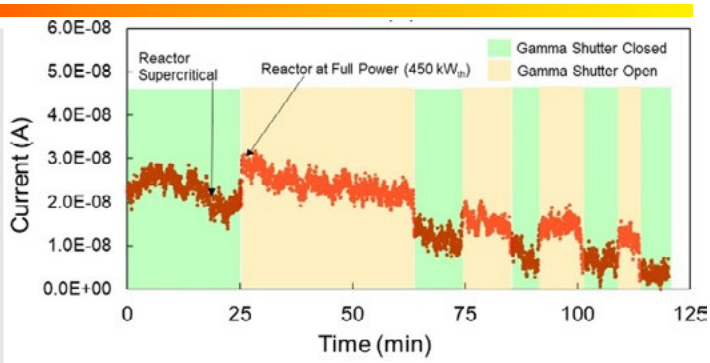
AFIT POC

Dr. Clark Taylor, Director
Autonomy & Navigation Technology (ANT) Center
AFIT/ENG
(937) 255-3636 x4614
Clark.Taylor.3@au.af.edu

Nov 2022

Solar Panel for Prompt Detection and Identification of Nuclear Detonations

- **Objective:** Examine the capability of solar photovoltaic (PV) panels for the identification of nuclear detonation by detection of the characteristic prompt and delayed signatures of a nuclear detonation.
- **Method:** Approach: Sense the abnormal change of baseline signal or the permanent and measurable residual signatures in solar PV panels due to interaction with ionizing radiation from a nuclear detonation, thereby, provide instant and accurate post-detonation forensics information. Unique Challenges: No or little relevant prior art in public domain for reference.



Electric current response of silicon solar cell to fast neutrons from a thermal fission spectrum at 450 kW_{th} reactor power

Status:

- The Ohio State University using USAF CRADA No. 20-AFIT-05 (final year of three year effort)
- **Status of effort:** Acquired experimental and simulation results demonstrating feasibility of neutron detection using solar PV panels; measured steady-state and transient response of solar cells to neutrons; studied X-ray induced damage in perovskite solar cells; studied gamma-ray induced damage in silicon and perovskite solar cells.

AFIT POC

Dr. John McClory
Nuclear Expertise for Advancing Technologies (NEAT) Center
AFIT/ENP
(937) 255-3636 x7308
John.McClory@afit.edu

Nov 2022

2022

AIR FORCE LIFE CYCLE MANAGEMENT CENTER DELEGATE

COMMAND, CONTROL, COMMUNICATIONS, INTELLIGENCE AND NETWORK DIRECTORATE

FY22 ORTA Report
PEO C3I&N, PEO Digital, PEO NC3, and the 66th ABG
Hanscom AFB, MA

1 & 2. Executive Summary & Organization Overview:

The Lantern: Hanscom Collaboration & Innovation Center, located at Hanscom Air Force Base, Massachusetts, is designated as the local Air Force Technology Transfer and Transition (AF T3) Office of Research and Technology Applications (ORTA) for PEO C3I&N (AFLCMC/HN), PEO Digital (AFLCMC/HB), PEO NC3 (AFNWC/NC), and the 66th Air Base Group. It serves as a key node for future joint warfighting experiments and has the capacity to provide a Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) and Cyber collaborative environment to support Research and Development (R&D), Developmental Test (DT)/Operational Test and Evaluation (OT&E) preparation, technical baseline establishment exercises, modeling and simulation, experimentation, acquisition program/project development and direct warfighter support to program offices. The 29,000 square foot facility has been providing programs access to the tools and data required at multiple classification levels since 1993.

The Lantern's mission is to coordinate and partner with local, regional, and national leaders within state and federal governments, Air and Army National Guard Units, Reserve Units, laboratories, FFRDCs, industry, academia, non-traditional capabilities, and those involved with STEM efforts to create a physical and business environment to enhance and extend leading-edge advances in all areas of defense applications, cyber defense techniques with multi-use purposes, and public safety. The Lantern functions as a "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.

Per the latest Lantern charter signed 19 Sep 2022, The Lantern is governed by a Board of Directors (BoD) comprised of PEO C3I&N (Chair), PEO Digital, PEO NC3, 66th Air Base Group Commander, and the Associate Director of Engineering and Technical Management (AFLCMC/EN). The most recent annual BoD meeting occurred 30 Sep 2022.

3. Strategy/Plan of the ORTA

The Lantern focuses on collaboration, experimentation, and capability demonstrations through enablement and training sessions, exercises and joint events, and proof of concept/proof of value events. The Lantern also supports participating mission partners and programs by providing network cafés and connectivity to operational and RDT&E networks, private and shared work areas, and virtual environments and managed cloud access. Further, The Lantern is committed to collaborate with industry on innovation and technology transition as a member of the Hanscom Innovation Team (HIT), Hanscom's front door for vendors seeking to do business with the federal government through the HIT's Pitch It process. The Lantern also hosts Light the Lantern (LTL) vendor demonstrations approximately twice a year at the facility, targeted to mission partner needs and technology interests. The last LTL event was held on 12 Oct 2022.

The Lantern's strategy is and will continue to be multi-faceted in future years. Flight-follow ABMS and integration into the Distributed System Integration Lab (DSIL) and BattleLab will be pursued, Lantern will strive to strengthen existing and establish new partnerships with Army, USSF, and the State of Massachusetts, including the Army DEVCOM C5ISR Center. Further, The Lantern is working to expand the facility footprint, including its SCIF, in anticipation of new customers and missions.

4. Year in Review

During fiscal year 2022, The Lantern had multiple significant successes. GVS-C (formally called SVTC) capability was launched in multiple areas of the Lantern to provide video teleconference at the Secret Collateral and SCI classification levels, Two AFRL capabilities (ALLNET and AFRL's Global Lightning Starlink Service) were implemented within the Lantern, a formal partnership with the MA Army National Guard's 126th Cyber Protection Battalion was established, and The Lantern supported Emerald Flag 22-3 exercises for the 96CTG Det 1 on 18-20 Oct 2022.

The Lantern is a relatively new but vigorous advocate for tech transfer efforts and demand from local units is increasing. During FY22, 8 CRADAs were coordinated to fruition through efforts of this ORTA and are available for review on AFRL DTTIS:

AWS: collaborating with integrator/partners (See entry for Microsoft below) on Cloud One (streamlined cloud services).
Dell: Zero Trust Proof of Concept
General Atomics: airborne, OMS-compliant tactical datalink gateways
Leidos (1): Multi-Intelligence (Multi-INT) Sensemaking using the Air Force (AF) Distributed Common Ground Station (DCGS) AI Inference Engine
Leidos (2): Cybersecurity Tool(s) Development with Artificial Intelligence and Machine Learning for Autonomous and Persistent Operations
Microsoft: collaborating with integrator/partners (See entry for Microsoft below) on Cloud One (streamlined cloud services)
Pacific Defense: Airborne Tactical Radios and Data Networking
Raytheon: Skyler Radar Feed

Hanscom AFB also has three Education Partnership Agreements (EPA) and one Partnership Intermediary Agreement (PIA). The EPAs are with the University of Massachusetts Lowell (since 2014), Northeastern University (since 2016), and Minuteman Technical High School (since 2018). The PIA facilitates Hanscom AFB's innovation workforce training and industry accelerator partnership with non-profit MassChallenge. It is managed by AFRL's Information Institute, Rome, NY and the Griffiss Institute.

5. Resources

Apart from the facilities and equipment covered in section 7, the Lantern currently employs a full-time staff of 12, who perform the Lantern's necessary day-to-day operations. The staff manages operations for numerous mission partners who maintain different levels of involvement at the facility. Currently, approximately 500 personnel at Hanscom AFB have entry access to the Lantern facility.

6. Financial

The Lantern operates on a reimbursable process to bill costs on a "fair-share" basis to each customer. It has not collected and does not anticipate collecting royalty, CRADA, or CTA income. Although Lantern manpower is leveraged to support T2 efforts, the Lantern also does not incur direct expenses to support T2 efforts.

7. Facilities/Equipment

The Lantern (both public and CAC-enabled URLs pending) provides users with access to the following networks: NIPR, SIPR, JWICS, DREN, SDREN, MITRE NERVE, JIOR, JTEN/KTEN, SVISION,

JMETC, and JSN as well as commercial internet provided by StarLink, Comcast CISP and Verizon 5G hot spots in unclassified areas.

Physical space within The Lantern facility includes the DREN Virtual Environment, an expansive working-level operations floor, a SCIF, private conference areas at both Secret and SCI classification levels, a large loading dock, and keyed private rooms. Additionally, the Lantern extends outdoors to a secure area containing numerous self-contained tactical shelters and a 119-foot tower providing warfighters and other collaborators with communications and testing options.

The Lantern provides Secure VTC on JWICS and SIPR (GVS-C) and SIPR & JWICS connectivity cafés to participating mission partners.

Lantern special authorities include Special Purpose Processing Node, Authority to Operate (ATO), and Inheritable Controls.

8. Performance Measures

8.1 Overall Trends

8.1.1. CRADAs
Active Agreements: 8
New Agreements: 8
Amendments: 0

8.1.2 EPAs
Active: 3
New: 0

8.1.3 CTAs
Active: 0
New: 0

8.1.4 MTAs
Active: 0
New: 0

8.1.5 ITAs
Active: 0
New: 0

8.1.6 NDAs
Active: 0
New: 0

8.1.7 PLAs
Active: 0
New: 0

Active & new agreements for any other T2 mechanisms: 1
Intellectual Property: 0
Invention Disclosures: 0
Patent Applications: 0
Patents Issued: 0

2022

AIR FORCE LIFE CYCLE MANAGEMENT CENTER DELEGATE

FIGHTERS AND ADVANCED AIRCRAFT DIRECTORATE

WA Laboratory FY22 Annual Report

1. **Executive Summary**

(U) The Air Force Life Cycle Management Center (AFLCMC) Fighters and Advanced Aircraft Directorate (WA) Laboratory at Wright-Patterson Air Force Base (WPAFB) has executed sixteen (16) Cooperative Research and Development Agreements (CRADAs) within the last Fiscal Year (FY). Prior to FY22, WA had six (6) CRADAs in the portfolio. Of the sixteen (16) newly executed CRADAs, fifty-six percent (56%) have been awarded to Small Business as defined by the Small Business Administration.

(U) In addition to the CRADAs, WA has awarded six (6) new Information Transfer Agreements (ITAs) within the last FY. There was only one (1) ITA in place prior to FY22.

2. **Organization/Laboratory Overview:**
   - 2.1 Laboratory Mission Statement: (U) The WA Lab supports efforts to include development, integration, model validation, and performance testing.
   - 2.2 Description of organization/laboratory: (U) Within the organization there are approximately twenty-five individuals comprised mostly of engineers.
   - 2.3 Geographic location: (U) The lab is in Dayton, OH.
   - 2.4 Technology Focus Areas: (U) The lab's focus is to burn down risk within the acquisition process by giving the government the ability to re-test and validate results from industry partners.
   - 2.5 Year of Commission: (U) The lab was stood up in 2019.

3. **Strategy/Plan of the ORTA**
   - 3.1 How ORTA fits into Lab Organization and Mission: (U) The WA Office of Research of Technology Application (ORTA) enables acquisition programs to burn down the risk of various technologies the Directorate is interested in using within the portfolio.
   - 3.2 How T2 Tools are a part of the lab strategic planning: (U) T2 Tools allow the ORTA to collaborate in the areas of innovative technologies, components, software, modeling, simulations, and systems for aircraft applications to further grow the marketplace.
   - 3.3 One Year Objectives and Strategy: (U) The ORTA plans to continue building up the industry players to allow for more competition while simultaneously bringing in the best of the best technologies to ensure the Air Force's superiority.
   - 3.4 Near Term Goals and Strategy: (U) The ORTA will exercise government ownership and ensure technical maturity with independent government assessments of operation, integration, and comparisons of technologies within the Lab.
   - 3.5 Long Term Objectives and Strategy: (U) The ORTA and our Lab want to give the Directorate the ability to crosscheck the information coming in from Industry Partners to help confirm acquisition decisions which could have multi-million if not multi-billion dollar impacts.

Controlled by: AFLCMC/WA
CUI Category: Procurement and Acquisitions
Limited Dissemination Control: Distro A
POC: Zachary Wilson, 937-705-1705

4. **Year in Review**

4.1 Success Stories (Successful transfer of technologies, establishment of innovative policy at lab that facilitates T2, etc.) Please include a short description below and a quad chart for each success story on the provided template.

4.1.1 Success Story: (U) A CRADA allowed WA to get a Collaborator on board, commit technology, and use the technology all within a four (4) month window. Without a quick CRADA, the operation would not have been able to take place due to the lengthy amount of time traditional contract vehicles take which would have resulted in an opportunity loss for USAF to gain valuable information. The data collected adds to the government's repertoire of information to help dictate important acquisition decisions.

4.2 Marketing and Outreach Activities: (U) Most outreach is done via word of mouth at the PEO level. Industry partners present their ideas to the PEO who then directs them to the ORTA so we can establish a CRADA and begin to collaborate on future opportunities. Additionally, the ORTA attends various Industry Days to learn about what technologies exist and look to establish CRADAs with interested parties.

4.3 Lessons Learned: (U) It is important for ORTA to stress to Collaborators that CRADAs are Agreements and not Contracts. Reinforcing this throughout the drafting process was key to getting the right people in the room and having them understand what it is we were after. A few times the wrong people in were in the room and wanted to address things that apply to Contracts related to the Federal Acquisition Regulations (FAR). Re-explaining what it is we were after and the vehicle that the CRADA provides put us back on track and allowed us to stand up the collaboration.

4.4. Barriers/problems faced, how they were overcome, things you would do differently in the future: (U) Our office churned out a batch of twelve (12) CRADAs within a week's timeframe. The basic CRADA template was the same minus the industry partner specific information. We would love to see a CRADA Template approved similar to the ITA template, but in the meantime, we kept an open line of communication with legal to address the urgency of the CRADAs needed in order to push certain developments forward. I hope that we can continue to have conversations with legal as to why our Laboratory could be the outlier that greatly benefits from a CRADA template so we can continue to move at the speed of relevance.

5. **Resources**

5.1 Human Resources: (U) Nothing substantial to report (NSTR)

5.2 T2 Education and Training Provided to Organization/Lab Staff: (U) The ORTA is sending one (1) individual the inaugural T2 University Capstone in Bozeman, Montana.

5.3 Professional Development of ORTA: (U) The ORTA has increased one hundred percent (100%) from FY21. Additionally, the ORTA has created and briefed the Directorate on Best Practices for establishing new CRADAs and ITAs which are the most popular forms of agreements within the Lab.

5.4 Incentives/Awards: (U) The ORTA has allowed Collaborators to play within the Lab's environment so they can better understand how their technologies will perform.

6. **Financial**

6.1 Royalty Income: (U) NSTR

6.2 CRADA Income: (U) NSTR

6.3 CTA Income: (U) NSTR

6.4 T2 Expenses (excluding salaries – e.g., conferences, publications, training): (U) The ORTA is sending one (1) individual the inaugural T2 University Capstone in Bozeman, Montana.

6.5 Other T2 Resources- e.g., interns, marketing funds: (U) NSTR

7. **Facilities/Equipment**

7.1 Laboratory's URL that lists facilities/equipment information: (U) NSTR

7.2 Unique Capabilities of the Laboratory: (U) The WA Lab infrastructure allows for confirmation of test reports given to the government by industry. The government no longer has to take industry at their word, but can use data and run models through the lab to confirm or confront industry on parameters of different technology efforts.

7.3 Examples of how some of these facilities/equipment are used by the private sector through CRADAs, test agreements etc.: (U) Industry partners have brought Independent Research and Development (IRAD) systems to the WA Lab to test their systems in a military environment as opposed to gathering data at various commercial locations.

8. **Performance Measures**

8.1 Overall Trends

8.1.1 CRADAs
Active Agreements: (U) 22
New Agreements: (U) 16
Amendments: (U) 0

8.1.2 EPAs
Active: (U) 0
New: (U) 0

8.1.3 CTAs
Active: (U) 0
New: (U) 0

8.1.4 MTAs
Active: (U) 0
New: (U) 0

8.1.5 ITAs
Active: (U) 7
New: (U) 6

8.1.6 NDAs
Active: (U) 0
New: (U) 0

8.1.7 PLAs
Active: (U) 0
New: (U) 0

8.1.8 Please list the number of active & new agreements for any other T2 mechanisms your lab has (training affiliation agreements, software license, etc.). (U) There have been no new agreements for any other T2 mechanisms within the WA Laboratory.

8.1.9 Intellectual Property
Invention Disclosures: (U) 0
Patent Applications: (U) 0
Patents Issued: (U) 0

2022

AIR FORCE RESEARCH LABORATORY DELEGATE

711TH HUMAN PERFORMANCE WING

AIRMAN SYSTEMS DIRECTORATE

US AIR FORCE SCHOOL OF AEROSPACE MEDICINE

711th Human Performance Wing/Airman Systems Directorate (RH) and U.S. Air Force School of Aerospace Medicine (USAFSAM)

1.0 Executive Summary

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 2022. 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).

2.0 Organization/Laboratory Overview

The 711 HPW leads the development, integration, and delivery of Airman-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. Established under the Air Force Research Laboratory, the 711 HPW is comprised of the Airman Systems Directorate (RH) and the United States Air Force School of Aerospace Medicine (USAFSAM).

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

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

2.1 Laboratory Mission Statement

OUR VISION – Experts in Airman/Guardian performance and recognized Department of Defense leaders in human performance.

OUR MISSION – To assure the dominant advantage in air, space, and cyberspace by advancing human performance.

2.2 Description of organization/laboratory

The 711 HPW accomplishes its mission through distinct but complementary mission units and an integrated staff located at Wright-Patterson Air Force Base, OH. In addition, the Wing includes about a dozen smaller operating locations within the United States and internationally.

AIRMAN SYSTEMS DIRECTORATE (711 HPW/RH) – The Directorate provides science and leading-edge technology to define Airman capabilities, vulnerabilities, and effectiveness; train warfighters; integrate operators and weapon systems; protect Air Force personnel; and sustain aerospace operations. The Directorate is the heart of Airman-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) – 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.

2.3 Geographic location

The Air Force currently has 43 ORTA branches in the United States, located in federal laboratories at 18 Air Force bases, the United States Air Force Academy, the Pentagon, and 2 government facilities. Each office consists of trained specialists to administer and manage the technology transfer functions for their dedicated laboratory within the federal government. AFRL has its headquarters at Wright-Patterson Air Force Base, OH.

2.4 Technology Focus Areas

There are more than twenty focus areas, they include, but are not limited to the following:

Aerospace Avionics
Autonomy
Bio-Optics
Biotechnology
Complex Materials and Devices
Cyberspace Communications
Directed Energy
Dynamic Systems and Control
Electronic Warfare/Electronic Protection
Flight Simulation
Human Performance
Information, Decision and Complex Networks
Man-Machine Interfaces
Missile Technology
Munitions
Nanotechnology
Next Generation Aerospace Systems
Power and Propulsion
Quantum and Non-Equilibrium Processes
Space Technology
Technical Intelligence Studies and Research
Weapons

2.5 Year of Commission

Established March 25, 2008, under the Air Force Research Laboratory, the 711 HPW was comprised of the Human Effectiveness Directorate, the United States Air Force School of Aerospace Medicine, and the Human Systems Integration Directorate. Currently, the 711 HPW comprises two mission units – the Airman Systems Directorate and the USAF School of Aerospace Medicine – and several functional directorates.

3.0 Strategy/Plan of the ORTA

3.1 How ORTA fits into Lab Organization and Mission

The ORTA plays a key role in shaping a federal laboratory's approach to technology transfer by developing and promoting effective partnerships between government and commercial entities.

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

Current functions performed by ORTAs consist of the following:

- Prepare application assessments
- Provide and disseminate info on federally owned or originated products, processes, and services
- Cooperate with NTIS and Federal Laboratory Consortium (FLC)
- Provide technical assistance to State and local government officials
- Participate in regional, state, and local programs designed to facilitate transfer of technology

3.3 One Year Objectives and Strategy

Throughout the year, there have been several personnel changes, to include retirements, transfers, and new hires. At the beginning of the Fiscal Year, there was only 1 FTE. In total, a minimum of 3 FTEs is required for the office to function in a timely and efficient manner, to provide a high level of daily customer service to 711 HPW researchers, and to support the myriad of requests for T3 data and updates from 711 HPW leadership, DoD offices, AFRL offices, 711 HPW offices, and outside agencies. Currently, 2 FTEs fill the position for various T3 roles. Therefore, as current Technology Business Specialists, the existing one-year objective is to revisit existing processes and procedures, bring agreements and administrative duties to current and work on becoming more efficient as an ORTA.

3.4 Near Term Goals and Strategy

The T3 presence on the AFRL SharePoint website continues to expand and is a proven valuable communication asset for the T3 Office. We anticipate leveraging this tool even more as the T3 personnel situation improves during the upcoming months. The goal is to improve the ease and speed of fact-finding as it relates to T3 agreements, domestic alliances, various affiliation agreements, T3 processes, and intellectual property. With a proper level of T3 personnel availability, the T3 office can accomplish this goal. A major goal is to transition all T3 agreements, tracking functions, and operational information to a new relational database for AF-wide T3 Agreements. The Department of the Air Force T3 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.

3.5 Long Term Objectives and Strategy

The 711 HPW T3 office envisions that the ORTA T3 activities will always exist as a self-supported program through leveraging collaborative resources into the 711 HPW's overall investment strategy. The goal is for T3 "funds-in" to cover a portion of the costs of the 711 HPW's T3 office and endeavors. In general, the T3 office can accomplish this by identifying collaborative opportunities within the Air Force and commercial industry/academia that can be satisfied through common research and development of technologies, ultimately allowing for improved products at a reduced cost and/or in a compressed schedule. Future considerations are to explore ways to increase cost sharing collaborations earlier in the

R&D process to relieve the burden on Air Force project funds and address commercial and military needs in parallel.

4.0 Year in Review

4.1 Success Stories

4.1.1 *Success Story #1*

Title: "The Air Force hopes this tiny box will help pilots fly through a chemical weapons attack."

Description: Analysts from the Air Force Research Laboratory's 711th Human Performance Wing spent several days at Eglin Air Force Base, FL in August 2022 conducting experiments on the F-15E Strike Eagle. The experiments were meant to determine how long it takes a chemical contaminant like tear gas to be purged from the aircraft, and to find possible new ways to get those chemicals out as soon as possible. William Greer, a senior chemical, biological, radiological, and nuclear (CBRN) analyst with 711th Human Performance Wing states, "we hope that this test will give aircrews more flexibility with how they operate in an austere environment and allow them to fly more missions over time." These tests were part of a larger Department of Defense effort to evaluate a cockpit environmental condition after a chemical weapon attack.

Website: https://taskandpurpose.com/news/air-force-cbrn-protection-suit/

4.1.2 *Success Story #2*

Title: "AFRL commander shares 2021 wins, 2022 plans in Lab Life podcast"

Description: Maj. Gen. Heather L. Pringle spoke about AFRL's ongoing supportive response to Covid-19 pandemic. Epidemiologists in AFRL and its 711th Human Performance Wing have been monitoring Covid by doing things such as conducting aircraft decontamination research and analyzing samples to see if our service members across the world are positive. Pringle recently checked in on the epidemiology lab as they handle the recent surge, and she said they are upping their production right now, but their morale is high. Maj. Gen. Pringle states, "their role continues to be very relevant today, as it was last year. COVID-19 has not gone away. And here we are at the beginning of 2022. It's been a long road. We still have a lot of important work to do. So, we get the mission done. We have the right technologies, the right precautions in place. But it's just important that we maintain our vigilance and keep up with the precautions as the local conditions in each of our AFRL locations dictates."

Website: https://www.afmc.af.mil/News/Article-Display/Article/2920455/afrl-commander-shares-2021-wins-2022-plans-in-lab-life-podcast/

4.1.3 *Success Story #3*

Title: "Air Force advancing body armor colling system, looking for commercialization partner"

Description: After promoting his personal colling system at a Spark Tank event in 2020, 1st Lieutenant Justin O'Brien is getting new R&D support from the Air Force Research Laboratory and a new prototype was constructed in December. It is the 711th Human Performance Wing, where experienced scientists and engineers are upping the system's technical readiness level to the point where manufacturing by the private sector is feasible. James Christensen, a product line lead in the Airman Systems Directorate, is now advising the project. In 2020, the Air Force filed for a 20-year U.S. utility patent, listing O'Brien as the inventor and now wants to out-license the patent to companies that will commercialize the technology.

ebsite: https://techlinkcenter.org/news/air-force-advancing-body-armor-cooling-system-looking-for-mmercialization-partner

l.4 *Success Story #4*

tle: "The Need for Speed Requires Intense Training"

scription: Being able to maneuver an aircraft while withstanding high levels of gravitational forces, or forces, is a key component to training for combat aviation. But mishap prevention and survival and hancing and sustaining performance all play a role. But, initial military aviation training focuses not st on the G's, but learning to control an aircraft, while also understanding the physiology of acceleration ces on the body. Air Force Maj. Stuart Sauls, who is the acceleration training branch chef in the Air rce Research Laboratory 711th Human Performance Wing at Wright-Patterson Air Force Base in ayton, OH discusses the vast number of trainings that an individual must undergo, to include a spiratory component. In the Air Force, undergraduate pilots begin flight training on the T-6 single prop plane – so they can experience moderate G-forces. The next step is the T-38 trainer for fighter aircraft. fore pilots can train in the aircraft they go to AFRL (711th Human Performance Wing) in Dayton for ts of exposure to severe G-forces at the only DoD human-rated centrifuge. The centrifuge can produce to nine G's, or nine times the normal force of gravity, to measure the student's ability to counteract the fect of G-forces to prevent G-induced loss of consciousness, also known as GLOC.

ebsite: https://health.mil/News/Articles/2022/07/18/The-Need-for-Speed-Requires-Intense-Training

l.5 *Success Story #5*

tle: "KBR to Conduct Medical Research of Biomedical Impacts on Airmen"

scription: KBR Government Solutions U.S. was awarded a strategic contract to expand its health and man performance research and development (R&D) support of the 711th Human Performance Wing, a it of the Air Force Research Laboratory (AFRL). Under this 3-year $20M contract, KBR will provide ientific support focused on airman readiness medical research. The cost-plus-fixed-fee contract verages KBR's existing R&D efforts at FRL onto a new agreement with an increased scope of work. nder the terms of the award, KBR will provide scientific and medical expertise to AFRL at Wright-tterson Air Force Base. KBR human health and performance specialists will investigate airmen adiness to include the biomedical impacts of air and space as well as cognitive and physiological rformance. KBR will support aerospace physiology research in Wright-Patterson' new centrifuge and search altitude chambers facilities in OH, as well as Neurology, Operational Vision and Enroute Care udies.

ebsite: https://apnews.com/press-release/pr-newswire/covid-science-health-medical-research-d6205b1b3027edaa0ee9ee50797b86

l.6 *Success Story #6*

tle: "Air Force Commits Millions for Wearables to Counteract Troops' Exhaustion"

scription: The Air Force Research Laboratory aims to produce and deploy technology-boosted cessories that can continuously monitor individuals' stress and fatigue in real-time – and wearable vices to counter those strains for people who operate in severe environments. Wearables refer to ctronic devices that are attached to human bodies to capture data about their health, GPS location, ysical movements, alertness and more. In recent years, multiple government agencies and military mponents have turned to this emerging technology to help spot disease outbreaks and optimize their

staff's performance, among other applications. A primary focus of the AFRL's fresh effort is to produce wearable systems that can track "biometrics of fatigue and stress" using electrophysiological modalities and biomarkers like cortisol and adrenaline. Technologies to measure stress based on heart rate and facial feature extraction may also be developed. Beyond that work, a secondary focus of this pursuit involves creating wearables, sensors and advanced algorithms to counter environmental stressors. Those solutions might involve noninvasive nerve stimulation, tDCS, or appropriate chemical stimulants. The lab's ultimate aim is to make and demonstrate mature technologies that are low-powered, inexpensive and manufacturable at scale.

Website: https://www.nextgov.com/emerging-tech/2022/01/air-force-commits-millions-wearables-counteract-troops-exhaustion/360842/

4.2 Marketing and Outreach Activities

Marketing efforts continue to be a primary function to promote the laboratory's efforts. Connections to and contacts made within the Federal Laboratory Consortium (FLC) are one avenue of making this possible. For instance, our office was contacted, in September 2022, by the Marketing Manager of FLC referencing an article that was written about the former "Aware by GlobalFlyte" technology. The FLC's key interest in the Multi-Modal Communications technology, which was licensed by GlobalFlyte through a Patent License Agreement (PLA) from the 711 HPW, had won a FLC award. After coming across this article, the Marketing Manager had reached out directly to our office to publish an update in the FLC Digest Newsletter and, in the future, publish a Labs in Action story when the technology becomes publicly available. Our office has contacted those individuals within the FLC to make these news releases possible. The connection to the FLC and its employees have been quite valuable to execute on marketing efforts. In addition to these news releases, the FLC created a Digital Marketing Pamphlet for our Political Leaders to publicize our award recognition for the 2022 Excellence in Technology Transfer Award for Battlefield Assisted Trauma Distributed Observation Kit (BATDOK).

4.3 Lessons Learned

During FY22, the 711 HPW T3 team had significant personnel changes. Two new ORTA professionals joined the team while the senior professional retired. To quickly learn their duties, the new ORTAs embraced a process improvement methodology called daily huddle to discuss goals, challenges, and daily tasks to organize what duties to complete each day.

4.4 Barriers/problems faced, how they were overcome, things you would do differently in the future

The benefit of having two new ORTAs on the team is they provided a fresh perspective on how to manage the team's duties. The new ORTAs promoted an overhaul and organization of the team's shared drive. The team dedicated specific weekly meetings over many months to this project, which resulted in significantly improved T3 information architecture and knowledge management.

5.0 Resources

5.1 Human Resources

The 711 HPW ORTA runs most smoothly with a team of three professionals. The team will be fully staffed by the beginning of the calendar year 2023.

5.2 T2 Education and Training Provided to Organization/Lab Staff

The T3 team fully embraces continuous learning and training and will take advantage of all learning and training opportunities and will share that knowledge with 711 HPW personnel.

5.3 Professional Development of ORTA

Professional Development activities include and are not limited to the following:

Department of the Air Force T3 Program Office

- Annual Workshop (November)

AFRL/SB

- In-person ORTA Training (April)
- In-person Royalties Training (April)
- ORTA Training (in accordance with statutes) – AFRL/SBT (October)

Federal Labs Consortium (FLC)

- FLC National Meeting (multiple training courses)

TechLink

- Technology Transfer University / ORTA Foundations Course (inaugural cohort)

Wright Brothers Institute (WBI)

- Annual Reviews
- Quarterly Reviews

5.4 Incentives/Awards

On December 14, 2021, the T3 Office was notified as an award winner. BATDOK had been selected as an award recipient to receive the 2022 Excellence in Technology Transfer from the Federal Laboratory Consortium for Technology Transfer (FLC). The 711 HPW stood out as one of the highest caliber nominations to be received by the FLC in the last year. This is quite the accomplishment for the laboratory and an award to continue striving for with other technologies that the laboratory develops.

6.0 Financial

6.1 Royalty Income: $40,221.54

6.2 CRADA Income: $0.00

6.3 CTA Income: $10,264.42

6.4 T2 Expenses (excluding salaries – e.g., conferences, publications, training): $450.00

6.5 Other T2 Resources- e.g., interns, marketing funds: $0.00

7.0 Facilities/Equipment

7.1 Laboratory's URL that lists facilities/equipment information

No known URL exists

7.2 Unique Capabilities of the Laboratory

The only human rated centrifuge owned by the Department of Defense is located at the United States Air Force School of Aerospace Medicine (USAFSAM), located at Wright-Patterson Air Force Base, Ohio. USAFSAM is assigned to the Air Force Research Laboratory's 711th Human Performance Wing.

USAFSAM's Aerospace Medicine Division provides initial and refresher acceleration training for all USAF fast-jet aviators in this human-rated centrifuge. The centrifuge allows students to experience up to 9 G's, or nine times the normal force of gravity, to teach the effects of G-forces on human physiology and to measure the subject's ability to counteract the effects and prevent G-induced loss of consciousness.

Aircrew acceleration training and research/testing missions are conducted in the centrifuge, which is capable of producing 20 times the force of gravity, or G's, and can accelerate up to 15 G's in one second.

Approximately 1,200 students (fighter pilots, aircrew members, flight surgeons, aerospace physiologists and others) can be trained in the centrifuge each year.

Pilots learn the anti-G straining maneuver to maintain consciousness at high G accelerations. Students are trained to no more than 9 G's.

The centrifuge has three interchangeable cockpits used for conducting the training and research/testing missions. Each cockpit is realistic and contains displays with high-definition visuals.

A unique capability that has not existed in previous centrifuges is that all three cockpits can be linked with the control room to create a virtual battle space.

The pitch and roll axis are motorized to create a more realistic sensation.

The centrifuge system achieved Full Operational Capability status May 30, 2018 and will begin providing training to students Oct. 1, 2018.

Centrifuge specifications:

Arm length: 31 feet
Degrees of freedom: 3 (Planetary, Pitch, and Roll)
Maximum peak G: 20Gs
Maximum G-onset rate: 15Gs per second
Sustained G profile: 60 minutes
3 cockpit modules (two training and one research)
1,000 lb. payload capacity for research module
High fidelity virtual tactical simulation
Realistic Cockpits and Displays with High Definition Visuals (210º Horizontal and 120º Vertical)
97% operational availability

Centrifuge Motor specifications:

45 rpm max

· Power:
3.5 MW or 4,700 hp

· Torque:
@ 100% 1153 kNm or 850,409 ft lb

Website: https://www.afrl.af.mil/About-Us/Fact-Sheets/Fact-Sheet-Display/Article/2333796/711-hpw-united-states-air-force-school-of-aerospace-medicine-human-rated-centri/

7.3 Examples of how government facilities/equipment are used by the private sector through CRADAs, test agreements etc.

- Through a CRADA titled, "Integration of High-Performance Computing with Topological Data Analysis," AYASDI Government Services, Inc. located in Reston, Virginia, will make use of a 100 Terabyte Server, functionally connected to computational resources within the High-Performance Computing facility at Wright-Patterson AFB. This property will be retained by AFRL but be accessible to Collaborator to support contracted customer requirements.

- Through a CRADA titled, "Effects of Non-Invasive Brain Stimulation on Vehicle Operator Performance," TK Holdings, Inc. located in Pontiac, Michigan, will receive the following Air Force property and equipment: tDCS hardware and reference metrology, including driver monitoring camera(s) for hear rate estimation. The primary objective is to determine the potential of non-invasive brain stimulation (NIBS) to 1) improve vehicle operator performance, and 2) assess candidate operator physiological state sensors, classifications of operator cognitive and physiological states, and application of appropriate forms of NIBS to enhance/improve operator effectiveness.

- Through a CRADA titled, "Enabling Technologies for Medical Readiness Training," KForce Government Solutions, Inc. located in Fairfax, VA will acquire Android devices (tablets/phones) that will receive the Air Force owned BATDOK™ application. KForce Government Solutions will benefit from the collaboration through jointly explored methods of integrating battlefield airmen programs of record with human patient simulators and commercialize/incorporating the knowledge gained through this effort into the 711th HPW's training approaches and simulators.

- In Summer 2022, TechLink's economic impact team published their report for DOD license agreements 2000 through 2021. This report shows the positive impact of the T3 team and the 711 HPW's license agreements that contributed to new economic activity and job creation in the United States and resulted in the transition of new technology to U.S. military use. The total economy-wide impact, as measured by output (the total value of purchases by intermediate and final consumers) was estimated at $528.3 million. Of the $528.3 million, the direct impact (sales of new products and services) was $202.6 million, the indirect effect, the result of inter-industry purchases (firms purchasing from each other) was $198.3 million and the indirect impact (the result of households spending payroll on goods and services economy-wide) was $127.4 million. Value added (the difference between a product's sale price and the cost of goods and services used to make it) was estimated at $249.6 million, representing new wealth creation in the economy. Employment impacts included 1,989 jobs with an average income of $80,536. Labor income was estimated at $160.2 million.

711 HPW's Economic Impact of License Agreements for 2000-2021

Impact Type	Output ($ Millions)	Value Added ($ Millions)	Employment (Number of Jobs Supported)	Labor Income ($ Millions)	Labor Income (Per Job)
Direct Impact	202.6	65.3	442	39.4	89,063
Indirect Impact	198.3	109.7	803	77.4	96,455
Induced Impact	127.4	74.7	744	43.4	58,288
Total Economy-Wide Impact	528.3	249.6	1,989	160.2	80,536

8.0 Performance Measures

8.1 Overall Trends

8.1.1 CRADAs

Active Agreements: 40
New Agreements: 7
Amendments: 0

8.1.2 EPAs

Active: 30
New: 1

8.1.3 CTAs

Active: 2
New: 1

8.1.4 MTAs

Active: 14
New: 3

8.1.5 ITAs

Active: 88
New: 21

8.1.6 NDAs

Active: 17
New: 4

8.1.7 PLAs

Active: 33
New: 3

8.1.8 Please list the number of active & new agreements for any other T2 mechanisms your lab has (training affiliation agreements, software license, etc.)

8.1.8.1 Data Sharing Agreement

Active: 13
New: 1

8.1.8.2 Evaluation License Agreement
Active: 2
New: 1

8.1.8.3 Faculty Affiliation Agreements
Active: 1
New: 0

8.1.8.4 Invention License Agreement
Active: 1
New: 0

8.1.8.5 Joint Ownership Agreement
Active: 2
New: 0

8.1.8.6 Patent Assignment Agreement
Active: 7
New: 0

8.1.8.7 Trademark License Agreement
Active: 10
New: 0

8.1.8.8 Training Affiliation Agreements
Active: 21
New: 0

8.1.8.9 Software License Agreement
Active: 4
New: 1

8.1.9 Intellectual Property

8.1.9.1 *Invention Disclosures*: 8

8.1.9.2 *Patent Applications*: 18

8.1.9.3 *Patents Issued*: 13

2022

AIR FORCE RESEARCH LABORATORY DELEGATE

DIRECTED ENERGY DIRECTORATE
SPACE VEHICLES DIRECTORATE

FY22 Annual Technology Transfer Report

AFRL Directed Energy and Space Vehicles

Executive Summary

ORTA 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 Outreach Branch office. The Technology Outreach 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 Outreach Office is chartered to enhance the laboratory's core mission capabilities through strategic partnerships developed to provide support and innovation to the warfighter.

Technology Outreach is supported by a Partnership Intermediary Agreement (PIA) with the New Mexico Institute of Mining and Technology (NM Tech). Through this agreement, NM Tech supports the management of tech transfer agreements, technology commercialization, intellectual property, and marketing efforts for AFRL RD & RV.

In FY22, ORTA 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, Innovate New Mexico Technology Showcase, Hyperspace Challenge, SpaceWERX, Catalyst Accelerator Cohort Challenge, and the 5th Annual AFRL Innovation Awards.

Definitions:

Education Partnership Agreements (EPAs): Provides lab personnel the ability to teach or assist in developing courses. Involves students and faculty in lab research. EPAs enable the loaning and donating of surplus equipment. EPAs also include STEM outreach and partnerships with K-12 institutions. Strategic EPAs are task-oriented, signed at the Division level and cover research, loaning of equipment, and course development.

Cooperative Research & Development Agreements (CRADAs): An agreement that allows AFRL to accept, retain, and use funds, personnel, services and property from a partner. AFRL can provide personnel, services, and use of property. CRADA may not involve funds out to Partner. Lab can loan GFE. FAR and DFARS do not apply. Low cost - CRADAs allow shared resources between Government and private industry.

Cooperative Research & Development Agreements - Non Disclosure (CRADA-NDAs): A limited agreement that enables preliminary discussion to occur between AFRL and partner prior to initiation of a CRADA.

Cooperative Research & Development Agreements - Limited Purpose (CRADA-LP): A limited version of the broader CRADA agreement that allows interest in collaborative research activities relating to certain activities between AFRL and partners prior to initiation of a CRADA.

Commercial Test Agreements (CTAs): May make available to any person or entity, at an appropriate fee, the services of any government lab, center, range, or other testing facility. Perform tests that are confidential and may not be disclosed outside the Federal Government without the consent of the persons for whom the tests were performed

Information Transfer Agreements (ITAs): Software/Data/Know-how users have the right to use, modify, reproduce, and enhance Software/Data/Know-how under this agreement. The ITA is used to further develop technology/software/data and to further evaluate development, testing, and application.

Material Transfer Agreements (MTAs): An MTA is a limited purpose CRADA. May use material and material information only for test and evaluation activities.

Joint Ownership Agreements (JOAs): JOAs include exclusive and non-exclusive options to negotiate if IP is co-owned by another party (such as a university or other federal agency), to enable the Air Force or university/federal agency to take the lead on licensing IP.

Patent License Agreements (PLAs): Licensed IP brings revenue back to the creating organization and is shared with the inventors. PLAs include exclusive and non-exclusive options for negotiation.

Non-Disclosure Agreements (NDAs): Non-Disclosure Agreements allow the AFRL inventor the ability to share important invention information with the partnering organization in order to help determine if the partnering organization would like to license the specific technology.

FY2022 Activities/Successes:

- **AFRL/RD&RV disclosed twenty-three (23) new invention disclosures.**

- **The ORTA office negotiated in executing seventy (70) tech transfer agreements.** This includes thirteen (23) CRADAs including ten (10) CRADA mods; five (5) CRADA-NDAs; three (3) CRADA-LPs, nine (9) EPAs including Strategic, K-12, Donations and Loans; two (2) MTAs; one (1) JOA mod; zero (0) PLAs; five (5) CTAs; and twenty (20) NDAs, and two (2) ITAs. Of the 70 agreements, one (1) is foreign.

- **Continue to Pioneer CRADA-NDAs with start-ups and Venture Capitalists (VC) in support of SpaceWERX and Hyperspace**

  - ***Cohorts with SpaceWERX, AFWERX, and New Soft Landing (Q Station):***

    - Creative (outside the box) ways to collaborate w/AFRL! Currently working w/multiple Venture Capitalist (VC) companies through the various collisions of cohorts
    - May - August 2022 - Presented to >30 companies/universities/+multi government
      - The Catalyst Accelerator (8 cohorts) - Presented on the different mechanisms they can collaborate with such as CRADAs and Patent licenses and other resources – the problem statement was Hybrid Data Movement on 11 May 2022 via zoom.
      - The Ogden Catalyst Accelerator out of Utah (8 cohorts) - Presented on the different mechanisms they can collaborate with such as CRADAs – the problem statement was Digital Data Strategies on 29 June 2022 via zoom.
      - Soft Landing Cohort (Q Station) (5 cohorts) - Presented on "How CRADAs work & How to Use Them with Small Business companies/startups" plus the do's and don'ts for domestic and non-domestic collaborations & testing capabilities on 21 July 2022.
      - International Space Domain Awareness to Catalyst Accelerator Cohorts (8 cohorts) - Presented on how Industry/University (Foreign) can collaborate with AFRL" and the do's and don'ts for domestic and non-domestic collaborations and testing capabilities on 15 August 2022, in Colorado Springs, CO.
      - The USSF/USAF University Consortium Strategic Technology Institute Symposium - Presented on a panel on "How to collaborate/enter into programs such as the AFRL Scholars/Professionals with RD & RV and the different mechanisms of T3 Agreements, including the mechanics of "On how Industry/University (Foreign) can collaborate with AFRL" and the do's and don'ts for domestic and non-domestic collaborations. 16 August 2022 in Colorado Springs, CO. Approximately over 20 Universities and other Academia attended, along with NASA, USRA, and APEX as well as other industry experts.

- **The TEO hosted the 5th Annual AFRL Innovation Awards.** The event celebrated AFRL RD &RV scientists, engineers and support staff who have done outstanding work in tech transfer and patent development. Eight (8) special awards were given and all of the year's inventors and patent awardees were recognized. The event was hosted at the Q Station collaboration center but allowed attendees to join via Zoom for a hybrid event.

2022 Innovation Award Recognitions:

- Mr. Waid Schlaegel (RD)
- Mr. Joey Wells (RD)
- Dr. Andreas Schmitt-Sody & Capt. James Wymer (RD)
- Mr. Joseph "Dan" Trujillo (RV)
- Dr. Wellesley Pereira (RV)
- Dr. Thomas Peng (RV)
- Ms. Dansil Green and Team (RV and SSC)
- Dr. Chastity Whitaker (AFMCLO/JAZ)

- **The ORTA office conducted technology marketing campaigns designed to identify potential partners for technology commercialization.** For each AFRL RD & RV patented technology, the ORTA office reached out to various companies that work in a similar area of research or product sales. We facilitated conversations with interested parties who responded to the email campaign to enter into a PLAs, CRADAs, and NDAs.
  - Marketing Metrics: Many of these are in follow-up stage for potential agreements
    - 10 targeted marketing campaigns; 300 unique companies contacted, 83 responses, 9% response rate; 10 new company interactions (tech presentations, inventor calls

- **The ORTA office developed and presented to <u>13</u>** various new Program Management, Town Halls, and Mil Calls including RD & RV Division/Branch offices below:

Division	Date/Time
RDLT	7/5/2022 @ 2pm
RDMP	7/6/2022 @ 3:30pm
RVB	7/12/2022 @ 1pm
RVSW	7/19/2022 @ 2:30pm
RDOA -PM/BM	7/20/2022 @ 1-3pm
RD - Tech Council	7/25/2022 @ 2:30
RVS Div Call	7/26/2022 @ 9am
RDMW	7/26/2022 @ 10am
PRS-Military Call	8/5/2022 @ 3pm
RDH	8/30/2022 @ 10am
RDK All Call	9/14/2022 @ 1:00pm
RVSV	9/22/2022 @ 9:30am
RDL Division Call	9/29/2022 @ 10:00am

Near and Long Term Initiatives:

· Continue to work with AFNWC/JA and AFMCLO/JAZ to develop processes for efficiently protecting RD/RV IP
· Continue to enhance and engage in-reach/outreach processes and T3 training
· Continue to support SpaceWERX and Space Force Innovation initiatives.
· Continue to expand AFRL store-front initiatives
· Continue Small Business outreach through challenges and expand the innovation network through outreach events like Kirtland Spark Cell, Enterprise Challenge, and Hyperspace Challenge
· Continue to develop T3 training and management programs that are compliant with RD/RV Directorate needs
· Maintain collaboration facilities that are compliant with Directorate needs
· Conduct training programs designed to increase participation by S&Es in T3 mechanisms such as CRADAs, EPAs, ITAs, PLAs, CTAs and Patent Disclosures and Application process
· Continue to provide technical assistance to S&Es on Invention Disclosures and Patent Application process
· Develop and implement processes for evaluating, marketing, and distributing new technologies developed with the lab to achieve their commercial potential
· Expand marketing and outreach efforts to include advertising available positions at Kirtland Air Force Base

Performance Measures

	INTELLECTUAL PROPERTY	FY-22	FY-21	FY-20
1	Invention Disclosures Received	23	30	34
2	Total Patent Applications Filed	7	6	14
3	U.S.	7	6	14
4	Foreign	0	0	0
5	Total PCT Applications Filed	0	0	0
6	Total Patents Issued	3	5	8
7	U.S.	3	5	8
8	Foreign	0	0	0

	LICENSES	FY-22	FY-21	FY-20
9	Invention Licenses, Total Active	7	7	5
10	New Invention Licenses	0	2	0
11	New Invention Licenses Granted to Small Businesses	0	2	0
12	Income Bearing Licenses, Total Active	3	3	3
13	New Income Bearing Licenses	0	0	0
14	Exclusive, Total Active	5	5	3
15	Partially-Exclusive, Total Active	0	0	0
16	Non-Exclusive, Total Active	2	2	2
17	Other Licenses, Total Active	7	7	5
18	New Other Licenses	0	0	0

19	New Other Licenses Granted to Small Businesses	0	0	0
20	Joint Ownership Agreements, Total Active – New	1	2	0
21	Elapsed Amount of Time for Granting Invention Licenses	0	0	0
22	Average (months)	2.5	2.5	0
23	Minimum (months)	3	3	0
24	Maximum (months)	8	8	0
25	Licenses Terminated for Cause	0	0	0

	CRADAs	FY-22	FY-21	FY-20
26	Total Active CRADAs *includes mods	*72	*57	*50
27	New CRADAs *mods	13/10*	13/4*	12/3*
28	Active CRADAs Involving Small Businesses	29	21	12
29	CRADAs with Foreign Entities	3	2	2
30	CRADA Income	$336,876	$237,150	$93,000
31	Estimated CRADA Contributed Value		$25,000,000	$10,785,500
32	Total Active CRADA-LPs/*New (NSF)	2/3*	2	3
33	Total Active CRADA-NDAs*/ **New (Includes 1 *mod/2 VC)	9*/5**	4	0
34	Total Active Material Transfer Agreements (MTAs)	4	2	2
35	New MTAs	2	0	1
36	Total Active Non-Disclosure Agreements/New	32/20	7	5

	OTHER T2 Metrics	FY-22	FY-21	FY-20
37	Total Active Commercial Test Agreements (CTAs)	10	8	7
38	New CTAs *mods	2/3*	1	1
39	CTA Income	$652,469	$395,558	$214,000
40	Total Active Information Transfer Agreements (ITAs)	3	9	8
41	New ITAs	2	1	8
42	Total Active Education Partnership Agreements (EPAs)	60	59	45
43	New EPAs *mods	9	20/*3	10
44	Total Active EPAs with HBCUs and Minority Serving Institutions	12	0	0
46	Total Active EPAs with Grade Schools	6	28	54
47	Total Active EPAs with High Schools	26	28	17
48	Total Active EPAs with Colleges/University	40	30	19

49	Total Software Licenses Executed	0	0	0

NOTE: GRADE SCHOOL COUNT INCLUDES: Pre-K through Middle School

NOTE: NEW EPAs COUNT INCLUDES K-12, Strategic EPAs, Standard EPAs, Task Amendments, Equipment Donations, and Modifications.

2022

AIR FORCE RESEARCH LABORATORY DELEGATE

INFORMATION DIRECTORATE

FY22 Annual Technology Transfer Report
Air Force Research Lab/Information Directorate

Executive Summary

The mission of AFRL/RI is to explore, prototype, and demonstrate high-impact, game-changing technologies that enable the Air Force and Nation to maintain its superior technical advantage. The RI vision is to lead the Air Force and Nation in Command, Control, Communications, Computers, and Intelligence (C4I) and Cyber science technology research and development. Technology Transfer (T2) continues to play an important role in this mission as we explore new ways of advancing RI's technologies through cooperative research, partnership agreements and commercialization.

ORTA Technology Transfer Strategy

The Air Force 2030 Strategy states, "Technological advantage depends on a healthy and secure national security innovation base of partners". RI's Office of Research and Technology Applications (ORTA) believes' that the AFRL T2 mission will help achieve technological advantage by: deepening and expanding the Air Force's scientific and technical expertise, connecting industry, individuals, universities, and government research centers with experts inside the Air Force Scientific and Technical (S&T) enterprise, optimizing taxpayer dollars through dual use and application of S&T, and regularly enabling outreach activities to help build, expertise, and streamline idea solicitation.

AFRL/RI has been utilizing the T2 mission as a force multiplier by helping achieve the above objectives by executing 39 new Cooperative Research and Development Agreements (CRADAs), 31 Educational Partnership Agreements (EPAs), 4 Commercial Test Agreements (CTAs), and 1 Patent License Agreement (PLA). AFRL/RI has also filed 10 Invention Disclosures, 5 patent applications, and 7 patents were issued. Although these numbers are impressive, the AFRL/RI ORTA and T2 team continues to strive for improvement.

A large part of the AFRL/RI T2 strategy is a comprehensive program called H.U.S.T.L.E (Helping Upstate Science and Technology Leaders Entrepreneurs). The Goals of HUSTLE are to research, explore, prototype and test how we might engage teams + technologies emerging from our significant network of Air Force + University R&D to populate our ecosystem with ventures that have high potential to advance the AFRL mission with complementary talent + technology. The approach to making HUSTLE successful is to align and leverage programs, networks, partners, and incubation resources beyond the PIA to synchronize and synergize with our T2 mission, cultivating external customer focus and attracting tech startups with potential to collaborate with AFRL/RI's strategic technology initiatives at the Innovare Advancement Center. The HUSTLE initiative will allow AFRL/RI to double down on both Spin-out and Spin-in technologies.

As part of our PIA, the Information Institute, whose goal is to provide outreach and partnerships with Academia to help with addressing Air Force hard problems, has grown in participation to 130 institutions in 22 states. Through the Information Institute, RI successfully provided grants for 22 professors along with 4 of their students to assist our Scientists and Engineers in facilitating innovative research to meet our mission and challenges this past summer.

The ORTA continues to work on conveying the message of the importance of the T2 mission to the Directorate's Scientists and Engineers (S&Es) including executive coaching for Information Directorate leadership.

FY22 Activities

H.U.S.T.L.E: This year welcomed the first year of HUSTLE (Helping Upstate Science & Technology Leaders & Entrepreneurs). The approach in making HUSTLE successful is to align and leverage programs, networks, partners, and incubation resources beyond the PIA to synchronize and synergize with our T2 mission, cultivating external customer focus and attracting tech startups with potential to collaborate with AFRL/RI's strategic technology initiatives at the Innovare Advancement Center. The seed stage startup accelerator hosts promising emerging ventures for 12 weeks in residence in the IAC Incubator. The startup companies receive intense entrepreneurial training, mentorship, and exposure to the research and technology assets of the AFRL-RI. Ultimately, companies pitched for prizes of $300,000 on Demo Day in August.

This year 5 companies entered. 3 CRADAs resulted, and 2 new jobs were created while 11 startup jobs were retained. Thermo.AI – a machine learning and AI platform for improving industrial combustion -- won top prize of $200,000, and CyberSpara, a socially based cybersecurity software platform took second place of $100,000.

Q4I: The Q4I Quantum Information Science 4th Annual International Workshop, was an incredible three-day event that took place on July 12-14, 2022, at the Innovare Advancement Center. Attendees engaged intimately with key government, academic, and industry leaders as we shaped the future of quantum together. Brought to you by the Air Force Research Laboratory (AFRL), Air Force Office of Scientific Research (AFOSR), Griffiss Institute, NYSTEC, SUNY and Innovare Advancement Center. This event is part of a global connectivity initiative to build an open ecosystem of government, academic, and industry collaborations and shape the future of quantum innovation for the US and its' partners. Designed around engagement with the research and academic community, the event presented opportunities to ask questions live to the keynote speakers, as well as a space to network with fellow colleagues in the field of Quantum Information Sciences.

Innovate Aspire Summit: The Air Force Research Laboratory's Information Directorate seeks transformational research and development partnerships with industry, academia, and other public and private organizations through the 2022 Innovare Aspire Series. Now in its second year, the annual campaign to converge diverse capabilities in United States Air Force and United States Space Force strategic priority areas such as artificial intelligence and machine learning, cyber, nanoelectronics, neuromorphic computing, quantum, and UAS; organize and motivate diverse teams to tackle specific technical challenges; and deliver high-impact, performance-ready capabilities that enhance American competitiveness through diversified commercialization pathways. Successful partnership idea submissions should align with the challenge areas, include research and development concepts that the organizations are pursuing, and would benefit from additional collaborations with the Air Force Research Laboratory or other industry partners. This year's challenges were Neuro-symbolic C2, AI-Enabled Change Detection in Non-Traditional Events, Internet of Things Living Laboratory, Harnessing Weird Machines, and Multi-source Workflows for Event Detection and Evaluation. Over 20 companies applied, 11 were selected for the summit and 6 CRADAs are actively being developed

Hack-A-Sat 3: A big success for the AFRL/RI ORTA was Hack-A-Sat 3, a follow-on effort to Hack-A-Sat 1, and Hack-A-Sat 2.

As our lives become increasingly dependent on technologies that lie deep in space, it is imperative that we do what it takes to secure our universe. The United States Air Force and United States Space Force jointly present

Hack-A-Sat 3, a prize competition designed to inspire the world's top cybersecurity talent to develop the skills necessary to help reduce vulnerabilities and build more secure space systems.

After a successful Hack-A-Sat 1 in 2020, and Hack-A-Sat 2 in 2021, Hack-A-Sat 3 began with an open, public qualification round on May 21st. The 30-hour virtual competition attracted over 800 teams made up of nearly 2,500 competitors from more than 75 countries. The qualification round consisted of 27 total challenges across 7 challenge categories that focused on a variety of different skill sets, including satellite operations, reverse engineering, and RF communications. The top 10 scoring teams (8 finalists, 2 alternates) were invited to the Final Event, a virtual event that took place on October 22-23, 2022.

The Hack-A-Sat 3 Final event was an attack/defend style CTF featuring a ground station and communications subsystem in a Digital Twin. The Digital Twin simulates/emulates real hardware components of space systems, more than just the satellite. Each team had their own system to operate and defend, while attacking opposing teams' systems. Teams must identify and patch any vulnerabilities to protect their Digital Twin from attack. At the same time, they must perform a set of missions and discover and exploit vulnerabilities in other teams' systems. Teams gain points by successfully exploiting another team's vulnerability and by keeping their own system performing normally. Teams lose points when they are attacked, they fail to complete a mission, or their system is not functioning normally.

The 8 finalist teams consist of some of the world's best security researchers and experts in both cyber and space domains, including vulnerability research, astrophysics, satellite operations and reverse engineering. Prizes are as follows:

1st place: $50K

2nd place: $30K

3rd place: $20K

The Hack-A-Sat 3 12-month endeavor allowed the AFRL/ORTA to collaborate with multiple private and public organizations and to shine a light on the ability to use a Partnership Intermediary to achieve non-traditional goals and objectives. Hack-A-Sat 3 was a resounding success, and its overall intent and motive will be published in multiple media outlets and video platforms in the months to come.

Innovare Advancement Center: In just its second year of operations and first year since most Pandemic restrictions were lifted the Innovare Advancement Center flourished as a physical linkage for the innovation of the AFRL-RI and its partners. The IAC's vision is to emerge 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 country via Technology Transfer means. The overall IAC mission is to build a magnetic ecosystem in which the world's leading scientific and entrepreneurial talent tackle the country's greatest challenges to national security and economic competitiveness. The Griffiss Institute (AFRL/RI's PIA partner) will be leading the charge in continuing to build relationships and fostering the reality and success of the IAC. FY 22 saw over 4100 unique visitors, the placement of over 200 interns, 52 visiting faculty, and a series of major conferences and events like Q4i, Invest NY Summit: Aerospace, The Summer Soiree and HUSTLE Demo Day.

Information Institute (II): AFRL/RI with our Air Force Partnership Intermediary Collaboration Center (APICC)-executed the Information Institute®, which is a partnership of over 130 universities allied with the Air Force Research Laboratory's Information Directorate (AFRL/RI) for the purpose of promoting, fostering, and

enhancing collaborative research between academic institutions and the Information Directorate. The II partners concentrate their research activities on jointly developed topics in the areas of Command, Control, Communications, Computers, Intelligence (C4I) and Cyber technologies. Research teams are assembled from II membership through a variety of means, but primarily through GI facilitated Educational Partnership Agreements (EPAs). The II provides extended onsite research programs by executing the Visiting Faculty Research Program, the Summer Faculty Fellowship Program, the National Defense Research and Engineering Graduate program, the AFRL Science and Technology Fellowship Program and the AFRL/RI graduate student internship program. The II hosted 70 (52 faculty, 18 students) researchers from these programs, representing 26 academic institutions across 22 states in 2022.

2022

AIR FORCE RESEARCH LABORATORY DELEGATE

AEROSPACE SYSTEMS DIRECTORATE

FY22 Annual Technology Transfer Report

Aerospace Systems Directorate

1.0 Executive Summary

This annual report, as prepared by the Aerospace Systems Directorate of the Air Force Research Laboratory (AFRL/RQ), highlights the various Technology Transfer (T2) and Transition activities of FY22.

This report will show that FY22 continued to be an exceptional year for AFRL/RQ and that technology transfer was a critical tool utilized effectively and consistently. AFRL/RQ executed a record number of agreements and made efforts to develop significant partnerships in technologies of national security interest. The Directorate received significant amounts of income from these partnerships and augmented the financial landscape of the laboratory in a time of resource constraints. During this time, AFRL/RQ also demonstrated leadership and innovation in technology transfer by exploring novel approaches and sharing knowledge across the DoD and Federal landscape.

2.0 Organization/Laboratory Overview:

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

2.2 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.

2.3 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.

2.4 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.

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

3.0 Strategy/Plan of the ORTA

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

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

3.3 One Year Objectives and Strategy

- 3.3.1 Objective – Continue to refine and develop technology transfer training mechanisms in order to enhance scientists & engineers' capability and intellectual property protection behaviors
- 3.3.2 Strategy – Utilize digital tools to deliver unique and tolerable educational artifacts while leveraging local partnership intermediaries to provide alternative access and approaches
- 3.3.3 Objective – Expand capabilities within sphere of influence to eliminate resource constraints and improve efficiency
- 3.3.4 Strategy – Continue to develop knowledge of supporting staff both in division and in geographically separated partnership support teams in order to minimize touch points and expand partnership capabilities

3.4 Near Term Goals and Strategy

- 3.4.1 Objective – Support development of expanding and formalizing processes and direction related to strategic partnering
- 3.4.2 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

3.5 Long Term Objectives and Strategy

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

3.5.2 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

4.0 Year in Review

4.1 Success Stories – The AFRL/RQ was involved in many successful technology transfer activities in FY22. The examples included are not necessarily the most valuable, and certainly do not portray the full scope of behaviors that have contributed to the success of the Directorate. However, what these do highlight is the breadth of utilization and application within the Directorate. Several examples also show how technology transfer efforts must be managed, nurtured, or revisited over many years in order to reap the maximum potential benefits.

4.1.1 Success Story #1 – Developing technologies in support of hot fuels thermal management. Several technology transfer agreements have been established to expand discussions and create an early-stage community of partners to increase transfer/transition success. Technologies currently under patent consideration and have high potential for licensing activity.

4.1.2 Success Story #2 – Once highlighted as the first Air Force software license, the FEMORPH software continues to be licensed and new efforts are underway to enable and enhance the licensing landscape for this valuable software. Efforts are underway to work with other Air Force organizations for capability development, and to support small businesses' attempts for access in order to explore novel commercialization opportunities.

4.1.3 Success Story #3 – Previously a Federal Lab Consortium award winning technology, the ASCENT green monopropellant has recently seen additional success, and the Directorate continues to explore opportunities to successfully integrate or transition the technology. The monopropellant was recently used in a highly publicized CubeSAT at NASA and the Directorate executed and is exploring several limited purpose CRADAs to expand the partnerships working to develop or apply the technology.

4.1.4 Success Story #4 – AFRL/RQ supported efforts led by the ORTA to establish a corporate process to improve efficiencies and decision making related to managing the intellectual property portfolio.

4.2 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.

4.3 Lessons Learned – In the past year, the AFRL/RQ ORTA has seen an increase in requirements to manage and maintain the current intellectual property portfolio. More centralized and corporate processes were needed to facilitate better decision making and streamlined funding transactions. The ORTA worked with functional staff to create a more transparent and controllable process for maintenance. Management of the portfolio still requires more development and will remain subpar until tools can be provided or developed. AFRL/RQ recovered from COVID-19 impacts well and activities appear to have returned to typical levels. However, based on experience and given current trends, there are indications of a high probability that activity will become stagnant, and it is possible that invention disclosures may even decline.

4.4 Barriers/problems faced, how they were overcome, things you would do differently in the future - AFRL/RQ continues to see positive activity in technology transfer despite significant constraints due to understaffing. 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. This reliance, while presently manageable, continues to limit the ability of the ORTA to expand awareness of T2 mechanisms. This lack of proper resources limits future T2 growth and successful transfer and transition potential. AFRL/RQ technologies will continue to be under-marketed, under-licensed, and potentially under-disclosed.

5.0 Resources

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

5.2 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. The ORTA is working to deploy future variations of training and will work to expand leveraging of training resources available through local PIA

5.3 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

5.4 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.

6.0 **Financial**

6.1 Royalty Income - $143,688.88
6.2 CRADA Income - $3,944,925.33
6.3 CTA Income - $229,155.69
6.4 T2 Expenses (excluding salaries – e.g., conferences, publications, training) – no expenses recorded in FY22
6.5 Other T2 Resources- e.g., interns, marketing funds – AFRL/RQ utilized core PIA funding to leverage the local PIA for marketing & training – those dollars were taxes received at the AFRL corporate level
6.6 Economic Impact – The Partnership Intermediary TechLink conducted an analysis of the economic impact of licensing agreements in the DoD from 2000 to 2021. The following tables show the impacts related to AFRL and AFRL/RQ, respectively. The definitions for output, value added, and impact types are provided below the tables along with broader figures related to the DoD as a whole.

Impact for Air Force Research Laboratory (AFRL)

Impact Type	Output ($ Millions)	Value Added ($ Millions)	Employment (Number of Jobs Supported)	Labor Income ($ Millions)	Labor Income (Per Job)
Direct Impact	815.0	363.3	3,088	282.4	91,471
Indirect Impact	658.6	348.3	2,957	234.5	79,316
Induced Impact	549.0	320.0	3,209	178,4	55,585
Total Economy-Wide Impact	2,022.6	1,031.6	9,254	695.4	75,142

Impact for AFRL Aerospace Systems Directorate (AFRL/RQ)

Impact Type	Output ($ Millions)	Value Added ($ Millions)	Employment (Number of Jobs Supported)	Labor Income ($ Millions)	Labor Income (Per Job)
Direct Impact	168.4	62.2	505	45.5	90,040
Indirect Impact	170.4	78.6	681	48.7	71,488
Induced Impact	99.5	56.3	599	30.5	51,018
Total Economy-Wide Impact	438.3	197.1	1,785	124.7	69,873

Total economic impact in DoD (*Output*): $69 Billion

Output is the total value of purchases by intermediate and final consumers. In this study, it represents the total economic impact of the DoD license agreements on the U.S. economy. According to the national IMPLAN model, the $32.3 billion in direct sales of new products and services [Direct Impact] reported by companies generated an additional $36.7 billion in sales economy-wide.

Of this amount, approximately $21.4 billion was generated from the indirect effect, the result of inter-industry purchases (firms purchasing from each other) [Indirect Impact], and $15.3 billion was generated from the result of households spending payroll on goods and services economy-wide [Induced Impact].

The sum of the direct, indirect, and induced sales—the output, or total economy-wide impact—was $69 billion.

Value Added: $35.8 Billion

Value added is the difference between a company's output and the cost of intermediate inputs. In other words, it is the difference between a product's sale price and the cost of goods and services used to make it.

7.0 Facilities/Equipment

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

7.2 Unique Capabilities of the Laboratory – 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

7.3 Examples of how some of these facilities and equipment are used by the private sector through CRADAs, test agreements etc. – AFRL/RQ has many active agreements that utilize many of these unique facilities. Here are several recent examples:

7.3.1 A facility CRADA executed with small business Innovative Scientific Solutions encourages and accelerates the development of advanced cycles, combustion systems, and components. The Collaborator will work with the Air Force to operate and run tests in the High-Pressure Combustion Research Facility (HPCRF), the Low-Pressure Combustion Research Complex (LPCRC), the Small Engine Research Laboratory (SERL) and the Detonation Engine Research Facility (DERF), as well as other Turbine Engine Research Complex (TERC) Facilities.

7.3.2 A CRADA with Northrop Grumman to perform wind tunnel testing at wind tunnel D at Arnold AFB. The experimental testing will provide valuable data related to hypersonic subscale inlet research. The data will inform future design capabilities and Computational Fluid Dynamics models prior to more costly full-scale testing.

7.3.3 A Commercial Test Agreement was executed that provided access to UES Inc. They utilized the Mach 6 High Reynolds Number Facility (HRNF) wind tunnel in order to perform flight simulations with laser based heating and aero loading on TPS materials at Mach 6 speeds. The data was collected by UES at a reasonable cost and used to inform efforts in support of MDA, Innovation Integration Incorporated, Lockheed Martin, and AFRL/RX related to high-fidelity evaluations of materials for use in DoD applications.

8.0 Performance Measures

8.1 Overall Trends

8.1.1 Collaborative Research and Development Agreements (CRADAs)
Active Agreements: 46
New Agreements: 11

8.1.2 Education Partnership Agreements (EPAs)
Active: 58
New: 8

8.1.3 Commercial Test Agreements (CTAs)
Active: 4
New: 3

8.1.4 Material Transfer Agreements (MTAs)
Active: 4
New: 1

8.1.5 Information Transfer Agreements (ITAs)
Active: 525
New: 115 (175 with MOU-ITAs)

8.1.6 Non-Disclosure Agreements (NDAs)
Active: 10
New: 8

8.1.7 Patent License Agreements (PLAs)
Active: 8
New: 0

8.1.8 Software Licenses
Active: 1
New: 0

8.1.9 Intellectual Property
Invention Disclosures: 15
Patent Applications: 38
Patents Issued: 15

Hot Fuels Thermal Management

Objective: *Enables jet fuel to be used as an aircraft's onboard coolant/thermal management fluid at temperatures above its traditional thermal limits.*

Benefits: *More efficient jet engines, better thermal management capabilities to enable higher speed and/or advanced onboard weapons*

Technology: *Jet fuel as a coolant to absorb heat on the vehicle without causing fuel coking (the coke clogs filters, jams valves, degrades heat exchangers)*

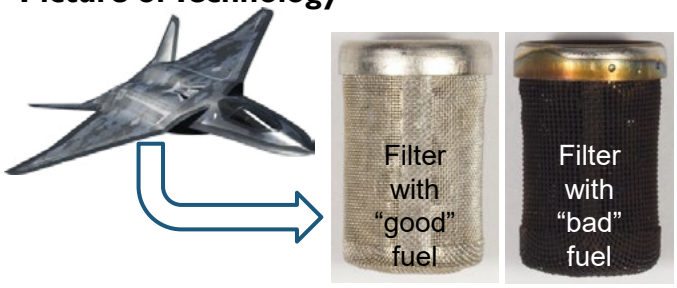
Includes:

- *Engineering rig tests of jet fuels at high temperature and possible anti-coke technologies*
- *Sensors to detect fuel coking in real-time*
- *Models to predict locations and amounts of coking*

Status: *Suite of technologies under patent consideration*

Established multiple Limited-purpose CRADAs with several large OEM, negotiating others, and collaborating with parties of interest in the Navy

Picture of Technology



AIR FORCE TECHNOLOGY TRANSFER AND TRANSITION PROGRAM

Linking technology with the mission and marketplace.

DISTRIBUTION STATEMENT A – Unclassified, Unlimited Distribution

FEMORPH

Objective: Develop software to reducing the engineering labor hours required to create new design models

Benefits:

FEMORPH automates key elements of the new product design process enabling rapid development of high payoff systems

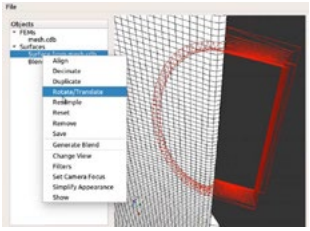
Technology: *The name FEMORPH is a combination of Finite Element Model (FEM) and Morph. FEMs are used in product design to predict deflection, temperature, and stresses before the parts are manufactured and tested. FEMORPH slashes product design time by morphing existing FEM to new geometry surfaces rather than the conventional process of manually rebuilding.*

Status:

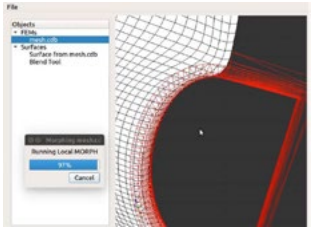
FEMORPH transitioned to Pratt & Whitney in 2018 under a Software License Agreement and is expected to renew for another five year interval.

Supporting efforts for partial integration in other AF capabilities and additional new licensing for similar purposes

Picture of Technology



Target Surface (Red)



Morphed Mesh

AIR FORCE TECHNOLOGY TRANSFER AND TRANSITION PROGRAM

Linking technology with the mission and marketplace.

Advanced Monopropellant, Green AF-M315E, Expanding Efforts

Objective: Propellant was developed to improve performance and reduce toxicity; current efforts see increased efforts to transition technology for expanded applications

Benefits: *Propellant provides improved performance with reduced toxicity in volume limited applications and creates a domestic source for this type of monopropellant*

Technology: *The technology is used in certain spacecraft for insertion into orbit or for maneuvering; this formulation is 50% higher performing than other state of the art propellant (Hydrazine). The propellant is also far less toxic than hydrazine allowing for faster turnaround times and safer handling (also lower handling costs)*

Status: *Technology is currently licensed but the lab is also actively entering into more agreements to explore other applications/distribution*

Technology recently utilized on high-interest CubeSAT with NASA (Lunar flashlight)

Several new CRADA-NDAs for exploring

Picture of Technology

AIR FORCE TECHNOLOGY TRANSFER AND TRANSITION PROGRAM

Linking technology with the mission and marketplace.

DISTRIBUTION STATEMENT A – Unclassified, Unlimited Distribution 3

T2 Facilitator

Objective: *Years of disjointed and cumbersome patent fee management led to overlooked, uninformed, and/or excessive patent maintenance fees*

Description of T2 Facilitator: *The ORTA worked with operations, financial, and senior leadership to establish a corporate requirement to centralize funding and empower the ORTA with decision making related to primary duties expected with IP portfolio management*

Organizational Impact: *The Aerospace Systems Directorate can now more proactively maintain patent statuses, avoid penalties, and streamline the decision-making process by utilizing ORTA expertise and eliminating unnecessary POCs and irrelevant data*

Broad Impact and Long-Term Benefits:
Initially, patent maintenance decisions can be addressed earlier, allowing for proper due diligence

Long term benefits include lower costs, more informed decisions, and transparency for technology divisions facing financial constraints

AIR FORCE TECHNOLOGY TRANSFER AND TRANSITION PROGRAM

Linking technology with the mission and marketplace.

2022

AIR FORCE RESEARCH LABORATORY DELEGATE

MUNITIONS DIRECTORATE

AFRL Munitions Directorate

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8.0 Performance Measures

1.0 Executive Summary

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.

2.0 Laboratory Overview

2.1 Laboratory Mission Statement

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

2.2 Laboratory Description

The Air Force Research Laboratory Munitions Directorate (AFRL/RW), located on Eglin Air Force Base, Florida, develops conventional munitions technologies to provide the Air Force with a strong technology base upon which future air-

delivered munitions can be developed to neutralize potential threats to the United States.

The rich history of the 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?"

2.3 Geographic Location

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

2.4 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

2.5 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.

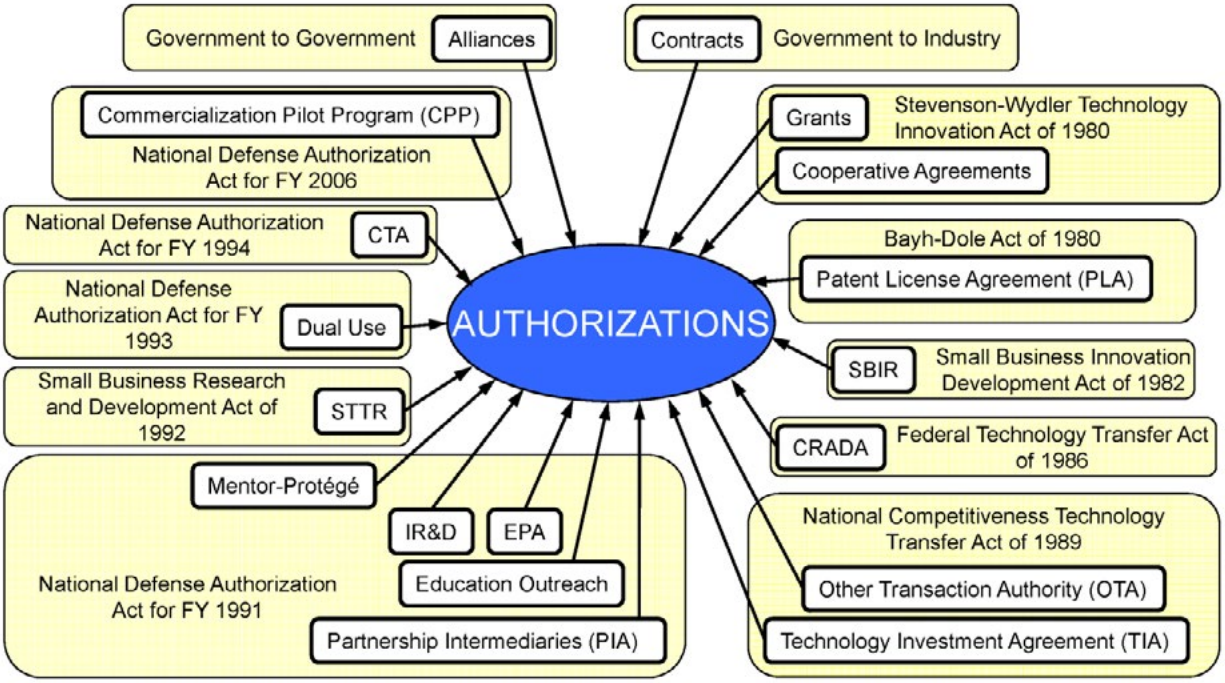
3.0 ORTA Technology Transfer Strategy

3.1 How the ORTA fits into the Lab Organization and Mission

The ORTA is located within the Strategic Planning Branch, Strategic Planning & Integration Division (RWPB), 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.

3.2 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.



3.3 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.

3.4 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 Defense Innovation Accelerator (DIA) to identify RW technologies that would be good candidates for entering the DIA program and having a team of entrepreneurs build a business plan for potential commercialization.

4.0 Year in Review

4.1 Success Stories

4.1.1 Commercialization Agreement with National Technology & Engineering Solutions of Sandia LLC.

The Munitions Directorate this year completed a Commercialization Agreement with National Technology & Engineering Solutions of Sandia LLC to commercialize a jointly owned RW patent, “Modular Multi-angle Synthetic Aperture Radar on a Track.” The jointly owned patent helps to commercialize

synthetic aperture radar technology to improve navigation and guidance in potential GPS denied environments. The agreement marks RW's third potential royalty bearing agreement in 3 years after not having any such agreements for over 20 years.

4.1.2 Non-Domestic CRADA with Australian National University

The Munitions Directorate this year completed its second non-domestic CRADA agreement. This CRADA agreement is a Material Transfer Agreement that facilitates collaboration with the Australian National University in semiconductor and nanophotonic research using Multiphysics Computational Modeling and novel semiconductor fabrication techniques. This agreement marks RWs second international CRADA agreement in two years after completing a CRADA last year with an Indian start-up company.

4.2 Marketing and Outreach

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

4.3 Lessons Learned / Barriers

The prior 4 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 have significantly reduced our innovative output in terms of 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.

5.0 Resources

5.1 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. The Doolittle Institute was without a Technology Transfer manger for nearly 3 years, due to turnover in leadership, impact of COVID 19, and lack of qualified candidates. The Doolittle Institute has recently hired a new Technology Transfer manager and the ORTA office will continue to train this person and use the PIA to extend the reach and scope or RW technology transfer activities. The ORTA office currently has 1 government employee and 1 support contractor who will be retiring at the end of the calendar year. A search is underway to find his replacement.

5.2 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.

5.3 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 all courses. Nearly all these activities have been done via teleconference due to most of them being canceled by COVID 19. The ORTA office looks forward to the resumption of normal in person annual training and conferences. 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).

5.4 Incentives/Awards

The ORTA office recently updated our Intellectual Property Incentive and Recognition Policy to add the new commander and clarify several policies. Through the updating process the ORTA office polled other Directorates to learn more about the other Directorate's incentive program and found that the Munitions Directorate has the most liberal recognition program and has given out over $65,000 in incentive awards since the implementation of the policy.

6.0 Financial

6.1 Royalty Income

AFRL RW had no royalty income for FY22.

6.2 CRADA Income

AFRL RW had no CRADA income for FY22.

6.3 CTA Income

AFRL RW had $41,000 in CTA income for FY22.

6.4 T2 Expenses

AFRL RW ORTA has no individual budget of our own. Our funding for travel and conferences is provided by our Division/Branch (Planning). Due to COVID 19 we had no travel.

6.5 Other T2 Resources

Nothing to Report

7.0 Facilities/Equipment

7.1 Laboratory's URL

http://www.eglin.af.mil/Units/AFRL-Munitions-Directorate

7.2 Unique Capabilities of the Laboratory

- **Technical Library**
  The Air Force Research Laboratory Technical Library enables and enhances access to scientific and engineering information to the scientists and engineers of Eglin Air Force Base, 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.

7.3 Examples of how facilities/equipment being utilized by the private sector

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.

8.0 Performance Measures

8.1 Overall Trends

8.1.1 CRADAs

Active Agreements: 22

New Agreements: 7

Amendments/Mod: 8

8.1.2 EPAs

Active: 6

New EPAs: 2

8.1.3 CTAs

Active: 2

New: 0

8.1.4 MTAs

Active: 1

New: 1

8.1.5 ITAs

Active: 0

New: 0

8.1.6 NDAs

Active: 1

New: 1

8.1.7 PLA's

Active: 3

New: 1

8.1.8 Intellectual Property

Invention Disclosures: 4

Patent Applications: 16

Patents Issued: 11

2022

AIR FORCE RESEARCH LABORATORY DELEGATE

MATERIALS AND MANUFACTURING DIRECTORATE

AFRL Materials & Manufacturing Directorate

1.0 Executive Summary

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 FY2022 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. FY22 was another exceptional year for establishing agreements to enable new partnerships.

The AFRL/RX T2 ORTA provided T2 support on a daily basis and found new ways to do business electronically. 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. AFRL/RX has also established several new Patent License Agreements, including a commercial evaluation license, which is a result of our participation in the FedTech Defense Innovation Accelerator (DIA). These agreements will come to full fruition in FY23.

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 FY23.

2.0 Organization/Laboratory Overview:

2.1 Laboratory Mission Statement

- Leading the discovery, development, and integration of affordable warfighting technologies for our air, space, and cyberspace force.

2.2 Description of organization/laboratory

- The Air Force Research Laboratory's Materials and Manufacturing Directorate develops materials, processes, and advanced manufacturing technologies for aircraft, spacecraft, missiles, rockets, and ground-based systems and their structural, electronic and optical components. Air Force product centers, logistic centers, and operating commands rely on the directorate's expertise in materials, nondestructive inspection, systems support, and advanced manufacturing methods to solve system, expeditionary deployment, and operational challenges.

2.3 Geographic location

-Wright-Patterson Air Force Base, Dayton, Ohio

2.4 Technology Focus Areas

-Photonic, Electronic, and Soft Materials
-Manufacturing and Industrial Technologies
-Composite, Ceramic, Metallic, and Materials Performance

2.5 Year of Commission

-2002

3.0 Strategy/Plan of the ORTA

3.1 How ORTA fits into Lab Organization and Mission

-The ORTA resides in AFRL/RX's Plans and Programs Branch (RXOP) in the RX Technology Transfer and Partnerships Office. This office includes T2, Alliance, SBIR/STTR, and the International Program so that all partnership-related functions are under one umbrella. All of these functions help move the RX R&D mission forward through partnering activities and commercialization efforts.

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

-AFRL/RX relies on the T2 function to enhance its R&D capability through collaborative partnerships that are only possible using T2 vehicles such as CRADAs. It also relies on the function to increase probability of technology commercialization that is defense, commercial, or dual-use centric.

3.3 One Year Objectives and Strategy

-Get a handle on past due royalties and other deliverables from active Patent License Agreements through better/consistent tracking and collection efforts.

3.4 Near Term Goals and Strategy

-Improving T2 electronic processes and anticipating the release of/learning the capabilities of the new AF T3 DTTIS.

3.5 Long Term Objectives and Strategy

-Continue to have a well-rounded T2 Program in AFRL/RX with competent staff and processes that deliver valuable collaborative R&D and technology commercialization opportunities.

4.0 Year in Review

4.1 Success Stories (Successful transfer of technologies, establishment of innovative policy at lab that facilitates T2, etc.) Please include a short description below and a quad chart for each success story on the provided template. What template? None was provided.

4.1.1 Success Story #1

-DOD PIA, MilTech, is assisting with technology maturation for an aircraft tire change tool that was developed/patented by RX. Their team of engineers is reviewing the tech for possible improvements, lining up potential manufacturers, finding additional use cases, etc. This will help get the technology commercialized and into the hands of Air Force maintainers at a larger scale than what was possible without the PIA. RX is still in the early stages of this effort, but the immediate success is using a DOD PIA in this manner.

4.2 Marketing and Outreach Activities

-Have worked with several PIAs (Wright Bros. Institute, TechLink, MilTech) to understand current technology landscape, review/select RX tech with high commercialization potential, and ran several marketing campaigns around selected technologies to garner interest for further discussion and full-on partnering activities via CRADA, PLA, etc. We also conducted a lab visit for one of our licensees to help them better understand our processes for creating battery membranes, which is the subject tech of our most recent PLA.

4.3 Lessons Learned

-Consistently checking in with licensees is important, as some companies that have exclusive patent licenses could fold and not let you know, which creates the issue of important intellectual property sitting and doing nothing.

4.4 Barriers/problems faced, how they were overcome, things you would do differently in the future

-Tracking royalties and other deliverables due from Patent License Agreements and other agreement types is an ongoing challenge. Each agreement has its own unique terms/deliverables/timelines, and it is difficult to accurately and consistently track and follow-up on a high number of active agreements. RX continues to pursue processes and/or other capabilities, such as software, that can help track timelines/deliverables and send due date reminders to help keep current on what is due to the Air Force and RX.

5.0 Resources

5.1 Human Resources
-One gov FTE
-One contractor to support T2 activities

5.2 T2 Education and Training Provided to Organization/Lab Staff
-ORTA provides T2 informational sessions at Division and/or Branch Meetings
-Periodic T2 updates to RX senior leadership (Executive Council)

5.3 Professional Development of ORTA
-Annual ORTA training provided by AF T3 Office
-TechLink ORTA Foundations Course

5.4 Incentives/Awards
-None

6.0 Financial

6.1 Royalty Income
-$50,000

6.2 CRADA Income
-TBD – awaiting RXF response

6.3 CTA Income
-None

6.4 T2 Expenses (excluding salaries – e.g., conferences, publications, training)
-$4,000

6.5 Other T2 Resources- e.g., interns, marketing funds
-None

7.0 Facilities/Equipment

7.1 Laboratory's URL that lists facilities/equipment information
- https://www.ues.com/lhmel

7.2 Unique Capabilities of the Laboratory
-Example: Laser Hardened Materials Evaluation Laboratory (LHMEL)

7.3 Examples of how some of these facilities/equipment are used by the private sector through CRADAs, test agreements etc.
-LHMEL is used by academia and industry to test and characterize the durability of materials against different types of lasers

8.0 Performance Measures

8.1 Overall Trends

8.1.1 CRADAs
Active Agreements: 57
New Agreements: 28
Amendments: 2

8.1.2 EPAs
Active: 27
New: 9

8.1.3 CTAs
Active: 0
New: 0

8.1.4 MTAs
Active: 2
New: 1

8.1.5 ITAs
Active: 3
New: 0

8.1.6 NDAs
Active: 2
New: 2

8.1.7 PLAs
Active: 11
New: 3

8.1.8 Please list the number of active & new agreements for any other T2 mechanisms your lab has (training affiliation agreements, software license, etc.)
-None

8.1.9 Intellectual Property
Invention Disclosures: 22
Patent Applications: 39
Patents Issued: 21

2022

AIR FORCE RESEARCH LABORATORY DELEGATE

SENSORS DIRECTORATE

SENSORS DIRECTORATE

Technology Transfer Annual Report

Fiscal Year 2022

1. Executive Summary

The Sensors Directorate Technology Transfer and Transition Program ensures that science and engineering activities promote the transfer and/or exchange of technology with government entities, academia, and industry, to create jobs, improve productivity, and increase competitiveness while supporting the Air Force mission.

The Sensors Directorate's Technology Transfer business plan reflects the accomplishments and activities of the past fiscal year as well as plans for the future year and beyond.

2. Organization/Laboratory Overview:

2.1. Laboratory Mission Statement

Our mission is to lead the discovery and development of future capabilities providing integrated intelligence, surveillance, and reconnaissance (ISR), combat identification, and spectrum warfare effects.

2.2. Description of organization/laboratory

The Sensors Directorate specializes in developing, demonstrating, and transitioning science and technology in the areas of intelligence, surveillance, reconnaissance, precision engagement, and electronic warfare for America's Air and Space Forces. The directorate's primary areas of technology investment include multi-spectral sensing, net-centric spectrum warfare, layered sensing exploitation, and electronic components.

Laboratory Structure

- **Layered Sensing Exploitation Division – AFRL/RYA**
  - Four branches:
    - Sensing & Effects Analysis Branch, AFRL/RYAA
    - Multi-Sensing Knowledge Branch, AFRL/RYAP
    - Sensing Management Branch, AFRL/RYAR
    - Decision Sciences Branch, AFRL/RYAT

- **Aerospace Component and Subsystems Division – AFRL/RYD**
  - Six branches:
    - Microelectronics & Embedded System Assurance Branch, AFRL/RYDA
    - Electronic Devices Branch, AFRL/RYDD
    - EO/IR Components Branch, AFRL/RYDH
    - Highly Integrated Microsystems Branch, AFRL/RYDI
    - Sensors Subsystems Branch, AFRL/RYDR
    - Trusted Electronics Branch, AFRL/RYDT

- **Multispectral Sensing & Detection Division – AFRL/RYM**
  - Five branches:

- Distributed RF Sensing Branch, AFRL/RYMS
- Multiband Multifunction RF Sensing Branch, AFRL/RYMF
- LADAR Technology Branch, AFRL/RYMM
- Passing RF Sensing Branch, AFRL/RYMP
- EO Target Detection & Surveillance Branch, AFRL/RYMT

- **Spectrum Warfare Division – AFRL/RYW**
  - Five branches:
    - Resilient & Agile Avionics Branch, AFRL/RYWA
    - Spectrum Warfare Systems Engineering Branch, AFRL/RYWD
    - RF Electronic Warfare Branch, AFRL/RYWE
    - Navigation & Communication Branch, AFRL/RYWN
    - Electro-Optics Countermeasures Branch, AFRL/RYWW

- **Sensors Plans and Advanced Programs Division – AFRL/RYZ**
  - Three branches:
    - Plans Branch, AFRL/RYZC
    - Advanced Programs Branch, AFRL/RYZT
    - Autonomy Capability Team, AFRL/RYZA

2.3. Geographic location

The Sensor Directorate's facilities are located in the heart of Wright-Patterson AFB, OH. Home to over 70 separate units, the base hosts the headquarters of the Air Force Materiel Command, the Air Force Life Cycle Management Center, Air Force Institute of Technology, National Air and Space Intelligence Center, the Air Force Research Laboratory, and is home to about 10,000 scientists and engineers. The base is located approximately eight miles from downtown Dayton, Ohio, located in the southwest quadrant of the state.

2.4. Core Technical Competencies (CTC)

Radio Frequency Sensing

Research and develop the next generation of Radio Frequency (RF) sensors for Contested Spectrum (CS) environments, primarily focused on all-weather Intelligence, Surveillance, and Reconnaissance (ISR) using non-traditional radar modes for persistence across the permissive, contested, and highly contested boundaries in airborne, space and ground-based radar systems. Passive RF sensing in A2/AD environments will exploit signals of opportunity for detection, geo-location and identification of modern and evolving integrated Air Defense Systems (IADS). Capability and capacity are enhanced via distribution of RF sensors and multi-mode (SAR/MTI/SIGINT) signal processing. Optimal utilization of the electromagnetic spectrum is achieved through management of sensor resources comprising primarily active antennas with multiple reconfigurable phase centers emitting independent waveforms. Increase spectral and spatial awareness on the ground, in the air and in space and become more fluid across the RF spectrum. In effect, augmenting the effectiveness of 2nd Offset platform

capabilities while introducing 3rd Offset Strategy sensing concepts that work seamlessly from contested through highly contested boundaries and more efficiently connect the ISR-BMC2-Tactical network.

Electro-Optical Sensing

The mission of the Electro-Optical (EO) Sensing CTC is to enhance Air Force (AF) capabilities for surveillance, reconnaissance, and targeting through the advancement of sensor technology throughout the optical to infrared (IR) regions of the electromagnetic spectrum. Research conducted under this CTC involves both active and passive, literal and non-literal sensing techniques, and ranges from exploratory research into advanced concepts and critical system components through the advanced technology demonstrations and transition of airborne and spaceborne EO/IR sensor systems.

Spectrum Warfare

The mission of the Spectrum Warfare CTC is to research, develop, and transition resilient, adaptive multi-spectrum warfare technologies and techniques to the warfighter with the goal of ensuring unrestricted access to the airspace and the electromagnetic (EM) spectrum in contested and congested environments. Essentially, the CTC is focused on aircraft mission assurance – the protection of airborne platforms, manned and unmanned, in contested environments. The CTC's investments are threat driven, with a particular focus on the enduring challenge of defeating enemy integrated air defense systems. This CTC provides the countermeasures complement to the sensing mission of the Directorate.

Trusted and Resilient Mission Systems

Lead the assessment, research, development, demonstration for rapid systems integration and transition of cyber secure, trusted and open systems. Perform research, development and assessment of resilient systems, systems architectures, systems integration, and systems assurance technologies.

Multi-Domain Sensing Autonomy

Orchestrates the discovery and transition of military relevant artificial intelligence and machine learning technology that fuses information from any source, reasons closed-loop over the environment, and enables improved, timely, and executable battlespace decisions. This CTC enables ubiquitous situational awareness by autonomously creating knowledge and executing decisions at speeds that dominate the enemy's OODA Loop.

Enabling Sensor Devices and Components

Leads the discovery, development, and transition of electronics, electro-optics, photonics, and supporting technologies to enable the Air Force's sensing and system survivability capabilities.

2.5. Year of Commission

October 1997

3. Strategy/Plan of the ORTA

3.1. How ORTA fits into Lab Organization and Mission

The Air Force Research Laboratory's Sensors Directorate (AFRL/RY) headquartered at Wright-Patterson Air Force Base (WPAFB) Ohio takes an active role in technical collaboration. AFRL/RY has established an Office of Research and Technology Applications (ORTA) to coordinate and promote technology transfer. All Sensors Directorate scientists and engineers consider technology transfer as an individual responsibility and their performance evaluations include technology transfer as a metric.

The Sensors Technology Transfer Office is located within the Integration & Operations Division of the Sensors Directorate. The ORTA technology transfer responsibilities fall within one full-time person office.

In the Sensors Directorate, this year's efforts focused on intellectual property protection, commercializing the technologies developed in our lab, and educational outreach. The organization has experienced a transformation change by making IP part of multiple S&E activities such as; Laboratory Management Reviews, publically releasing papers, and when briefing their programs to management.

3.2. How T2 Tools are a part of the lab strategic planning

The ORTA office at AFRL Sensors directorate act as a mechanism to protect the Intellectual property of Air Force, conceptualized by the scientists and engineers working on the state-of-the-art technology at WPAFB. Also, the ORTA office manages and facilitates all agreements between the directorate and industry, government entities, and academia.

3.3. One Year Objectives and Strategy

Increase the number of meaningful CRADAs

The ORTA will identify and ameliorate some of the administrative and logistical burdens that currently discourage S&E's pursuit of CRADAs (and to a lesser extent, other cooperative agreements). AFRL/RY and the ORTA have determined that CRADAs provide the best bang for the buck in terms of flexibility, engagement with industry and academia, and equitable benefit to the collaborator and the AF. However, notwithstanding this new focus, if the process to initiate a CRADA is onerous or slow, S&Es will either fail to participate, or they will circumvent established procedures and correspondingly increase associated risks. Removing hurdles to CRADA participation will yield benefits for years to come.

Increase the number of licensing agreements.

The ORTA is working closely with S&Es to identify technologies with commercialization potential as soon as the invention disclosures are filed. Additionally, we will actively engage with our Partnership Intermediary Agreements (PIA), to include TechLink and WBI, to identify and contact new potential licensees. Additionally, the ORTA will use patent analytics software to evaluate patentability and determine the commercial value of Directorate Intellectual Property. It is acknowledged that the Directorate will never achieve the financial ROI on research dollars that a corporate entity would find acceptable. However, active licenses to AF technologies will lead to valuable industry partnerships and collaborations. Additionally, the influx of funds, will reward inventor's efforts and enable additional research flexibility and capacity.

3.3.1. Information Reporting and Management

The ORTA maintains AFRL/RY's portion of AFRL's DTTIS database for Cooperative Research and Development Agreements (CRADAs); Educational Partnership Agreements (EPAs) and Limited Purpose Cooperative Research and Development Agreements (LPCRADAs). DTTIS will be maintained and updated on a regular basis. In addition, the ORTA avails itself of an AFRL/RY created and maintained online tool for invention disclosures, patent maintenance fees, and Patent License Agreements.

3.3.2. Internal Relations Plan

The ORTA and Intellectual Property Law Office will provide intellectual property rights training sessions for the general Science and Engineering (S&E) population at AFRL/RY using the patent attorneys from the AFMCLO/JAZ office. Specifics such as patents (the process and procedures), pitfalls that imperil patentability of an invention disclosure, licensing of technology, and the benefits to the laboratory and individual will be covered.

The ORTA will provide branch-level en masse and individualized technology transfer training on a regular basis.

3.3.3. External Relations Plan

The ORTA will coordinate with Wright Brother's Institute to aggressively sensitize small businesses and academia to the AFRL/RY investment strategy and the Directorate's strategic goals.

The ORTA will coordinate with Wright Brother's Institute to identify and pursue First Responder and Homeland Security technology needs for suitable Sensors Directorate capability insertions and facilitate technical interchanges.

The ORTA will coordinate with Wright Brothers Institute and TechLink to identify inventions ready for patents and assemble a panel of local business leaders to discuss potential applications for the technologies through and Invention Discovery Event (IDE).

3.4. Near Term Goals and Strategies

Training

The Technology Transfer Office will continue to conduct training designed for smaller, specific groups at the branch level, focusing on specific technology transfer topic modules. Audiences that lack a strong foundation of technology transfer concepts will be trained on introductory modules, such as how to enter into CRADA agreements, how to complete invention disclosures, and the value of licensing inventions. Advanced topic areas of training will be crafted for those who have already received introductory T3 training. These training presentations are aimed toward expanding the knowledge base of technology transfer processes, avoiding dangerous practices that jeopardize securing IP rights, and empowering inventors to secure collaborations and licensees. The Sensors Directorate will also continue to partner with the AFMCLO/JAZ office to deliver training related to intellectual property and patents. The goal is to increase the quality of agreements and invention disclosures during the next three-year period.

Strategy for RY Developed Software

Substantially all software inventions are not patent-eligible under 35 U.S.C. §101. Multiple branches in RY create government developed software and need to protect the product or have a means to share with industry or other government institutions. The ORTA will work closely with S&Es to devise the best solution for each technology via Information Transfer Agreements (ITAs), CRADAs, or software licensing.

Mining for Inventions

The Sensors Directorate will continue to move aggressively to file patent applications and provisional patent applications to protect its intellectual property.

ORTA and CTC leads will work with the directorate S&Es to determine whether there are any inventions to disclose. More specifically, opportunities have been historically lost because inventors occasionally fail to recognize when a series of incremental improvements culminate into a technology that is ripe for patent protection. Frequent contact with S&E will facilitate identifying when the threshold for patentability has been crosses. The ORTA will assist inventors with writing disclosures to ensure that the AFMCLO/JAZ attorney has the information necessary to move forward. Additionally, RY will use Directorate bonuses to incentivize S&Es to produce quality invention disclosures and issued patents.

The ORTA will use the RY Tech Transfer App to track the total number of invention disclosures, patent applications, issued patents, and patent maintenance requirements each fiscal year.

Licensing

Currently, about half of license activity is generated from Joint Ownership Agreements when government contractors elected to take title to joint inventions under the Bayh Dole Act. As Invention Disclosures are filed, the ORTA will contemporaneously work toward licensing technologies or entering into additional agreements to further the development of inventions. Enhanced collaboration with TechLink and Wright Brother's Institute has been beneficial and is ongoing so that the ORTA can avail himself of their expertise with respecting to marketing and obtaining licensees.

3.5. Long Term Objectives and Strategy

The ORTA's objectives are:

- To develop a robust and proactive outreach and marketing program. Creative marketing strategies through social media, external web pages, and PIA activities will increase new agreements invention disclosures and patent applications.
- Continue to identify and use other mechanisms besides CRADAs to facilitate collaboration with academia and industry.
- Maintain continuous improvements to internal relations plan, providing new and innovative training methods to scientists and engineers on intellectual property and technology transfer mechanisms.

4. Year in Review

4.1. Success Stories

4.1.1. Success Story #1

Executed a significant three-year CRADA with Applied Research Associates for the further development and application of the Passive RF Injection Spectrometry (PRISM) technology. PRISM is a non-destructive evaluation tool and technique that accurately, efficiently, and non-destructively inspects microelectronics to detect counterfeits and clones. It is estimated that up to 15% of all spare and replacement parts for DoD weapons, vehicles, and equipment are counterfeit and, therefore, at greater risk of experiencing failure due to inferior, damaged, or modified parts. PRISM shows tremendous applicability for clone and counterfeit detection, there is a significant amount of untapped potential requiring further development. The collaborative effort is valued between $750k and $1M.

4.1.2. Success Story #2

Initiated a collaboration with Tiami Networks, LLC. to explore Multi-function RF sensors for joint communications and sensing. Multifunction sensors capable of integrated sensing and communications (ISAC) are projected to be a cutting-edge force multiplier for situational awareness on the battlefield. Applications include high-precision location tracking of dismounted warfighters while simultaneously communicating data to them, and

fast localization and engage-on-remote of adversarial emitters. ISAC is technically challenging since radar and communications datalinks have different waveform structures and signal processing needs. Using separate RF antenna chains and DSP cores for each function results in multifunction sensors with high CSWaP. Tiami's solution is to use the AFRL/RY subject patent for simultaneous transmit and receive (STAR) functionality at the RF antenna to solve the radar-data interference problem when using a single antenna. This enables the sensor to receive radar returns while simultaneously transmitting or receiving broadband data. The collaboration is valued at over $1.2M, and will bring multifunction sensor functionality to dismounted warfighters, smart munitions, autonomous platforms, and other space-constrained scenarios.

4.2. Marketing and Outreach Activities

S&Es in the Sensors Directorate publish in a variety of journals and other technical publications. Robust publication activity is one of many mechanisms for increasing the notoriety of RY technologies, that can lead to new collaboration opportunities. The ORTA is included in the routing process of the APRS publication system, to ensure that patentable subject matter is filed upon before publication takes place.

The ORTA will work with Wright Brothers Institute and TechLink to identify national, regional, and local institutions to create partnership and agreements with relevant tech transfer opportunities. Our PIA contact have access to powerful analytic tools and database subscriptions that will help broker new licensee opportunities. This will increase positive exposure to RY's programs, promote patents and licensing, and increase the involvement of basic researchers from academia and the national laboratory community.

The ORTA will establish additional Education Partnership Agreement (EPA) outreach by utilizing Sensors Directorate equipment no longer in use. The ORTA will send memorandums to applicable academic institutes to inform them of sensors equipment available for loan or donation.

4.3. Lessons Learned

During FY22, the RY ORTA Team experienced a significant personnel change. The seasoned team lead left to pursue goals outside of the Air Force, leaving a relatively new T2/Alliance manager to oversee all current efforts. The resources available via the Air Force ORTA community, Air Force T3 Program Office, and legal expertise provided by the Air Force Material Command Law Office (AFMCLO/JAZ) have been invaluable during this transition period.

5. Resources

5.1. Human Resources

The Air Force Research Laboratory's Sensors Directorate (AFRL/RY) headquartered at Wright-Patterson Air Force Base (WPAFB) Ohio takes an active role in technical collaboration.

AFRL/RY has established an Office of Research and Technology Applications (ORTA) to coordinate and promote technology transfer. The Sensors Technology Transfer Office is located within the Integration & Operations Division of the Sensors Directorate. The Office of Research and Technology Applications consists of a government employee and one full time contractor.

5.2. T2 Education and Training Provided to Organization/Lab Staff

In fiscal years 2022 through 2024, the Technology Transfer Office will continue to conduct training, but the training will be designed for smaller, specific groups at the branch level, focusing on specific technology transfer topics based on the audience. Audiences that lack a strong understanding of technology transfer will be trained on introductory topic areas, such as how to enter into CRADA agreements, how to complete invention disclosures, and the value of licensing inventions. The new, advanced topic areas of training will be geared toward those who have already received an initial technology transfer briefing. These training presentations are aimed toward expanding the knowledge base of technology transfer processes and their importance in an effort to spur increases in output. The Sensors Directorate will also continue to use attorneys from the AFMCLO/JAZ office to deliver training related to intellectual property and patents. The goal is to increase the quality of agreements and invention disclosures during the next three-year period.

5.3. Professional Development of ORTA

The ORTA Team will be attending regional and national conferences as schedule permits as well as monthly telecoms and other seminars available to ensure alignment with the Air Force T3 Office.

5.4. Incentives/Awards

The ORTA, along with the AFMCLO/JAZ Patent Attorneys, will continue to sponsor continuing intellectual property rights training sessions for the general S&E population. Specifics such as patents (the process and procedures), licensing of technology, the benefits to the laboratory and individual and current copyright law, etc. will be covered. Of note, we will provide particular emphasis to the generous royalty sharing provisions that may benefit inventors of licensed technology.

Sensors has a Technology Transfer and Transition award that is presented as part of the Directorate's Quarterly and Annual Award Programs.

2022

AIR FORCE SUSTAINMENT CENTER DELEGATE

AFSC Office of Research and Technology Applications (ORTA)

2022 Annual Report

Donna Stacy, AFSC ORTA PM

Robert Wright, AFSC/ENSI

1.0 Executive Summary

1.1 The AFSC ORTA (AFSC/ENSI) leads AFSC organizations in establishing Technology Transfer agreements and ensuring agreements meet strict AFMCLO/JAZ format and review. Because AFSC has limited access to R&D funds, Tech Transfer activities are a valuable opportunity to develop and advance new technologies. AFSC/ENR has also placed a special focus on EPAs to support AFSC goals for STEM outreach. In addition to STEM outreach and recruiting, AFSC views EPAs as an opportunity to open up the conversation to engage in CRADAs or other types of T2 agreements that contribute to technology advancement within AFSC.

1.2 2022 was AFSC's first year to have an officially designated ORTA. Ms Donna Stacy was designated as ORTA PM. The ORTA PM hosted biweekly status meetings with ALC and AFSC/EN representatives to manage AFSC agreements. The ORTA representatives are AF employees that execute T2 agreements for the AFSC/EN, ALCs, SCWs, or ABWs.

1.3 During this year, AFSC established 8 new EPAs, 2 new CRADAs, filed 9 new patents and 1 trademark, and received $50,000 in CRADA income.

2.0 Organization/Laboratory Overview:

2.1 AFSC Mission Statement AFSC mission statement is to "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"

2.2 Description of organization/laboratory

2.2.1 AFSC is not a traditional laboratory but rather a Technical Activity that engages in Technology Transfer activities. 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/

2.3 Geographic location

2.3.1 AFSC depots and accompanying Air Base Wings are located in Warner Robins, Georgia, Ogden, Utah, and Oklahoma City, OK. AFSC also includes other Geographically Separated Units (GSUs).

2.4 Technology Focus Areas

2.4.1 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.

3.0 Strategy/Plan of the ORTA

3.1 How ORTA fits into Lab Organization and Mission

Technology Transfer is a key enabler of AFSC Goal 3 to "Modernize the Sustainment Enterprise"

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

3.2.1 T2 activities are reported each month to the AFSC Engineering Directorate AFSC/EN as part of the AFSC/EN strategic plan.

3.3 One Year Objectives and Strategy

3.3.1 In FY22, our first goal was to get AFSC and AFRL approval for our ORTA and Delegation authority for our organizations. This was accomplished in early FY22. For FY23, AFSC/EN is building on numerous personnel changes, including a new AFSC ORTA PM and AFSC EN director who acts as the AFSC Reviewing Official. As such our goal is to train these personnel in managing T2 efforts. The ORTA PM will then propose near term and long term goals for FY23 and beyond.

3.4 Near Term Goals and Strategy

3.4.1 See 3.3 above

3.5 Long Term Objectives and Strategy

3.5.1 See 3.3 above

4.0 Year in Review

4.1 Success Stories: Overall, AFSC focused on establishing 8 new EPAs and 2 new CRADAs. EPAs were established at all 3 geographic locations, supporting AFSC/EN goals for recruiting. Examples of activities that resulted from these EPAs are described below:

4.1.1 The University of Nevada – Las Vegas (UNLV) Education Partnership Agreement was signed October 2021 and became the first agreement signed by the Ogden Air Logistics Complex (OO-ALC). UNLV, along with subsequent OO-ALC partners, participated in a Capstone Collider event where Hill organizations presented potential projects to university representatives. From this event, UNLV selected a Missile Maintenance Group (MMXG) project to have students tackle the issue of Detecting Hidden Corrosion and present their proposed solution to the MMXG technical point of contact.

4.1.2 Utilizing an EPA with the University of Georgia, WR-ALC successfully engaged and supported organizing the Cyber Physical Systems (CPS) Security consortium at University of Georgia (UGA). This consortium helped increase (1) awareness of the underlying challenges and (emerging) opportunities in CPS security and resilience; (2) brought together experts from academia, industry and government agencies (and federal research labs) working on various aspects of CPS security in different domains, e.g., manufacturing, power generation and transmission, transportation, healthcare and agriculture. We had 20 companies and 20 professors – all of whom work closely with us; the provided information about their work and met with UGA faculty that work in the field of cyber-physical systems, artificial intelligence, and machine learning. UGA is making significant investments in fields that are directly aligned with work at Robins AFB, and they are working on how to align these investments to best support our work in the Air Force. WR-ALC is currently exploring how to best use the Enterprise Essential Engineering Capability Program (E3CP) opportunity to formalize collaboration and partnership in CPS related digital transformation technologies (such as AI/ML and Data Science, Digital Twin, Networked Systems, Cyber Security).

4.1.3 In accordance with an EPA with Georgia Tech University, 402 CMXG, among several partners across the state, wrote two separate letters of support for the

Georgia Artificial Intelligence (AI) for Manufacturing (GA-AIM) proposals led by Georgia Tech. The first was for the initial selection phase, and the second was for the final selection. The GA-AIM consortium was selected as one of 21 winners in the Build Back Better Regional Challenge and will receive $65M to double in size the Advanced Manufacturing Pilot Facility and imbed AI in manufacturing processes. CMXG will be considered to model, simulate, and improve our manufacturing processes such as those utilizing robotics.

4.1.4 Under the Georgia Tech University EPA, 402 CMXG started a second Senior Design project with the Industrial and Systems Engineering (ISYE) department. This project will develop requirements to house the 574th CMMXS in a single facility. Currently the 574th, the largest Squadron in 402 CMXG, is housed across 3 facilities, one of which is five miles away off-base. Students will develop real world skills, and CMXG will receive usable information to optimize work. A similar project won the ISYE Sr Design competition at Georgia Tech among 27 candidates and placed third nationally.

4.1.5 On an EPA with Oklahoma Christian University, 76 AMXG engineers worked with Oklahoma Christian's business innovation student team which competed and reached the quarter finals in the Love's Cup Business s competition in April 2022. Using the EPA in the Fall of 2022 , Tinker engineers help established Oklahoma Christian University's new Entrepreneurial program for students to work with Air Force inventors at Tinker to create businesses Under the EPA, Tinker engineers demonstrated their inventions to Oklahoma Christian entrepreneur students with the goal of marketing and creating a business for those inventions. Tinker conducted a tour of OC-ALC in November 2022 for Oklahoma Christian University's entrepreneurial students, business professors, and engineering professors.

4.1.6 OC-ALC EPAs: The OC-ALC has an ever growing need of new talent in science, technology, and engineering. The intern and new-hire needs of the organization have accelerated over the last 2 years; software engineers, mechanical and aerospace engineers, and cyber security IT being among the highest in criticality. Although not all internships resulted from the existence of our EPAs, the expanding relationship we have been fostering created the willingness of faculty and administration to distribute advertisements/flyers, welcome free recruiting seminar speakers to Partners' campuses, or even faculty distribute e-mail their student body with our recruitment workflow e-mail. The EPAs fostered many higher-education relationships that supported the mission of advertisement of career opportunities with the AF.

4.1.7 The OC-ALC has also carried out activity on the CRADA with Oklahoma University on the subject of Artificial Intelligence and Machine Learning within the Software Engineering Group.

4.1.8 The OC-ALC also donated a supercomputer to the University of Central Oklahoma for the purpose of enhancing and promoting STEM studies, such as computational fluid mechanics and finite element analysis.

4.1.9

4.2 Patents: In addition to technology transfer agreements, AFSC personnel filed 9 new patents and 1 trademark, either with AFLCMC/LOJAZ or the USPTO office. 6 additional ideas were

identified for future patent filings. Specifics on these intellectual property filings are documented at : AFSC T2 Tracking 11-21-22.xlsx

5.0 Marketing and Outreach Activities AFSC/EN conducted numerous outreach activities to universities in the Tinker AFB, Hill AFB and Robins AFB areas to pursue EPAs.

6.0 Lessons Learned – Having a well-defined and documented process and plan was key to managing T2 efforts and Patents. In 2022, AFSC wrote a supplement to AFI 61-301 defining roles and responsibilities for T2 activity within AFSC. This supplement is scheduled to be published in early 2023.

7.0 Barriers/problems faced, how they were overcome, things you would do differently in the future

7.1.1 Based on feedback from AFLCMC/LOJAZ, in the future, AFSC ORTA will advise personnel to not pursue R&D under an EPA, but rather pursue a CRADA in concert with the EPA.

8.0 Resources

8.1 Human Resources - AFSC currently has only identified the ORTA PM as an official position to support ORTA efforts. This is a ½ time role. In addition, personnel at each location and multiple organizations provide support on T2 agreements and patent applications as an additional duty.

8.2 T2 Education and Training Provided to Organization/Lab Staff - The ORTA PM has hosted Lunch and learns on the Third Thursday of every month covering topics such as technology transition funding sources, patent applications.

8.3 Professional Development of ORTA - In FY23, professional development of the ORTA PM will focus on participation in initial training opportunities identified by AFRL/SB.

8.4 Incentives/Awards - N/A

9.0 Financial

9.1 Royalty Income - In Sep 2022, Swanda Brothers, Inc. made a $10,000 royalty disbursement for patent license royalties for a license to the following Intellectual Property (IP): U.S. Application No. 17/509,214 and International Application PCT/US21/57173.

9.2 CRADA Income - 309 SWEG received $55,000 upfront funding used to pay for TDY and other costs to perform the duties identified in the CRADA with SuperMicro Inc.

9.3 CTA Income – 0

9.4 T2 Expenses (excluding salaries – e.g., conferences, publications, training) - 0

9.5 Other T2 Resources- e.g., interns, marketing funds – 0

10.0 Facilities/Equipment

10.1 Laboratory's URL that lists facilities/equipment information - https://www.afsc.af.mil/

10.2 Unique Capabilities of the Laboratory – As discussed in section 2.2.1, AFSC is not a traditional laboratory. A description of AFSC capabilities can be found at the url in 10.1.

10.3 Examples of how some of these facilities/equipment are used by the private sector through CRADAs, test agreements etc. – Current CRADAs do not provide use of AFSC equipment to its private partners.

11.0 Performance Measures

11.1 Overall Trends

11.1.1 CRADAs

Active Agreements: 2 (including new)

New Agreements: 2

Amendments: none

11.1.2 EPAs

Active: 16 (including new)
New: 8
Under work: 1

11.1.3 CTAs
Active: 0
New: 0

11.1.4 MTAs
Active: 0
New: 0

11.1.5 ITAs
Active: 0
New: 0

11.1.6 NDAs
Active: 0
New: 0

11.1.7 PLAs
Active: 1 (established before the ORTA was stood up)
New: 0

11.1.8 Other T2 mechanisms (training affiliation agreements, software license, etc.)

11.1.9 Intellectual Property
Invention Disclosures: 16
Patent Applications: 9 (+ 1 trademark application)
Patents Issued: 0

11.2 Details on each of the agreements and patents described above can be found at: AFSC T2 Tracking 11-21-22.xlsx

12.0 Additional Information: All AFSC ORTA information may be found here: AFSC STEP T2 Information

2022

DEPARTMENT OF DEFENSE CYBER CRIME CENTER

DELEGATE

FY22 Annual Technology Transfer Report
Organization/Laboratory

1.0. Executive Summary. 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 benefitting 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 addresses the need to build 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.

2.0. Organization/Laboratory Overview.

2.1. Laboratory Mission Statement: DC3's mission is to deliver superior D/MM forensics services, cyber technical training, vulnerability sharing, technical solutions development, and cyber analysis within the following DoD mission areas: cybersecurity and critical infrastructure protection, law enforcement and counterintelligence, document and media exploitation, counterterrorism, and flight safety.

2.2. 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.

2.3. Geographic location: 911 Elkridge Landing Road, Linthicum, Maryland

2.4. 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.

2.5. Year of Commission: 1998

3.0. Strategy/Plan of the ORTA. DC3 does not have a specific ORTA Strategic Plan; however, the recent DC3 Strategic Plan highlights specific goals and objectives that proactively expand our T3 outreach with commercial industry, academia, and R&D centers. The DC3 Strategic Plan also addresses the need to build our RDT&E branding and protect our intellectual property.

3.1. 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.

3.2. 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.

3.3. 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.

3.4. Near Term Goals and Strategy: 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.

3.5. 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.
- 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.

4.0. Year in Review.

4.1. Success Stories:

4.1.1 Success Story #1: The ND-ISAC and DC3 collaboration allowed DC3/DCISE to share over 300 cybersecurity situational awareness and threat mitigation information reports with ND-ISAC members. Members included a number of companies outside of the pre-existing Defense Industrial Base Cybersecurity Program who perform unclassified work for the DoD such as small and medium sized firms with no classified facilities or cybersecurity professional personnel requirements, as well as large companies with key interdependencies to the Department who provide commercial products or services. This information was viewed by over 2,500 analysts from across ND-ISACs 130+ member companies. Companies participating in ND-ISAC were able to reply to information shared and, in some cases, contribute to context or threat vectors, adding to DC3/DCISE knowledge on the threat.

4.2. Marketing and Outreach Activities:

4.2.1 With support from TechLink, DC3 has conducted outreach to commercial vendors interested in Patent Licensing of the DC3 Patent US 10,853,177 B2.

4.3.1 Through the DC3 Vulnerability Disclosure Program, collaborated with Northeastern University to support 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.

4.3. Lessons Learned: None

4.4. Barriers/problems faced, how they were overcome, things you would do differently in the future: No issues or areas of concern

5.0. Resources.

5.1. Human Resources: DC3 does not have any full-time resources dedicated to the ORTA and T3. The T3 Focal Point performs ORTA responsibilities part-time and has a staff of one that supports the ORTA on a part-time basis.

5.2. T3 Education and Training Provided to Organization/Lab Staff: Air Force and DoD T3 Training Workshops

5.3. Professional Development of ORTA: None at this time

5.4. Incentives/Awards: Currently, DC3 does not have awards related to ORTA or T3.

6.0. Financial.

6.1. Royalty Income: None

6.2. CRADA Income: None

6.3. CTA Income: None

6.4. T3 Expenses (excluding salaries – e.g., conferences, publications, training): None

6.5. Other T3 Resources- e.g., interns, marketing funds: None

7.0. Facilities/Equipment.

7.1. Laboratory's URL that lists facilities/equipment information: https://www.dc3.mil/tools

7.2. 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 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 Technical Solutions Directorate tailors software and system solutions engineered to the specific requirements of digital forensic examiners and cyber intrusion analysts.

7.3. Examples of how some of these facilities/equipment are used by the private sector through CRADAs, test agreements, etc.: None

8.0. Performance Measures.

8.1. Overall Trends

	CRADAs	FY-22
1	Total Active CRADAs	1
2	New CRADAs	0
3	Amendments	0
4	Total Active Material Transfer Agreements (MTAs)	1
5	New MTAs	1
6	Total Active Non-Disclosure Agreements (NDAs)	3
7	New NDAs	1

	EPAs	FY-22
8	Total Active EPAs	20
9	New EPAs	0

	CTAs	FY-22
10	Total Active CTAs	0
11	New CTAs	0

	ITAs	FY-22
12	Total Active ITAs	0
13	New ITAs	0

	PLAs	FY-22
14	Total Active PLAs	0
15	New PLAs	0

	INTELLECTUAL PROPERTY	FY-22
16	Invention Disclosures Received	0
17	Total Patent Applications	0
18	Total Patens Issued	0

	INTELLECTUAL PROPERTY	FY-22
19	Invention Disclosures Received	0
20	Total Patent Applications	0
21	Total Patents Issued	0

	OTHER T2 Metrics	FY-22
22	Total Software Licenses Executed	0

DoD Cyber Crime Center (DC3)

Objective:

Develop a methodology for the Department of Defense Cyber Crime Center (DC3) with its subordinate entity the DoD - Defense Industrial Base Collaborative Sharing Environment (DC3/DCISE) to share cybersecurity situational awareness and threat mitigation information with the National Defense Information Sharing and Analysis Center (ND-ISAC) member companies.

Technology:

Leveraging ND-ISACs secure information sharing platform, DC3/DCISE shared cybersecurity situational awareness and threat mitigation information reports. Participating companies were able to reply to information shared and, in some cases, contribute to context or threat vectors.

Benefits:

DC3 benefits from collaborating and sharing threat and mitigation information across a broader set of DIB sector companies, increasing awareness and resiliency for the sector, delivering relevant and timely analytical services and actionable threat products aligning with the critical infrastructure protection related component of DC3's mission.

Status:

The CRADA between DC3 and ND-ISAC concluded on 25 September 2022. Both parties agree that this was a positive partnership between two organizations with a similar mission: to raise the resiliency and cybersecurity posture of the DIB and share relevant threat information to enable collective defense of the DIB sector. DC3/DCISE recommends continued sharing efforts to allow for a broader audience of non-cleared Defense Industrial Base Companies to receive unclassified threat data to enhance their network security posture and protect DOD controlled unclassified information within the DIB.

AIR FORCE TECHNOLOGY TRANSFER AND TRANSITION PROGRAM

Linking technology with the mission and marketplace.

T2 Facilitator

Objective:

The key objective of the collaboration was to enable the parties to meet, coordinate, collaborate on threat and mitigation issues; to share cybersecurity, communications reliability, and related data and information; to conduct analytical collaboration activities, and to share technical capabilities associated with joint research, development, test, and evaluation efforts associated with the security of critical infrastructure networks and systems.

Description of T2 Facilitator:

DC3 has a broad mission to enhance cyber security within the DIB which includes the sharing of cyber threat information and the provision of cybersecurity products and services to the DIB. Due to the size of the DIB relative to DC3 resourcing, DC3 does not have the ability to directly and robustly engage with all DIB members to promote its cybersecurity threat information products and services. The CRADA enabled research of the effective delivery of cyber threat information to inform development of more effective cyber threat information products and services and the processes by which they are made available, advertised, delivered and assessed. ND-ISAC, as a non-profit corporation promoting cybersecurity among its constituent membership provided a useful testbed for research and development as discussed above. Research methodologies were developed, and data obtained to evaluate effectiveness and make improvements with the objective of providing and enabling greater enhancement of cybersecurity for the DIB as a whole.

Organizational Impact:

DC3/DCISE shared 305 cybersecurity situational awareness and threat mitigation information reports with ND-ISAC members. Members included a number of companies outside of the pre-existing DIB CS Program who perform unclassified work for the DoD such as small and medium sized firms with no classified facilities or expertise in cybersecurity, as well as large companies with key interdependencies to the Department who provide commercial products or services. This information was viewed by 2,588 analysts from across ND-ISACs 130+ member companies. Companies participating in ND-ISAC were able to reply to information shared and, in some cases, contribute to context or threat vectors, adding to DC3/DCISE knowledge on the threat.

Broad Impact and Long-Term Benefits:

- Providing situational awareness regarding the most critical cyber issues more immediately within 48 hours.
- Increasing cyber threat information sharing with the broader DIB.
- Identifying DIB contractors that have moderate or low cybersecurity capability and developing tailored methods of engagement.
- Developing and testing new cybersecurity threat information products and methods of delivery.

AIR FORCE TECHNOLOGY TRANSFER AND TRANSITION PROGRAM

Linking technology with the mission and marketplace.

2022

SPACE SYSTEMS COMMAND DELEGATE

SPACE DOMAIN AWARENESS AND COMBAT POWER

BATTLE MANAGEMENT COMMAND AND CONTROL

FY22 Annual Technology Transfer Report

Space Systems Command (SSC)

Space Domain Awareness and Combat Power (SZ) and Battle Management Command and Control (BC)

Written by Steve Testa, Administrator for SSC/SZ-BC T2 Program

1.0 Executive Summary

- FY22 was a successful year for Industry Outreach and CRADA development at 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. The highlights for this FY are provided below.
- DoD Tech Transfer (T2) interview/survey. Mr. Yowell (SSC/SZET), Mr. Madey, and Mr. Testa were interviewed by the DoD T2 POC, Kristen Schario (TechLink), on 15 Feb 22. This was part of the nation-wide DoD Tech Transfer (T2) survey sponsored by the Under Secretary of Defense for Research and Engineering. The interview consisted of questions associated with ways to improve industry outreach, T2, and the CRADA process.
- SSC/SZE-BCE (the ORTA for SSC/SZ-BC) became a key stakeholder in the new "SSC Front Door" program. SSC Front Door is the new one-stop-shop for industry prospects that want to engage SSC. SSC/SZET-BCET provides training to SSC to the Front Door "technology scouts" as it relates to CRADAs and the CRADA process.
- SSC/SZ-BC CRADA partners tested the new SSC Front Door "new account sign up" web portal. This web portal provides industry partners' exposure to other divisions and branches in the SSC portfolio. Sensing Strategies, York Space, and Advanced Scientific Concepts (ASC) completed the online information sign-up and provided the web developers feedback on their experience.
- Participated in joint meeting between SSC/SZ-BC CRADA partners - Virgin Orbit Space National Systems and Astroscale. Pivotal meeting for advancing the "state of the art" for space industry. Virgin Orbit Space National Systems produces a launch system that provides "rapid replenishment" of satellites worldwide using it 747 aircraft as the launch carrier for its expendable rocket that can carry multiple satellites to low earth orbit (LEO); Astroscale is providing "space tug" capabilities to extend the life of older satellites by rendezvousing on-orbit.
- SSC/SZET-BCET and Defense Innovation Unit (DIU) engagement. Joint meetings addressing advancements with the SpinLaunch Corporation "mass accelerator" launch system. A game changing technology, our industry outreach team visited their facility in Long Beach and had the opportunity to observe a live test using the company's scaled mass accelerator. SpinLaunch is currently performing sub-orbital test launches at Spaceport America, New Mexico.
- Provided bullet background papers (BBP) on CRADA partners for Program Executive Officer (PEO) level use at the National Space Symposium, Colorado Springs, 4-8 April 2022. Various companies met with Gen Sejba (SSC/SZ-BC) at the event.

- Worked with Chastity Whitaker, AFMCLO/JAX IP attorney, and Joseph Gordon, AF Tech Transfer & Transition Director, to address taskers/questions in support of obtaining the new SSC/SZ-BC "Letter of Delegation" to originate and process CRADAs internally at SSC/SZ-BC.
- Collaborated with AFRL/SB, Mr. Oswaldo Delacruz (Data Engineer), to obtain DTTIS accounts adding SSC/SZ-BC CRADA metrics to the AFRL database.
- SSC Front Door IPT stakeholder. Working to develop the "Classified Front Door" adjunct to SSC Front Door.
- Drafted and received approval for new "Waiver of Review Authority for NDA-CRADAs." This removed the need for NDA-CRADA signatures at the O-7 level. This reduced NDA-CRADA processing time by seventy-five percent.
- Attendee/panelist for Space Rapid Capabilities Office (SpRCO) and SpaceWERX "Connect" Event. Virtual event for 22 companies, facilitating targeted exposure for small, non-traditional companies who have technologies of interest for prime contractors and SpRCO.
- Attendee/panelist for "TRIAD" virtual event.
- Participated in various industry day events:
    - TAC-ISR Reverse Industry Day
    - Cislunar/SDA 1-on-1 meetings with industry
    - TacRS Reverse Industry Day
    - SWAC Force Design
    - AFCEA Space Industry Days

2.0 Organization/Laboratory Overview:

2.1 *Laboratory Mission Statement* – Develop, build, train, and equip United States Space Force (USSF) with advanced space systems to win engagements with hostile countries.

2.2 *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 DAF TEO; SSC/SZE-BCE is the Office of Research and Technology Application (ORTA) for SSC/SZ-BC.

2.3 *Geographic location* – SSC is located at Los Angeles Air Force Base, El Segundo, CA.

2.4 *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.

2.5 *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.

3.0 Strategy/Plan of the ORTA

3.1 *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.

3.2 *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.

3.3 *One Year Objectives and Strategy* – Build and expand SSC Front Door; create classified adjunct. https://www.ssc.spaceforce.mil/Connect-With-Us/Space-Systems-Command-Front-Door

3.4 *Near Term Goals and Strategy* – Create documentation (MOU or MOA) to refine processes between branches and divisions.

3.5 *Long Term Objectives and Strategy* – Merge T2/T3 into the SSC Front Door process and across directorates.

4.0 Year in Review

4.1 Success Stories (Successful transfer of technologies, establishment of innovative policy at lab that facilitates T2, etc.) Please include a short description below and a quad chart for each success story on the provided template.

4.1.1 Success Story #1- Represented SSC at **Virgin Orbit National Systems** launch events and briefly met with Virgin owner Sir Richard Branson prior to launch in Southern California

4.1.2 Success Story #2 – Assisted **York Space** in understanding SSC spacecraft R&D barriers. York won completion to build two Tetra class satellites for SSC.

4.1.3 Success Story #3 – Introduced SSC engineers/scientists to **Advanced Scientific Concepts (ASC)** which lead to critical advancements in Light Detection and Ranging (LIDAR) sensors.

4.2 Marketing and Outreach Activities – See executive summary

4.3 Lessons Learned – Educating the bulk of SSC personnel about the T2 mission is challenging due to size of the overall organization and dynamic environment.

4.4 Barriers/problems faced, how they were overcome, things you would do differently in the future – Obtained guidance from AFMCLO/JAZ and AFRL/SB

5.0 Resources

5.1 *Human Resources* – Two personnel (1 government, 1 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.

5.2 *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.

5.3 *Incentives/Awards* - NA

6.0 Financial

6.1 *Royalty Income* - NA

6.2 *CRADA Income* - NA

6.3 *CTA Income* - NA

6.4 *T2 Expenses* (excluding salaries – e.g., conferences, publications, training) - NA

6.5 *Other T2 Resources*- e.g., interns, marketing funds - NA

7.0 Facilities/Equipment

7.1 *Laboratory's URL that lists facilities/equipment information* - NA

7.2 *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.

7.3 *Examples of how some of these facilities/equipment are used by the private sector through CRADAs, test agreements etc.* - NA

8.0 Performance Measures

8.1 Overall Trends

8.1.1 CRADAs
Active Agreements: 18
New Agreements: 9
Amendments: 0

8.1.2 EPAs
Active: NA
New: NA

8.1.3 CTAs
Active: NA
New: NA

8.1.4 MTAs
Active: NA
New: NA

8.1.5 ITAs
Active: NA
New: NA

8.1.6 NDAs
Active: NA
New: NA

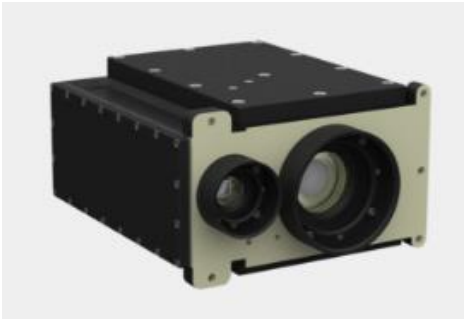
8.1.7 PLAs
Active: NA
New: NA

8.1.8 Please list the number of active & new agreements for any other T2 mechanisms your lab has (training affiliation agreements, software license, etc.) - NA

8.1.9 Intellectual Property
Invention Disclosures: NA
Patent Applications: NA
Patents Issued: NA

Advanced Scientific Concepts LLC (ASC)

POC: Michael Dahlin
Phone: 805.966.3331 x105
Email: mdahlin@asc3d.com



Product Description: GSFL-16KS Space Qualified Flash LIDAR
Product maturity: TRL-9

Company Overview:
- Leading provider of global shutter flash LIDAR cameras of space and military applications.
- Small business founded in 1986
- 11,000 sq. ft facility located in Goleta CA

Military Space Impact:
- Only commercially available flash LIDAR for space applications.
- Selected for 2022 AFWERX award to optimize flash LIDAR sensor for long range (>50 km) resident space object (RSO) detection, characterization, and tracking.

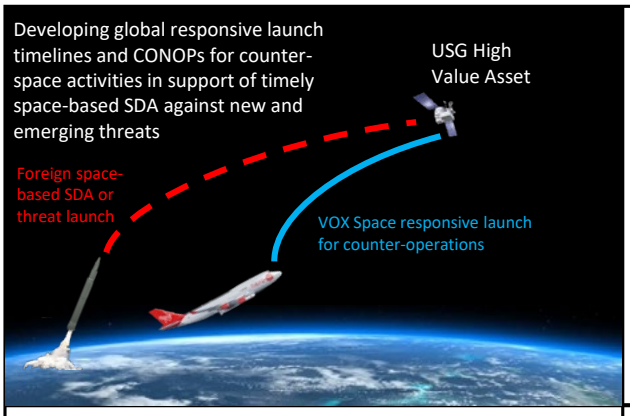
Past Performance:
- 2018-2022: ASC's space LIDAR cameras have flown on four space missions (NASA, Boeing Commercial, (2) US government).
- 2020: Space Force funded study (FA8819-20-C-10 04), "Global Shutter Flash LIDAR for Resident Space Object Situational Awareness Applications"

VOX Space

Responsive SDA through Small Launch

Tech POC: Gilbert Tseng
Phone: 562-760-2639
Email: gilbert@voxspace.com

Admin POC: Ellen Phelan
Phone: 562-505-1749
Email: ellen@voxspace.com



VOX Space Company Overview

- Founded in 2017, wholly-owned, independent subsidiary of Virgin Orbit
- FOCI mitigated entity, holding TS FCL from DCSA
- Provides small satellite air-launched responsive launch capability using the LauncherOne system from non-traditional spaceports
- LauncherOne System: modified 747-400 carrier aircraft releasing a 70ft 2 stage expendable rocket called LauncherOne
- Baseline capabilities: 300-500kg payload mass to 500-1200km altitude in inclinations from equatorial to retrograde

Military Space Impact

Product Description: Global responsive launch CONOPs, utilizing dedicated small satellite launch for space-based SDA
Product maturity: TRL 2

Product Description: Responsive launch timelines to support rapid launch to counter adversarial launches and threats
Product maturity: TRL 3

Past Performance

Current Contracts:
Island Hopper – FA8818-19-C-1001

- Assessing and demonstrating space launch from alternate bases

STP-27VP - W15QKN-18-9-0001

- Multi-manifest launch services for Space Test Program

STP S28 - FA8818-20-D-0007

- Multi-manifest launch services for Space Test Program

York Space Systems Capabilities Summary

POC: Melanie Preisser
Phone: 720-616-9405
Melanie.Preisser@yorkspacesystems.com

Versatile Commercial Commodity Buses:

S-CLASS
- ESPA compatible
- 24" x 24" x LV stowed payload vol*
- 85kg+ payload mass
- 274W payload peak power

LX-CLASS
- ESPA/ESPA Grande compatible
- 34" x 34" x LV stowed payload vol*
- 300kg+ payload mass
- 1500W payload peak power

Launch
- Compatible with multiple LVs

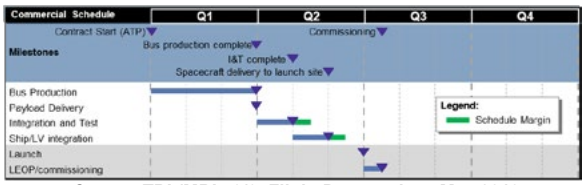
**Height determined by LV*

Company Overview

- Non-Traditional, US aerospace company based in Denver, CO
- Founded to radically improve spacecraft affordability and reliability
- Turn-key space solution provider: satellite manufacturing; AI&T; launch services; automated mission ops; and ground station services
- In place production facilities – up to 150 SVs/year with rolling inventory reducing schedule spans and risk
- SECRET mission ops; TS/SCI FCL approved

Military Space Impact

- Versatile, affordable S-CLASS and LX-CLASS spacecraft buses
- York acquires PLs or integrates GFE/CFE PLs
- LEO, GEO, and Lunar mission design
- Offer schedules as short as 6-7 months. Typical order-to-orbit timelines ~12 months



Current TRL/MRL: 9/9; Flight Proven since May 2019

Past Performance

Harbinger – CRADA effort with Army SMDC; launched May 2019 with DoD STP; operated today from York MOC via comm'l ground terminals; 5-payload demonstration built in only 4 months

Tetra – SMC contract awarded 2019; S-CLASS bus adapted for GEO ops & AFSCN/MMSOC compatibility; delivering 2 SVs for GEO SDA & RPO

Transport Layer Tranche 0 – Space Development Agency (SDA) contract awarded Sep 2020; mesh data network constellation of 10 LEO SVs; SV AI&T is underway; launch 2022

Khon – Commercial contract awarded mid-2021; S-CLASS bus adapted for cislunar operations supporting Lunar-to-Earth comms; launch in 1H CY2023

Transport Layer Tranche 1 – SDA contract awarded March 2022; 42 SV constellation providing direct-to-warfighter connectivity; launch 2024

ACRONYMS

25 AF	25th Air Force Intelligence
59 MDW/STA	59th Medical Wing
60 MDG/SGSE	60th Medical Group
66 ABW	66th Air Base Wing
67 CW/XPP	67th Cyber Wing
75 ABW	75th Air Base Wing
96 TW	96th Test Wing
99 MDG	99th MedicalGroup
319 RW	319th Reconnaissance Wing
412 TENG/CL	412th Test Wing
688 CW/XPGX	688th Cyber Wing
711 HPW	711th Human Performance Wing

A

AEDC	Arnold Engineering Development Complex
AETC	Air Education Training Command
AFCEC	Air Force Civil Engineering Center
AFGSC	Air Force Global Strike Command
AFI	Air Force Instruction
AFIT	Air Force Institue of Technology
AFLCMC	Air Force Life Cycle Management Center
AFLCMC/EB	Armament Directorate
AFLCMC/EN-EZ	Engineering and Technical Engineering Services Directorate

AFLCMC/HB	Digital Directorate
AFLCMC/HN	Command, Control, Communications, Intelligence and Networks Directorate
AFLCMC/HNIX	Enterprise IT and Cyber Infrastructure Division
AFLCMC/RO	Rapid Sustainment Office
AFLCMC/WAC	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 Law Office
AFMRA	Air Force Medical Readiness Agency
AFNSA	Air Force Medical Support Agency
AFNWC/NC	Air Force Nuclear Weapons Center
AFOSR	Air Force Office of Scientific Research
AFRL	Air Force Research Laboratory
AFRL/FZAO	Air Force Research Laboratory Financial Accounting Office
AFRL/RC	Research Collection and Computing Directorate
AFRL/RD	Directed Energy Directorate
AFRL/RI	Information Directorate
AFRL/RQ	Aerospace Systems Directorate
AFRL/RV	Space Vehicles Directorate
AFRL/RW	Munitions Directorate
AFRL/RX	Materials and Manufacturing Directorate
AFRL/RY	Sensors Directorate
AFRL/SB	Small Business Directorate
AFSC	Air Force Sustainment Center
AFSOC	Air Force Special Operations Command
AFTAC	Air Force Training Applications Center
AFTC/ENS	Air Force Test Center Engineering and Technical Management
AFWERX	Air Force Work Project
AHCNM	Albuquerque Hispano Chamber of Commerce
APEX	Academic Partnerhsip Engagement Experiment
AMRDC	Army Medical Research and Development Command
ARL	Army Research Lab
ATETA	AETC Transformational Education and Training Applications

B

BRICC	Basic Research Innovation Collaboration Center

C

CBC	Chemical Biological Center
CFSCC	Combined Force Space Component Command
CNMI	Central New Mexico Community College Ingenuity Incorporated
COTS	Commercial-Off-the-Shelf
CRADA	Cooperative Research and Development Agreement
CRP	Commercial Readiness Program
CTA	Commercial Test Agreement

D

DAF	Department of the Air Force
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 Cyber Crime Center
DEVCOM	Army Combat Capabilities Develoopment Command
DFAS	Defense Finance Accounting Service
DHA	Defense Health Agency
DISA	Defense Information Systems Agency
DoD	Department of Defense
DTTIS	Defense Technology Transfer Information System

E

EDA	Economic Development Administration
EPA	Educational Parternship Agreement
EXP	Explora Science Center and Children's Museum

F

FBI	Federal Bureau of Investigation
FDA	Food and Drug Administration
FY	Fiscal Year

G

GI	Griffiss Institute
GOTS	Government-Off-the-Shelf

I

IP	Intellectual Property
ITA	Information Transfer Agreement

J

JBA	Joint Base Andrews

L

LQEP-T2	Laboratory Quality Enhancement Program Technology Transfer

M

MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MSU	Montana State University
MTA	Material Transfer Agreement

N

NASA	National Aeronautics and Space Administration
NASIC	National Air and Space Intel Center
NAVAIR	Naval Air Systems Command
NDAA	National Defense Authorization Act
NGO	Non-Governmental Organizations
NSIN	National Security Innovation Network
NMSU	New Mexico State University
NRL	Naval Research Laboratory
NSA	National Security Agency
NTTS	NASA Technology Transfer System
NYSTEC	New York State Technology Enterprise Corporation

O

ORTA	Office of Research and Technology Applications
OSD	Office of the Secretary of Defense

P

PAR	Parallax Advanced Research
PEO	Program Executive Officer
PI	Partnership Intermediaries
PIA	Partnership Intermediary Agreement
PLA	Patent License Agreement

R

R&D	Research and Development
ROI	Return on Investment
RTI	Research Triangle Institute

S

S&Es	Scientists and Engineers
SAF/AQR	Deputy Assistant Secretary of the Air Force for Science, Technology and Engineering
SBIR	Small Business Innovation Research
SETA	Systems Engineering and Technical Assistance
SLA	Software License Agreement
SLD	Space Launch Delta
SMC	Space and Missile Systems Center
SSZ-SC-BE	Space Systems Command Delegate
STEM	Science, Technology, Engineering, and Mathematics
STTR	Small Business Innovation Research
SUNY	The State University of New York

T

T2	Technology Transfer
T3	Technology Transfer and Transition
TRL	Technology Readiness Level
TSEAL	TechLink Software Engineering and Analysis Laboratory

U

UNMRI	University of New Mexico Rainforest Innovations
USAFA	United States Air Force Academy
USAFSAM	United States air Force School of Aerospace Medicine
UTEP	University of Texas at El Paso
UTSA	University of Texas at San Antonio

W

WBI	Wright Brothers Institute
WPAFB	Wright-Patterson Air Force Base

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