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88th Air Base Wing Public Affairs

During the Air Force Institute of Technology’s Graduate School of Engineering and Management graduation ceremony on March 25, history was made as this year’s class included Guardians of the U.S. Space Force. A total of 230 master’s and six doctorate degrees were awarded in the science, technology, engineering and math fields. One graduate earned dual master’s degrees.

Due to COVID-19 concerns, the commencement ceremony was livestreamed for family and friends. The graduating class included 172 Air Force officers and three noncommissioned officers, 33 Space Force officers, six Army officers, five Marine Corps officers, 11 Defense Department civilians and three defense contractors. Two international students from Australia also graduated.

“Your AFIT degree will give you initial credibility with others but also establish some very high expectations of your ability to use what you learn here to help solve some of the tough challenges facing our Air and Space Forces today and in the future,” said Dr. Todd Stewart, AFIT director and chancellor. “I am confident that your AFIT program has prepared you well to make important contributions for our Air and Space Forces.”

Following Stewart’s remarks, Acting Secretary of the Air Force John P. Roth relayed a message in a recorded video. “Graduates, as you relish in this moment, be proud,” he said. “Benjamin Franklin once said, ‘If a man empties his purse into his head, no one can take it away from him. An investment in knowledge always pays the best interest.’ As a career comptroller, I can tell you, he was right.

“Education certainly pays the best interest, but it is up to you to invest. Going forward, I encourage you to take what you have learned combing over thousands of pages, hundreds of studies, and countless papers and focus on three areas: inspire, inquire and take initiative.”

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USSF Chief of Space Operations Celebrates AFIT Grads as Commencement Speaker

Dr. Stewart, AFIT Director and Chancellor, Lt. Gen. Hecker, AU Commander and President, Dr. Ries, AFIT Chief Academic Officer, and Dr. Badiru, AFIT Graduate School of Engineering and Management Dean.

Students participated in the socially-distanced 2021 AFIT graduation while friends and family were invited to watch online.

U.S. Air Force photos

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www.afit.edu/EN/afitengineer
The Importance of Celebrating Women in STEM

Dr. Marie Ventrice, Tennessee Tech University Visions magazine, Spring 1995

This is a very powerful statement that sets the benchmark for what today’s DEI pursuits should represent. I invite readers to enjoy it, reflect on it, and practice the principles therein contained.

Respectfully,

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

Why is it important that we encourage women to pursue nontraditional careers? I emphasize women because I am one. Much of what I say applies to African Americans and other minorities also. If we restrict some areas to white males only, we lose the benefits of all the insight, understanding, inventiveness, creativity, intelligence, quickness, initiative, hard work, and everything else that those who are excluded have to offer. If we restrict people’s options, we constrict their minds and their lives. We throw away and destroy valuable resources.

And engineering is a challenging, satisfying, and rewarding profession; so why should only the guys get to participate?"

—Dr. Marie Ventrice, Tennessee Tech University Visions magazine, Spring 1995

"Today, we are operating in an extremely complex security environment, probably the most complex environment since the Cold War," Raymond said. "There is a lot that can go wrong and there are many challenges that lie ahead. Now, more than ever, we need technically minded joint warfighters who are ready to meet the challenges of our time.

"While I have no doubt that our joint coalition forces are the envy of the world; our advantage, our superiority is diminishing. Parity undermines global stability. We must rapidly evolve and stay ahead of that growing threat. The Department of Defense is primed for rapid innovation and transformation, and it is you who will inspire and lead that change. There is no moment better than now, and no one better than you to lead that effort."

Raymond urged the graduates to employ what they had learned at AFIT. "Don’t be afraid to fail, don’t be afraid to fall short," the general said. "Trust yourself and trust what you learned. You are all ready and all of you are good enough to do great things in defense of our freedom."


top to bottom (left to right): Air Force and AFIT leadership arrive on stage for the 2021 commencement ceremony. AFIT Chaplain Capt Gerardo Rodriguez provided the ceremony’s invocation. Graduate students participate in a socially-distanced 2021 graduation ceremony. Air Force Chief of Staff Gen Brown delivers a virtual message to graduates. AFIT Graduate School Dean of Students Col McQuade congratulates the class of 2021. AFIT students celebrate graduation achievements. Three U.S. Army students earned master’s degrees in operations research.

USAF Chief Celebrates AFIT Grads

Continued from cover

Lt. Gen. James Hecker, Air University commander and president, also congratulated the graduates. "You will be known as AFIT graduates now. There is only a small fraction of our Air and Space Force that can say they are AFIT graduates, and that means something," he said.

"Make sure that you always know people will look at you differently because you are an AFIT graduate. Be the person the commander goes to when they have a hard job to get done, because that is going to be the expectation.

"And guess what? You will deliver because of the faculty and everything you learned here. You are prepared to meet that challenge."

Gen. John W. "Jay" Raymond, the first chief of Space Operations, was guest speaker for this year’s ceremonies and praised the graduates for their hard work and accomplishment. Raymond conveyed that the Air Force Institute of Technology has been the means by which the Air Force has enhanced the technological superiority of the nation’s air, space and cyber forces for more than a century. AFIT and its predecessor organizations have delivered world-class education to hundreds of thousands of defense professionals.

"Today, we are operating in an extremely complex security environment, probably the most complex environment since the Cold War," Raymond said. "There is a lot that can go wrong and there are many challenges that lie ahead. Now, more than ever, we need technically minded joint warfighters who are ready to meet the challenges of our time."

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Each graduation event represents the culmination of years of study, testing grading, and reaffirmation in a student-faculty partnership demonstration. As students receive their rewards in terms of diplomas and certificates, the faculty also receive awards for their superior performance in preparing students to reach their respective end goals. Because we are in the profession of arms in the military, I often remind myself of the analogy of considering an academic curriculum as a weapon (albeit non-kinetic) of knowledge transfer. For this reason, I extend my congratulations to the students and faculty whose accomplishments in the 2021 commencement exercises.

— Dr. Aledeji Badiru

Dean, Graduate School of Engineering and Management
Dr. James Petrosky received the General Bernard A. Schriever Award. This award is given in recognition of a person who advances aerospace power, technology, doctrine, or the Air Force as a profession. The award is named in honor of Col. Crocker who served as the dean of AFIT’s School of Systems and Logistics from 1971-1972 and was a coauthor of papers on turbulence associated with blunt body flow.

Dr. James Petrosky is a professor of nuclear engineering in AFIT’s Graduate School of Engineering and Management responsible for teaching and research in nuclear focused research. Under his leadership, the group published six provisional patents.

Dr. Julie Jackson received the Gage H. Crocker Outstanding Professor Award. This award is presented to the individual who made the most significant contribution to the AFIT mission through excellence in teaching, curriculum development, educational innovation, consulting, or research. The award is named in honor of Col. Crocker who served as the dean of AFIT’s School of Systems and Logistics from 1971-1972 and was a coauthor of papers on turbulence associated with blunt body flow.

Jackson is a professor of electrical engineering in AFIT’s Graduate School of Engineering and Management where she teaches courses on advanced radar system analysis, multidimensional signal and image processing, and random signal and system analysis. In 2019 her unique innovations made her an international leader in radar research as evidenced by her recognition as the Institute of Electrical and Electronics Engineers’ top young radar engineer in the world with the Field Nathanson Memorial Radar Award for her innovative systems engineering advancements in the exploitation of scattering phenomena for the next generation passive and active imaging radars.

Dr. Todd Stewart, Air Force Institute of Technology director and chancellor, presented the 2019 Air Force Association Wright Memorial Chapter awards to AFIT faculty members including Maj. James Bevins.

Maj. James Bevins received the Colonel Charles A. Stone Award. This award is given in recognition of an individual who accomplished specific achievements that furthered the AFIT mission through new and innovative efforts involving demonstrated personal leadership. The award is named in honor of Capt. Stone, the dean of AFIT’s School of Systems and Logistics from 1962-1966, who was instrumental in the school receiving accreditation to award master of science degrees.

Bevins is an assistant professor of nuclear engineering in AFIT’s Graduate School of Engineering and Management where his research interests include radiation transport modeling, radiation detection and analysis methods for nuclear security applications. In 2019 he led a robust research group of master’s students, four doctoral students, and one research faculty member while directly executing over one million dollars in nuclear focused research. Under his leadership, the group published six journal articles with five more in review, 13 conference papers, and two provisional patents.

The recognition by the Air Force Association is a high point for us as they help recognize our outstanding individuals in the service of our Air Force and country. — Dr. Todd Stewart, AFIT director and chancellor

By Katie Scott
Air Force Institute of Technology

During a virtual ceremony on Feb. 25, three AFIT Graduate School of Engineering and Management faculty members received awards sponsored by the Wright Memorial Chapter 212 of the Air Force Association. The awards recognize faculty who advance aerospace power and technology through innovative efforts in education and research. The AFA has sponsored the awards since 1982.

One part of the AFA mission is to promote aerospace and STEM education and professional development. “Our sponsorship of these awards is a great opportunity to celebrate the amazing achievements of those professionals who contribute so much to our shared values and goals,” said Dave Babcock, executive vice president of the AFA Wright Memorial Chapter.
DATA ANALYTICS

GRADUATE CERTIFICATE

In 2018, the Air Force Chief Data Officer (CDO), Mr. Eileen Vidrine, outlined her vision for the future of Air Force data analytics in which she remarked, “the Air Force is a data-driven organization, which requires technology, process, and people. A graduate education in data analytics is a key component in our workforce development approach to improve the Air Force data enterprise and increase data-driven decisions.” This facilitates the intent of Air Force Chief of Staff Gen. Brown, who said a priority is “fostering a new cadre of Airmen who are experts in software development, artificial intelligence, and joint operations...” Along similar lines, the National Defense Strategy emphasized the growing need for personnel with data analytics capabilities in order to maintain military advantage, while recognizing that few DoD personnel are taught the skills required to manage and analyze data.

In response, in 2019 the Air Force Institute of Technology launched an on-line data analytics certificate program designed to aid the U.S. Air and Space Forces in becoming more data-informed organizations. The five-course sequence focused on enabling Airmen and Guardians to use and understand data analysis applications and tools and included topics such as database design and management, machine learning, statistics, and computer programming. A little over a year later, 404 students have taken at least one class and 27 have earned a Certificate in Data Analytics as part of the first graduating class in winter 2021.

One of the CDO’s primary goals was to help democratize the use of data analytics throughout the service. Mission effectiveness of all organizations could be enhanced by using data analytics to recognize actionable opportunities in the mountains of data they generate. Thus far, the DA Certificate program has helped meet this goal by reaching students from around the globe including all U.S. Air and Space Force MAJCOMs, Airman/Guardians supporting EUCOM, INDO PACOM and USTRANSCOM, Headquarters Air Force, over a dozen agencies and Direct Reporting Units. The Data Analytics Certificate Program Director, Dr. Brent Langhals stated, “We are extremely excited by the reach our program is having throughout the Air and Space Forces. We are seeing interest from all corners of the Air Force and Space Forces in becoming more data-informed organizations. The five-course sequence focused on enabling Airmen and Guardians to use and understand data analysis applications and tools and included topics such as database design and management, machine learning, statistics, and computer programming. A little over a year later, 404 students have taken at least one class and 27 have earned a Certificate in Data Analytics as part of the first graduating class in winter 2021.

Currently, the data analytics certificate program is open to all active duty and civilian Air and Space Force personnel at no cost. Students can expect to gain an understanding of how to combine analysis techniques with their specialized expertise to enhance data analysis leading to better policies, processes, and decisions.

Continued on next page

In the certificate capstone course, Machine Learning, students devote five weeks towards performing a machine-learning analysis on a topic that supports their organization’s mission. This fulfills the CDO’s goals of developing subject matter experts to identify and exploit data analytics opportunities. After completing their certificate, several students have made progress publishing their analyses with the support of Data Analytics faculty.

The following are several examples of the level of analysis students are capable of upon graduation:

- **Determine the Risk of Marijuana Use by Personality Trait Data** – Marijuana is the most commonly abused drug for military personnel tested at the Air Force Drug Testing Laboratory. A publicly available database with 30 variables and 1885 datapoints related to drug use, personality traits and demographic data were modeled with logistic regression, decision tree and neural network models. Neural networks had the best performance after two iterations of a 9-dimensional hyperparameter search, and the final accuracy (0.86%) improved upon prior work by 8%. These results could increase the efficiency of military drug prevention and intervention programs.

- **Per-pixel Cloud Cover Classification of Multipsectral Landsat-8 Data** – Random forest and neural network algorithms are applied to identify cloud cover in images using 10 of the wavelength bands available in Landsat-8 imagery. 38,800,000 pixels from 32 image sets were classified as clear, cloud-shadows, light cloud, or cloud. The best overall classifier was found to be a random forest with an overall accuracy of 77% across the four classes. Automated cloud mask identification could free an imagery analyst to apply their expertise to advanced analytical techniques, rather than searching for cloud-free image sets.

- **Synthetic Aperture Radar Image Recognition of Armored Vehicles** – Synthetic Aperture Radar (SAR) imagery is not affected by weather and allows for day- and night-observations; however, it can be difficult to interpret as shown in the graphic. The publicly available Moving and Stationary Target Acquisition and Recognition dataset was used, which contained 2,987 total observations of BMP-3, BTR-70, and T-72 armored vehicles, with 19,182 input variables resulting from 138x139 pixel images. A convolutional neural network was able to achieve a 97% accuracy with lower model complexity than currently exists in the literature. Automated target recognition using SAR imagery has the potential to further improve situational awareness for blue forces.

The ability to recognize statistical and machine learning opportunities in data is a learned skill, and the examples above show that the Data Analytics certificate develops this ability in students to improve personnel retention, process efficiency and situational awareness. Infusing Data Analytics expertise into subject matter experts across the Air Force and Space Force has a strong potential to increase mission effectiveness at all levels. After completing the certificate, several students have made progress towards publishing their analyses with the support of the Data Analytics faculty.

We are extremely excited by the reach our program is having throughout the Air and Space Forces. We are seeing interest from all corners of the Air Force and beyond, including new partnerships with organizations like Lawrence Livermore National Labs and the National Geospatial Agency.

**Want More Information?**

1. More information on AFIT’s Graduate Certificate in Data Analytics is available on the AFIT website at www.AFIT.edu/EN/allprograms.
2. Questions can be emailed to AFITDataAnalytics@afit.edu
3. Prospective students can apply online at www.AFIT.edu/Admissions/AFITApplicationProcess

**Dr. Brent Langhals**
AFIT Data Analytics Certificate Program Director

**FOLLOWING THE DATA**

**SUCCESS IN NUMBERS**

**2019**

- 414+ Students have taken at least one Data Analytics class
- 27 Students earned at least one Data Analytics class

**GLOBAL REACH**

The Data Analytics Certificate Program is reaching students from all U.S. Air and Space Force MAJCOMs, Airman/Guardians supporting EUCOM, INDO PACOM and USTRANSCOM, Headquarters Air Force, and over a dozen other agencies and Direct Reporting Units.

**MISSION IMPACT**

Infusing Data Analytics expertise into subject matter experts across the Air Force and Space Force has a strong potential to increase mission effectiveness at all levels. After completing the certificate, several students have made progress towards publishing their analyses with the support of the Data Analytics faculty.

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**Dr. Brent Langhals**
AFIT Data Analytics Certificate Program Director
The Air Force Institute of Technology is proud to recognize its 2021 Air Education and Training Command (AETC) Challenge Award winners. Dr. Scott L. Nykl, Associate Professor of Computer Science at the Graduate School’s Department of Electrical and Computer Engineering, took first place in the Accelerate Change Award category for the 3D virtual training application “Cyber Space Odyssey.” 1stLt Kasey Stout, Academic Program Manager and Executive Officer, and Dr. Alice Grimes, Graduate School of Engineering and Management Director of Faculty Development, were awarded second place in the ADAPT Award category for the “Facilitator Cadre Program.”

The 2021 Innovative Challenge (Challenge) was launched last November by Lt Gen Brad Webb, AETC Commander, with the aim to capture and fund innovative ideas that directly align with the Air Force Chief of Staff Gen Brown’s “accelerate change or lose” action orders and AETC Strategic Plan priorities. All of AETC was challenged to take part, and those who submitted the most innovative ideas were selected as Finalists to present their virtual pitch on April 19 to Lt Gen Webb and the AETC Selection Committee.

On May 6, Webb announced two winners from each of the three AETC Challenge categories and awarded a combined $300,000 during the annual Gathering of the Torch event. The winners will work with their wing leadership to use the funds to further advance their innovative ideas.

### Cyber Space Odyssey

**Dr. Scott Nykl**

2021 Challenge Accelerate Change Award 1st Place Winner ($75,000)

In this challenge category, winners developed innovations in direct support of CSAF Brown’s priority to “accelerate change or lose.”

Cyber Space Odyssey (CSO) is a novel, 3D virtual training application that gamifies cyber security in a live, team-oriented scenario while incorporating the most ubiquitous cyber tools in today’s arsenal. The elements create an effective and motivating training environment to increase cyber training efficacy and tempo. Specifically, it facilitates hands-on network analysis involving the capture and crafting of simple UDP network traffic to manipulate the state of a real-time 3D virtual world.

Trained levee state-of-the-art network analysis tools (e.g. Wireshark) and perform network packet crafting (e.g. UDP datagram construction). The acts of successfully capturing network traffic, decoding it, and crafting syntactically and semantically correct packets receive immediate positive reinforcement through visible changes within the 3D virtual world set in earth’s orbit. Teams compete against each other and the clock to collect intel and solve the game’s mystery. This “capture, analyze, craft, visualizes” paradigm provides a powerful and responsive pedagogical mechanism for learning enhancement.

Cyber Space Odyssey can help develop the next generation of cyber-security leaders through effective training tools and has been used at AFIT’s Advanced Cyber Education (ACE) summer ROTC training program for the past five years with excellent success.

**Col James Fees, AFIT Deputy Director & Director of Staff, presents the AETC Challenge Award to Dr. Scott Nykl (first place winner) during a virtual meeting with Lt Gen Hager, A1 Commander and President.**

### Facilitator Cadre Program

**“Our current goal is to bring Cyber Space Odyssey to the larger USAF, USCG, and greater DoD. To do this, we plan to move Cyber Space Odyssey into the cloud, making it accessible to a vast pool of future cyber defenders. We have already created a proof-of-concept implementation within Amazon’s AWS GovCloud showing the technology is feasible; but we require more software development resources to fully achieve this undertaking. Winning the Challenge and receiving support funding is a step in the right direction,” Nykl explained.**

“Competitions like this show how seriously the Air Force seeks innovative solutions to challenging problems. With Cyber Space Odyssey, being able to pitch such a ‘moonshot’ idea to the highest levels was an excellent opportunity to advance the digital prototyping and help our fellow Airmen receive the best cyber training possible. I look forward to our continued engagement with USAF/USCG leaders and delivering the best cyber education the Air Force has to offer,” Nykl said.

### 2020 STEM Award Winners Announced

Congratulations to the GSEM winners in the 2020 Air Force Science, Technology, Engineering, and Mathematics (STEM) Awards program.

**AIR FORCE-LEVEL AWARD WINNERS:**

Dr. Stephen C. Cain

Dept. of Electrical and Computer Engineering

Air Force John L. McLucas Basic Research Award

Lt Col James Rutherford

Dept. of Aeronautics and Astronautics & AFAC Air Force Outstanding Science and Engineering Educator

2d Lt Katherine E. Cheney & 2d Lt David D. King

Autonomous Unmanned Aerial Systems Team

AFIT Systems Engineering Award

**AFIT ALUMNI AWARD WINNERS:**

Capt Austin Trowey

(M.S. Systems Engineering, 2018)

Air Force Outstanding Scientist/Engineer Award – Junior Military category

Maj Michael Archer

(M.S. Electrical Engineering, 2015)

Air Force Outstanding Scientist/Engineer Award – Mid-Career Military category

Lt Col Gregory Idzopik

(M.S. Electrical Engineering, 2005)

Air Force Outstanding Scientist/Engineer Award – Senior Military category

Capt Anthony Portante

(M.S. Cyber Operations, 2017)

Air Force Research and Development Award

**AETC-LEVEL AWARD WINNERS:**

Maj Robert A. Bottiger

Dept. of Astronautics and Astronautics

AFIT Outstanding Scientist/Engineer – Mid-Career Military

Dr. Julie A. Jackson

Dept. of Electrical and Computer Engineering

AFIT Outstanding Scientist/Engineer – Mid-Career Civilian

The Center for Space Research and Assurance

AFIT Outstanding Scientist/Engineer – Team of the Year Award

Lt Col Jeffrey R. Komives

Dept. of Astronautics and Astronautics

AFIT Science and Engineering Educator of the Year Award

### 2021 AETC iChallenge Award Winners

The Facilitator Cadre Program has made great strides under Program Manager 1st Lt Kasey Stout’s leadership. Stout guided the program as it recruited and trained a team of volunteer facilitators, organized a leadership committee to guide the program, and developed a set of training goals and materials in less than a year since the program inception. These steps have been taken to ensure that facilitators are well-equipped to conduct small group discussions in the workplace. The Facilitator Cadre achieved a new milestone when it successfully conducted its first small group discussion with all members of the AFIT community on the topic of extremism during the Air Force mandated stand down on April 1.

“We really threw our facilitators in the deep-end right off the bat, and they handled it wonderfully. We learned a lot as a program for the future, but this was a significant step in our development as we now have relevant and practical experience under our belt,” Stout said.

The Facilitator Cadre Program committee is now focused on creating an online process for training, certification, and management of volunteer facilitators to address the needs of AETC. Stout and Grimes believe AETC’s program has the potential to be developed into a USAF-wide training center to train and equip military members and civilian employees alike with a foundation of facilitation skills at a minimal cost and in a relatively short period of time.

**The Air Force Institute of Technology**

2021 AETC iChallenge Award Winners

Read more about the AFIChallenge winning projects

[Read more on the AFIChallenge winning projects](https://www.afit.edu/EN/afitengineer)

[Watch a Cyber Space Odyssey instructional video](https://www.youtube.com/watch?v=h9twfj4wncI)
AFIT Research Recently Cited in IEEE Spectrum

Using Publicly-available Data to Create an Automated Satnav Interference Detection System

Lt John Stader, an Electrical Engineering master’s student with a focus on Global Navigation Satellite System (GNSS) interference detection, and Dr. Jesenjus Gurskawietrz, Research Assistant Professor of Electrical Engineering with the Autonomy & Navigation Technology (ANT) Center, authored a paper describing a system that automatically infers data from publicly available sources and applies algorithms to detect GNSS interference events. The data is sourced from the International GNSS Service (IGS), a network of over 500 satnav signal monitoring sites spanning all seven continents.

Their paper, titled “Leveraging Worldwide, Publicly-Available Data to Create an Automated Satnav Interference Detection System,” was cited in a March 2021 IEEE Spectrum article that discusses tracking GPS interferences around the world. The article follows an incident where a private pilot experienced anomalous GPS readings on final approach to an airport in California. The pilot happened to be a professor at Stanford University and was aware of research on GNSS anomalies being performed at the Stanford GPS lab.

Professor Todd Humphreys and his team from the Navigation lab at the University of Texas at Austin are exploring the detection of GNSS anomalies using low earth orbit satellites. This methodology shows promise. However, it will be at least a few years until a worldwide capability exists using this method.

The article follows an incident where a private pilot experienced anomalous GPS readings on final approach to an airport in California. The pilot happened to be a professor at Stanford University and was aware of research on GNSS anomalies being performed at the Stanford GPS lab.

As discussed in the article, the AFIT research possesses a unique advantage since the IGS stations are located across the globe and are already available. After the publication of the article, AFIT researchers went on to detect approximately 50 interference events across a subset of 15 IGS sites that occurred over a span of a single day. Incidences of satnav interference have been on the rise for the past several years, particularly with the availability of ‘personal privacy’ and other such devices available on the internet. These illegal devices have been known to disrupt essential satnav-based services over a wide area, and therefore present a threat to military operations. AFIT’s system allows continuous worldwide monitoring of satnav interference without having to deploy specialized infrastructure. Analyzing data from the system can provide situational awareness and actionable intelligence for the Air Force. Development continues to field this capability as an operational system that will benefit the warfighter.

LEARN MORE ONLINE
AFIT’s complete peer-reviewed paper is located here: https://www.ieee.org/publications/article.cfm?articleId=17826
The full IEEE Spectrum article is at: https://spectrum.ieee.org/tech-talk/aerospace/aviation/the-networks-that-aim-to-track-gps-interference-around-the-world

AFIT Earns Reaccreditation for Another Ten Years

By Katie Scott
Air Force Institute of Technology

The Higher Learning Commission reaffirmed the accreditation for the Air Force Institute of Technology for the maximum 10-year period in March 2021. As an independent organization, HLC accredits degree-granting programs at secondary educational institutions in the North Central region.

“After years of preparation and months of execution actions, we are delighted about AFIT’s HLC accreditation reaffirmation and we are celebrating it as a campus team achievement,” said Dr. Adelyke Badin, dean of AFIT’s Graduate School of Engineering and Management.

AFIT followed HLC’s Open Pathway option for reaccreditation which focuses on quality assurance and institutional improvement. An institution demonstrates that it meets the criteria for accreditation by preparing an assurance argument and completing a quality initiative project.

There are five criteria for accreditation: 1) mission, 2) integrity: ethical and responsible conduct, 3) teaching and learning: quality, resources, and support, 4) teaching and learning: evaluation and improvement; and 5) resources, planning, and institutional effectiveness.

AFIT’s QIP focused on modernizing instructional capabilities across the institute addressing five thrust areas: 1) classroom and teaching laboratory design, function, and utilization; 2) e-learning technologies for resident and distance delivery; 3) faculty and staff development programs and support infrastructure; 4) infrastructure to support advanced instructional technology capabilities; and 5) organizational structures, policies, processes, and human resources.

After AFIT’s successful completion of the QIP, the Higher Learning Commission conducted an on-site visit and found that AFIT has achieved full reaccreditation for the next 10 years. The team of external reviewers met with faculty, staff, and students to discuss AFIT’s mission, goals, and educational programs. The team also reviewed AFIT’s policies and operations to ensure that they align with the institutional standards.

This reaccreditation for another 10 years is a significant milestone for AFIT, affirming the institution’s commitment to providing a high-quality education and research environment for its students and faculty. This achievement is a testament to the hard work and dedication of the AFIT community, and it positions AFIT for continued success and growth in the future.

GSEM to Offer Non-thesis MS Degree Program to USAFA Grads Awaiting Pilot Training

By Stacy Burns
Air Force Institute of Technology

AFIT’s history of providing innovative academic programs to the U.S. Air and Space Forces continues with its announcement of a non-thesis master’s degree program option for officers in the USAF pilot training pipeline.

The Graduate School of Engineering and Management will be offering the option of an in-residence master’s program that does not require completion of a thesis to acquire a degree. This 12-month program will provide officers a quicker path to earning a STEM-related master’s degree. The creation of this program is in direct alignment with Air Force Chief of Staff Gen. Brown’s “accelerate, change or lose” proclamation.

AFIT is the first military service to offer the non-traditional MS degree option that will initially serve U.S. Air Force (USAF) pilots who are experiencing significant delays in undergraduate pilot training pipeline report dates.

“AFIT has provided a solution to the Air Force-level delay in pilot training throughout. AFIT is offering what we know best, graduate-level education, to answer that need and provide an opportunity to newly commissioned officers to obtain a MS degree benefiting the Air Force and the officer,”Col. John M. McQuade, AFIT Graduate School of Engineering and Management Dean of Students, said.

Seventy-two USAFA graduates have been accepted to the new 12-month program and are set to arrive at USAF on July 28 for in-processing. The students will start their academic progression in the fall quarter. Without AFIT’s degree program option, this group of officers would have been assigned to a training base where they would remain on “casual status” until their underwriter pilot training start date.

“AFIT enrolls officers every year from USAFA that have been accepted into GSP (Graduate School of Pilot Training) who are also in the aviation pipeline with a UPT seat. This group will be in addition to those officers. These officers are not expected to go on and become scientists and engineers in the Air Force. However, this experience will teach them problem framing, analysis, solving, and a deeper appreciation of their chosen academic discipline. All of these skills are required, whether flying a plane or not, to embody the ‘accelerate change or lose’ challenge handed to us from Gen. Brown,” McQuade explained.

AFIT’s Graduate School hopes to expand the program to include USAF ROTC in follow-on yearly offerings. This new non-thesis MS degree program options include advanced degrees in Aeronautical Engineering, Cyber Systems, Operations Research, Space Systems and Systems Engineering.
These accomplished and multi-talented women contribute to AFIT’s continued academic and research success while taking the time to mentor students who follow in their footsteps.

**Dr. Heidi Ries**

**TITLES:** AFIT Chief Academic Officer; Professor of Physics, Department of Engineering Physics

**RESEARCH AREAS OF INTEREST:** Radiation effects, nonlinear optical materials, electron paramagnetic resonance spectroscopy, and laser processing of materials.

**YEARS AT AFIT:** 21

Who or what were some of the most important influences that guided you to STEM?

My father was always reading popular science books at the dinner table, although his career was in K-12 music instruction. He encouraged my scientific interests, and never brushed off my questions. We often consulted the Encyclopaedia Britannica or other books together to find answers.

What do you consider your biggest achievement in STEM?

Successfully leading the Center for Materials Research (CMR) at Norfolk State University was my biggest achievement. What do you consider your biggest achievement or other books together to find answers.

Who or what were some of the most important influences that guided you to STEM?

Throughout undergraduate and graduate school in physics, I was fortunate to have excellent research advisors. I was given an opportunity to spend my summer between junior and senior years at Bell Telephone Laboratories Murray Hill, NJ location – where I met and interacted with top physicists. Those summer research programs continue to be instrumental in helping young people build their resumes for graduate school. Later, in graduate school, my advisor was extremely supportive and taught me how to balance the research business with academic career business. Although I was often the only female in my classes, the research support I received from my colleagues and advisor helped a lot.

Describe a favorite moment in your career.

Some of my most favorite moments were when my female PhD students surpassed me in being the experts in their studies. Unfortunately, that meant they were ready to go off on their own! It was very rewarding to be a faculty member and helping young people attain their goals. Looking back, I see my stubbornness as a useful shield to the professional discrimination. Females pursuing physics and engineering careers at the current time hopefully have an easier job in getting their achievements recognized. Pick your advisor carefully.

**What first sparked your interest in the STEM field?**

I was challenged by physics and math in high school; these academic fields were worthwhile to study since they were not just regurgitating what was in a textbook. The challenge meant they were worthwhile intellectual endeavors.

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**What was your education and career path?**

Since my high school days, I have always been fascinated by STEM which led to my PhD in Applied Chemistry in India. In the U.S., I worked as a Research Scientist at the Environmental Protection Agency and eventually found an ideal place at AFIT to continue my professional career and pursue scientific research alongside world-class experts.

What is your favorite part of your job?

Interacting and collaborating with world-class experts in science and engineering and the excitement of learning new technologies. My current organization allows me to continually grow myself technically and professionally as well as mentor the next generation of students and future scientists.

What unique qualities do you think girls and women bring to STEM?

As quoted by Salvador Dali, “Intelligence without ambition is a bird without wings.” Along with passion, leadership, and innovation, women bring ambition to STEM and inspire the next generation of women scientists, engineers, and doctors. These qualities are essential to succeed in all STEM-associated careers, eventually leading to betterment of the society.
I am extremely near WPAFB. because he lived me about applying, and saw the supplemental call to AFIT as a cadet. He encouraged, I applied Bowyer. Thanks to his in AF ROTC, Maj Rick that I had from a mentor 16

YEARS AT AFIT: 4.5

What first sparked your interest in the STEM field?
My brother’s Lego blocks, and later my own. I love trial and error, building and creating. I would take my own toys apart to optimize or hack them. There’s nothing like learning (it only took one time) that toy motors will smoke and melt if you rewire them and plug them into the wall.

Who or what were some of the most important influences that guided you to STEM?
My sister Laurie; she forged the mental model that college was just what you did. Also, a mix of rebellion and passion for engineering. My Mom told me I was wasting my time going to college; I’d just fail out and get married, why bother? What self-respecting teenager is going to let their parents be right?

What was your education and career path?
I chose engineering because I love it and the military because I wanted to serve and give back. I have had a winding path, from operations, to engineering, to program management/staff and new academia. I am where I’m at by choice, it’s a place where I am constantly learning new things and helping students grow and achieve.

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**Who or what were some of the most important influences that guided you to STEM?**

Truth be told, I was watching “Pinky and the Brain” as a child. I declared at that time I wanted to be a government scientist and take over the world, just like Pinky and the Brain. So two cartoon characters motivated me into STEM.

**How has your AFIT STEM degree helped your career?**

I arrived at AFIT as a statistician and they molded me into an Air Force engineer. AFIT taught me how to: learn, lead, fail, ask for help, and finally succeed. It was not easy, but it was invaluable.

**Lt Col Olivia Elliott, Ph.D., USAF**

Current Title: Munitions Directorate Test Lead in AFRL/RW and Deputy Program Manager Tactical Boost Glide

AFIT Degree: Ph.D., Aeronautical Engineering, 2019

**Maj Elizabeth Scherrer, USAF**

Current Title: Electromagnetic Pulse (EMP) Program Lead, AFGSC/A3C

AFIT Degrees: Ph.D., Applied Physics, 2019; M.S. Nuclear Engineering, 2013

**Who or what were some of the most important influences that guided you to STEM?**

Having an advanced degree brings instant legitimacy and I work with aircrew and missileers closely. I am on a MAICOM staff for an operational unit, and I work with aircrew and missileers closely. Having a Ph.D. in Physics brings instant legitimacy to the table. Additionally, scientists from other organizations speak differently to me once they learn about my education.

**How has your AFIT STEM degree helped your career?**

I was selected to serve as an Army FA52 which allowed me to pursue my Master’s and Ph.D. in Nuclear Physics at AFIT. My parents, they had me participating in a variety of STEM camps, extra-curricular activities, and advanced math classes. They grew up in rural Appalachia so they made sure I had every opportunity not afforded to them. When I was older, it was my high school calculus teacher and many of my professors.

**Dr. Amanda Bullock**

Current Title: Process and Data Integration Team Lead, AFRL/EZD

AFIT Degree: Ph.D., Electrical Engineering, 2013

**What advantages are there for women in the AF who earn advanced STEM degrees?**

I would not be an engineer at AFRL without my degree from AFIT. Having an advanced STEM degree as a woman in USAF since there are fewer of us apart from the rest of the USAF, but it’s even more true for women in USAF. Women bring diverse thought and diverse thought sparks innovative approaches to solving problems.

**LTC Christina Dugan, U.S. Army**

Current Title: Nuclear Disablement Team Chief, Nuclear Disablement Team – 3, 20th Chemical Biological Radiological Nuclear Explosive (CBRNE) Command, Aberdeen Proving Ground, MD

AFIT Degrees: Ph.D., Nuclear Engineering, 2018; M.S. Nuclear Engineering, 2011

**How was your education and career path?**

I graduated West Point in 2000 with a Chemistry Life Science Degree and a Nuclear Engineering track. While deployed to Afghanistan in 2007-2008 as a logistics company commander, I was selected to serve as an Army FA52 which allowed me to pursue my Master’s and Ph.D. in Nuclear Physics at AFIT.

**How has your AFIT STEM degree helped your career?**

An AFIT STEM degree has greatly strengthened my ability to solve complex problems. The problem may be research related or characterizing a component of the nuclear fuel cycle. In addition, my AFIT degree specialized in nuclear weapons and their effects, which correlates directly with my career as an Army’s Nuclear CWMD officer.

**LTC Dugan trains on glovebox sampling techniques.**

**Who or what were some of the most important influences that guided you to STEM?**

I attended the United States Air Force Academy with the goal of becoming a military pilot. In 2000, I graduated from USAFA with a bachelor’s degree in Astronautical Engineering. I went on to obtain my Master’s in Satellite Control Theory and spent eight years flying before entering the U.S. Air Force Test Pilot School where I transitioned into acquisitions as a test pilot. In 2016, I was selected to attend AFIT where I obtained a Ph.D. in Hypersonics Aerodynamics. Currently, I serve as the test lead for the Air Force Research Laboratory’s Munitions Directorate at Eglin Air Force Base in Florida.

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FEMALE FIRSTS
AT THE AIR FORCE INSTITUTE OF TECHNOLOGY

1968

FIRST FEMALE TO ENTER CIVIL ENGINEERING FIELD
Col (Ret.) Susanne Waylett (M.S. Engineering Management, 1984) was the first female to enter the civil engineer career field.

1971

FIRST FEMALE GRADUATE TO EARN PH.D.
Ann Wells is the first female to earn a Ph.D. from AFIT in Dec. 1987.

1987

FIRST FEMALE COMMANDANT
Brig Gen Paula Thomhill assumes command of AFIT from Brig Gen Matthews as AFIT’s first female commandant on Oct. 3, 2006.

2006

FIRST GRADUATE WITH ALL-FEMALE THESIS TEAM
Ms. Taylor Flaxington, an AF civilian employee, was the first student to graduate from the Graduate School of Engineering Management with an all-female thesis team. Flaxington attended AFIT through the PALACE Acquire program to study systems engineering.

2020

FIRST FEMALE CAO
Dr. Heidi Ries is selected as AFIT’s first Chief Academic Officer (CAO) in Feb. 2021. She is charged with overseeing and ensuring the highest standards of academic quality in both graduate and professional continuing education instruction and research.

2021

FIRST FEMALE CAO

DID YOU KNOW?
Lt Susanne M. Waylett (M.S. Engineering Management 1984), then Oxborough, was personally welcomed to the Air Force by the Air Force Vice Chief of Staff Gen. John C. Meyer in 1971 (shown above). In April of that year, she became the first female to enter the civil engineer career field. She went on to become the first female civil engineer squadron commander in 1987 and the first female CE to reach the rank of colonel in 1993. Waylett, who retired in 2000 as the commander of the 10th Civil Engineer Group, U.S. Air Force Academy, Colorado Springs, paved the way for other women in the career field.

NOTABLE ALUMNI
FEMALE GRADS MAKE THEIR MARK ON THE U.S. AIR FORCE

Brigadier General Rosanne Bailey, USAF, Retired
M.S. Engineering Management, 1984
Served as commander, Cheyenne Mountain Operations Center, Cheyenne Mountain AFS, CO

Colonel Eileen A. Bjorkman, USAF, Retired, SES
M.S. Aeronautical Engineering, 1986
B.S. Aeronautical Engineering, 1982
Executive Director, Air Force Test Center, Air Force Materiel Command, Edwards AFB, CA

Brigadier General Linda S. Hurry, USAF
M.S. Transportation Management, 1995
Director of Logistics, Deputy Chief of Staff for Logistics, Engineering and Force Protection, Headquarters U.S. Air Force, Arlington, VA

Major General Susan K. Mashiko, USAF, Retired
M.S. Electrical Engineering, 1986
Served as Deputy Director, National Reconnaissance Office, and Commander, Air Force Space Command Element, National Reconnaissance Office, Chantilly, VA

Ms. Claudia V. Kropas-Hughes, Ph.D.
Ph.D. Electrical Engineering, 1999
Policy advisor for technology transition activities, Air Force Materiel Command, Wright-Patterson AFB, OH.

Colonel Leigh E. Method, USAF, Retired, Senior Level Executive
M.S. Transportation Management, 1998, Distinguished Graduate
Deputy Director of Logistics, Engineering and Force Protection, Headquarters, Air Mobility Command, Scott Air Force Base, IL

“ My time at AFIT was invaluable to me. I worked with some of the best minds in the country. My career has been shaped by my time there. Air Force issues can be unique and intricate, and solving those problems requires innovative thinking, as well as a dedication to the U.S. Air Force – both of which I learned at AFIT!”

—Dr. Kropas-Hughes
Alumni Profile: Lt. Col. Proano

By Katie Scott
Air Force Institute of Technology

Lt. Col. Zac “CHAOS” Proano earned a master’s degree in applied mathematics from the Air Force Institute of Technology’s Graduate School of Engineering and Management in 2006. “I valued my time at AFIT and enjoyed being able to focus as a full-time student on active duty immediately after commissioning. It was eye-opening to experience what graduate-level work is like. It was challenging, but also a huge confidence booster,” recalled Proano. “I give full credit to [Dr. [Alvin] Liu who really helped me with my studies. They took more time with me than I would have received at a civilian university. They really helped me across the finish line, and I wouldn’t be where I am today without their guidance early in my career.”

His graduate thesis titled “Existence of Large Solutions to Non-Monotone Semilinear Elliptic Equations” focused on semi-elliptic partial differential equation theory and was published in the Australian Journal of Mathematical Analysis and Applications in 2007. The effort to research and write his thesis has proven beneficial for Proano who said “it provided me with a larger aperture academically and cognitively to succeed in a variety of missions and my career.”

Proano’s current assignment is the Analysis Branch Chief in Headquarters Air Force Strategic Planning Integration Division (AFA/BP04), where he is in charge of developing the Air Force’s 30-year resource allocation plan, “Blessed and humbled to have the opportunity to serve in all you get to see every aspect of where the Air Force is going in the future, at a very high level,” said Proano. “It’s a very challenging and rewarding assignment, especially balancing fiscal constraints and accelerating desired capabilities, but Proano and his team remain focused on bringing future high-end fight capability to the here and now much faster. “It’s rewarding to come full circle in my career and apply same analysis rigor, using the knowledge the AFIT team helped me develop,” said Proano.

Proano is also a B-52H Instructor/Evaluator WSO and most recently served as the Chief Flight Examiner for all of Air Force Global Strike Command and Deputy Division Chief for AFGSC/AST. Additionally, he served three years in a data masked assignment as an F-16 Combat WSO responsible for a $5 billion dollar portfolio of 100 classified programs. A rated Senior CWSO with 1,492 flight hours, he led initial flight testing of the MC-130W and TH-1H helicopter, flew over 70 classified programs. A rated Senior CSO with 1,492 flight hours, he led initial flight testing of the MC-130W and TH-1H helicopter, flew over 70 classified programs. A rated Senior CSO with 1,492 flight hours, he led initial flight testing of the MC-130W and TH-1H helicopter, flew over 70 classified programs.

“My education at AFIT provided an amazing foundation for my entire career,” said Proano. A foundation he would like to expand by continuing his pursuit of being an astronaut, which was a driving force for Proano joining the Air Force. In 2016 and then again in 2020, he was selected by the Air Force as an astronaut candidate to NASA.
AFIT Receives the Air Force Organizational Excellence Award

The Secretary of the Air Force and commander of AETC awarded the Air Force Institute of Technology with the Air Force Organizational Excellence (AFOEA) Award for exceptionally meritorious service for the time period of 1 July 2019 through 30 June 2020.

AFIT distinguished itself during this period as it adapted to the coronavirus pandemic and safely provided education to over 30,000 total force and foreign military allies representing the acquisition, logistics, civil engineering, medical, cyber, and other career fields. The Graduate School of Engineering and Management awarded accredited science, technology, and mathematics advanced degrees to over 300 graduates, while it continued to expand its portfolio of high-demand programs. The Institute’s research centers developed products and expertise across the Department of Defense, conducting over 23 million dollars in defense-focused sponsored research in areas to include on orbit space situational awareness, sensor development, cyber, and many others.

The Civil Engineering School enrolled 9,600 students, the School of Strategic Force Studies enrolled 2,300, and the School of Systems and Logistics graduated 16,500 students, all while converting some initial skills training to distance learning. Finally, the Civilian Institutions program managed 1,900 medical students and 600 Airmen pursuing advanced degree programs, generating over 1,000 medical and legal professionals. The distinctive accomplishments of the members of the Air Force Institute of Technology reflect great credit upon themselves and the United States Air Force.

The Secretary of the Air Force authorized the AFOEA in August 1969 to recognize the achievements and accomplishments of USAF organizations or activities. It is awarded to Air Force internal organizations that are entities within larger organizations. They are unique, unnumbered organizations or activities that perform functions normally performed by numbered wings, groups, squadrons etc.