CONNECT 2
FALL 2017
U.S. AIR FORCE TECHNOLOGY TRANSFER PROGRAM
www.wpafb.af.mil/t2

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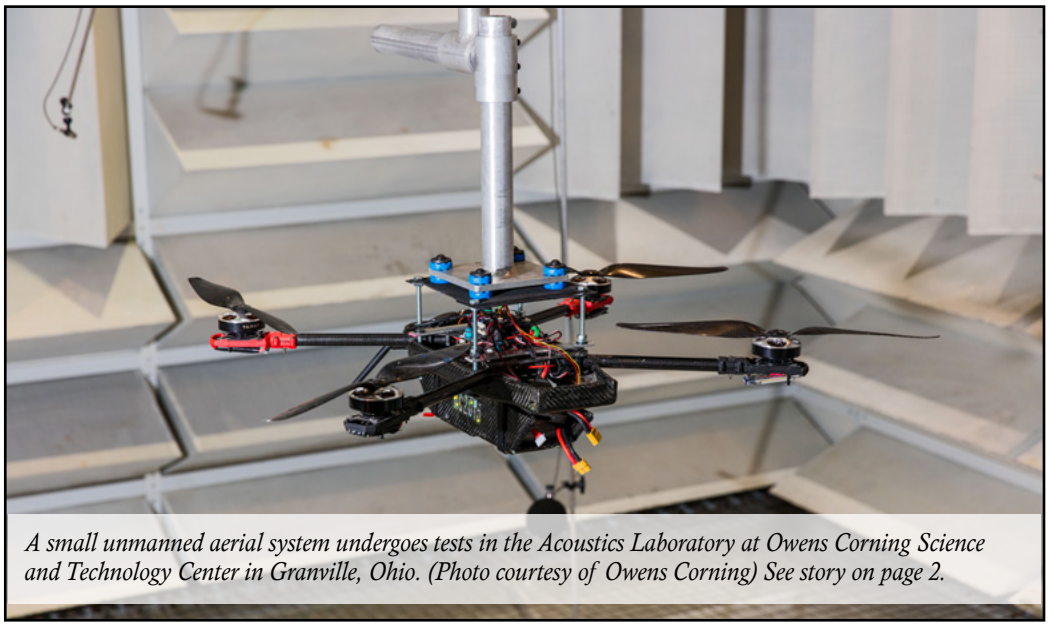

A small unmanned aerial system undergoes tests in the Acoustics Laboratory at Owens Corning Science and Technology Center in Granville, Ohio. (Photo courtesy of Owens Corning) *See story on page 2.*

VIEWPOINT

By Ryan Helbach

Tapping the Entrepreneurial and Intrapreneurial Spirit

There is an aspect of the American spirit that celebrates the entrepreneur for the risk that they take and the possibility to chase one's dream by starting a new business to solve a nagging problem. Taking a page out of the lean startup play book the Air Force Research Laboratory is building new products and solutions, testing them out and measuring their impact. At the heart of this is tapping into the American entrepreneurial spirit.

Three years ago a group of AFRL scientists and engineers started a group called Shaping Holistic Innovative Future Technologies - also known as SHIFT - with the goal of forming a grassroots network to create a sustainable innovative culture within AFRL. It has been a place for new ideas to be championed and tested. There have been a number of missteps and lessons learned but we firmly believe that if you are not "failing" every now and then, you are not truly learning. At its heart, the folks that make up SHIFT are intrapreneurs (entrepreneurs operating inside AFRL to create new products, services and systems for the benefit of the Air Force). One of the programs that grew out of SHIFT was AFRL's Entrepreneurial Opportunities Program (EOP).

Ryan Helbach
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The Air Force Technology Transfer (AFT2) "Connect2" newsletter is published quarterly by the AFT2 Program Office, which is managed at the Air Force Research Laboratory, Wright-Patterson Air Force Base, OH. The goal of the AFT2 Program is to ensure Air Force science and engineering activities are transferred or intentionally shared with state and local governments, academia and industry.

This publication provides the Air Force, DoD and other government leadership insight into the valuable contributions that the Air Force Technology Transfer program makes to Air Force research and development activities. It can be found online at www.wpafb.af.mil/t2.

spotlight on INNOVATION

AFRL Agreement Aimed at Protecting Public from UAS Noise

WRIGHT-PATTERSON AIR FORCE BASE, Ohio – The Air Force Research Laboratory 711th Human Performance Wing, Airman Systems Directorate, Battlespace Acoustics Branch and Owens Corning have entered into a Cooperative Research and Development Agreement to develop and understand best practices for measuring and labeling the sound produced by small commercial unmanned air systems.

The Department of Defense uses a variety of UAS platforms to perform military functions. Similarly, commercial entities use UASs as a cost-effective solution for numerous activities, including agriculture and forestry management, cellular tower inspection, and landfill monitoring. Given the growing current and potential use of these devices in the future, UASs could become a source of sound pollution. As a result, researchers at the AFRL are working to develop sound regulations to avoid what could become a critical issue for the public.

Under the agreement, Owens Corning will measure the acoustic characteristics of UAS platforms in its world-class acoustic laboratory while the Air Force will provide open-air characterization at its White Sands Missile Range site in New Mexico. The research obtained from this agreement will be utilized to develop a national standard which could include measuring and labeling innovative acoustic materials and structures as well as defining manufacturing specifications for key technologies.

"The goal of this agreement is to recommend a national measurement and sound power labeling standard for small unmanned air systems. If adopted by the Federal Aviation Administration, all manufacturers of these products would be required to label their drones, similar to how appliance manufacturers attach a sound power label to a dishwasher," stated John Hall, program manager for AFRL/711HPW.

"Through this agreement, we are able to capture the sound power radiating from drones as measured in an anechoic (echo free) facility in a practical way rather than trying to measure drones in flight," continued Hall.

The Owens Corning Acoustic Research Laboratory in Granville, Ohio was designed by Hale Sabine, a pioneer of acoustic research, and is accredited through the National Voluntary Laboratory Accreditation Program. The lab houses three reverberant chambers and an anechoic chamber that enables precise sound measurements that acoustically simulate a drone in the sky at a high altitude.

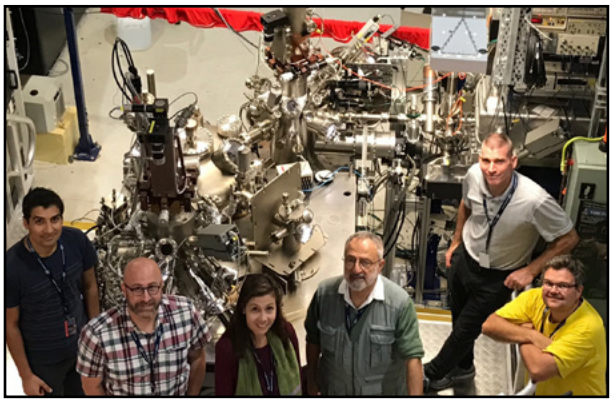
NEW AGREEMENTS

AFRL Material Transfer Agreement Leads to International Research Grant with Australia

By Mindy Cooper, Air Force Technology Transfer Program

WRIGHT PATTERSON AIR FORCE BASE, Ohio – A recent material transfer agreement between the Air Force Research Laboratory Materials and Manufacturing Directorate (AFRL/RX) and the Griffith University of Nathan, QLD 4111, Australia resulted in an international cooperative research and development grant. The new agreement is between AFRL/RX, the Naval Research Laboratory and the Australian Defense Science and Technology Group (DSTG).

An MTA is one type of limited-purpose Cooperative Research and Development Agreement that allows for quick collaboration with the Air Force. A CRADA is a legal agreement between a federal laboratory and one or more nonfederal parties such as private industry and academia. CRADAs offer both parties the opportunity to leverage each other's resources when conducting research and development that is mutually beneficial.



A team of researchers from the Air Force Research Laboratory Materials and Manufacturing Directorate (AFRL/RX), Griffith University, and Australian Synchrotron Facility are pictured in the Soft X-Ray Spectroscopy laboratory. The visit was part of research conducted under a Material Transfer Agreement between AFRL/RX and Griffith University. Pictured in the photo from left to right are: Mojtaba Amjadi Pour (QUT student), Tyson Back (AFRL contractor,Surface Scientist), Francesca Iacopi (former professor at Griffith University, currently at Univeristy of Technolgy Sydney) Patrick Soukiassian (long-time collaborator from CEA-Saclay, Synchrotron Expert), John Boeckl (AFRL/RX), and Anton Tadich (Australian Synchrotron, Beamline Scientist).

Under the MTA, and with partial funding under a grant from the Asian Office of Aerospace Research and Development, the Air Force Office of Scientific Research's international office in Tokyo, the university delivered samples of epitaxial cubic silicon carbide (3C-SiC) on silicon (Si) substrates. The purpose of the agreement was for the Air Force to investigate the graphene fabrication that results from the 3C-SiC material. Graphene is a material of interest for several applications, including electronic device development, because of its high conductivity, flexibility and strength.

The directorate has had a working relationship with the university for several years. Griffith University also houses an Australian NanoFabrication Facility Node for growing SiC epitaxially on a silicon substrate. The university is one of only a handful of groups in the world that can fabricate this material and one of only two that grow and then convert it into graphene.

"The CRADA was a helpful tool to formalize this research collaboration, spell out the IP that would be owned by each organization, and effectively outline the scope of the research being conducted," said Dr. John Boeckl, the AFRL/RX materials scientist leading the effort.

AFRL scientists conduct cross-sectional transmission electron microscopy to evaluate the material quality, helping to guide the graphene synthesis development, and scientists at the Naval Research Laboratory measure the plasmonic response of nano-scaled device structures fabricated from the material. The team also submitted a proposal to the Australian Synchrotron Facility in Melbourne and was granted use of the facility's Soft-X-ray Spectroscopy testing equipment. This allowed the team to conclusively identify the existence of the buffer layer of graphene on the 3C-SiC, which was known for graphene grown on bulk hexagonal poly-types of SiC, but was unconfirmed on the cubic poly-type. These results will be a key in refining future device structures.

As a result of the MTA CRADA and the favorable plasmonic response measured, the research was awarded a grant from the Secretary of the Air Force, International Affairs Office. In addition, an official Project Agreement will be established between AFRL/RX, the Naval Research Laboratory and the Australian Defense Science and Technology Group. This research will focus on complex low-loss plasmonic structures based on Griffith University graphene material.

"Working with the US Air Force, and other US military laboratories has been a boon to my research interests, and shows how a strong international collaboration can enhance and benefit each country's interests," asserted Francesca Iacopi, the Griffith University professor whose pioneering graphene synthesis from SiC has earned her numerous awards. She recently accepted a new position at the University of Technology in Sydney where she will continue to pursue this research.

AFRL officially kicked off its EOP efforts in 2016 and has seen a number of successes. EOP supports AFRL's technology transfer mission by providing entrepreneurialism as a viable mechanism for maturing promising AFRL technologies into commercial products. It consists of two phases: the first, a sabbatical to lay the foundation for starting or expanding a technology based business and the second, a formal separation from AFRL with priority consideration to return to AFRL within five years if the endeavors do not succeed. EOP was based on the Department of Energy Sandia National Laboratories Entrepreneurial Separation to Transfer Technology program which has seen over 150 researchers start or grow businesses in the past 20 years. AFRL currently has two applicants in the pipeline for the program, three individuals in the sabbatical phase, and four that have separated to start or grow tech based businesses. Additionally one of the folks that has started their company has grown from two to 15 people in the past year and a half.

In addition to these two efforts we are experimenting with new collaborative environments in Dayton and Albuquerque; exploring the benefits of tapping into existing business technology accelerators, such as Y Combinator and Techstars; embedding our researchers for rapid joint R&D efforts with leading innovative companies; creating maker spaces to prototype new ideas more rapidly; and working with college students and entrepreneurs to find new commercialization opportunities for our technologies. While I will be the first to admit that some of these ideas are not without flaws we need to be constantly challenging our assumptions about the way that technology innovation is conducted.

H.G. Wells stated "Adapt or perish, now as ever is nature's inexorable imperative." We are constantly striving to do better when it comes to technology transfer and we need to be constantly adapting our approaches for the benefit of our warfighters.

AFRL Technology Transfer Manager Receives Regional FLC Award

Tina Culpepper

Tina Culpepper, the technology transfer manager for the Air Force Research Laboratory Sensors Directorate, received the 2017 Federal Laboratory Consortium Midwest Regional Excellence in Technology Transfer award for her work securing the directorate's first patent licensing agreement.

The award recognizes Culpepper's effort in the transfer of the Active Shooter Protection System (ASPS), a technology developed by the Air Force during the 2015 Air Force Research Laboratory Commander's Challenge. The Commander's Challenge is a 9-month long Air Force-wide competition, held each year, which focuses on finding solutions for real-world threats the military faces. The Commander's Challenge process stimulates innovation, allows AFRL a chance to develop more than one potential solution, and often creates opportunities for commercial spin outs.

The ASPS system was developed jointly by a Robins Air Force Base team comprised of Chris Perrine, Captain Carlos Horner, and First Lieutenants Dan Gunderson, Evan Glowiak, Andrew Hyde and Bruce Von Niederhausern. It was developed with simplicity in mind and is best described as a fire alarm for active shooters.

The ASPS system detects the sound of a gunshot using advanced digital signal processing and artificial intelligence to differentiate from other loud noises. When a gunshot is detected, the system sounds an alarm and transmits the exact location of the emergency to police and fire dispatch. Additionally, the ASPS elegantly integrates into existing fire alarm systems and associated wiring, eliminating the need for stand-alone networks, servers or software. This greatly reduces cost, putting gunshot detection systems within the realm of widespread affordability for the first time ever.

At the outset, Culpepper helped facilitate the invention disclosure process and set expectations for the parties involved. She engaged the Air Force attorneys and the inventor team in order to complete a patent application with the USPTO. Ultimately, when Protective Innovations expressed interest, Culpepper worked with them to apply for the license, reviewed their business plan and license application – and began negotiating the exclusive license on behalf of the Air Force. Creatively, she used a new patent analytics tool to help assess patentability and determine the value of the IP.

Culpepper consulted with TechLink, a Department of Defense Partnership Intermediary and conducted formal market research to assess the commercial potential and market viability. She also consulted with the Air Force law office on legal aspect of the agreement. Her work enabled this effort to be a success.