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AIR FORCE INSTITUTE OF TECHNOLOGY GRADUATE SCHOOL OF ENGINEERING & MANAGEMENT

AFIT ENGINEER

The Graduate School of the U.S. Air Force

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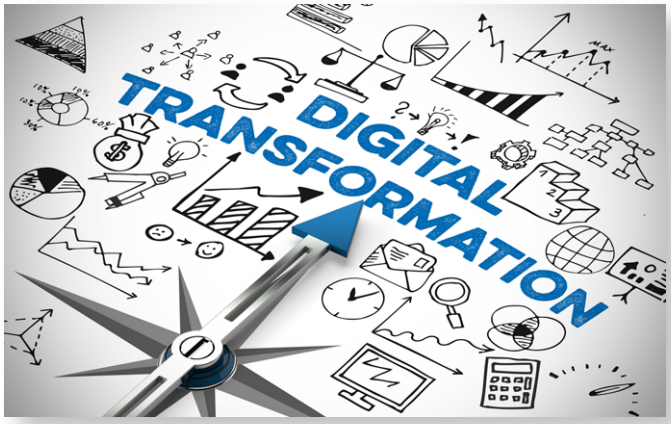
Digital Transformation

Universities Often First Adopters of Latest Technological Advancements

By Dr. Adedeji Badiru
Air Force Institute of Technology

Welcome to the digitally-themed June 2022 issue of the *AFIT Engineer.* From stone tablets to digital devices, universities around the world are transforming themselves daily, at the speed of bits and bytes. In the Summer of 2018, I was invited to lecture at Complutense University in Madrid, Spain—one of the oldest universities in the world. What I witnessed at that university made me to reflect on how universities have transformed over the centuries into what we see and enjoy today. I reflected on how my own university, AFIT, although only 100 years old, has transformed over the years in a manner akin to what has happened at universities that are over 800 years old.

The common thread in university transformations has been the exponential rise of digital platforms. Even in the early days of computerization, universities were often the first adopters of the latest technological advancements for educational purposes. I recall how AFIT's Graduate School of Engineering and Management, under my command in 2014, radically shifted from the traditional paper-based system to electronic theses and dissertations, in spite of doubts and vacillation at that time. We overcame all the Doubting-Thomas scriptures and we have never looked back. Today, AFIT students and faculty are accustomed to electronic theses and dissertations.



The most important aspect of digital transformation is that we have to jump into it and swim against the tide, if need be, onward toward a platform of better efficiency, effectiveness, and consistency. Digital transformation requires boldness to take risks, but with the comfort that digitalization under the banner of Internet of Things (IoT) is the new way of the world. To not be left behind is to keep up with the transformation going on around us. We must be in the game to win the game.

That's how the world's oldest universities have survived over the centuries. Universities of the future will increasingly operate on digital platforms and remote operations.

Continue reading on page 2

INSIDE THIS ISSUE

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www.afit.edu/EN/afitengineer

Digital Transformation of the World's Oldest Universities

(continued from cover)


Dr. Adedeji Badiru

Although the digital transformation and remote operation trend has been going on for many years, the emergence of COVID-19 pandemic expedited the movement. In just two years, universities have discovered the pedagogical power of remote delivery of education.

AFIT's commitment to digital engineering is a part of that new normal. Fully remote and hybrid deliveries will be embraced and there will be less reliance on the traditional-brick-and-mortar infrastructure of universities. This will, no doubt, expand the worldwide footprint of education. Are we ready for that digital modernization? Yes, we are. Articles in this issue of the *AFIT Engineer* show us how, within the context of national defense needs.

Please read on!

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

AFMC Leverages AFIT Toolset in Training Digital Experts

By Estella Holmes
Air Force Materiel Command

The Air Force Materiel Command continues to employ all available means to transform today's warriors into tomorrow's digital experts. Training equips Department of U.S. Air Force teams to engage as peers with industry partners.

"Command experts must be prepared to utilize and interface with the digital tools and system models which are being used more frequently by the acquisition community," said Steve Tormey, Systems Engineering Technical Expert, Air Force Life Cycle Management Center.

Training command engineers in the use of Model Based Systems Engineering (MBSE) and SysML, a systems modeling language, helps warrior-support teams more efficiently digitally design, sustain and modernize platforms. "Model Based Systems Engineering supports the Digital Campaign, and training arms members to achieve that vision," said Tormey.

MBSE is the formalized application of models at different levels of product development. An existing contract leveraged through the Air Force Institute of Technology is focused on training approximately 3,400 members of the AFMC workforce. The Model-Based Systems Engineering: Theory-to-Practice Model Creator course instructs attendees on use of the Cameo software tool for MBSE and how to create models within that software suite.

TEACHING WHAT WE RESEARCH. RESEARCHING WHAT WE TEACH.

AFIT ENGINEER
AFIT Graduate School of Engineering and Management

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AVOLVE

SAVE THE DATE:
Aug 5, Sep 2, Oct 7, Nov 4, Dec 2

Avolve Demo and Ask Me Anything

Join us to learn about Avolve and to ask any questions you might have at our virtual seminar held the first Friday of each month, 1300-1400 Eastern. For U.S. Military, DoD Civilians and DoD Contractors.

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Like YouTube, Avolve empowers Air, Space, and military professionals to directly share and collaborate with others. This enables members to determine best practices to accomplish their mission. Like Netflix, curated content provides organizations with easy to find information. Specific content can be aligned to military missions, AFSCs, geography, and more.

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Avolve content is organized by "Hubs", such as "Aircraft Maintenance Hub", or "Learning Professionals Hub". Learn how organizations can take the lead and create a new Hub that reflects their knowledge out to the rest of the Air Force and Space Force.

Questions?
Send Email to: cytcoeworkflow@afit.edu

Seminar Link
https://www.zoomgov.com/j/1619968973?pwd=VUZnV1gwUEx2WlROZ3ZZcW9PcGZ0Zz09

Contact
Please contact Rob Roseman for more information:
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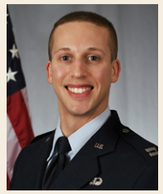
AFIT Grad Wins Prestigious USAF Cost Analyst of the Year


Captain Dakotah Hogan

Captain Dakotah Hogan, a 2020 graduate of AFIT's Cost Analysis program and current analyst at the Air Force Cost Analysis Agency (AFCAA), has been recognized as the Air Force's top Cost Analyst. The Air Force Financial Management and Comptroller Annual Acquisition Cost Analyst of the Year recognizes the acquisition cost analyst who set their self apart by demonstrating exemplary performance and service excellence. The Honorable Kristyn E. Jones, Assistant Secretary of the Air Force for Financial Management, and Comptroller and Brig. Gen. Michael A. Greiner, Deputy Assistant Secretary for Budget, presented the award.

Among Capt. Hogan's major accomplishments was uncovering a significant programming disconnect in funding/quantity for the F-35. His analysis averted a $3.7B budget shortfall across the FYDP that garnered SECAF interest. Capt. Hogan credits AFIT for providing the foundation and critical skills needed. "The AFIT Graduate Cost Analysis Program and Data Analytics Graduate Certificate Program afforded me the domain knowledge, technical skills, and critical thinking abilities necessary to hit the ground running in my current role of providing cost estimating and analysis for major defense acquisition programs at AFCAA," said Hogan.

Capt. Hogan is an AFIT Distinguished Graduate and winner of the International Cost Estimating and Analysis Association (ICEAA) outstanding cost thesis award. This award is presented to the author of the thesis which best qualifies both as an outstanding research effort and as a significant contribution to the development and/or application of cost analysis or cost accounting. Capt. Hogan published his thesis research in *Forecasting* in 2020.

Hang with Hangar 18

Aug 3, Sep 7, Oct 5, Nov 2, Dec 7

Join us to learn about Hangar 18 and to ask any questions you might have at our virtual seminar held the first Wednesday of each month, 1400-1500 Eastern. For U.S. Military, DoD Civilians and DoD Contractors.

Hangar 18 was born from a need to create an Agile approach to help the Air and Space Force communities in efficiency and deliverables in a cost-effective way. We pride ourselves on understanding our clients' needs and delivering a prototype in rapid succession. Data already exists. We take that data and get your project moving at warp speed. The new Hangar 18 is a modern symbol for inspiring technology that is "out of this world"!

Questions? Send Email to: hangar18@afresearchlab.com

Seminar Link: https://www.zoomgov.com/j/1605013208?pwd=dEZEQ1FxcElpK1ZBUkdRUHZWYjA3Zz09

Contact: Please contact Matt Jacobsen for more information:
matthew.jacobsen.1@afrl.af.mil

Reinforcing National Security Through International Collaboration

INTRODUCTION BY
DR. ADEDEJI BADIRU, DEAN
AFIT GRADUATE SCHOOL OF ENGINEERING & MANAGEMENT

As we are witnessing now in the current developments around the world, partnerships and collaboration are essential for resolving and/or preempting conflicts. No single government has the wherewithal to advance and protect its interests around the world. Consequently, it becomes very important for allied nations to establish and sustain international collaboration. The benefits of collaboration are multi-faceted and include topics such as national defense, economic advancement, intellectual exchange, and advancement of democracy. When we host exchange visitors, we are able to better understand what each partner brings to the table in areas of common interest. When a threat to national defense develops, we can count on our partnering nations for a collaborative response that is prompt and appropriate for the specific threat. I am happy to welcome Mr. Andreas Mertens to AFIT's Graduate School of Engineering and Management and look forward to a year of collaborative research endeavors between our partner nations.

Mr. Andreas Mertens presents a co-authored research paper at the 47th Dayton-Cincinnati Aerospace Sciences Symposium. U.S. Air Force photo by K. Scott

AFIT Hosts German Civil Servant as Participant of APEP Program

By Stacy Burns & Andreas Mertens
Air Force Institute of Technology

QUESTION: Describe your title/role at AFIT, the purpose and the length of your exchange program.

ANSWER: My assignment as a civil servant of the German Federal Ministry of Defense (MoD) at AFIT is based on the "Administrative and Professional Personnel Exchange Program" (APEP). This professional development exchange program, accompanied by the German Liaison Office for Defense Material USA/Canada, provides career-broadening work assignments for foreign government defense personnel in U.S. defense establishments. Thus, it serves to strengthen national military and administrative capabilities, to develop and consolidate common standards, and to produce interoperable, competitive solutions for the mission-oriented equipment of the armed forces.

APEP is designed to last one year, and during this time, I will be cooperatively involved in AFIT's processes and primarily support research initiatives of the Graduate School of Engineering and Management (GSEM). My spouse and my children are accompanying me for the whole period. Hence, not only gaining considerable work experience, but also the intercultural experience of integrating into the United States of America, is a substantial part of the assignment.

QUESTION: How did you learn of the opportunity to work at AFIT and what motivated you to take on this role?

ANSWER: A German MoD colleague of mine, a former APEP participant, strongly recommended an assignment at AFIT with its collaborative and extraordinary working environment as well as its eminent academic mission. From my point of view, the features of a successful exchange program are dedication and contribution of the participant on the one hand, and being well integrated and involved by the host institution on the other hand. In this context, AFIT is an excellent place to gather work experience, while it also provides an exceptionally integrating atmosphere.

In my application for the assignment, I specified AFIT as a preferred institution; therefore, I am very delighted that it worked out accordingly. An important factor that helped create a successful transition to this assignment, was the early contact I had with my supervisor, Dr. Adedeji Badiru, Dean of AFIT GSEM. From this early relationship, I not only learned what I could expect, but also discovered which tasks and research initiatives at AFIT best matched my academic background.

"I am focused on incorporating views and approaches from my academic discipline into engineering problem solving methodology, and thereby contributing to improved organizational efficiency, performance, and effectiveness."
— Mr. Andrew Mertens, APEP participant

QUESTION: Describe your background and the type of work you were doing in Germany before coming to AFIT. What do you hope to learn and to contribute while in the United States?

ANSWER: I have extensive experience as a government professional, having served the German Federal Armed Forces both on active military duty and as a civil servant in different administrative positions at German MoD and subordinate agencies. My business administration background and experience in project officer positions, particularly in connection with economic efficiency and optimization studies, have made my assignment at AFIT a natural fit.

In my previous position, I served as an assistant project manager of a MoD task force on the follow-up solution of the German Federal Armed Forces' organization for clothing and personal equipment management. Duties of previous stations in my civilian career with the Federal Armed Forces Administration involved strategic purchasing measurement and procurement process optimization, conducting of organizational studies as well as economic feasibility study consulting.

Participating in the exchange program has allowed me to expand my horizon of experience with the aspect of international cooperation. It has enabled me to learn firsthand from our U.S. ally and partner, and to experience efficient strategies and initiatives. As a representative not only of the German Federal Armed Forces staff, but also of my country, I am confident of my ability to contribute to mutual trust and partnership between our allied countries. Being embedded in the U.S. defense education, science and technology community, it is my honor to support AFIT's mission and to make a contribution to the U.S. military requirements and the evolvement of military capabilities.

QUESTION: What projects will you be collaborating on during your time at AFIT?

ANSWER: I am currently working with Dr. Badiru on scholarly research of international collaboration using a systems thinking approach. The overall goal is to develop and deliver work products in response to the Graduate School's mission needs. I am specifically focused on incorporating views and approaches from my academic discipline into engineering problem solving methodology, and thereby contributing to improved organizational efficiency, performance, and effectiveness.

An example that illustrates my recent contribution is a research paper collaboration on the Mathematical and Graphical Representation of Systems Integration in the trademarked DEJI Systems Model, which was developed by Dr. Badiru. I brought expertise of cost benefit analysis to this project. Not only was I involved in the creation of the joint research paper, but also in its co-presentation at the 47th Dayton-Cincinnati Aerospace Sciences Symposium. The applicability of the integrative approach of the DEJI Systems Model on multi-faceted platforms and domains allows techniques from different perspectives to be incorporated into the structured framework.

Furthermore, I am collaborating on additional journal and research papers as well as providing administrative process support for a handbook of AFIT GSEM technical journal publications.

QUESTION: Describe some of the differences in government work culture you found between Germany and the United States?

ANSWER: Our countries are strongly connected partners which share common values. I believe our similarities by far outweigh our differences—most notably due to the joint membership in NATO and the perpetual exchange of expertise. As a result, our modes of operation and workplace cultures have a mutual foundation. Furthermore, I am glad it is common for both work environments to have teams consisting of military and civilian personnel.

Nevertheless, I have experienced some dissimilarities in the field of centralization vs decentralization—specifically in administrative and support processes such as infrastructure, IT-support, recruiting and human resources management, and finance. For example, the different level of centralization influences government work culture in the way of organizational responsibilities and structure. Also, the career pathways both of military and civilian staff seem to differ.

QUESTION: What have you experienced so far that will be of benefit when you return to Germany?

ANSWER: I have found the Graduate School's implementation of MS Teams to be an effective way of optimizing day-to-day operations. The benefit of this collaborative IT-tool is the uncomplicated way it improves cooperation and efficient team communication and I expect to continue using similar integrated task progress tracking and communication systems after returning to Germany. Additionally, the professional and accommodating onboarding process I experienced at AFIT exemplified the prototype of a welcoming and effective integration for newcomers. From my perspective, a positive onboarding experience contributes to a collaborative and inclusive work atmosphere that serves a common mission by incorporating diverse views as an integral part of the culture. Experiencing the collaborative work culture of AFIT will serve me well in future assignments.

Finally, I have much respect for the exceptional mission-related focus of educational, technological and research work, programs and initiatives at AFIT, which are aligned to anticipate the requirements and to meet the challenges of the U.S. Armed Forces' missions and to advance its military capabilities.

Graduate Thesis Research on DoD Software Factories

The field of software development within the DoD has received renewed attention over the past five years as Congress and other decision-makers have made it a priority to improve how the services develop software systems. There have been a number of legislative and organizational changes that have caused a new type of acquisitions organization, the "Software Factory," to become a popular new mode with which to develop and deliver software. This new type of organization utilizes non-traditional acquisition methods and has proven itself difficult to define and at times fit within standard acquisition pathways.

AFIT MS Acquisition and Program Management graduate student, 1st Lt. Zachary Ryan's thesis research looks to help define these organizations through the use of network mapping techniques in order to identify common characteristics and provide a method of guiding future organizational development.

THESIS WORK & PUBLICATION

Lt. Ryan teamed up with AFIT faculty Dr. Mark Reith, Assistant Professor of Computer Science, and Lt. Col. Paul Beach, Assistant Professor of Systems Engineering, to perform an exploratory network analysis on a single organization to test the approach's validity and gather input and guidance from the software community. The team analyzed a single organization and wrote an article about their proposed approach which will appear in the May 2022 issue of *Crosstalk, The Journal of Defense Software Engineering*.

"I'm excited about this research because it allows me to combine my acquisitions background and my interest in software development and use that perspective to provide value to the greater DoD community," Lt. Ryan said.

DOD & AIR FORCE BRIEFINGS

In addition to submitting the article for publication, Lt. Ryan briefed two joint audiences on the approach and the team's initial results. In March, he briefed the DoD Software Factory Working Group on his project and it was positively received. As a result of that briefing, Lt. Ryan was asked to brief the Air Force Chief Software Officer's office on his work. In June, he again pitched his work, at the DoD level, at the DevSecOps Community of Practice as a part of the Hangar 18 presentation. This group also expressed positive reception.

RESEARCH IMPACTS

Lt. Ryan and his team hopes that this effort will provide the DoD with a method to guide future Software Factory development and provide a new tool to help guide strategic messaging for Software Factory organizations. This effort is the first to propose a value network mapping technique as a method to quantify and define the DoD's Software Factory organizations. Previous efforts have primarily focused on traditional cost-schedule-performance metrics so this is a novel new approach.

FUTURE GOALS

Lt. Ryan and team intends to apply this tested technique to multiple software factory organizations in an attempt to identify commonalities, value streams, and organizational relationships that would be missed with more traditional approaches. It is the team's intent to take the value maps and develop a formalized framework by which to define future and current Software Factory organizations.

"I am incredibly lucky to have advisors like Dr. Reith, Lt. Col. Beach, and Lt. Col. Koschnick who have encouraged me to pursue my inter-departmental interests," Lt. Ryan said. "The faculty have been incredibly supportive of my goals and I'm grateful to be an active part of the AFIT community."

CLICK TO LEARN MORE ONLINE

Community of Practice–Office of the Chief Software Officer, U.S Air Force

Crosstalk, The Journal of Defense Software Engineering–APAN Community

ARTICLE ABSTRACT

Over the past five years, the Department of Defense (DoD) has placed renewed emphasis on improving the DoD Acquisition System's ability to develop and manage its increasingly complex arsenal of software-centric materiel solutions. This sharpened focus on software development has led to the widespread implementation of both legislative and organizational changes that have directly impacted how Department of the Air Force (DAF) programs develop software capabilities. With the evolving acquisitions landscape, organizations have been exploring alternative business strategies that take advantage of modern development practices in order to improve organic development capabilities and more rapidly deliver secure and reliable code to end-users. A new business model, the "Software Factory", has become increasingly popular and has proven itself as a key capability enabler for many organizations. While the intent and tactical direction of the software factories are generally well understood by their parent units, exactly how these organizations fit within the larger acquisition's lifecycle and the manner by which they deliver long-term value is less clear. This article seeks to shed light on the underpinnings of the DAF's software factory ecosystem by first modeling the relationships between a single software factory and its stakeholder organizations in order to identify how value is unlocked, and then proposing a set of generalizable criteria with which to define and evaluate the greater software factory ecosystem.

Faculty, Students and Alumni Earn AF STEM Awards

Eight Air Force Institute of Technology faculty, students and alumni earned 2021 Science, Technology, Engineering, and Mathematics (STEM) Awards.

"I congratulate all our award winners, who, once again demonstrate the technical landscape of AFIT in meeting the national-defense needs of our nation," said Dr. Adedeji Badiru, dean, Graduate School of Engineering and Management. "The foundation for excellence in AFIT's Graduate School is our dedication to defense-focused graduate research. What emanates from that provides the basis for these competitive awards. I am delighted that our students, faculty, and alumni are flying the AFIT flag high everywhere."

AF Outstanding Science and Engineering Educator Award


Maj. Costantinos Zagaris

Maj. Costantinos Zagaris won the Air Force Outstanding Science and Engineering Educator Award. This award recognizes the efforts and achievements of the top Air Force instructor in the science and engineering fields, whose contributions and performance best characterize the principles of excellence in science and engineering education. Zagaris is an assistant professor of aerospace engineering within AFIT's Graduate School of Engineering and Management. He made significant improvements to three graduate level courses, updating materials and including new methods to challenge students, earning numerous accolades from students. Additionally, he taught four highly technical graduate level courses to 51 students and directly contributed to the development of future Air and Space Force leaders.

AF Science and Engineering Award, Exploratory or Advanced Technology Development – Individual Category


Lt. Col Robert Bettinger

Lt. Col. Robert Bettinger earned the AF Science and Engineering Award, Exploratory or Advanced Technology Development – Individual category. This award is given for noteworthy achievements in areas of applied research or advanced technology development (budget activity 6.2, 6.3 or equivalent) with emphasis on improving the technology readiness level, transitioning into acquisition programs, or direct fielding to operational forces. As an assistant professor of astronautical engineering within AFIT's Graduate School of Engineering and Management, Bettinger secured $500k in DOD research grants to support space-based missile defense, satellite navigation and systems engineering in 2020. A subject matter expert, Bettinger advised a graduate student in exploring the use of nighttime city lights for satellite navigation in a contested environment and received a provisional patent for the technique.

AFIT Systems Engineering Award

The Cubesat Modeling Team received the AFIT Systems Engineering Award. This award recognizes AFIT students or teams for outstanding achievements in furthering systems engineering understanding in the Department of the Air Force. The student group of **Maj. Sean Kelly, USSF, Capt. Keith Dreyer, USSF, and 1st Lt. Kyla Brown-Miller, USSF**, completed groundbreaking research as part of their systems engineering master's theses, demonstrating the use of model based systems engineering reference architectures in support of rapid prototyping of Cubesats. Their research documents an agile approach using MBSE, shortens the learning curve for new development teams, and facilitates rapid prototyping and system verification.

AFIT Alumni Receive Awards

Additionally, three alumni from AFIT's Graduate School of Engineering and Management earned awards: **Lt. Col. Joseph Lay (M.S. Systems Engineering, 2014)** received the AF Outstanding Scientist/Engineer Award–Mid-Career Military; **Maj. William Adorno (M.S. Operations Research, 2015)** received the John L. McLucas Basic Research Award; and **Maj. Eli Garduno (M.S. Applied Physics, 2014)** received the Engineering Achievement Award.

Gunawardena Recognized by NAVIGATION Journal for Top Ten Downloaded Paper of 2021

Dr. Sanjeev Gunawardena, AFIT Research Associate Professor of Electrical Engineering, was recently recognized by *NAVIGATION: Journal of the Institute of Navigation* for authoring one of the publication's top ten downloaded papers of 2021. Technical paper downloads are one of the leading indicators for measuring a paper's ultimate success in the academic world.

"Gunawardena's research in Software Defined Radios for use in Satellite Navigation continues to have tremendous impact on the Air Force, Space Force, and broader DOD," said Dr. Kenneth Hopkinson, AFIT Electrical and Computer Engineering Department Head.

Read Gunawardena's research article "ION GNSS software-defined radio metadata standard" online at https://navi.ion.org/content/68/1/11

AFIT Faculty Receive AFA Sponsored Awards

Dr. Walter Jones, Air Force Institute of Technology director and chancellor, presented the 2021 Air and Space Forces Association Wright Memorial Chapter awards to five AFIT faculty members on May 19. The awards, sponsored by the Wright Memorial Chapter 212, recognize faculty who advance aerospace power and technology through innovative efforts in education and research. The AFA has sponsored the awards since 1982.

GENERAL BERNARD A. SCHRIEVER AWARD

Dr. Steven Fiorino

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 Gen. Schriever, an AFIT alum from 1941, who organized and formed the Air Force's ballistic missile and military space program. Fiorino is a professor of atmospheric physics and director of the Center for Directed Energy within AFIT's Graduate School of Engineering and Management. He expertly led a team of over 10 scientists, engineers, and research interns, whose effort contributed to the overall goal of advancing directed energy science and technologies. Fiorino was heavily involved in the Directed Energy Professional Society over the last 10 years, while he chaired numerous technical sessions for the society's annual and systems symposia and served as the technical editor of the *Journal for Directed Energy*.

Fiorino is widely recognized throughout the DoD, academia, industry and internationally, and was recently designated as a subject matter expert for NATO SCI-264 and SCI-316 Atmospheric Effects on Laser Propagation, the Effects of High Energy Lasers Project Arrangement Atmospheric Effects on Laser Propagation, and AFRL's Directed Energy Directorate Scientific Advisory Board.

COLONEL CHARLES A. STONE AWARD

Capt. Sven Ellefson

This award is given in recognition of an individual who has made outstanding contributions to furthering the AFIT mission through new and innovative efforts involving demonstrated personal leadership. The award is named in honor of Col. 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.

Ellefson is an instructor in AFIT's Civil Engineer School teaching courses on project management, readiness, and emergency management. In his first year at AFIT, Ellefson superbly directed four courses, taught 85 lessons, and achieved over 1,500 student contact hours resulting in educating 900 total force engineers across 118 installations. He blazed a new path for the Civil Engineer School by developing new educational content for the enlisted force, an expanding demographic in the school's mission.

Ellefson leveraged his deployed and overseas construction management experiences to redesign the 10-hour introduction to project management course. These updates enabled the course to meet the newly mandated upgrade training requirements for over 25,000 enlisted engineers and provided all civil engineer professionals working on construction projects a foundational understanding of project management. His efforts contributed to a 25% increase in enlisted force students at the Civil Engineer School.

PROFESSOR EZRA KOTCHER AWARD

Capt. Danielle Tabb

This award is given in recognition of an individual who made significant contributions to curriculum or instructional development within AFIT. The award is named in honor of Col. Kotcher, the first director of AFIT and an aeronautical engineer who worked on inflight fueling and directed the development of the X-1 and X-2 jet planes.

Tabb is a project management instructor in AFIT's Civil Engineer School. She displayed unprecedented creativity to achieve student learning objectives to overcome distance learning challenges and increase student participation during pandemic operations. Using gamification tools, she authored an instructor guide for the hands-on and immersive Project Safety "Escape Room" lesson in the Air Force Civil Engineer Initial Skills course, effectively increasing student exam and homework scores from 43% to 85%.

Because of her innovative mindset, Tabb was selected to present "Synchronous and Asynchronous Project Management Gamification" at the 2022 Air Force Learning Professionals' Consortium. In addition, Tabb developed a "choose your own path" scenario for the Introduction to Project Management course that enhanced comprehension and application levels of learning for 697 students. She increased student accessibility by 80% through embedding this scenario in the learning management system.

Continued on next page

AWARDS & RECOGNITION

GAGE H. CROCKER OUTSTANDING PROFESSOR AWARD

Dr. Christine Schubert Kabban

This award is presented to the individual who made the most significant contribution to the AFIT mission through excellence in teaching, research, and service in order to maintain the excellence of AFIT's degree-granting academic programs. 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.

Schubert Kabban is a professor of statistics in AFIT's Graduate School of Engineering and Management where she teaches courses on applied statistical data analysis, applied general linear models, theory of probability, and nonparametric statistics. She exhibited outstanding leadership in classroom teaching and course development, earning her an amazing 4.78 out of five possible on the online student evaluation system. A prolific author, she published critical articles that addressed important applications that advance the Air Force, such as of protection strategies aimed at extending the lifespan of critical infrastructure elements. Schubert Kabban chaired the Graduate Applied Mathematics Curriculum Committee and served as academic advisor to all mathematics students, providing new students with wise counsel and mentorship, as she aided them in setting up their education plans.

PROFESSIONAL CONTINUING EDUCATOR AWARD

Capt. Samuel Joslin

This award is presented to the individual who made the most significant contribution to AFIT as evidenced through excellence in teaching in order to maintain the excellence of AFIT's professional continuing education academic programs.

Joslin is a mechanical systems instructor in AFIT's Civil Engineer School. In his first year, he single-handedly executed the two-instructor mechanical engineering portfolio for eight months. As the largest of the technical engineering portfolios, he directed five course offerings and taught an additional seven courses for a total of 112 hours of live instruction to 408 students. Joslin significantly revamped the Introduction to Mechanical Systems course curriculum after the original became corrupted and was no longer accessible. He created six new lessons and re-formatted an additional 13 lessons. His quick thinking and long hours saved the course for 72 students.

As the director of the officer field education portion of the Civil Engineer Officer Initials Skills course, Joslin led 15 officer cadre and 25 enlisted trainers through a seven-day contingency field training capstone that cycled 63 new civil engineer officers through 54 hours of full spectrum capabilities.

GSEM Faculty Research Receives Publication

AFIT Graduate School of Engineering & Management faculty member **Dr. Hengky Chandrahalim**, Assistant Professor of Electrical Engineering, and **Lt. Jeremiah C. Williams** (MS Electrical Engineering, 2020) recently received publication of their work titled "Multiphoton Nanosculpting of Optical Resonant and Nonresonant Microsensors on Fiber Tips" in the ACS Applied Materials & Interfaces journal. ACS Applied Materials & Interfaces is considered a respectable journal in its field as indicated by its journal impact factor of 9.2. This work was also featured as the supplementary cover art of the ACS Applied Materials & Interfaces journal (Vol. 14, Issue 17) as shown in the photo. Co-authors of the article include Joseph S. Suelzer and Nicholas G. Usechak of the Sensors Directorate, AFRL.

READ THE JOURNAL ARTICLE ONLINE

https://pubs.acs.org/doi/10.1021/acsami.2c01033

AFIT Collaborates with Air Force Orgs on STEM Projects to Advance State-of-the-art Research

By Air Force Life Cycle Management Center Public Affairs

The Air Force Life Cycle Management Center Engineering and Technical Management Directorate (AFLCMC/EN-EZ) is collaborating with Air Force Research Laboratory Sensors Directorate (AFRL/RY) and the Air Force Institute of Technology Center for Directed Energy (AFIT-CDE) to advance state-of-the-art research with a unique patented laser sensor system that measures turbulence in the atmosphere above the laser, while allowing AFLCMC Palace Acquire new hires (PAQs) and part-time interns to demonstrate STEM technology development.

The Turbulence and Aerosol Research Dynamic Interrogation System (TARDIS) is an invention of several researchers at AFRL/RY and AFIT. TARDIS detects turbulence by using a laser beam and timed sensor to measure pulse reflections from different atmospheric layers to create a profile along the beam. Knowledge of turbulence is a key parameter for optimizing long range imaging and laser propagation. The system has been built under a research collaboration between RY and AFIT-CDE. Then PhD graduate student Steven Zuraski first built a prototype system in the AFIT-CDE lab under the guidance of co-advisors Dr. Steve Fiorino, CDE Director, and Dr. Elizabeth Beecher, then AFRL/RYMT Electro-Optical/Infrared (EO/IR) Space-Based Sensing Team Lead.

U.S. Air Force photo by Steve Zuraski

TARDIS laser beam at John Bryan Observatory.

Next, under research contracts funded by AFRL/RYMT and AFIT-CDE, a real world TARDIS was constructed by leveraging an existing 24 inch quad-axis telescope located at contractor Applied Optimization's observatory facility located at John Bryan State Park. TARDIS has been operational and taking data throughout 2021. Zuraski completed his dissertation work with data collected by TARDIS and graduated in September 2021. He has also recently published two journal articles, five conference papers, and two invited talks on his research with TARDIS, one of which received "Editor's Choice" for scientific excellence and was a top download that month.

To operate a high powered laser shooting up into the sky, several approvals have to be orchestrated prior to every evening's data collection. The Laser Clearinghouse (CSpOC/SPD) has to confirm there are no celestial objects that could be sensitive to the laser orbiting overhead. The Federal Aviation Administration (FAA) has to be notified so that they can publish a Notice to Airman. In addition, the FAA requires that two human spotters be constantly scanning the sky to verify that no air traffic is coming close to the 'keep out zone' of the laser beam, and to tell operators to shut down the laser if an aircraft seems to be heading towards the laser.

Recently, several AFLCMC/EZA Avionics Engineering Division PAQs and interns volunteered to serve as laser safety spotters at the laser observatory site at John Bryan State Park. This involves working at night outside scanning the skies to locate aircraft flying around the observatory, then notifying the laser operators if the aircraft gets too close to the beam. AFLCMC interns Mahmoud Abouzahra, Jason Dong and Jennifer Swabb worked as spotters.

"Spotting at JBO [John Bryan Observatory] was a great experience! As someone interested in electro-optics, seeing the laser in action was inspirational," Swabb said. "I'm glad I got the opportunity to work with the folks at JBO and help out with the project."

AFIT-CDE and AFRL/RY have arranged for funding to continue TARDIS research throughout 2022. Future AFIT students, AFRL researchers and AFLCMC interns will benefit from the continuing collaborations and field test data that will be obtained with TARDIS and GeoFence.

READ THE COMPLETE ARTICLE ONLINE

https://www.afit.edu/news.cfm?article=0360420F

Hinged Mirror Temperature-Immune Self-Referencing Fabry–Pérot Cavity Sensors

PATENT # 11,320,596 **DATE:** May 3, 2022

INVENTORS: Dr. Hengky Chandrahalim, Assistant Professor of Electrical Engineering, and **Lt. Jeremiah C. Williams,** MS Electrical Engineering, 2020.

ABSTRACT: A passive microscopic Fabry–Pérot Interferometer (FPI) sensor includes a three-dimensional microscopic optical structure formed on a cleaved tip of the optical fighter using a two-photon polymerization process on a photosensitive polymer by a three-dimensional micromachining device. The three-dimensional microscopic optical structure having a hinged optical layer pivotally connected to a distal portion of a suspended structure. A reflective layer is deposited on a mirror surface of the hinged optical layer while in an open position. The hinged optical layer is subsequently positioned in the closed position to align the mirror surface to at least partially reflect a light signal back through the optical fiber.

ONLINE LINK: https://patentimages.storage.googleapis.com/a0/e2/16/12bdb23153113a/US11320596.pdf

Professor Awarded Patent for Spacecraft Re-entry Time Prediction System

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

Lt. Col. Robert Bettinger, assistant professor of astronautical engineering, Air Force Institute of Technology, was recently awarded a patent for his invention, "Early Warning Reentry System Comprising High Efficiency Module for Determining Spacecraft Reentry Time." The system utilizes simplified representations of both the satellite and atmosphere to predict the re-entry time of uncontrolled spacecraft with improved prediction accuracy.

"Using coarse approximation, the linear model enables increased confidence in re-entry time prediction nearly a week prior to the event without the need for exact spacecraft aerodynamics or knowledge of the solar cycle," said Bettinger, assistant professor and deputy of AFIT's Center for Space Research and Assurance.

Space professionals estimate there are more than three thousand active spacecraft of various sizes orbiting the Earth. The disposal of spacecraft from low Earth orbit in the atmosphere is important to reduce the growing population and associated risks of space debris. Not all satellite re-entries are controlled, however, and the re-entry of uncontrolled space vehicles poses a risk to both people and property.

Recent uncontrolled atmospheric re-entries of low Earth orbiting spacecraft have highlighted the necessity of accurate re-entry time and location predictions. The problem and potential hazard of re-entering "space junk" has become a global news story, such as the re-entry of the Tiangong-1 space station in April 2018 and the Long March 5 Upper Stage in mid-2021.

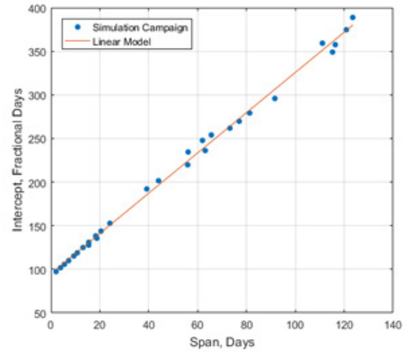
Unfortunately, re-entry time predictions are highly uncertain due to the very nature of the re-entry environment: the atmosphere. In recent decades, the inclusion of increasingly precise models for spacecraft aerodynamics and atmospheric density into re-entry prediction algorithms has improved overall prediction accuracy, but at a cost of computational complexity.

"AFIT faculty, students, and staff are conducting leading-edge research with a direct application to the immediate and long-term technical challenges facing our Nation and its allies. Patents are one important way to recognize our technical innovations and are a laudable achievement for both the inventor and the Department of the Air Force," said Dr. Walter Jones, AFIT Director and Chancellor.

In the future, the Center plans to utilize the patent for expanding AFIT's re-entry analysis program and to spur the development of enhanced models to predict the re-entry time of spacecraft in highly-elliptical orbits, such as a launch vehicle in a Geosynchronous Transfer Orbit.

The Air Force Institute of Technology, or AFIT, located at Wright-Patterson AFB, Ohio, is the Air and Space Force's graduate school of engineering and strives to be the student's first choice for advanced academic education and technical professional continuing education.

To contact the inventor of the patent, email: Robert.bettinger@afit.edu or robert.bettinger@us.af.mil



AF contributed graphic

Lt. Col. Robert Bettinger's module uses three simplified inputs: spacecraft physical shape, spacecraft aerodynamics, and atmospheric density. Shown in the diagram is an example output of the linear model. Individual re-entry time predictions (blue dots) converge to a line as the actual re-entry date approaches, and this line gives the overall prediction estimate.

> "Using coarse approximation, the linear model enables increased confidence in re-entry time prediction nearly a week prior to the event without the need for exact spacecraft aerodynamics or knowledge of the solar cycle."
>
> —Lt. Col. Robert Bettinger, Assistant Professor of Astronautical Engineering

DIGITAL ENGINEERING

Digital Engineering is the combined art and science of creating, capturing, designing, evaluating, justifying, and integrating data using digital (i.e., electronic) tools and processes. This requires the humans in the loop of the process to also have a digital mindset. With its education mission, AFIT is most suited for leading and participating in digital initiatives for the U.S. Air and Space Forces.

AFIT Poised to Lead Digital Efforts

Integration is Key for Success in Digital Implementation

By Dr. Adedeji Badiru
Air Force Institute of Technology

This article is a revisit to my previous article entitled "Digital Engineering is Foundational for the Air Force Mission" published in the March 2021 issue of the *AFIT Engineer.* (Visit www.afit.edu/en/afitengineer to read the article.) A lot more digital movement has occurred since that article. The Department of the Air Force (DAF) is even more digital-centric in 2022 and the trend is projected to continue. Are we ready to take on and utilize all that digital engineering has to offer? The answer is a resounding "Yes," judging by the recent digital-centric initiatives at AFIT and elsewhere throughout the DAF.

Unlike buzzwords of the past, digital engineering is not a fad. The proof for this can be easily seen, observed, and felt in our present-day operating environment, and can be seen and read in the coverage of this issue. The ongoing wave of artificial intelligence products, tools, and techniques are facilitated by new digital platforms. The smartphones we carry around with us demonstrate how our communication modes have been transformed on a rapid scale by digital platforms, and the phones are getting smarter with each new release. Digital engineering will continue to revolutionize operations in all aspects of our lives. Digital engineering will continue to advance how we do everything in business, education, industry, government, and the military. Any entity that is sluggish in embracing digital engineering will be left behind, cannot participate fully in emerging technological advancements, and cannot claim to be on the leading edge of innovation.

In the context of what we do at AFIT, to collaborate on digital engineering, we must all have a common understanding of what it entails. For our common understanding, digital engineering is the combined art and science of creating, capturing, designing, evaluating, justifying, and integrating data using digital (i.e., electronic) tools and processes. This requires the humans in the loop of the process to also have a digital mindset. A digital tool that is devoid of the digital readiness of humans will be for naught. So, workforce development along the digital spectrum is essential for sustainable success.

With its education mission, AFIT is most suited for leading and participating in digital initiatives for the U.S. Air and Space Forces. For digital efforts to succeed and be sustainable, we need new and novel methods, systems-based processes, and appropriately-customized tools. One tool that is being embraced both in academia and business is the trademarked DEJI Systems Model® for design, evaluation, justification, and integration (see Figure 1).

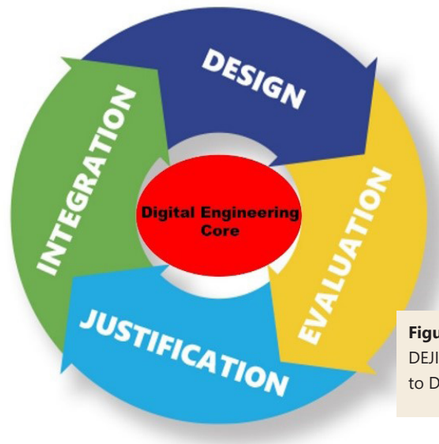


Figure 1.
DEJI Systems Model®
to Digital Engineering Integration

Integration is the key for success in any digital implementation. Any digital product must integrate into how people think and work. Otherwise, the product will be misaligned and not leveraged to its fullest extent.

The International Space Station above Earth.

As we are foraging more and more into Space, we must be cognizant of how things integrate up there in relation to here on Earth. For example, based on the emergence of digital engineering with potential applications of additive manufacturing (3D printing) on the International Space Station, we can influence the world positively from way above the Earth. Coincidentally, advanced research in 3D printing for space applications is one of AFIT's present capabilities. The International Space Station has demonstrated the possibility of collaborating nations working "peacefully" way up there.

With the spread of digital engineering, we learn new space-based disposition towards pursuing sustainable peace down here on Earth and advancing technologies that remedy environmental disasters around our world. In fact, the floating international space station can be an integrated systems platform for worldwide collaboration.

References:
Badiru, Adedeji (2021), "Digital Engineering is Foundational for Air Force Mission," *AFIT Engineer,* March 2021, p. 8.

Badiru, A. B. (2022), Systems Engineering Using DEJI Systems Model: Design, Evaluation, Justification, and Integration with Case Studies and Applications, Taylor & Francis CRC Press, Boca Raton, FL.

Digital Transformation

Improved Integration and Enhanced Insights in the Developmental Lifecycle

By Lt. Col. Amy Cox & Dr. Michael Miller
Department of Systems Engineering & Management
Air Force Institute of Technology

WHY DIGITAL TRANSFORMATION IS IMPORTANT

Digital Transformation and Digital Engineering are key topics in defense acquisitions. Many may ask "what is behind this interest" or "is this another fleeting management trend?" Like the transition from the drafting table to Computer Aided Design (CAD) in the 1980s and 90s which dramatically streamlined the engineering to production process, we are at the cusp of a similar transition. At the core of this transformation is improved integration. The models permit tracing of requirement sets to elements in systems models which interact with life cycle data and engineering models to enhance insights and create more robust tradeoffs throughout the development lifecycle. This integration and traceability, enabled by new tools, offers a means to better manage the complex systems that exist across the DoD.

Largely, the Digital Transformation triggers the following questions:

1. Why, when, and how should we pursue a future state of integrated models and data?
2. What are the costs and benefits of these integrated models?
3. How do these tools transform the way we acquire, sustain, and operate these systems?

These questions are at the heart of curriculum and research in AFIT's Graduate School of Engineering and Management.

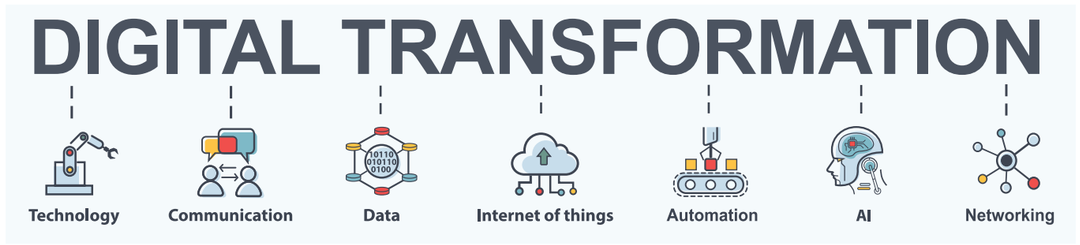
AFIT HISTORY IN DIGITAL TRANSFORMATION

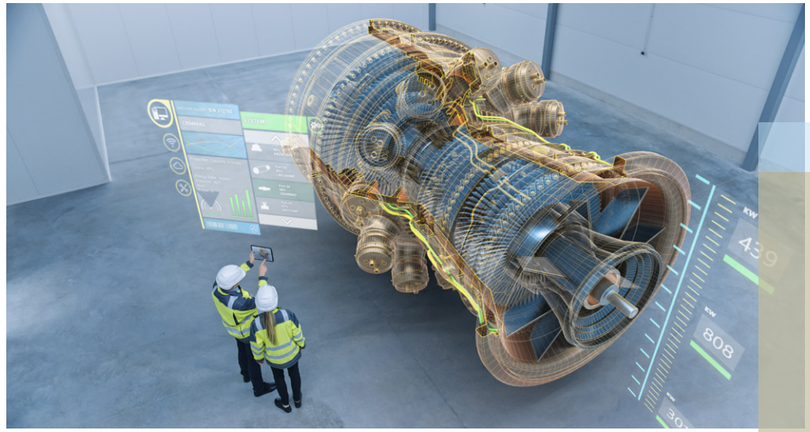
AFIT has a long history of creating and applying digital models across the graduate school to include physics-based models through operations models. These types of models are part of the Digital Transformation, the new challenge is integration of these models and data structures. How does one take data from a physics-based model (ex. kinetic weapons effects) and have them integrate with an operations model (ex. a sortie into denied airspace) and have those models trace to stakeholder requirements (ex. mission effectiveness and lethality) or perhaps to trade studies (ex. life cycle cost versus effectiveness across various architectures)?

ONGOING INNOVATIVE RESEARCH

To fulfill the promise of Digital Engineering, it will be necessary to integrate various models and modeling environments within a robust acquisition process. Recent AFIT systems research has focused on application of systems models using Model-Based Systems Engineering to explore systems to include smart munitions, aircraft, spacecraft, and maintenance systems.

Under the guidance of Dr. David Jacques and Lt. Cols. Jeremy Geiger and Warren Connell, a group of four recent AFIT graduates investigated Networked Cooperative Autonomous Systems (NCAS). By implementing digital twins of the munitions in MBSE and AFSIM, the team investigated a range of potential system architectures and behaviors. The integration of MBSE tools with AFSIM permitted the team to explore how the combinations of these tools could be used to facilitate selection of various architectures as well as to perform verification, validation, and accreditation processes. Just one of the tools developed in this research permitted an automated verification of all system interfaces to assure their compliance with published standards (minutes versus week or months); the ability to have such automated verification provides just one answer to 'what are the benefits?' The associated research with mission models considered thousands of architectures virtually, allowing more informed selection of a design.





While the NCAS research considered a future system, Lt. Col. Jeremy Geiger and his student Capt. Patrick Assef measured and quantified the hours necessary to transition legacy documentation of an ACAT III program to full structural system models. With just under 100 hours of effort, the program documentation was transferred to permit automated queries to be completed in minutes to determine the effect of eliminating interfaces, changing components, or changing interfaces.

To explore how this digital transformation changes our acquisition processes MBSE tools were applied to support both airworthiness decision factors as well as physical structure design and visualization. Dr. Tom Ford led a project in which MBSE tools were used to computationally evaluate various physical arrangements of aircraft components. These tools were integrated with Engineering Sketchpad to provide additional analyses and visualizations. This arrangement provided the ability to rapidly evaluate various sizes and placements of wings among other physical components for future aircraft designs.

The impact of these tools are not limited to system acquisition, they influence mission engineering and operations. Space related projects led by Dr. Tom Ford, Mr. David Meyer, and Lt. Col. Paul Beach included evaluation of notional space domain awareness and satellite communication architectures. These projects included the definition of space assets using MBSE software which was integrated with either Systems Tool Kit or AFSIM to model the dynamic performance of assets and to understand the benefits and deficiencies of various architectural solutions for addressing mission needs.

Besides modeling hardware and software components, work was also conducted to model human performance and support. This included research, led by Dr. Michael Miller and Maj. Joe Kristbaum that explored reference architectures for augmented reality systems to support aircraft maintenance, as well as models to analyze and guide training development. A related project led by Lt. Col. Amy Cox explored organizational structures designed to further user driven innovation through support of user toolkits. This research leveraged MBSE models to understand organizational structures, human roles, and tasks within user toolkit ecosystems described in the literature to synthesize the important roles and tasks which support user innovation using these toolkits.

Overall, AFIT research and graduate curriculum on Digital Engineering and Model-Based Systems Engineering has been designed to support the DoD's digital transformation. We are developing the workforce that can lead this transformation. We are driving research to advance our understanding of how to transform our current structures and processes. This is a transformation that spans all DoD systems; altering our acquisition processes, enhancing our insight into hardware, software, and personnel integration, and driving changes to how we ultimately carry out our missions.

"Digital transformation spans all DoD systems; altering acquisition processes, enhancing insight into hardware, software, and personnel integration, and driving changes to how we ultimately carry out our missions."

—Lt. Col. Amy Cox, Assistant Professor of Systems Engineering

Digital Literacy

AFIT Programs Target Increased Digital Literacy Across the DAF

The Department of the Air Force created a digital literacy core competency for its workforce which involves taking advantage of technologies such as high-speed information technology pipelines, cloud-hosted data repositories, cloud computing, the Internet-of-Things, artificial intelligence, and digital data management and visualization. Key to this enterprise is a workforce that has the necessary knowledge, skills, and abilities to implement these technologies, and a workplace culture that embraces them. The Air Force Institute of Technology offers education, research, and consulting targeted to making the Department of the Air Force a digital enterprise.

Digital Literacy Education at AFIT is Focused on These Six Topic Areas

"AFIT primarily approaches digital engineering in the context of conducting technical activities for managing weapon systems," said Richard Sugarman, head of the department of software and systems engineering management within AFIT's School of Systems and Logistics. "This includes concepts like model-based engineering, model-based systems engineering, multidisciplinary design analysis and optimization, and model-based simulation and analysis."

Sponsorship from the Office of the Assistant Secretary of the Air Force for Acquisition, Technology and Logistics (SAF/AQ) and Air Force Materiel Command has enabled AFIT to expand offerings. "The Graduate School of Engineering and Management has more than doubled our online capacity for core systems engineering graduate courses," said Lt. Col. Amy Cox, program chair and assistant professor of systems engineering. "In the last five years we have had well over 300 Airmen and Guardians participate in our graduate certificate program. The certificate courses provide fundamental model-based systems engineering tools."

Digital acquisition is a larger category of activities associated with managing weapon systems that includes digital engineering technical topics, plus non-technical topics such as program and project management, life-cycle logistics, contracting and contract management, and financial management. "Beyond workforce development, our research on how to transition to digital is helping blaze the trail," said Cox. "Much of the early focus has gone towards the programs that are digital natives, it has been exciting to see the transformative gains for legacy programs as they transition from document to model-based methods. Even partial and incremental adoption of digital tools has a return on investment."

Data science uses scientific methods, processes, algorithms and systems to extract knowledge and insights from structured and unstructured data. "Primary Institute activities are the graduate data science and operations research degrees offered by the Graduate School of Engineering and Management, and the data analysis continuing education courses in the School of Systems and Logistics," said Sugarman.

AFIT has a long history of cybersecurity education and has been designated as the Air Force's Cyber Technical Center of Excellence since 2008. "With respect to AFIT's role in digital literacy education, cybersecurity is largely in the context of securing information technology networks and cyber physical systems, and conducting offensive and defensive cyber warfare," explained Sugarman.

Mission engineering uses mission-focused threat-informed analyses to evaluate capability solutions, advise on development of requirements, and inform technology investment decisions. Joint All-Domain Operations integrates mission engineering across the joint force in multiple domains including air, land, maritime, cyberspace and space domains, and the electromagnetic spectrum.

> "AFIT primarily approaches Digital Engineering in the context of conducting technical activities for managing weapon systems. This includes concepts like model-based engineering, model-based systems engineering, Multidisciplinary Design Analysis and Optimization and model-based simulation-and-analysis."
>
> — Mr. Richard Sugarman, AFIT School of Systems and Logistics

Continued from previous page

"As a military organization with an education mission, AFIT's academics and research are tied to real-world Air and Space Force operations. The topics of mission engineering and JADO are widespread throughout the Institute," said Sugarman. "As the Department of the Air Force moves towards a more digital enterprise, these warfighting activities will take place increasingly in a virtual environment."

Partnerships with AFMC directorates and centers are strategically important to ensure AFIT is meeting the demand signal. "Specifically with respect to digital engineering, partnerships between AFRL and AFIT are incredibly important. One of the Air Force's newest software factories, Hangar 18, is one such coalition focused on helping organizations adopt digital engineering, agile, development, security, and operations, and related competencies," said Dr. Mark Reith, assistant professor of computer science within AFIT's Graduate School of Engineering and Management and a liaison to Hangar 18.

"One of our key initiatives with Hangar 18 is to acquire tool support to promote more education, research and consulting to Air Force units. Think of it as a 'digital engineering lab' that provides direct experience with the tools, language and methodology associated with digital engineering," said Reith.

With AFIT's recognition as a leader in graduate and continuing education, research, and consulting, it stands as a valuable asset to the DAF in improving digital literacy.

For additional information, including course and degree programs, please visit our website at https://www.afit.edu/diglit/

Dr. Reginald Turner, associate dean of the Air Force Institute of Technology's School of Systems and Logistics, speaks during the Historically Black Colleges and Universities Digital Literacy Summit at Central State University.

U.S. Air Force photo by Kenneth McNulty

Digital Literacy Summit Unites HBCUs, DAF Science, Technology Communities

By Aleah M. Castrejon
Air Force Research Laboratory
Public Affairs

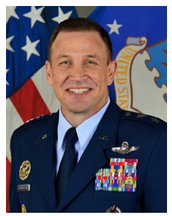
An Historically Black Colleges and Universities, or HBCU, Digital Literacy Summit, presented by the Department of the Air Force, was broadcast from Central State University in Wilberforce, Ohio, June 21-22, 2022. The summit served to bring HBCUs and DAF Science and Technology communities from the Air Force Research Laboratory and Air Force Institute of Technology together to establish channels that will strengthen collaborative agreements and research efforts in digital engineering, digital acquisitions, and big data research to address DAF challenges.

The event featured many speakers including Maj. Gen. Heather L. Pringle, commander, AFRL and technology executive officer, supporting both the U.S. Air Force and U.S. Space Force; Dr. Victoria Coleman, chief scientist of the U.S. Air Force; Dr. Michael Hayduk, deputy director, AFRL Information Directorate; retired Gen. Lester Lyles, former vice chief of staff of the U.S. Air Force and commander of Air Force Materiel Command; and Dr. Shery L. Welsh, member of the senior executive service, director of the Air Force Office of Scientific Research, or AFOSR. AFOSR is a directorate within AFRL. Dr. Reginald Turner, associate dean of the Air Force Institute of Technology's School of Systems and Logistics, hosted the event.

"This is a concerted effort by the DOD to enable HBCUs to become equal partners in solving our nation's most critical challenges," Turner said. "One key outcome of this summit is to form a task force that will deliver a plan that can be implemented to realize the seamless collaboration sought between the DAF and the HBCU Community," he added.

The summit advances the HBCU propelling agency relationships toward a new era of results for students, or PARTNERS, Act, a White House initiative aimed at addressing systemic inequities within HBCUs. The act aims to align the educational end economic competitiveness priorities; provide students at HBCUs with the highest quality educational and economic opportunities; bolster and facilitate productive interactions between HBCUs and federal agencies; and to encourage HBCU participation in and benefit from federal programs, grants, contracts and cooperative agreements.

8 Alumni General Officer Promotions



Maj. Gen. John D. Lamontagne

Air Force Maj. Gen. John D. Lamontagne (M.S. Systems Engineering, 2004) was confirmed for appointment to the grade of lieutenant general with assignment from Chief of Staff, United States European Command, Stuttgart-Vaihingen, Germany to Deputy Commander, United States Air Forces Europe, and Deputy Commander, United States Air Forces Africa, Ramstein AB, Germany.

Brig. Gen. Bradley L. Pyburn

Air Force Brig. Gen. Bradley L. Pyburn (M.S. Computer Systems, 1999) was nominated for appointment to the grade of major general. Pyburn is currently serving as the director of operations, 16th Air Force; and deputy commander, Joint Force Headquarters Cyber, Air Combat Command, Joint Base San Antonio-Lackland, Texas.

Brig. Gen. Daniel A. DeVoe

Air Force Brig. Gen. Daniel A. DeVoe (Master of Air Mobility, 2008) was nominated for appointment to the grade of major general. DeVoe is currently serving as the commander, 618th Air Operations Center, Air Mobility Command, Scott Air Force Base, Illinois.

Brig. Gen. David J. Sanford

Air Force Brig. Gen. David J. Sanford (M.S. Supply Management, 1998) was nominated for appointment to the grade of major general. Sanford is currently serving as the commander, Defense Logistics Agency- Aviation, Defense Logistics Agency, Richmond, Virginia.

Brig. Gen. Michael A. Greiner

Air Force Brig. Gen. Michael A. Greiner (M.S. Cost Analysis, 1996, DG; former AFIT faculty member) was nominated for appointment to the grade of major general. Greiner is currently serving as the director, Financial Management, Headquarters Air Force Materiel Command, Wright-Patterson Air Force Base, Ohio.

Brig. Gen. David W. Snoddy

Air Force Brig. Gen. David W. Snoddy (M.S. Information Resource Management, 1996) was nominated for appointment to the grade of major general. Snoddy is currently serving as the deputy director, Operations, J-3, U.S. Cyber Command, Fort George G. Meade, Maryland.

Brig. Gen. Evan L. Pettus

Air Force Brig. Gen. Evan L. Pettus (Master of Logistics Sciences, 2008, DG and Mervin E. Gross Award winner) was nominated for appointment to the grade of major general. Pettus is currently serving as the vice commander, U.S. Air Force Warfare Center, Air Combat Command, Nellis Air Force Base, Nevada.

Space Force **Col. Kristin L. Panzenhagen** (M.S. Aeronautical Engineering, 2004) was nominated for appointment to the rank of brigadier general. Panzenhagen is currently serving as the senior material leader, Integrated Ground Enterprise Directorate, National Reconnaissance Office, Chantilly, Virginia.

BY THE NUMBERS

32 TOTAL AFIT GENERAL OFFICER ALUMNI

2 Lieutenant Generals

17 Major Generals

13 Brigadier Generals

AFIT Ph.D.'s Embark on International Research Opportunity with AFOSR

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

Air Force Institute of Technology alumni, Maj. Grant Thomas, Ph.D. and Maj. David Swanson, Ph.D. are recent transfers to the European Office of Aerospace Research and Development, Air Force Office of Scientific Research, London, United Kingdom. AFOSR is the basic research technical directorate of the Air Force Research Laboratory supporting the United States Air Force and Space Force through the One Lab, or Two Services approach.

As a vital component of AFRL, AFOSR's mission is to discover, shape and champion basic research that profoundly impacts the future Air and Space Forces. AFOSR accomplishes its mission through global investment in advanced discovery research efforts in relevant scientific areas.

As international program officers, Thomas and Swanson are responsible for investigating new and emerging scientific research efforts in Europe and selecting the most exciting and relevant programs to receive Air Force grant funding. The technical expertise required for their current assignments was acquired through the challenges of studying and researching current Air Force topics, and establishing Air Force collaboration partnerships as AFIT doctoral students.

"My experience at AFIT's Center for Space Research and Assurance was invaluable. Both fellow students and professors have extensive experience with space topics and close ties with space collaborators and partners," said Maj. Thomas, international program officer, space science, EOARD AFOSR.

Maj. David Swanson, Ph.D. (far right), AFIT materials science doctoral alumnus, and recent transfer to the European Office of Aerospace Research and Development, Air Force Office of Scientific Research, London, United Kingdom. Pictured is a renowned European research collaborator in their laboratory that was selected to receive AF grant funding from the EOARD AFOSR.

AF contributed photo

"As an AFIT astronautical engineering doctoral student, I utilized valuable resources such as telescopes, state-of-the-art lab equipment, [access to] journal articles, etc. These resources made it possible to obtain an advanced space degree while making a significant contribution to defense-related space research solutions," said Thomas.

Since the Center was founded in 2014, more than 100 masters of science and post-doctoral degrees have been awarded in astronautical engineering and space systems engineering programs by AFIT's Graduate School of Engineering and Management. Post-graduation, 50-75% of space graduates work in space-affiliated Department of Defense organizations.

"The combination of top-notch academics, hands-on, relevant research, and collaboration with Department of Defense space organizations, provide our graduates a great foundation for technical career paths in space engineering," said Col. Tim Albrecht, AFIT CSRA director.

Although international assignments are rare, an advanced degree in space has the potential of leading to many other exciting opportunities throughout the entire DoD," said Albrecht.

The Air Force Institute of Technology, or AFIT, located at Wright-Patterson AFB, Ohio, is the Air and Space Force's graduate school of engineering and strives to be the student's first choice for advanced academic education and technical professional continuing education.

For additional information about graduate or post-doctoral degrees in astronautical engineering or space systems, please visit the CSRA website at https://www.afit.edu/CSRA/ or call 937-255-6565 extension 4753.

Maj. David Swanson

Maj. Grant Thomas

"My experience at AFIT's Center for Space Research and Assurance was invaluable. Both fellow students and professors have extensive experience with space topics and close ties with space collaborators and partners."

— Maj. Grant Thomas, Ph.D., USAF

CALENDAR EVENTS

JULY 2022

AFIT Graduate School Fall Quarter Registration Begins
5 July 2022 I AFIT Campus, WPAFB, OH

Advanced Cyber Education (ACE) Summer Course
11 July-5 Aug 2022 I AFIT Campus, WPAFB, OH

SEPTEMBER 2022

AFIT Graduate School Summer Quarter Classes End
02 Sep 2022 I AFIT Campus, WPAFB, OH

AFIT Graduate School Summer Graduation Ceremony
15 Sep 2022 I AFIT Campus, WPAFB, OH

Call for AFIT Alumni Award Nominations

In conjunction with the AFIT Foundation, AFIT is seeking nominations for three alumni awards to recognize and honor alumni who have distinguished themselves and made outstanding contributions in their career. The categories are: AFIT Distinguished Alumni Award, AFIT International Alumni Award and AFIT Young Alumni Award.

Information on eligibility, criteria, nomination procedure, timeline, and selection process for each of the awards can be found at the link below. Nomination deadline is 14 Aug 22.

https://www.afit.edu/ALUMNI/?source=GovD

GRADUATE SCHOOL MISSION & VISION

MISSION
To produce outstanding technical leaders in the Department of Defense by providing superior graduate education built on defense-focused research.

VISION
To be internationally recognized as the school of choice in engineering and applied science for defense-focused and research-based graduate education.

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