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THE GRADUATE SCHOOL OF ENGINEERING AND MANAGEMENT AFIT ENGINEER

Air Force Institute of Technology

AFIT IN SPACE

Career-building Education and Research Starts Here

**By Col Timothy Albrecht, Director
Air Force Institute of Technology
Center for Space Research and Assurance**

Welcome to the September issue of the AFIT Engineer—an issue that highlights AFIT's role in preparing our students for the rapidly evolving space domain. As one of eight research centers within the Graduate School of Engineering and Management, the Center for Space Research and Assurance (CSRA) meets the challenge head-on with an interdisciplinary team comprised of faculty, staff, and students focused on the evolution of defense and intelligence missions in space. Here, and in subsequent articles, we introduce you to our award-winning people, facilities, academics, and research activities.



Col Timothy Albrecht

Founded in 2012 to enhance AFIT's research-based, space-focused graduate education programs and to provide a staff of technical experts across space-related disciplines, CSRA links the AFIT research team with external Dept. of Defense (DoD) and Intelligence Community (IC) sponsors while providing laboratory and other resources to support research objectives. In this way, students apply their thesis and dissertation efforts to tackle real-world challenges in the DoD and IC space communities.

CSRA creates and facilitates collaborations with government organizations such as the Air Force Research Laboratory, National Reconnaissance Office, the National Air and Space Intelligence Center, and the Space and Missile Systems Center. We pursue research challenges for these sponsor organizations across space disciplines such as astrodynamics, guidance, navigation, optimal control, propulsion, systems architectures, as well as structures and materials. We also enter into agreements with commercial

entities like SpaceX, Pumpkin Inc., Analytical Graphics Inc., and Tethers Unlimited Inc. to further our students' space research efforts.

CSRA's \$12M laboratory and equipment suite enables us to pursue cutting edge research across the space portfolio, giving our students hands-on experience in areas like the design, fabrication, and testing of small spacecraft. Recent successes in this area include two AFIT-designed and built spacecraft that were launched into space; SOS in 2019 and SkyPad in 2020. Two more experiments are slated for delivery in 2021 and 2022.

The DoD stood-up the United States Space Force (USSF) in December of 2019 to align resources, mission, and organization with the imperative of defending and projecting our national interests in and through the space domain. Likewise, CSRA continues to adapt to meet the challenges of a space domain that is increasingly contested and congested. Our faculty have designed new courses to address current and future space issues within our Astronautical Engineering and Space Systems degree programs. These new courses include: spacecraft survivability, proximity operations, space control, spacecraft reverse engineering, cislunar orbital design, and space combat modeling and simulation.

The stand-up of the USSF closed out 2019, which saw AFIT celebrate its centennial with none other than Apollo 11 astronaut 'Buzz' Aldrin in attendance. Our CSRA team had a banner year too, taking home "AFIT's Team of the Year 2019" award as well as the "General Muir S. Fairchild Educational Achievement Award" for 2019 for the most significant achievement to Air Force education. Our faculty and staff continue to earn individual recognition at the Air Force level in STEM research and education while our students regularly earn recognition amongst their peers for their thesis and published research. We look forward to carrying our successful momentum from 2019, through the COVID environment in 2020, and into 2021.



CSRA's SkyPad team (shown above) delivered a space-ready mission in less than six months.

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www.afit.edu/EN/afitengineer



'Virtuality' Emerges as Mode of Operation During COVID-19 Pandemic

We are delighted to bring you another edition of the **AFIT ENGINEER**. This Volume 2, Issue 3 continues the tradition of keeping our constituents informed and abreast of the latest developments in the Graduate School of Engineering and Management at the Air Force Institute of Technology (AFIT). With the physical separation mandated by the COVID-19 pandemic, it is even more imperative that we reach out to everyone via the printed word. "Virtuality" (yes, my new term of systems engineering, not yet in your e-Dictionary) is emerging as the mode of operation in most things we do. Two cases in point are the recent virtual orientation programs we conducted for new faculty and new Air Force Scholars (students) assigned to AFIT. Without compromising quality or content, we are figuring out new ways of moving AFIT's education mission forward. A total of 22 new faculty joined AFIT this Fall Quarter. All the programs for getting the faculty properly oriented to the teaching, research, and Air Force consultation requirements were conducted via virtual means. Similarly, we conducted a virtual orientation for 245 new Air Force Scholars. This demonstration of adaptability, flexibility, reliability, and virtuality allows us to practice what we teach in terms of expanding the concept of "ilities" of systems engineering in our mission skills set.



Dr. Adedeji Badiru

Missions are accomplished through people working with machines. A good demonstration of this symbiotic relationship is the growing interfaces we are creating with our computer tools in the COVID-19 era. With limited person-to-person interactions nowadays, it has become more imperative that we pay explicit attention to **Diversity and Inclusion (D&I)**. We do better together when we are diverse. Under the leadership and guidance of Dr. Alice (Betsy) Grimes, AFIT is making a notable mark on D&I initiatives. A series of seminars, invited talks, and discussion groups have taken place at AFIT in recent months. So much so that Dr. Grimes, a member of AFIT's Diversity and Inclusion Working Group, was invited to give a virtual D&I presentation for the Air Force Research Lab (AFRL) recently. Please read about this on page six of this newsletter.

In closing the message for this issue, I would be remiss not to mention the ongoing project to develop a customized Teaching Evaluation Tool (TET) for the Graduate School of Engineering and Management. As an educational institution, teaching is foundational to what we do. We teach what we research and we research what we teach. Further, we practice what we teach and research. TET is being designed to be a tool of teaching improvement, as a component of our overall commitment to continuous process improvement. I will be sure to give you updates on TET in future issues of the **AFIT ENGINEER**. Meanwhile, please mask up and stay safe.

Respectfully,

Adedeji B. Badiru, Ph.D., PE, PMP, FIIE
Dean, Graduate School of Engineering and Management

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AFIT Welcomes New Students

Graduate School Hosts First-ever New Student Virtual Orientation

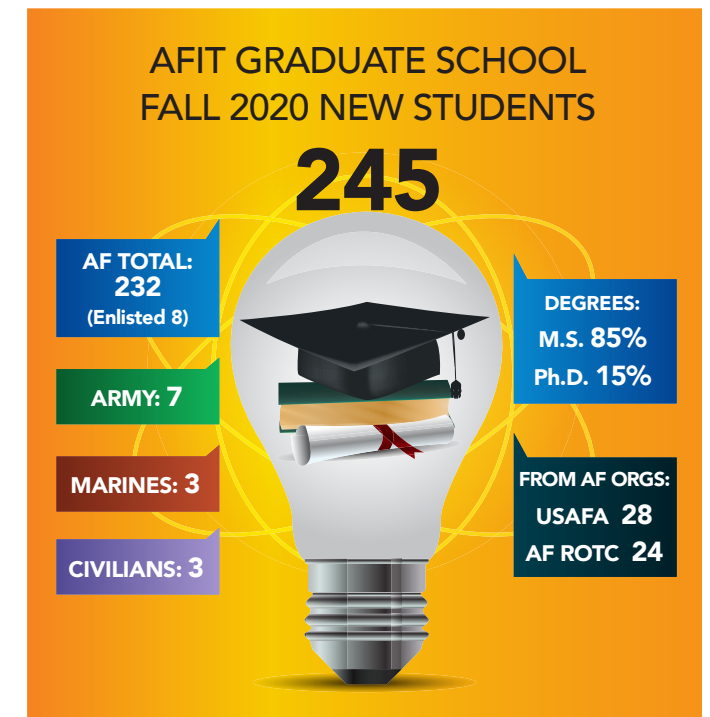
The Graduate School of Engineering and Management hosted AFIT's first-ever virtual new student orientation on 24 Aug 2020 which was led by Col John "Andy" McQuade, Dean of Students. The virtual event welcomed approximately 245 new graduate students to the AFIT campus, WPAFB and the Dayton area.

"This orientation was designed to ensure that the best and most accurate information could be transferred to you and that you feel as though your AFIT family is happy you are here, that your AFIT family is focused on you progressing through your mission and that you are going to be a full-up round when October gets here and you start that mission," said McQuade.

The orientation included remarks from AFIT Director and Chancellor, Dr. Todd Stewart, who reminded new students to be proud of being competitively selected for a unique advanced academic education opportunity at AFIT.

Additional remarks came from AFIT leadership including Col Paul Cotelleso, AU DET 1 Commander/Director of Staff, Dr. Adedeji Badiru, Dean of the Graduate School of Engineering and Management, and Col James Fee, Associate Dean of the Graduate School of Engineering and Management.

Briefings were made by Mr. Eric Welsh, Chief of Security, Dr. Amanda Bullock, AFIT Foundation, Capt Devin DePalmer, AFIT Diversity & Inclusion, 2nd Lt Kyle Emery, AFIT Student Association, Ms. Tess Willstatter, AFIT Spouses Association, and Maj Timothy Bennett, AFIT Legal Office. These representatives introduced students to the various organizations that offer support and services to AFIT graduate school students, both on and off campus.



Graduate School Faculty Academic Promotions

The Air Force Institute of Technology's Graduate School of Engineering and Management has completed the academic year 2019-20 promotion and tenure cycle. Seven faculty members underwent a rigorous evaluation of their teaching, scholarship and service resulting in a promotion in academic rank.

"Our promotion and tenure evaluation process is built on a rigorous evaluation of each candidate in order to identify those of such high quality as to merit academic promotion," said Dr. Christine Schubert Kabban, Faculty Council President for the Graduate School.

By Katie Scott | Air Force Institute of Technology

Dr. Julie Jackson

Dr. Julie Jackson earned promotion to Professor of Electrical Engineering within the Electrical and Computer Engineering department. Jackson joined the Graduate School in 2009 following receipt of her Ph.D. from The Ohio State University.



Jackson's research interests include radar signal processing, synthetic aperture radar imaging, passive radar, and automatic target recognition. She has authored 15 peer-reviewed journal articles; contributed to 45 peer-reviewed conference papers; has one patent pending; supported 26 funded research projects totaling over \$2.2M, including over \$1.2M in personal funding; and advised 25 master's and five Ph.D. students.

Jackson has received numerous awards and honors including the prestigious IEEE Fred Nathanson Memorial Radar Award (2019).

Dr. Brian Lunday

Dr. Brian Lunday earned promotion to Professor of Operations Research within the Operational Sciences department. Lunday first joined the AFIT faculty in 2013 as an Assistant Professor while serving as an active duty Army officer. He was hired as a civilian faculty member in 2016 and awarded tenure the following year. He earned a Ph.D. in industrial and systems engineering from Virginia Polytechnic Institute and State University in 2010.



Lunday has published 38 archival journal articles, 23 of which are in what are considered top-tier, and six in the top journal in his field. He is

a sought-out academic advisor having advised four Ph.D. students and 22 master's students. He received the 2019 Professor Ezra Kotcher Award.

Lunday's technical research emphasizes theoretical developments in math programming, game theoretic models, and algorithmic design for global optimization, as well as applications to the areas of network design, network optimization, network interdiction, network restoration, facility/resource location, and resource location/allocation and assignment.

Dr. John McClory

Dr. John McClory earned promotion to Professor of Nuclear Engineering within the Engineering Physics department. He earned a Ph.D. from AFIT in nuclear engineering in 2008 and then joined the AFIT faculty while serving as an active duty Army officer.



McClory has taught most of the AFIT nuclear engineering courses, 37 course offerings to 906 students. He is an excellent instructor and has a very successful record mentoring AFIT graduate students, serving as the committee chair for 36 master's and 17 Ph.D. students.

He has 90 refereed publications, 53 in open source archival journals and 37 in limited distribution publications of the DoD. He and his students present in the restricted annual Hardened Electronics and Radiation Technology Conference and have publications in the associated peer-reviewed Journal of Radiation Effects, Research and Engineering at ITAR or classified levels.

McClory's research in radiation effects on electronic devices and materials, radiation

detector development, and nuclear weapons effects has been lauded by DoD customers. He has brought in more than \$2M of sponsor funding and manages \$350,000 per year as the director of the NWEPP program.

Dr. John Elshaw

Dr. John Elshaw earned promotion to Associate Professor of Systems Engineering with tenure within the Systems Engineering and Management department. He is a graduate of Purdue University with a Ph.D. in management specializing in organizational behavior and human resource management. He joined the AFIT faculty as a military member in 2008, and became a civilian faculty member in 2013 upon retirement from active duty in the Air Force.



Elshaw has published 11 refereed journal articles, 1 book chapter, and 12 peer-reviewed conference papers. He has received numerous research grants, with direct responsibility for over \$380K of research funding. He has advised 24 students as thesis chair, and 37 additional students as a committee member across all department programs.

Elshaw's research interests include acquisition in the DoD environment; learning curve analysis and its application to organizations; leadership; human-technology interaction (virtual teams, electronic monitoring, distance leadership); motivation (self-regulation, intrinsic versus extrinsic control); human performance; and organizational trust and commitment. Together with co-principal investigators, Elshaw received the 2016 Best Track Paper – Safety, Human Factors, and Ergonomics at the Industrial and Systems Engineering Research Conference.

Lt. Col. Andrew Geyer

Lt. Col. Andrew Geyer earned promotion to Associate Professor of Statistics with military tenure within the Mathematics and Statistics department. In 2014, Geyer graduated from AFIT with a Ph.D. in Applied Mathematics then joined the faculty. He has served as the researcher advisor for three doctoral and 11 master's students.



Geyer's research interests include design of experiments, combinatorial optimization problems in statistics, statistical performance metrics, and statistical classification techniques.

He has published eight refereed journal articles, one book chapter, and 16 conference presentations. He received research grants totaling \$214K from the Air Force Technical Applications Center, Air Combat Command, the 45th Weather Squadron, and the U.S. Space Command.

Lt. Col. Andrew Hoisington

Lt. Col. Andrew Hoisington earned promotion to Associate Professor of Engineering Management with military tenure within the Systems Engineering and Management department. He has 19 years of active duty experience in civil engineering and education. He received a doctorate degree from the University of Texas at Austin in environmental engineering in 2013.



Hoisington has advised seven master's theses, served on committees for two Ph.D.'s and 11 master's students, and led 13 undergraduate researchers. His dedication to education and students has been recognized in awards including the Society of American Military Engineers National Educator of the Year, USAFA Outstanding Academy Educator, and the AFIT Military Officers Association of America Outstanding Military Instructor.

To date, Hoisington has 21 peer-reviewed journal articles, one book chapter, five conference publications, six distinguished lectures, and 64

non-peer reviewed articles. Google scholar notes his peer-review work has 347 citations and he has h-index of 10.

Hoisington's primary research focus is studying the built environment to improve occupant's health. Specifically, his work has investigated building factors that correspond with negative mental health outcomes. In addition, he has interest in the microbiome of occupants and the built environment.

Dr. Scott Nykl

Dr. Scott Nykl earned promotion to Associate Professor of Computer Science with tenure within the Electrical and Computer Engineering department. He joined the Graduate School faculty in 2015, approximately two years after receiving his Ph.D., summa cum laude, in computer science from Ohio University.



Nykl has advised 11 master's students, four of which were distinguished graduates, and one earned the prestigious AFIT-level Polk Award recognizing student research that has made a significant contribution toward strengthening the nation's industrial defense base.

Nykl has authored 11 peer-reviewed journal articles, two book chapters, contributed to 18 peer-reviewed conference papers, 12 peer-reviewed abstract conferences, and awarded two patents with one additional patent pending. Nykl has supported 15 funded research projects totaling over \$1.9M, including \$1M in personal funding. His research interests include real time 3D computer graphics, computer vision, sensor fusion, parallel processing, interactive virtual worlds, and computer networking.

Nykl's awards and honors include the Air Force Level Winner for STEM Advanced Technology Development (2019) and the Air Education and Training Command's nominee for the Air Force Outstanding Scientist/Engineer (2018). Nykl was also mentioned in Forbes' "The Greatest Young Inventors In America" in 2012 for his work on an aWake-Turbulence Aware Altimeter.

(This article has been edited for length.)

"These successful applicants have demonstrated the value of an AFIT education by strategically integrating teaching, research, and Air Force consultation. I am proud of their accomplishments and I look forward to their future contributions to the advancement of graduate education at AFIT."

— Dr. Adedeji Badiru, Dean of the Graduate School of Engineering and Management

By The Numbers

Accumulative achievements by these seven graduate school faculty members:

300+ publications

165+ students advised

nearly \$7M in sponsored research funds

CLICK TO READ FULL FACULTY BIOS

SMART Scholarship Recipient Earns Degree at AFIT

By Katie Scott
Air Force Institute of Technology

Raised in the small town of Denison, Texas, Lansing S. Horan IV earned a bachelor's of science degree in nuclear engineering from Texas A&M University. In his undergraduate senior year, he researched graduate schools and funding sources when he came across the Science, Mathematics, And Research for Transformation Scholarship-for-Service Program.

The SMART Scholarship program is an opportunity for students pursuing a technical undergraduate or graduate degree in science, technology, engineering, and mathematics disciplines to receive a full scholarship and guaranteed civilian employment with the Department of Defense upon degree completion.



The opportunity to earn a master's degree and have a job when complete was very attractive to Horan. "It's nice to have something guaranteed, especially in our current environment," Horan noted.

Horan learned about an advanced educational opportunity from the Air Force Institute of Technology through an internet search on nuclear engineering programs. "I saw that it was a very unique program offering a focus on nuclear weapon effects as opposed to nuclear power or radiation detectors that civilian universities offer," Horan added.

"AFIT is an ideal institution for civilians to attend as part of the SMART Scholarship program," said Col. Andy McQuade, dean of students within AFIT's Graduate School of Engineering and Management. "The immersive academic and research experience allows civilian scholars to work defense-focused problems with uniformed service members, other civilians, and international partners."

Attending the Air Force's graduate school seemed like a nice pairing since Horan's sponsor was the Air Force Technical Applications Center at Patrick Air Force Base, Fla. "With AFIT located on a military base and being a military organization, and then knowing I was going to work for the DoD, it linked together for me," said Horan.

Horan's thesis focused on researching asteroid deflection using a nuclear explosive. Done in collaboration with the Planetary Defense group at Lawrence Livermore National Laboratory, it is a topic that Horan believes he was able to choose because of the unique connections that AFIT faculty have with the DoD and other defense-focused agencies like the DoE. "If I had gone into almost any other nuclear engineering program in the country, I don't think I would have had the opportunity to study a topic like that," said Horan.

"For me, AFIT was definitely the right choice," Horan noted. "It was a very valuable experience and AFIT's uniqueness plays an important role in shaping an individual's diversity of education and experience."

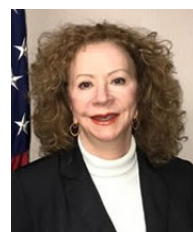
More information about the SMART Scholarship-for-Service Program can be found at www.smartscholarship.org. More information about AFIT's STEM degree programs can be found at www.afit.edu/EN/allprograms.

AFIT Diversity and Inclusion Working Group Invited to AFRL

By Donna Lindner
Air Force Research Laboratory

Air Force Women in Science and Engineering resource group from the Air Force Research Laboratory (AFRL) recently hosted a virtual presentation titled "Unconscious Bias in Hiring Practices" by Dr. Alice (Betsy) Grimes, member of the Diversity and Inclusion Working Group at the Air Force Institute of Technology (AFIT).

Grimes discussed assumptions and judgements often made when first introduced to someone. She commented that these biases are based on upbringing,



Dr. Alice Grimes
Director of Faculty
Development

life experiences, social norms and stereotypes. They may result in unconscious and quick projections about personalities, capabilities and beliefs. Grimes believes that it is imperative to recognize biases and develop strategies to avoid pitfalls.

"Awareness of unconscious bias and its potential impact is the first step in diminishing the effect and helping to ensure that individuals are evaluated fairly," said Grimes.

Another barrier leading to bias are interview questions that may be ill suited for a particular job and more general in nature, leaving room for the interviewer's own interpretations and judgments to cloud decisions. A good tactic would be to give a realistic scenario for the job being filled and



ask the candidate how they would respond to specific scenarios.

"We hear about promoting respect and preserving dignity in the workplace," said Simone Koram, AFRL's Sensors Directorate Learning Officer and AFWISE member. "Equality and

race is a sensitive topic on the radar of many minds, yet undeclared due to fear of being misunderstood or judged. Today's leaders are seizing the opportunity to address the uprising emotions of the workforce on the issue of unfair treatment and respect for equality," she said.

[CLICK TO READ FULL STORY](#)

Marine Commander's View on an AFIT Education

By Katie Scott
Air Force Institute of Technology

United States Marine Corps Lieutenant Colonel James C. Paxton III is currently serving as the Commanding Officer of Marine Corps Air Station Yuma Headquarters and Headquarters Squadron (nicknamed the "Guardians") in Yuma, Arizona. He is a naval aviator who flew F/A-18C and KC-130J aircraft, and now flies the UC-12F. He attended TOPGUN in 2007, and was designated a Strike Fighter Tactics Instructor.



United States Marine
Corps Lt. Col. James
C. Paxton III

Returning from deployment in 2013, Paxton was selected by the Commandant's Professional Intermediate-Level Education Board to earn a master's degree in aeronautical engineering from the Air Force Institute of Technology's Graduate School of Engineering and Management.

Attending AFIT was a humbling experience for Paxton who was nearly 15 years removed from his last college experience. "I had been outside of the academic environment for quite some time. I definitely learned a lot from the second lieutenants who had just graduated from the Air Force Academy," Paxton said. But his operational experience brought a valuable dynamic to his classes where he was able to share how he applied the material to real world scenarios.

"AFIT was positively a full-up, intense academic institution so there had to be quite a bit of time put into purely learning and understanding the material," said Paxton. He fondly recalled working on class projects like designing small unmanned aircraft systems that could be launched from cargo aircraft as well as taking classes outside his major's track. One of those classes was "Effects of Nuclear Weapons" which afforded him the opportunity to travel with the class to Livermore, CA and Albuquerque, NM to visit nuclear weapons laboratories.

Being one of a few Marines in a predominately Air Force school didn't hinder Paxton. He found a community of other students with whom he shared common experiences to enhance his learning. "I remember two of the Air Force pilots who were there as part of Test Pilot School. I appreciated the insights and perspectives they had on flying how their experiences related to the subjects we studied. I interacted with different circles of students to learn from others in addition to assimilating what the instructors provided," said Paxton.

Following graduation in 2015, Paxton reported to the United States Naval Academy where he served as an aerospace engineering instructor. "I don't think I would have been able to effectively teach had I not gone to AFIT. Reintroducing those basic fundamentals to me was critical and it also reignited a hunger for learning. It was a huge blessing to bring an academic foundation as well as the operational and leadership experience to the midshipmen," said Paxton.

"My experiences both at AFIT and teaching at the Naval Academy have been very helpful in formulating my command philosophy and desire to develop the leaders among Marines so they can be competent in their field, courageous in whatever decisions they make, and also compassionate in taking care of other Marines," shared Paxton.

The process of researching and writing his master's thesis helped to hone his critical thinking and decision making skills that are vital to his leadership of the squadron. "Even though it isn't in the same technical realm, just analyzing all the information at hand and being able to apply it to the situation and make a decision utilizes the same thought processes we employed at AFIT. It has been very helpful because as a commander you need to think beyond the tactical level and understand the repercussions of decisions at the operational and strategic levels," said Paxton.

Paxton's advice for future AFIT students is to go all in. "Go for it – do it – I think it is going to be a great experience. But I also say buckle up because you are going to be doing some hard work. There is always the tendency to do well enough to make the grade and move on, or even compete with each other to get the best grade, but embrace the actual learning so that you can take the knowledge and experiences with you wherever you go in order to better serve others."

[CLICK TO READ FULL STORY](#)

Alumni/Student Semifinalists of AFMC 2020 MAJCOM Spark Tank

By Marisa Alia-Novobilski
Air Force Materiel Command

Four AFIT alumni and one current Ph.D. student from the Graduate School of Engineering and Management were selected as AFMC 2020 MAJCOM Spark Tank semifinalists. Spark Tank, a collaboration between AFWERX and Deputy Under Secretary of the Air Force, Management, is an annual campaign designed to spur and empower innovative ideas from Airmen to further strengthen Air Force culture and capabilities.



The semifinalists present their innovative and game-changing ideas to a panel of leaders during the upcoming AFMC Senior Leader Conference. The top two ideas will go to represent the major command in the 2021 Air Force Spark Tank competition.

The AFIT alumni/student semifinalists are:

- Data Driven Facilities with Robotic Process Automation (RPA), submitted by **Maj. Patrick Grandsaert** (M.S. Engineering Management, 2015), Air Force Civil Engineer Center
- Pubs 3.0, submitted by **Lt. Col. Daniel Montes** (M.S. Aeronautical Engineering, 2005), Air Force Office of Scientific Research
- Patent Pending Aircraft Diagnostic Using Nanomaterial Based Paint, submitted by **1st Lt. Michael Sherburne** (M.S. Electrical Engineering, 2020), **1st Lt. Candice Mueller** (M.S. Aeronautical Engineering, 2020), and **Maj. John Brewer** (AFIT Ph.D. student), Air Force Research Laboratory

(This article has been edited for length.)

2019 Federal Library of the Year

The AFIT/AFRL D'Azzo Research Library Recognized with Award

By Katie Scott
Air Force Institute of Technology

The Federal Library and Information Network (FEDLINK) selected the D'Azzo Research Library for the 2019 Federal Library/Information Centers of the Year award in the large library/information center category. The award recognizes the many innovative ways that federal libraries fulfill the information demands of the government, business, and scholarly communities.

The D'Azzo Research Library, a joint effort between the Air Force Institute of Technology's Academic Library and the Air Force Research Laboratory's Technical Library, was honored for increasing information access and outreach to AFIT students and faculty, AFRL engineers and scientists, and the global research community.

"I am delighted for the D'Azzo Research Library's recognition for both its outstanding customer service and collaboration on electronic subscriptions," said Ms. Annette Sheppard, AFRL/RQWL branch chief and AFRL library director. "Our partnership is important to both organizations as we share similar goals to support the mission of the Air Force and the Warfighter."

Working with AFRL and base contracting, the organizations collaborated to purchase more than 23 databases and journal collections, saving more than \$382,000. On-site, a staff of 13 responded to 5,612 reference requests and taught 36 academic research classes to



D'Azzo Research Library staff and leadership gathered in honor of National Library Worker's Day in April 2018. The joint AFIT/AFRL library received the 2019 Federal Library/Information Centers of the Year award in the large library/information center category.

U.S. Air Force photo by Katie Scott

"We strive to meet the changing learning, research, and teaching needs of the Graduate School of Engineering and Management to enable the school to attain its strategic directions. As we move forward, we will endeavor to continue our support to faculty, enhance spaces, and most importantly, student success."

— Dr. Ellis Beteck, AFIT library director

532 participants while completing a library space reconfiguration that increased visits by eight percent.

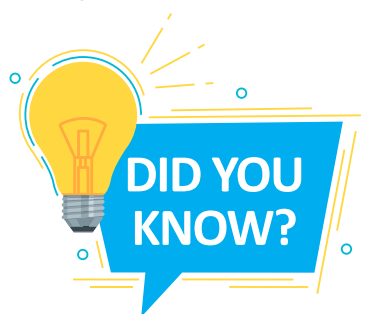
"As a direct and frequent user of the library, I cannot be more proud of our librarians for this externally-bestowed honor. This proves that our librarians are the best," said Dr. Adedeji Badiru, Dean of AFIT's Graduate School of Engineering and Management.

"I am extremely proud of the progress the D'Azzo librarians have made towards increasing access to resources and improving the user interface and research experience," said Mr. Rob Marshall, AFRL/RQW division chief.

In fiscal year 2019, the library launched its institutional repository, AFIT Scholar, a single, central, searchable database and delivered 36,850 thesis and dissertation downloads to 2,486 institutions in 166 countries.

"We strive to meet the changing learning, research, and teaching needs of the Graduate School of Engineering and Management to enable the school to attain its strategic directions. As we move forward, we will endeavor to continue our support to faculty, enhance spaces, and most importantly, student success," said Dr. Ellis Beteck, AFIT library director.

The library is named in honor of Dr. John D'Azzo, an engineer, educator, and technology leader, who served nearly 64 years at Wright-Patterson AFB. With more than one million items, it is the third largest research library in the Air Force.



AFIT Launches Online Graduate Certificate in Countering Weapons of Mass Destruction

By Katie Scott
Air Force Institute of Technology

Weapons of mass destruction can be man-made or naturally-occurring in a chemical, biological, radiological, or nuclear form. Regardless of the source or type of agent, several U.S. government agencies are responsible for anticipating, evaluating, and countering WMD threats. Personnel with an understanding of the scientific principles behind WMDs are critical to advising leaders at all levels of government.

"The COVID-19 pandemic has brought back to light the fact that weapons of mass destruction, whether they be biological, chemical or nuclear, can make a huge impact on our way of life," said Dr. James Petrosky, professor of nuclear engineering and director of the Nuclear Expertise for Advancing Technologies Center at the Air Force Institute of Technology.

The Countering of Weapons of Mass Destruction graduate certificate is an online part-time program designed to be completed in one year. Students take one course each quarter that will provide a fundamental scientific knowledge base related to the production, use, effects, and mitigation of WMD.

"The graduate certificate programs at AFIT fill a niche with graduate-level, technical and achievable education for working professionals to complete part-time in about a year," said Dr. Jeremy Slagley, assistant professor of industrial hygiene and environmental science and the director of the CWMD graduate certificate program.

What makes the AFIT CWMD certificate program unique is the graduate-level technical focus of the classes with a focus on both warfare and terrorism. "There are several programs offered throughout the country on CWMD, but none are technical. They are political science type programs based on policy and agreements," said Dr. John McClory, professor of nuclear engineering and chair of the nuclear engineering program at AFIT.



U.S. Army photo/Lt. Col. Carol McClelland

The Air Force Institute of Technology launched an online graduate certificate in countering weapons of mass destruction. The graduate certificate is an online part-time program designed to be completed in one year.

The ability for AFIT to launch the online certificate program is due to support received from the Department of Homeland Security whose leaders were looking for technical, graduate-level education in the WMD field. "There is a need for this technical education, especially in the folks who are looked to as experts to advise decision makers at all levels of the government," said Slagley.

The first course in the series this fall is biological weapons effects and technology. The course is particularly interesting at this time with the COVID-19 pandemic and the worldwide response. "A relatively quiet period in infectious disease was ended by the emergence of COVID-19. Biological weapons generally are simply infectious diseases and the world is affected all the time," explained the course instructor, Lt. Col. Casey Cooper, assistant professor of industrial hygiene.

AFIT first awarded the CWMD certificate in 2009 as part of an in-resident master's degree program. Thirty students earned the certificate before the master's program was suspended in 2018. This is the first time the certificate has been offered as a stand-alone program and executed fully online. The CWMD graduate certificate program is open to government personnel at no cost.



More information on the CWMD Online Graduate Certificate is available on the AFIT website at www.AFIT.edu/EN/allprograms and prospective students can apply online at www.afit.edu/Admissions/AFITApplicationProcess.

New Graduate School Program Options Available AY20-21

MASTER'S IN-RESIDENCE PROGRAMS

Acquisition & Program Management

Scientific & Technical Intelligence

MASTER'S DISTANCE-LEARNING PROGRAM

Data Analytics
(Anticipated JAN 2021)

IN-RESIDENCE CERTIFICATE PROGRAMS

Low Observables
Radio Frequency

Low Observable
Materials Engineering

Space Vehicle Design
(Anticipated JAN 2021)

DISTANCE-LEARNING CERTIFICATE PROGRAMS

Countering Weapons of
Mass Destruction

Data Analytics

Modeling, Simulation,
and Analysis
(In-residence option also)

Operations Research

Space Systems
(In-residence option also)



DATA FROM SPACE

CSRA Space Object Self-Tracker Sending Daily Data Messages

By Jaclyn Knapp
Air Force Institute of Technology
Center for Space Research and Assurance

The Air Force Institute of Technology's Space Object Self-Tracker experiment, launched in June of 2019, is now fully operational, providing daily data messages containing its current position and velocity in space.

The SOS is a self-sufficient, low-cost, low-weight, and low-power system which demonstrates precise orbit tracking capabilities for use in future Space Domain Awareness and Space Traffic Management applications. The SOS experiment is a hosted payload on NASA's Green Propellant Infusion Mission spacecraft. As a hosted payload, AFIT's Center for Space Research and Assurance's SOS team anxiously waited for permission to begin its experimental mission. AFIT's CSRA designed, manufactured and tested the payload through one of several collaborative efforts with the Air Force Research Laboratory Space Vehicles Directorate at Kirtland AFB, New Mexico.

"Now fully operational, SOS data will be used in both the classroom and for further research. Our collaborative relationships with sponsors like AFRL/RV provide our students with unique opportunities to receive both a hands-on space education, while also making a research contribution to the larger space community," said Dr. Rich Cobb, CSRA associate director.

Student involvement with SOS technology development has contributed to research topics in orbital dynamics, systems engineering, and solar cell and panel design technology. AFIT astronautical engineering graduate, John Claybrook, researched an orbital dynamics problem for his thesis to ensure the mission objective could be achieved.

"The two greatest benefits of my education at AFIT were the ability for a hands-on research investigation leveraging modeling and simulation tools as well as collaborating with other senior subject matter experts," said Claybrook, section chief and capability manager, space asset resilience, Arnold Engineering Development Complex.

"This experience was also an opportunity to conduct thesis work within a real, meaningful DoD-based problem-set, rather than a pure academic investigation where the thesis ultimately ends up sitting on a shelf," said Claybrook.

According to Dr. William Wiesel, AFIT professor of astronautical engineering and SOS principal investigator for the navigation mission, the data from AFIT's SOS experiment is now being used to qualify and further develop the next generation of autonomous, onboard satellite navigation and mission planning software. Although the original experiment software showed that kilometer level navigation was possible, computer technology is advancing so quickly that miniature single board computers can now execute advanced orbit determination algorithms, allowing for accuracy of a few tens of meters.

"SOS-derived technology will allow much of the satellite's ground site 'handholding' to be offloaded to the satellite itself, allowing the vehicle to plan and execute a list of high-level objectives," said Wiesel.



Courtesy photos

Top photo: Chris Sheffield, laboratory technician for AFIT Center for Space Research and Assurance, conducts testing on AFIT's Space Object Self-Tracker

Center photo: The Space Object Self-Tracker after completing pre-ship checkout before delivery for final integration. The payload is now fully operational, and provides daily data messages containing its current position and velocity in space.

Bottom photo: AFIT CSRA team members completing final checkout of the Space Object Self-Tracker experiment. The SOS launched in June of 2019.



CSRA BY THE NUMBERS

**CSRA'S \$12M
LABORATORY &
EQUIPMENT SUITE =
6,000+ SQ FT OF LAB SPACE**



FACILITIES & CAPABILITIES

- EE Space Systems Prototype Design Lab
- Satellite Tracking & Control Ground Station
- Space Environment Chambers
- Space Propulsion Chambers
- SIMSAT System
- Spacecraft Hardware Qualification Lab
- Electrodynamics Shakers
- Clean Room 10,000 ISO 7
- Mechanical Design Lab
- Helmholtz Cage
- Solar Simulator

RESEARCH & FOCUS AREAS

- Spacecraft Design, Manufacture, and Test
- CubeSats
- Experimental Payloads
- Space Situational Awareness
- Orbital Engagement
- Formation Flying
- Responsive Orbits
- Modeling & Simulation
- Mission Planning & Modeling
- Spacecraft Survivability
- Communication
- Propulsion
- Reentry Dynamics
- Structures
- Cyber Assurance

GRADUATE THESIS TOPICS

AFIT space-related graduate thesis research topics are online at <https://www.afit.edu/CSRA>
Click on the "Research Publications" tab

RESEARCH COLLABORATION OPPORTUNITIES

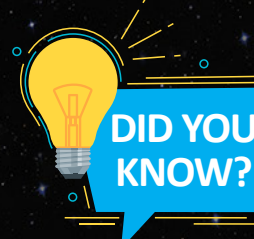
Learn about research collaboration opportunities with CSRA at <https://www.afit.edu/CSRA>
Click on "Research Opportunities"



RESEARCH PARTNERS



CSRA works with DoD and other U.S. government agencies to ensure AFIT is responsive to the national security space community.



AFIT was the first U.S. school to offer an astronautical engineering degree.

AFIT'S ASTRONAUTICAL ENGINEERING & SPACE SYSTEMS DEGREE PROGRAMS

AFIT's Astronautical Engineering (GA) and Space Systems (GSS) fully-accredited master's degree programs provide students with the opportunity to broaden their knowledge in the field of Astronautical Engineering and Space Systems, respectively, and apply that knowledge to an in-depth investigation of a specific research topic.

A doctoral specialty may be pursued in any of the areas of concentration within the Department. Specialty coursework generally consists of one or more graduate sequences, augmented by the more advanced courses, which are offered for doctoral students. Students interested in a doctoral program should discuss those interests with a member of the Department who is actively engaged in research in an area of interest to the student.



Additionally, the Space Systems (GSS) certificate is available as either an in-residence or distance learning program.

For additional information about graduate or post-doctoral degrees in Astronautical Engineering or Space Systems, please visit the CSRA web page at <https://www.afit.edu/CSRA/> and click on the "Degree Programs" tab.

AFIT SPACE PROGRAMS ADD VALUE TO USAF & USSF

- Astronautical Engineering (GA) and Space Systems (GSS) graduate students are prepared to perform a wide variety of functions within the U.S. Air Force and U.S. Space Force. Due to the breadth of courses taken by AFIT students, they are conversant in many technical disciplines.
- GA/GSS graduates help form a cadre of USAF/USSF/DoD space professionals who will shape emerging national space doctrine, operations, and future organizational structures.

- The research performed by GA/GSS graduates is focused on current and future USAF/USSF technology issues. All space research topics are sponsored by the U.S. Air Force, U.S. Space Force or DoD organizations.



SPACE ACADEMIC PROGRAMS

CSRA LAUNCHES NEW SPACE COURSES

Space Control Sequence
CSRA debuted two new graduate-level courses in 2019 as part of a wider specialty course sequence pertaining to "Space Control." The first course, ASYS 633A (Spacecraft Safety and Survivability), provides students with the analytical tools necessary to understand spacecraft failures, forensically characterize and predict spacecraft reliability, and assess spacecraft survivability. The second course, MECH 633A (Spacecraft Maneuver and Rendezvous), examines the dynamic modeling and control of multiple spacecraft operating in close proximity. In 2020, a third course was added, ASYS 733A (Integrated Multi-Domain Combat Modeling), which provides a detailed introduction to campaign analysis and combat modeling with an emphasis on today's integrated and multi-domain warfighting environment, with an eye towards combat in the space domain.

Cislunar Orbit Design Grad Course
The newest addition to AFIT's suite of graduate-level astrodynamics courses, MECH 733A (Numerical Methods for Orbit Design), provides advanced instruction in formulating cislunar trajectories and understanding the complex dynamics of multi-body gravitational systems. The course is in-line with the current U.S. national, defense, and commercial push towards conducting operations within the cislunar environment.

HOW TO APPLY TO AFIT

For more information on eligibility requirements and how to apply to AFIT, visit the admissions page at <https://www.afit.edu/ADMISSIONS/>



NEW IN-RESIDENCE GRADUATE CERTIFICATE BEGINS IN 2021

Space Vehicle Design Certificate
Starting in January 2021, students will be able to enter into the new Space Vehicle Certificate program which leverages, in part, AFIT's existing space vehicle design sequence, originally a three-course sequence designed to give students in-depth knowledge of all aspects of spacecraft design and test.

The first course of the program, ASYS 531 (Space Mission Analysis and Systems Design), begins with a short mission description and ends with the development of a space vehicle requirements document. In the second course, ASYS 631 (Satellite Systems Engineering), students develop a design solution that satisfies the space vehicle requirements. In the next course, ASYS 632 (Satellite Design and Test), students actually build a representative space vehicle and conduct requirements verification and environmental qualification testing. The fourth and final course, ASYS 629A (Spacecraft Systems Analysis & Design), is new to the AFIT curriculum and will debut in October 2021. This course will serve as the capstone to the program, and will introduce students to forensic and reverse engineering.

After completing this sequence, students will have been exposed to all aspects of the space vehicle development life cycle from mission and system definition, through preliminary and detail design, to assembly, integration and testing. This unique certificate combines analytical design with laboratory tests of actual spacecraft systems to provide students with a unique immersive, hands-on experience. Please check with the Department or the AFIT Registrar for program eligibility.

AIR FORCE INSTITUTE OF TECHNOLOGY

WOMEN IN STEM & SPACE

By Jaclyn Knapp
Air Force Institute of Technology
Center for Space Research and Assurance

Female Graduate Students Sound Off on AFIT Education and Careers in Space



RECENT AFIT GRAD

1 Lt Liberty Shockley
Satellite Test Flight Engineer

Degree: Master of Science,
Astronautical Engineering, March 2020

Follow-on assignment:
United States Space Force, SMC/DCIOX

Why should a prospective student attend AFIT instead of a Civilian Institution?

"Attending AFIT was my only opportunity to blend my work experience at NASA to pursue a space specialty. AFIT professors are focused on students and research in a way that is unmatched in the civilian world. They are either in their lab or in their office for the full duty day, whereas at the CI I attended for my undergrad, I was sitting outside my advisor's office for hours."

What problems did you encounter in your research and course work and how did AFIT resources help you solve them?

"If I couldn't find the professor of a class at AFIT, I could talk to anyone in the CSRA hallway and get help with my problems. At AFIT, they're looking out for you and your career, whereas at a CI, they have no idea about military obligations and time commitments, and could slip your degree six months to a year."

How did AFIT and your degree as a whole contribute to your current career in the Space Force?

"I would not be as capable in my current job without an MS in Astronautical Engineering. AFIT and only a handful of CI programs offer a space-focused degree rather than just an aerospace degree with space topics. It made a world of difference and I feel like I can help solve problems in my current profession that makes my contributions specifically valuable."

CURRENT AFIT STUDENT

1 Lt Cecily Agu
AFIT Graduate Student

Field of Study: Master of Science,
Astronautical Engineering, March 2021

Follow-on assignment:
Department of the Air Force (DAF)
Rapid Capabilities Office

How has CSRA staff and other AFIT resources assisted with the complexities of transitioning to Distance Learning?

"CSRA staff and AFIT resources have done a great job making the shift to distance learning. Instructors have communicated expectations early and often, leaving no ambiguities as to when and how course work is to be accomplished."

Why should a prospective student attend AFIT?

"AFIT has enough resources and dedicated staff for ensuring the success of the student, but it also falls on the individual to take the challenges head on. Staying motivated and driving yourself to learn through unconventional means will instill a resiliency that will serve you well in your most difficult classes and research problems."

AFIT ALUMNA

1 Lt Megan Maikell
LDPE (Long Duration Propulsive ESPA)-1
Launch Vehicle Integration Manager

Degree: Master of Science,
Astronautical Engineering, March 2019

Follow-on assignment:
United States Space Force, SMC/DCISS

How has your degree and overall experience at AFIT contributed to your current career in the Space Force?

"My time at AFIT increased my technical understanding of space vehicle systems and the importance of the testing these vehicles go through pre-launch. AFIT contributed to my career by expanding my technical foundation, which is paramount for a developmental engineer in today's Space Force."

What course at AFIT was the most beneficial to your degree program and current career?

"The most beneficial part of my AFIT experience for my career was my thesis itself, not because I currently do any work with Hall Effect Thrusters, but because the process provided me with so much first-hand experience and feedback with background research, technical defense, and working with hardware and test equipment."

Why should a prospective student attend AFIT?

"AFIT is a great career choice for anyone who would like to pursue higher education opportunities as a full-time assignment. The instructors are phenomenal and there is enough technical expertise to assist any thesis."

CSRA SPACE RESEARCH



AFIT's Center for Space Research and Assurance was founded in November 2012 to meet the space needs of the Department of Defense (DoD), Department of the Air Force (USAF and USSF) and Intelligence Community (IC) by both enhancing AFIT's research-based, space-focused graduate education programs through external sponsorship and by providing a staff of technical experts in many disciplines to support a wide variety of areas of research across multiple academic departments.

RIGEX Space Shuttle Experiment (2008)

Rigidizable Inflatable Get-Away-Special Experiment (RIGEX), an experiment designed and built by AFIT students to study the behavior of structures built using rigidizable/inflatable technology, was flown on NASA Space Shuttle Endeavour Mission STS-123 and successfully tested in a near zero gravity environment. The first-ever designed/built/tested space flight experiment for AFIT, RIGEX was the collective thesis effort of multiple AFIT students (AF and Navy) across the Aeronautical, Astronautical, Electrical, and Systems Engineering programs.

ALICE 3U CubeSat Experiment (2012)

The ALICE (AFIT LEO iMESA CNT Experiment) satellite was a 3U CubeSat supplied by the National Reconnaissance Office (NRO) Colony CubeSat program to test technologies in orbit. The satellite carried the iMESA (Integrated Miniaturized Electrostatic Analyzer) and the CNT (Carbon Nano-Tube) experiments. Georgia Tech manufactured the carbon nanotube array and AFIT built the payload and assembled and tested the satellite. The objective was to test the performance of the carbon nanotube array by using custom-built integrated miniaturized electrostatic analyzer (iMESA) sensors, based on designs provided by the U.S. Air Force Academy.

ALICE was designed, tested, and integrated at AFIT by a multi-department team of professors, students, and technicians. ALICE launched as a secondary payload on an Atlas-5-501 vehicle from Vandenberg Air Force Base, CA, as part of the GEMSat/ELaNa II NASA mission and was controlled by a ground station at AFIT. This represented an end-to-end space mission design, build, and fly capability and was the first by AFIT's newly formed Center for Space Research and Assurance.

GRISOM 6U CubeSat Program Initiation (2016)

AFIT is developing a space-qualified 6U CubeSat bus, called Grissom, to support hands-on student education and research. Students will use the Grissom 6U busses both in classroom and thesis work to design, build, and test CubeSat missions. This effort will leverage significant bus component and core flight software development performed at AFIT over the past few years and will include in-house hardware and software development, bus integration, and environmental testing.

For its first mission, the DoD's Space Experiment Review Board (SERB) approved the Grissom-1 CubeSat to launch aboard the Space Test Program's STP-S28 mission in early 2022 and carry two experimental payloads. The Grissom-1 CubeSat represents AFIT's first autonomous space flight experiment to be fully developed, integrated, and tested by AFIT faculty, staff, and students. Lessons learned from the Grissom project will enhance the development of the planned 12U (Cooper) and 27U (Eisele) CubeSat buses. The CubeSats are named after AFIT alumni who became astronauts: Lt Col Virgil "Gus" Grissom (B.S. Engineering Sciences, 1956), Col (ret.) Leroy Gordon Cooper (B.S. Aeronautical Engineering, 1956), and Col (ret.) Donn Eisele (M.S. Astronautics, 1960).



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AFIT's Space Object Self-Tracker (SOS) Experiment Launched (2019)

AFIT's Space Object Self-Tracker (SOS) experiment launched in June 2019 on the Department of Defense's first SpaceX Falcon Heavy rocket. The SOS is a self-sufficient, low-cost, low-weight, and low-power system which demonstrates precise orbit tracking capabilities for use in future Space Domain Awareness and Space Traffic Management applications. The SOS experiment is a hosted payload on NASA's Green Propellant Infusion Mission spacecraft.

AFIT's CSRA designed, manufactured, and tested the payload through one of several collaborative efforts with the Air Force Research Laboratory Space Vehicles Directorate at Kirtland AFB, New Mexico. Data from AFIT's SOS experiment is being used to qualify and further develop the next generation of autonomous, onboard satellite navigation and mission planning software. As of July 2020, the tracker was fully operational, providing daily data messages containing its current position and velocity in space.

AFIT's SkyPad Payload Launched (2020)

USF-7 mission successfully launched AFIT's SkyPad, a payload aboard the United States Air Force Academy's FalconSat-8 spacecraft bus, which is an experiment hosted on the X-37B Orbital Test Vehicle. SkyPad's mission is to demonstrate star tracking and high performance on-board processing using commercial cameras and graphic processing units. The GPUs will be reprogrammable on-orbit to enable experimentation in star tracking, image processing, data compression, and orbit determination using software code developed at AFIT. The payload employs an experimental suite of components for demonstration in the space environment. This collaboration also provides a platform for graduate research and hands-on education in mission analysis and design, payload hardware and software development, integration and testing and on-orbit experimentation. The CSRA SkyPad team, composed of more than 60 students, military, and civilians, delivered a space-ready mission in less than six months ahead of schedule.

AFIT's MC3 Network Node (2013-Present)

In addition to conducting experiments in space, AFIT also participates in a CubeSat communications network. This network, known as Mobile CubeSat Command and Control (MC3) System is a collection of individual ground stations managed by the Naval Post Graduate School. Multiple ground stations increase the total time available for CubeSats to download their mission data and enables technology demonstrations to be developed and tested in a faster development cycle.

Communication capability upgrades in 2018 enabled CSRA's MC3 System to download remote spacecraft data, or telemetry data from four new satellites in only 13 days. Since its inception in 2013, the MC3 System has communicated with 11 satellites. Data received from the satellites is used for positioning satellites in space.

The MC3 network node at AFIT has enabled student exposure to real-world satellite experience, end-to-end satellite testing, and satellite communications. CSRA student thesis topics regarding MC3 have included managing telemetry, tracking, and commanding, finding and fixing software bugs, and developing more robust software for the network.

CSRA was initially chosen as one of two locations in the eastern United States to house a ground station due to mutual educational goals, increased base security and less frequency disruption on site for receiving data. The collaboration allows improvements to DoD satellite management and provides payloads for CSRA's in-house CubeSat bus.

AFIT ALUMNUS IN SPACE

"The two greatest benefits of my education at AFIT were the ability for a hands-on research investigation leveraging modeling and simulation tools as well as collaborating with other senior subject matter experts," explains John Claybrook, AFIT graduate. "This experience was also an opportunity to conduct thesis work within a real, meaningful DoD-based problem-set, rather than a pure academic investigation where the thesis ultimately ends up sitting on a shelf."

Mr. John Claybrook, Section Chief and Capability Manager, Space Asset Resilience
Arnold Engineering Development Complex
Master of Science, Astronautical Engineering, 2013



AFIT ALUMNI IN SPACE

During the past century, AFIT and its predecessor organizations have educated hundreds of thousands of military professionals. AFIT graduates have made significant contributions in Air Force organizations such as Space and Missile Systems Center (SMC), United States Air Force Academy (USAFA), Air Force Research Laboratory (AFRL) and the newly-created United States Space Force (USSF). In regards to space, 30 astronauts have received their graduate degrees at AFIT.



VIRGIL "GUS" GRISSOM
(LT. COL., USAF)
NASA Astronaut 1959-1967

B.S. Engineering Sciences, 1956

- Selected as one of NASA's Original Seven Mercury Astronauts
- Became the first Air Force astronaut in space on the second Project Mercury mission
- First man to fly in space twice (Gemini III)
- Selected to command the first Apollo manned mission
- Died at NASA Kennedy Space Center in the 1967 Apollo spacecraft fire during a launchpad test
- Inducted into the U.S. Astronaut Hall of Fame (1990)
- AFIT's CSRA manages the *Grissom CubeSat Project*, a 6U common bus development effort, named to honor the AFIT alumnus and astronaut

EDWIN "BUZZ" ALDRIN (COL., USAF, RET.)*
NASA Astronaut 1963-1971

Massachusetts Institute of Technology, Ph.D. Astronautics, 1962

- Aldrin obtained a graduate education through AFIT's Civilian Institutions education program
- Became a member of the Gemini 12 mission in 1966 and established a new record for extravehicular activity (EVA), spending 5-1/2 hours outside the spacecraft
- Named lunar module pilot for Apollo 11 (the first manned lunar landing mission) which resulted in Aldrin becoming the second human being to set foot on the Moon in July 1969
- Inducted into the U.S. Astronaut Hall of Fame (1993)
- Participated in AFIT's Centennial (2019) astronaut panel



DID YOU KNOW?

Lt Edwin Aldrin, Sr. was a student of the first graduating class of the Air Service Engineering School (AFIT) in June 1920. In his class photo, Aldrin, Sr. is the first student seated on the bottom row.

GUION "GUY" BLUFORD, JR.
(COL., USAF, RET.)*
NASA Astronaut 1978-1993

Ph.D. Aerospace Engineering, 1978 M.S. Aerospace Engineering, 1974 Distinguished graduate

- The first African American in space
- Logged more than 688 hours in space on four separate flights
- Inducted into the U.S. Astronaut Hall of Fame (2010)
- Participated in AFIT's Centennial astronaut panel (2019)
- Received the Ohio Distinguished Service medal for his lifetime achievements in service to the state and nation (2020)



COL. SHANE CLARK
30th Space Wing vice commander,
Vandenberg AFB (Ret. Summer 2020)

M.S. Space Systems, 2004

- Launch Decision Authority (LDA) for two launches: Delta II and Falcon 9, two flight tests; Minuteman III and a Missile Defense Interceptor, and participated in numerous other launches and tests
- Final launch: Mission director for the May 2020 launch of the USSF's USSF-7, and the X-37B Orbital Test Vehicle for the Department of the Air Force's Rapid Capabilities Office
- AFIT's Center for Space Research and Assurance's SkyPad payload was also aboard the U.S. Air Force Academy's FalconSat-8 spacecraft bus, which is an experiment hosted on the X-37B Orbital Test Vehicle



MARK BROWN (COL., USAF, RET.)
NASA Astronaut 1984-1993

M.S. Astronautical Engineering, 1980 Dayton, Ohio native

- Supported STS flights 2, 3, 4, 6, 8 and 41-C in the Flight Activity Officer/Staff Support Room of the Mission Control Center
- Served as astronaut member on the Space Station Freedom Program
- Mission Specialist: Orbiter Columbia STS-28 mission (1989) and Orbiter Discovery STS-48 mission (1991)
- Participated in AFIT's Centennial astronaut panel (2019)

BRIG. GEN. DOUGLAS SCHEISS
Commander, 45th Space Wing, Patrick Space Force Base & Cape Canaveral Space Force Station

M.S. Space Systems, 2004

- Achieved "Drive to 48" in 2019:
Aug 2019: Launched four times within four weeks; launched two times within 34 hours (which hadn't been done in 30 years)
Dec 2019: Supported two launches in one week
- Commander of the first base to change their name to reflect the USSF (2020)



Historic Milestones Achieved Despite COVID-19 Constraints

By Jaclyn Knapp
Air Force Institute of Technology
Center for Space Research and Assurance

The COVID-19 restrictions have brought many changes and challenges for the students, faculty and staff of the Air Force Institute of Technology's Center for Space Research and Assurance. One immediate challenge was switching all in-person classes to distance learning; something that has never been implemented before in the history of the Center. Through the use of Microsoft Teams 365, professors are able to teach classes live with video capabilities and other technological modifications and applications. Faculty office hours, research meetings, student presentations and study groups have also continued through the use of virtual technology. In addition, faculty can also record live lectures so students can view again later for clarification. "The education we are receiving now is of the same caliber of education we were receiving before the distance learning began," said 2d Lt. Nathaniel Enders, astronautical engineering student. "This is a testament to both the faculty's and student's ability to adapt. All of my instructors this quarter have been very responsive to questions I have in and out of class. They care about students learning just as much as the students do," said Enders.

To encourage class interaction, professors will present questions to be answered within a time limit. This approach also assists with keeping students actively engaged in class since distance learning requires more effort to stay focused.

"CSRA staff and AFIT resources have done a great job making the shift to distance learning. Instructors have communicated expectations early and often, leaving no ambiguities as to when and how course work is to be accomplished," said 1st Lt. Cecily Agu, astronautical engineering student. "AFIT has enough resources and dedicated staff to ensure success of the student, but it also falls on the individual to take challenges head on. Staying motivated and driving yourself to learn through unconventional means will instill a resiliency that will serve you well in your most difficult classes and research problems," said Agu.

In March 2020, CSRA welcomed its first international intern, 2d Lt. Paul Gindre from the French Air Force Academy (L'École de

l'Air); another history-making milestone for the Center. Lt. Gindre's research has involved small spacecraft systems engineering. One project focused on validating software-based radiative heat transfer models in order to improve modeling confidence and accuracy of CubeSat component thermal designs. Another focus of his research was to minimize the number of commercial-off-the-shelf modular attitude control units for a 6U CubeSat while maximizing the control torque for a given mission.



Courtesy photo

Due to COVID-19 restrictions, AFIT CSRA was forced to switch all in-person classes to distance learning; something that has never been implemented before in the history of the Center. In March 2020, the Center also welcomed its first international intern from the French Air Force Academy; another history-making milestone.

Due to COVID constraints and restriction of access to the AFIT campus, Lt. Gindre's research was changed from a hands-on approach to a computer-based effort. Although the greatest difficulty was completing the research in a telework environment through the use of video conferencing and phone calls, one major benefit of this collaboration was the ability to start a dialogue with a fellow NATO member for space systems design, development, and testing. The internship also laid the foundation for future research collaboration in space, as well as other technical/engineering disciplines across AFIT. In relation to the Center, the internship enhanced its diversity by bridging international cultures to create a collaborative environment for space research and analysis.

"Our Department of the Air Force leadership emphasizes the importance of building and strengthening partnerships. AFIT and CSRA look forward to expanding the relationship begun with Lt. Gindre in the critical domain of space," said Col. Timothy Albrecht, CSRA director.

Follow-on Space Assignments for AFIT Graduates

Follow-on assignments for space-related March 2020 AFIT graduate students include the following: NRO, AFRL/RV, SMC, 3SES, 533TRS, UPT, and F-22 SPO.

Maj Timothy Anderson earned a Ph.D. in applied Mathematics and his follow-on assignment is the detachment commander for the 18th Space Control Squadron, Detachment 1. The current mission is Space Domain Awareness (SDA) with the ultimate goal of converting the Detachment into a space experimentation squadron within the SDA domain.

1 Lt Taylor Whitney earned an M.S. in Applied Physics and her thesis research focused on solar physics working toward the goal of forecasting solar flares. Her follow-on assignment is at the Space Weather Operations Center, where her work will support the Space Force.

Capt Brandon Hufstetler, 13S, earned an M.S. in Operations Research and he is assigned to the 533 Training Squadron at Vandenberg AFB, CA to be a space instructor at the schoolhouse. His thesis was titled Heuristic Approaches for Near-Optimal Placement of GPS-Based Multi-Static Radar Receivers in American Coastal Waters. He has applied to the NASA Astronaut program with an endorsement from Gen Raymond.

Center for Space Research and Assurance Wins General Muir S. Fairchild Award

By Jaclyn Knapp
Air Force Institute of Technology
Center for Space Research and Assurance

The Air Force Institute of Technology's Center for Space Research and Assurance was selected as the winner of The General Muir S. Fairchild Educational Achievement Award for 2019.

"This most prestigious award is a well-deserved recognition of all of the outstanding contributions of the faculty, students and staff affiliated with AFIT's Center for Space Research and Assurance. With the recent establishment of the United States Space Force as the nation's newest military service, it is particularly fitting that this award recognizes and highlights AFIT's unique capabilities to support the advance education needs of that new service," said Dr. Todd Stewart, AFIT director and chancellor.

The General Muir S. Fairchild Educational Achievement Award was established in 1964 to recognize the most significant contribution to Air Force education. Its purpose is to stimulate and reward creative and outstanding achievement in military education and to increase interest in furthering professional educational development with the Air Force.

During the award period, 1 January 2019- 31 December 2019, CSRA graduated 26 master's and doctorate astronautical engineering and space systems students and delivered over one thousand quarter hours of graduate credit in high-priority space-related disciplines. In addition, CSRA's laboratories enabled unique hands-on graduate student research projects, including the successful launch of AFIT's Space Object Self-Tracker on a SpaceX Falcon Heavy rocket in June 2019. The SOS payload was entirely designed, manufactured and tested by AFIT's CSRA faculty, staff and students.

As a participant in AFIT's centennial celebration in November 2019, CSRA hosted Apollo 11 astronaut, Col. (retired) Buzz Aldrin and four space shuttle astronauts as the highlight of the event. In addition, eighteen student-collaborative research papers were published in internationally-recognized, peer-reviewed journals signaling the caliber of AFIT's students, faculty, and research.

"2019 was a great year for AFIT and the Center. I'm proud of our team and the work we accomplished last year when the DoD and USAF spotlight shined on the space domain," said Col. Tim Albrecht, CSRA director.

"We're honored Lt. Gen. Hecker, commander and president of Air University recognized us with this award and look forward to carrying this momentum through 2020 in support of our students and research programs," said Albrecht.

CSRA is one of eight interdisciplinary research centers of AFIT's Graduate School of Engineering and Management.



Courtesy photos

Col Tim Albrecht, Director of the Center for Space Research and Assurance, was presented with the General Muir S. Fairchild Award at the "AFIT All Call" on 27 August 2020 by AFIT Chancellor, Dr. Stewart.

AFIT Distinguished Alumnus Gen Muir S. Fairchild



1929: Air Corps Engineering School (AFIT)

1946-1948: Commander of Air University

1948: Vice Chief of Staff of the Air Force (rank of a four-star General)

1950: Died in active duty as Vice Chief of Staff

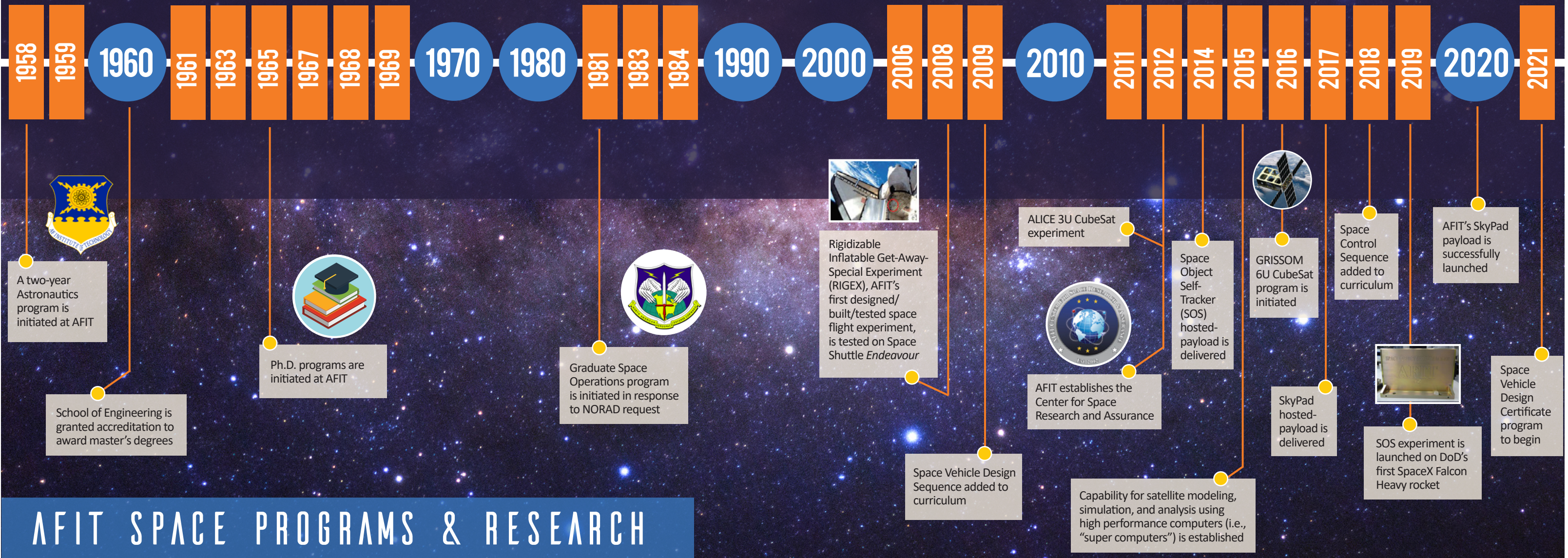
Daedalians

General Muir S. Fairchild Educational Achievement Award Presented by General Kehoe to:
The Center for Space Research and Assurance



Daedalian Commander and Chairman, Lt Gen Nicholas B. Kehoe III, USAF (Ret), presented the prestigious award virtually. The winner of the General Muir S. Fairchild Award is determined from an individual or organization that contributed the most to AFIT, Air University (AU) or Air Force education. Since 1964, each winner is engraved on a trophy that is on display at AU, Maxwell Air Force Base, Alabama.

AFIT SPACE HISTORY



AFIT SPACE PROGRAMS & RESEARCH

UPCOMING EVENTS

OCTOBER 2020

AFIT Graduate School Summer Graduation Degree Conferral (No Ceremony)

AFIT Campus, WPAFB, OH | 01 Oct 2020

AFIT Graduate School Fall Quarter Classes Begin

AFIT Campus, WPAFB, OH | 01 Oct 2020

WPAFB TechExpo

Virtual Event, WPAFB, OH | 20 Oct 2020

HLC Reaccreditation Team Visit

AFIT Campus, WPAFB, OH | 19-20 Oct 2020

NOVEMBER 2020

AFIT's 101st Birthday

AFIT Campus, WPAFB, OH | 10 Nov 2020

DECEMBER 2020

AFIT Graduate School Fall Quarter Classes End

AFIT Campus, WPAFB, OH | 17 Dec 2020

AFIT Graduate School Fall Graduation Degree Conferral (No Ceremony)

AFIT Campus, WPAFB, OH | 24 Dec 2020

Coming in the December 2020 AFIT Engineer:
Artificial Intelligence Education & Research



AFIT FACULTY SEARCH



To search for AFIT Graduate School faculty members and view their online bios, please visit us at www.afit.edu/BIOS

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