



2023 RESEARCH DIRECTORY

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INTRODUCTION



DEAN'S LETTER



RESEARCH AT USAFA

This is an exciting time at the Air Force Academy!

New construction projects, including the Madera Cyber Innovation Center, the North Gate Commons, and the planned Space Education Center are in the works. New curricula like a new Data Science major, Quantum Computing course, and Airpower Studies minor are in place. Innovation is on the rise, with 50% of the 50 patents in the Academy's 68-year history awarded in the past five years. The Academy is the number one funded undergraduate institution in the nation – we brought in more research funding last year than all of the other service academies combined.

Research is central to all of these activities. However, these data points can distract from what is truly extraordinary about our academic program: Our faculty and cadets. The Academy's military and civilian faculty are competitively hand-chosen to develop our nation's future leaders. They challenge our cadets with difficult, complex problems; many are scientific leaders in their fields.

Our cadets bring an innovative spirit and intellectual curiosity to solving complex problems that will serve them well when they graduate. The research they conduct and publish is on par with students in graduate programs, and our Air Force and Space Force will be better because of the lessons our cadets learn through research.

The Centers, Institutes, and Departmental Research Programs described in this annual research directory support USAFA cadet and faculty researchers as they set the course for our future. While our objective accomplishments and metrics are impressive, the faculty and cadet accomplishments described on the following pages are truly the hallmark of our Air Force Academy.

A handwritten signature in black ink, appearing to read 'Linell A. Letendre'. The signature is stylized with a long, sweeping underline.

Linell A. Letendre
Brigadier General, USAF
Dean of the Faculty, United States Air Force Academy

RESEARCH DATA



RESEARCH AT A GLANCE

24 Research Centers and Institutes

\$40M+ in Annual Research Funding

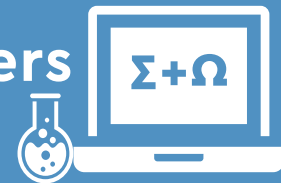


259 active national and international research agreements

34 Visiting Researchers

1K+ Research Publications Per Year

180K PreK-12 students, 7,055 teachers in STEM Outreach Program



USAFA RESEARCH FUNDING

#1 Funded Undergraduate Research Institution

USAFA brings in more research funding than the other Military Service Academies combined

\$36,478,870 FY 2022 Total Research Funding

Air Force Office of Scientific Research (AFOSR) Funding

\$4,890,528

CADET SUMMER RESEARCH PROGRAM (CSRP)



The Cadet Summer Research Program (CSRP) provides opportunities for cadets to solve relevant problems, learn through real-world application of classroom principles, and build lasting collaborative relationships with various government, academia, and industry facilities throughout the world.

Summer research has played a critical role in USAFA's mission for 52 years. Historically, 100 to 200 cadets participated in CSRP, but in recent years an increased emphasis on research and experiential learning has grown the program significantly. In 2022, 320 rising First Class cadets (seniors) enrolled in the program. Additionally, over 50 rising Second Class cadets (juniors) voluntarily gave up their summer leave to participate in CSRP. In the summer of 2022, these 370 cadets traveled to 93 locations across the world. They directly contributed to research projects such as 3-D printing bandages in austere environments, using lasers to detect atoms associated with nuclear testing, exploring biocementation in space applications, and building a program for a single operator to control multiple UASs.

Also contributing to CSRP's success is the growing number of sponsors that enthusiastically ask to host and fund cadet summer travel. Many of these sponsors stay engaged with USAFA cadets and faculty during the academic semesters that follow CSRP. The Academy is gracious for these external partners that have a lasting impact on cadet education and officer development. The Cadet Summer Research Program is centrally managed by the Academy's Office of Research. Interested cadets and hosts are encouraged to engage directly with relevant academic departments or the Office of Research.

CADET RESEARCH AT A GLANCE

370+ Cadets Participated
in CSRP

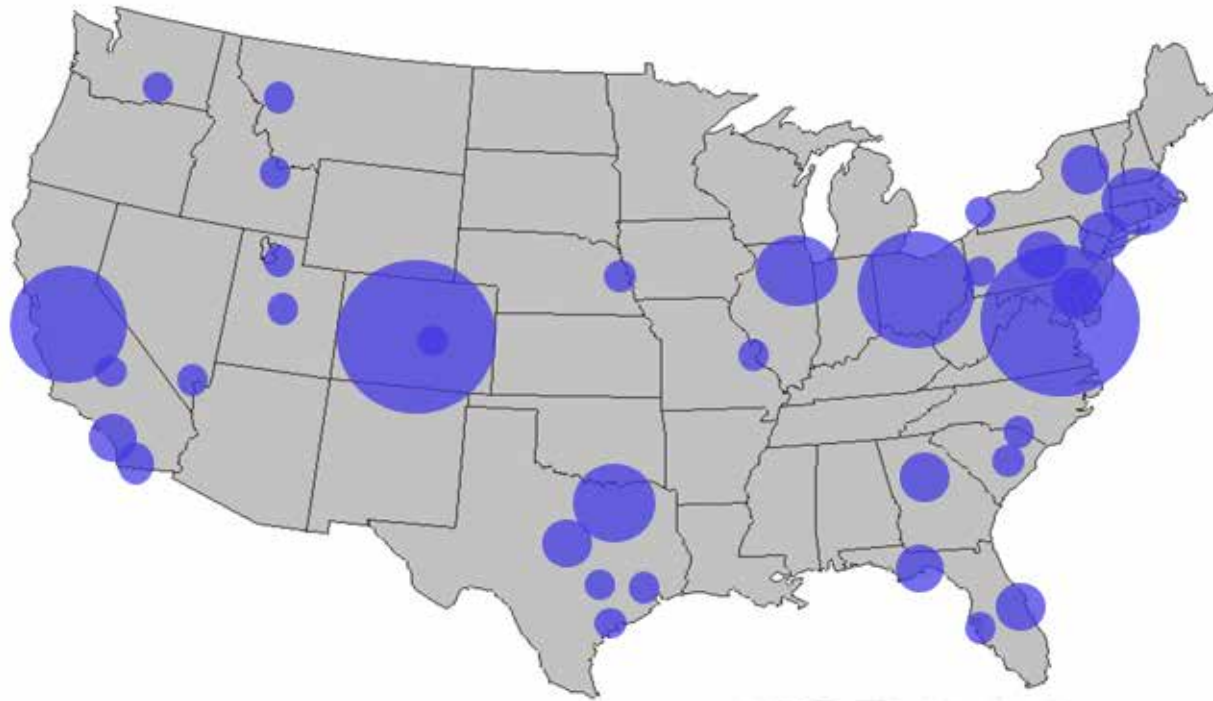


2022 CSRP Award Winners

150
CSRP CRADAs

93 Locations Across
The World

RESEARCH BEYOND USAFA



- Size of circles represent the number of collaborations in the area.
- 11 United States Air Force Academy military faculty participate in exchange programs around the world.
- USAFA military faculty are serving as Air Force Office of Scientific Research (AFOSR) International Program Officers in Santiago, Chile; Tokyo, Japan; and London, England.



2022 CSRP Locations

TECHNOLOGY, TRANSFER, AND TRANSITION (T3)

50 Patents

2 Partnership
Intermediary
Agreement
(PIAs)

3 Patent License
Agreements (PLAs)

The Air Force Technology, Transfer, and Transition (T3) Program was created to ensure Air Force science and engineering activities are transferred or internally shared with state and local governments, academia, and industry. The exchange of knowledge, expertise, equipment, and testing facilities leverages research and development investment made by the Department of Defense (DoD).

The USAFA Office of Research is a designated Air Force Laboratory and Office of Research Technology Applications (ORTA). The Office of Research supports USAFA faculty, staff, and cadets through the T3 process. In the past 5 years USAFA has submitted 30 invention disclosures and has received 30 patents.

INNOVATION IS ON THE RISE AT THE AIR FORCE ACADEMY.



Each summer we bid farewell to more than 300 cadets who travel around the world to take part in the Academy's Cadet Summer Research Program (see Pg. 6.) The participating cadets learn valuable lessons about discovery and innovation that serve them well as officers.

Cadets are also learning about innovation through their cadet-run "Spark Cell." The Air Force began these cells across the world to allow government problem solvers access to operators and an outlet for their ideas. Cadets stood up their own cell at the Academy including 40 "actualizers" throughout the cadet wing with a mission to "Inspire, promote and sustain exponential thinking and disruptive innovation."



When we think of war, images of battlefields, weapons and even space and cyber domains come to mind. However, it is likely that the future fight is currently being waged in laboratories, think tanks and spark cells across our nation to include the Academy. While our cadet innovative activities are beneficial to the future of the Air Force, it is the lessons they learn about leading innovation and the value of encouraging unbridled creativity that gives us an edge in future fights.

No metric of innovation at the Academy is more impactful than the patent productivity in the past five years. Since 2017 cadets and faculty have earned 30 patents, more than half the total patents received during the Academy's 68-year history.





DIRECTORY

AIR

Aeronautics Research Center (ARC)

The Aeronautics Research Center in the Department of Aeronautics seeks to provide every Aeronautical Engineering cadet with a meaningful research experience, employing projects supporting customers in the Air Force, DOD, other government agencies and commercial partners. The center makes use of the USAFA Aeronautics Laboratory, the best-equipped aeronautics facility in all of academia. It is complemented by a broad range of faculty and researcher expertise in aerodynamics, flight control, propulsion and flight test. These capabilities combine to produce highly motivational cadet learning experiences, quality research products for the customers, and faculty/researcher technical currency.

CORE COMPETENCIES

- Aerodynamic flow control
- Subsonic wind tunnel testing in five different facilities
- Aircraft Stability and Control
- Supersonic/hypersonic experiment and computation
- Gas turbine and combustion research
- Small air vehicle design/build/fly
- Parachute canopy development/computation

MAJOR PROJECTS

- A-10 degraded configuration flight worthiness
- Parachute Design and Optimization
- Flight demonstration of innovative flight control effectors
- Multiple UAV design/build/fly programs
- Quiet propellers and propulsive ejectors
- Supersonic vehicle aerodynamic actuators
- NASA Orion vehicle dynamic stability



Center for Aircraft Structural Life Extension (CASTLE)

The Center for Aircraft Structural Life Extension has a two-fold research mission in support of the safe sustainment of aging structures. First, to perform a wide range of research and technology development projects focused on delivering critical science and technology (S&T) data, tools and other products required to understand the impact of material degradation in structural systems for various government, academic, and commercial sponsors. Second, but no less important, to educate, train, inspire, and otherwise prepare future generations that might become the core of the S&T community within the government and the general professional population. CASTLE's core competencies, developed over more than two decades of successful research product delivery to our sponsors, fully address all aspects of the mission.

CORE COMPETENCIES

- Aircraft Structural Integrity Program (ASIP) support; component & full-scale testing, teardown analysis, flight data acquisition, root-cause analysis, modeling, etc.
- Structural re-design, material substitution, prototyping, and validation testing
- Basic research in material degradation prevention and control, OSD sponsored Technical Corrosion Collaboration between university, DOD, and commercial research groups
- Short courses, videos, science center exhibits, design challenges, college readiness programs, etc.

MAJOR PROJECTS

- Structural testing and analysis (full-scale, component level, and coupon)
- Material degradation (corrosion, cracking, etc.)
- Material processing, testing, and development
- Structural teardown analysis and root-cause analysis
- Measurement and impact analysis of operational loads, stress, and environment
- Educational outreach & curricula development

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Hypersonic Vehicle Simulation Institute (HVSII)

The Hypersonic Vehicle Simulation Institute, sponsored by the DOD High Performance Computing Modernization Program, is a national effort managed from the USAFA. The vision of this effort is to bring together disparate DOD, DOE, NASA, academic and industry hypersonic researchers to address current shortcomings and advance the state-of-the-art in hypersonic vehicle simulation. This program will enable academic and research institutions around the country to pursue advances in the ability to simulate the challenging aerothermodynamic and propulsion system phenomena—such as boundary layer transition, shock-shock and shock-boundary layer interactions, ablation, non-equilibrium chemistry and fluid/thermal/structural interactions—of hypersonic flight in order to accelerate technology development and transition into superior defense capabilities for the United States. Faculty and cadets associated with the USAFA Research Centers may compete for funding through this effort in areas such as development and evaluation of hypersonic turbulence models, and creation of experimental data sets to enable verification and validation of new simulation capabilities.

CORE COMPETENCIES

- Access to DOD supercomputing resources
- High-speed network access and local storage systems
- Partnerships with universities throughout the country for hypersonics research
- Supersonic/hypersonic experiment and computation

MAJOR PROJECTS

The first area for funding was chosen to be development of improved turbulence models for use in hypersonic flight simulations, including design and conduct of experiments that could provide validation data for these models.



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SPACE

Astronomical Research Group and Observatory (ARGO)

The Astronomical Research Group and Observatory, based at the USAFA Observatory, houses a 41-cm Ritchey-Chretien telescope, and supports the worldwide Falcon Telescope Network (FTN). A state-of-the-art 1-meter Ritchey-Chretien telescope and large-format camera system was installed in fall 2019 (pictured above), and is now fully operational. A high-resolution echelle spectrograph is scheduled for integration into the 1-meter system in fall 2020. ARGO conducts deep-space research including asteroid tracking, astronomical spectroscopy and photometry and exoplanet studies, as well as SDA research including resolved and non-resolved space object tracking. ARGO also supports the other Department of Physics research centers and grant work. Finally, ARGO hosts STEM outreach activities at the observatory for Scout groups, school groups and teachers, in partnership with the newly-reopened USAFA Planetarium.

CORE COMPETENCIES

- Deep space photometry and spectroscopy
- Space object identification and tracking
- Space object photometry and spectroscopy
- STEM education and outreach in astronomy and space science

MAJOR PROJECTS

- Search for exoplanets in support of NASA TESS Mission
- Spectroscopy of exoplanetary host stars
- SDA research with the new 1-meter telescope
- Hazardous near-Earth asteroid tracking



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Center for Space Situational Awareness Research (CSSAR)

The Center for Space Situational Awareness Research provides cadets and faculty at the United States Air Force Academy an education and research program in space situational awareness (SSA) using world-class facilities and capabilities.

CORE COMPETENCIES

- Small aperture optical telescopes for satellite characterization
- Non-imaging photometric, spectral and polarimetric techniques for characterization of un-resolved space objects.

MAJOR PROJECTS

- Development of the Academy's global Falcon Telescope Network and new 1-meter telescope
- Spectral and polarization measurements of solar panel glints from geosynchronous satellites
- Four-channel polarimeter to determine linear polarization states from un-resolved satellite optical signatures



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Laser and Optics Research Center (LORC)

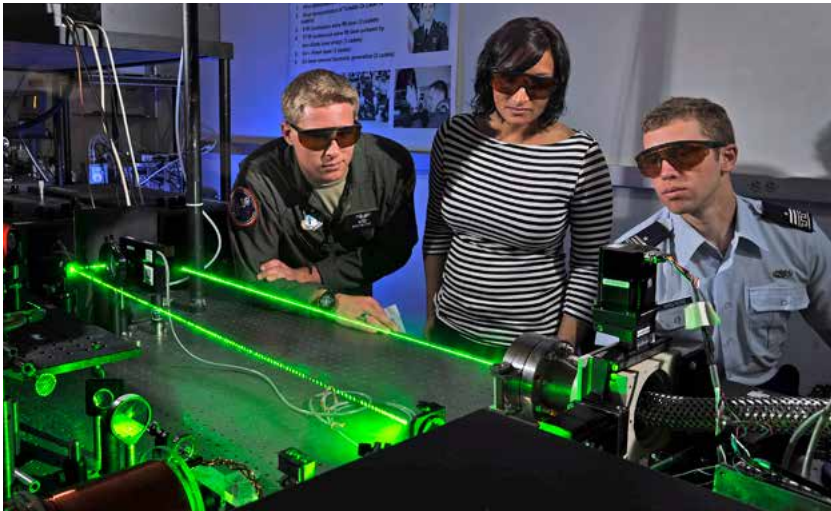
The Laser and Optics Research Center performs research in laser development, laser applications and large optics for space with cadets, faculty and contractors using a well-equipped laboratory. Lasers and large optics are increasingly used by the military for directed energy weapons, precision munitions, communications and surveillance.

CORE COMPETENCIES

- Pulsed tunable lasers
- Laser and optical test equipment
- Laser and optical modeling
- Design and fabrication of unique laboratory apparatus
- High power continuous wave lasers

MAJOR PROJECTS

- Diode pumped alkali lasers
- Fiber lasers
- Atomic and nuclear physics
- Novel materials
- Photon sieves and wavefront sensors



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Space Systems Research Center (SSRC)

The Space Systems Research Center designs, builds, tests, and flies cadet-built, DOD-backed satellites. It focuses on cadet education while achieving real DOD objectives and supports national Science, Technology, Engineering and Mathematics (STEM) educational objectives.

CORE COMPETENCIES

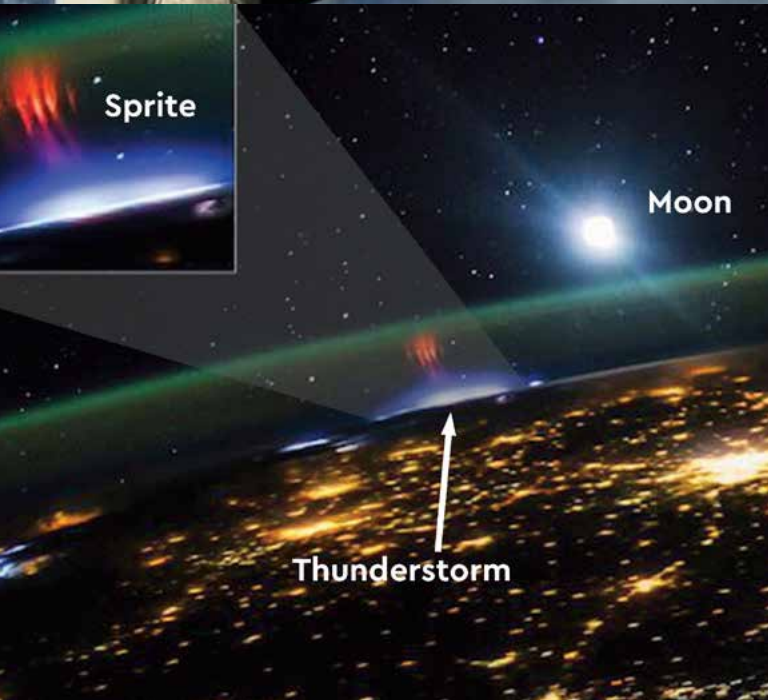
- Designing, building, testing and flying small spacecraft
- Systems engineering
- Avionics testing and simulation

MAJOR PROJECTS

- FalconSAT-X
- FalconSAT-6
- FalconSAT-8
- EyasSAT Technology Demonstrator
- Cadet Space Operations Squadron



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Space Physics and Atmospheric Research Center (SPARC)

The Space Physics and Atmospheric Research Center faculty and cadets perform basic research in the solar terrestrial environment and investigate how perturbations in that environment can negatively impact the performance and longevity of U.S. Air Force space assets. SPARC specializes in development of aggressively miniaturized payloads that fly on experimental spacecraft to make observations of the ionosphere.

SPARC then works with cadets to incorporate these measurements into the broader framework of the ionospheric system, with the long-term goal of developing physics-based predictive models eventually leading to the ability to forecast the geospace environment.

CORE COMPETENCIES

- Miniaturized payloads
- Space physics
- Applied physics

MAJOR PROJECTS

- Analysis of data from the first ever Air Force Academy Space Weather satellite constellation. Cadets analyze data from six plasma instruments flown by the Department of Defense Space Test Program (STP)
- Delivery of the Falcon Solid State Energetic Electron Detector in collaboration with the Air Force Research Laboratory
- Designing Falcon Neuro, the first ever flight in space of a neuromorphic camera. Falcon Neuro will be hosted on the to study lightning and sprites in the atmosphere below the ISS.

Academy Center for Cyberspace Research (ACCR)

The Academy Center for Cyberspace Research is the research center for the USAFA's Department of Computer and Cyber Sciences (DFCS). Through deliberate development, the faculty in the DFCS is prepared to conduct high-impact research driven by partnerships with internal research centers, operational Air Force entities, and industry. All of the ACCR projects are designed to match operational needs, industry partners, faculty expertise and cadet interest. Through this pairing we are able to create powerful capabilities that are targeted for providing a direct capability to USAF operations.

CORE COMPETENCIES

- System Security Analysis
- Artificial Intelligence and Autonomy
- Immersive Environments
- Business Process Automation

MAJOR PROJECTS

- Modern Cyber Security Operations
- Autonomous Drone Swarms
- Robotic Process Automation



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Air Force Cyberworx

Air Force CyberWorx collaborates with Airmen, academic, and industry experts to solve operational problems using human-centered and agile design methods. CyberWorx aims to resolve challenges for the Air Force with forward-looking solutions. Partnering with AF CyberWorx provides airmen and cadets with the opportunity to work with real-world practitioners, creating teaming environments that will help with their leadership skills in their Air Force careers. CyberWorx is based at the Air Force Academy to harness the ingenuity of 4,000 digital-native airmen and cadets and more than 100 Ph.D. faculty members, its vibrant research partnerships with industry, as well as the growth of the cyber business sector in Colorado Springs.

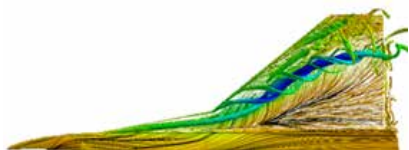
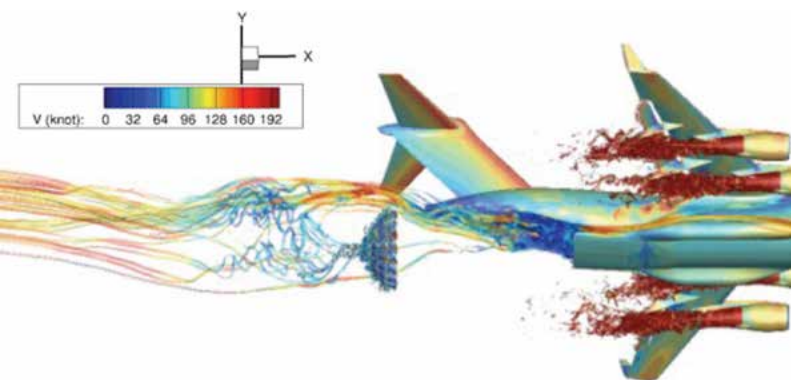
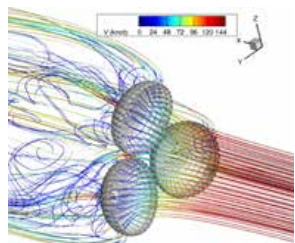
CORE COMPETENCIES

- Use industry best practices
- Collaborative design groups
- Create impactful solutions
- Rapid, low-fidelity prototyping
- Collaboration with public and private partnerships
- Educating Airmen to be innovators

MAJOR PROJECTS

- Cyber Risk Ecosystem(CRE): An AI/ML multi-domain command and control tool
- Program Unified Combat Coordinator (PUCC): A web-based application that mimics existing AF flight scheduling puck boards
- Position Navigation Timing (PNT) without GPS
- Readiness Dashboard (COP): A web application that consolidates numerous data sources into one dashboard
- Self-Healing Drone Swarm: Algorithms to establish an autonomous drone swarm
- Optimis (Flight Evaluation App): An app-based training management program that can be accessed on issued government iPads with real-time inputs that sync wirelessly to a central database.
- Software Guard Extensions (SGX)
- Autonomous Drone Swarms
- Robotic Process Automation

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High Performance Computing Research Center (HPCRC)

The High Performance Computing Research Center provides access to high performance computing resources (local and remote), high speed network access to those resources and the expertise to use them efficiently. These resources are available to all faculty, staff and cadets, regardless of academic department or discipline. As part of the Department of Aeronautics, HPCRC researchers assist aeronautical engineering majors to conduct research in computational modeling of aerodynamics and high-speed gas dynamics.

CORE COMPETENCIES

- Access to DOD supercomputing resources
- High-speed network access and local computer and storage systems
- Partnerships with local universities for HPC research
- Expertise in Computational Fluid Dynamics (CFD)

MAJOR PROJECTS

- Computational aerodynamic modeling of full aircraft for USAF and DOD
- High fidelity modeling of propeller and engine flow interactions with aircraft bodies
- CFD-based reduced-order modeling for aircraft stability and control characteristics
- Computational modeling of hypersonic vehicles
- Fluid-Thermal-Structure-Interaction (FTSI) simulations for hypersonic vehicles
- Automation of CAD & CFD from the JET Aircraft Design Tool

READINESS

Office of Labor and Economic Analysis (OLEA)

The Office of Labor and Economic Analysis is dedicated to providing labor economic analysis with the rigor necessary to define, develop, shape, sustain, and deliver an Air Force and Space Force workforce with efficiency. Products from OLEA provide senior leaders responsible for managing the Department of the Air Force's human capital portfolio with critical information in the development of strategic guidance. OLEA addresses unmet needs in personnel policy identified by senior leadership, with a focus on the application of labor economics principles and econometric analysis to understand the impacts of policy and incentive structures on the behavior of Airmen and members of the Space Force.

CORE COMPETENCIES

- Labor economic theory
- Causal empirical analysis
- Market design
- Personnel policy development and analysis
- Econometric data processing

MAJOR PROJECTS

- Matching market for initial officer job classification
- Initial officer job classification retention impacts
- Blended Retirement System retention impacts
- Rated pipeline analysis
- Valuation of Support of Military Families criteria for Strategic Basing



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Human Performance Laboratory (HPL)

The Human Performance Laboratory applies sports science principles to improve Academy athletic teams and individual cadet performance. Coaches, cadet athletes and cadets receive specific physiological information by way of testing, research, training and education. The Human Performance Lab also provides subject matter expertise on the Air Force fitness program and human performance, offering scientific data through research and exercise physiology principles. Through the use of various physiological tests, to include Dual Energy X-ray Absorptiometry (DXA) scans for body composition, Resting Metabolic Rate, VO₂max, Anaerobic Endurance, Anaerobic Power and Anaerobic Threshold, the HPL can aid athlete and cadets to improve their performance, nutritional habits and overall fitness levels. The HPL tests and trains more than 2,000 cadets and approximately 200 faculty, staff and active duty members annually while also hosting and conducting informational and educational tours for more than 150 high schools, college universities, elite athletes, professional sport teams and military personnel from all over the world.

CORE COMPETENCIES

- Physiological tests to aid athletes and cadets to improve their performance, nutritional habits, and overall fitness level, including: Dual Energy X-ray Absorptiometry (DXA) scans for body composition, Resting Metabolic Rate, VO₂max, Anaerobic Endurance, Anaerobic Power and Anaerobic Threshold
- Testing and training of more than 1,800 cadets and approximately 100 faculty and staff members annually
- Altitude Training Tent to simulate sea level to 16,000+ feet, used for interval or maximal effort training events to further adapt the skeletal muscle and improve athletic performance

MAJOR PROJECTS

- Conducting a multi-year study with Fighter Squadrons around the United States to investigate the negative physiological effects of long-duration passive and active heat stress on cognitive function and hydration status in aviator population.
- 1.5-mile Altitude Dose research study to determine if a significant difference in aerobic performance exists between five different altitudes and if it does, to what extent and if possible, determine a regression equation for each altitude to aid the Air Force in determining an appropriate correction factor at bases around the world
- Falcon Fuel continues to provide nutritious options to help fuel cadets before, during and after physical activity.

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Scholarship of Teaching and Learning (SoTL)

The Scholarship of Teaching and Learning Program represents a national and international professional movement that recognizes, publicizes, funds and advocates the scholarly approach to understanding factors that impact student learning. These factors include specific teaching techniques, incorporation of technology, factors impacting student motivation, and use of group work.

CORE COMPETENCIES

Support an academic culture of innovation and educational research by providing:

- Resources for evidence-based teaching approaches
- Opportunities to discuss and share evidence-based practices
- Guidance on research method design and ethics approval for educational research
- Support for educational research project presentation at conferences
- The Scholarship of Teaching and Learning Program represents a national and international professional movement that recognizes, publicizes, funds and advocates the scholarly approach to understanding factors that impact student learning. These factors include specific teaching techniques, incorporation of technology, factors impacting student motivation, and use of group work.

MAJOR PROJECTS

- Information security: Assessing alternative reading strategies for international security studies
- Multi-disciplinary investigation of knowledge surveys to develop student self-assessment of learning
- Exploring the impact of genetics education on racial stereotyping

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STRATEGIC STUDIES

Strategy and Warfare Center (SWC)

The Department of Military and Strategic Studies (DFMI) hosts the Strategy and Warfare Center (SWC). The two pillars of the SWC are Research and Experiential Learning. Through SWC, cadets have opportunities to engage in hands on policy-relevant research with prominent faculty, think tanks, and agencies, and collaborate with research centers at the Academy and other external agencies to solve the Services' most pressing concerns. The fully immersive Multi-Doman Lab (MDL) housed in SWC enriches cadet learning of military and strategic studies in preparation for their future roles as officers. The MDL operates using the combat snow globe concept of wargaming that allows for a flexible and scalable learning environment to allow students to develop leadership and decision-making skills while testing the merits of cooperation, competition, and conflict. Through the SWC, cadets will get their informational experiences of what modern, joint all-domain conflict looks, sounds, and feels like—and the importance of air and space power for our nation's defense.

CORE COMPETENCIES

- Air and Space Power and the Joint Force in a Multi-Domain World
- Strategic Foresight for the Future Fight
- Defense Institutional Effectiveness: Organizational and Cultural Adaptation
- Wargaming as Professional Development

MAJOR PROJECTS

- Developing Maturity Model for US military assistance programs
- Developing Correlates of War (COW) Militarized Interstate Dispute (MID) dataset, version 6
- Future of Vertical Lift Operations in INDOPACOM
- Athena Leadership Project
- Tri-Service Academy Wargaming Collaboration

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Eisenhower Center for Space and Defense Studies

Named after President Dwight Eisenhower, the first American president to establish a national policy shaping U.S. engagement in space for both military and peaceful purposes. The Eisenhower Center provides cadets and faculty with unique opportunities to participate in research and policy discussions on the future of American defense policy through first-hand contact with senior leaders and experts in the military, civilian government and private sector from the United States and major space-faring nations. Building on this foundation, the Eisenhower Center examines challenges to USAFA's National Security learning outcome across other frontiers of technology development to include cyber security and developments in hypersonic delivery vehicles. Through its journal, Space and Defense, the Eisenhower Center promotes an ongoing discussion of space and security policy issues from a broad range of professional and intellectual perspectives among academics, leading research institutes, and policy makers.

CORE COMPETENCIES

- National security policy, with an emphasis on deterrence theory, particularly in the nuclear, space, and cyber domains
- Supports teaching and scholarship related to USAFA's National Security learning outcome, including the Nuclear and Space Minors
- Collaborates with external partners such as Office of the Secretary of Defense, U.S. Strategic Command, U.S. Northern Command, U.S. Space Command, National Laboratories (Dept. of Energy), Koch Foundation, Stanton Foundation, and Center for a New American Security National Laboratory

MAJOR PROJECTS

- Sponsored cadet presenter (young leader) at Center for Strategic and International Studies – Project on Nuclear Issues (CSIS-PONI) summer 2020 and capstone 2021 meetings. Cadet earned 2021 Dean's Outstanding Cadet Researcher Award
- Supported American Defense Policy, 9th Ed. textbook (Johns Hopkins University Press, forthcoming); Space & Defense Vol. 12, Nos. 1-2; and named lectures, including former National Security Advisor H.R. McMaster (Academy Assembly 62 keynote) and author David Kilcullen (2021 Eaker Lecture)
- Administered \$14K annual Scowcroft fund to celebrate Gen Brent Scowcroft's legacy of service and support National Security outcome with national conference presentations, pre- and post-election webinar workshops on civil-military relations, and guest speakers for upper-level National Security courses

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Institute for Future Conflict (IFC)

The USAFA Institute for Future Conflict (IFC) is an integrative concept designed to enhance the capabilities and skills of all USAFA cadets and faculty in thinking about and waging the future fight. The IFC helps USAFA produce leaders of character not only versed in emerging technology, but also able to think critically about the social, historical, and philosophical implications of these developments. The IFC supports and integrates existing USAFA programs and provides resources for cadets, faculty and senior leaders to pursue high-impact learning opportunities and build deeper roots in the technological and socio-cultural demands of modern/future conflict.

CORE COMPETENCIES

- Understanding of emerging technologies: advanced computing, "bigdata" analytics, artificial intelligence, autonomy, robotics, directed energy, hypersonics, and biotechnology
- Implications of emerging technologies on strategic policy, arms control and deterrence
- Collaborates with United States Space Force, NORAD/NORTHCOM, and other external partners (MIT, Johns Hopkins, Los Alamos National Laboratory (LANL), MITRE Corp., etc.)
- Generates, cultivates, and advances scholarship on technology and the future fight
- Helps educate faculty, staff, cadets, and the wider Air Force on emerging technology and security issues

MAJOR PROJECTS

- Summer Seminars on emerging technologies, warrior ethos, diversity/demography, and the humanities
- United States Space Force Fellowship
- Visiting scholar/scientist program with LANL
- Support of MyMajors academic and career assessment program



Institute for National Security Studies (INSS)

The USAF Institute for National Security Studies (INSS) was established in 1992 to advance research and education on strategic policy issues. Its core mission is to promote a better understanding of the nuclear aspects of competition and conflict in the 21st century, although INSS sponsors work on a broad range of national security topics. It aims to prepare current and future US leaders to meet the evolving requirements for strategic stability and deterrence through independent and innovative scholarship, instruction, and outreach. INSS funds and publishes leading-edge, policy-relevant research and organizes workshops, strategic dialogues, and table-top exercises in support of Department of Defense sponsors. It contributes to the Nuclear Weapons and Strategy Minor and broader education and leadership development goals at the US Air Force Academy.

CORECOMPETENCIES

- Strategic stability, deterrence and allied assurance
- US nuclear weapons policy and capabilities
- Analyzing the strategic arsenals, operational concepts, and doctrines of nuclear-armed adversaries
- Arms control, threat reduction, and WMD proliferation
- Integrated deterrence concepts

MAJOR PROJECTS

- *China's Strategic Arsenal: Worldview, Doctrine, and Systems*, published by Georgetown University Press
- *Arms Control in a New Era of Great Power Competition*, forthcoming volume published by Lynne Rienner Publishers
- Alternative North Korean nuclear command and control arrangements: implications for US deterrence and defense planning
- Assessing Japan's evolving "nuclear sharing" debate
- After Ukraine: challenges and opportunities to strengthen regional deterrence in Eastern Europe



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Nuclear Enterprise Research Center (NERC)

The Academy Nuclear Enterprise Research Center, hosted by the Department of Physics, focuses on interdisciplinary research in support of the nuclear weapons complex. The center utilizes partnerships across the nuclear enterprise to perform cutting edge research across the nuclear science and policy spectrum. The center supports the Nuclear Weapons and Strategy Minor, and provides research opportunities for cadets of all academic backgrounds and majors.

CORE COMPETENCIES

- Ability to do Classified Research
- Nuclear Detection
- Nuclear Weapon Effects
- Countering Nuclear Proliferation
- Radiation Health Physics

MAJOR PROJECTS

- Space Dosimetry on the iMESA and FalconSEED instruments
- Noble Gas Analysis for Nuclear Forensics
- Nuclear Reactor Modelling
- Particle Distribution Modelling
- Modelling of Radiation Damage and Repair

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WARFIGHTER SUPPORT

Academy Center for Unmanned Aircraft Systems Research (ACUASR)

The Academy Center for Unmanned Aircraft Systems Research, hosted by the Department of Electrical and Computer Engineering, focuses on adding autonomy to UAS, to allow one operator to control multiple UAS that can autonomously search, find, identify and track various targets. UAS serve as an excellent platform for our cadets across various disciplines to conduct meaningful research supporting the warfighter.

CORE COMPETENCIES

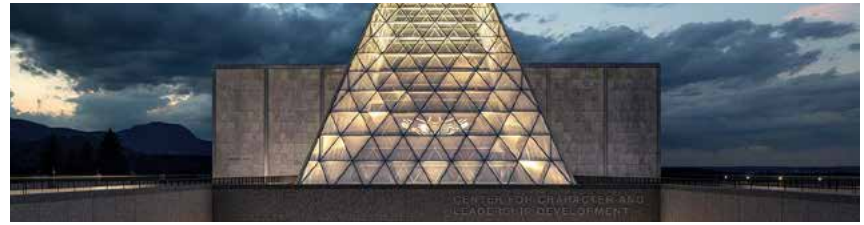
- Simulating and test flying autonomous algorithms for multiple UASs
- Sensor Fusion (EO, IR, RF)
- GPS-Denied Navigation
- Sense and avoid path planning
- Counter-UAS methods

MAJOR PROJECTS

- Won the Boeing Tri-Service Autonomous MicroUAS Swarm Challenge, defeating USMA and USNA
- Hosted a five University Counter-UAS demonstration at the USAFA
- Developed Range-Sensor and Image-based Navigation for GPS denied environments
- DARPA Service Academy Swarm Challenge Competition, a drone war fielding 25 autonomous USAFA UASs vs 25 USMA/USNA UASs



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Center for Character and Leadership Development (CCLD)

The Center for Character and Leadership Development is the Academy's most visible focal point for understanding, enhancing and integrating Academy cadet and staff efforts to achieve the essential mission of developing officers of character. CCLD conducts research and brings scholars and practitioners together to understand the evolving Profession of Arms and the changing demands of military leadership and character development. We support the developmental processes which prepare cadets to serve effectively as leaders.

CORE COMPETENCIES

- Generates and shares research, assessment and understanding of military character and leadership questions of importance
- Designs and coordinates selected professional development activities for Academy-assigned personnel, to provide for their own personal growth and to enhance cadet development
- Leverages the newly-completed Polaris Hall to support both cadet development and USAFA institutional outreach to external (USAF, DOD, national and international) discussants in character and leadership issues
- Publishes print and electronic scholarship in the field of character and leadership integration

MAJOR PROJECTS

- Publication of the Journal of Character and Leadership Development
- Executed the annual National Character & Leadership Symposium and Scholars Forum
- Continuing the "Living Honorably" Study and follow-on research activities
- Developed and delivered Permanent Party Professional Development Seminar Series and expanded offerings to include sessions on emotional intelligence, communication and feedback

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Chemistry Research Center (CRC)

The research team in the Chemistry Research Center at the U.S. Air Force Academy focuses on new chemical discoveries from to meet operational Air Force and DOD mission partner needs as well as private partnerships with academia and industry. CRC and the Department of Chemistry faculty have proven success through external partnering with academia, industry and national laboratories in order to leverage an expanding technology base.

CORE COMPETENCIES

- Advanced materials and composites processing and fabrication
- Robust small molecule, biomolecular and macromolecular synthesis and characterization
- Molecular computational modeling and simulation for predictive chemical properties
- Senior and post-doctoral associates and faculty with a broad spectrum of specialties to adapt to the ever-changing world of chemistry challenges
- Support expanding DFC cadet research, faculty professional development, and pedagogical innovation through grant management and resource allocation

MAJOR PROJECTS

- Light harvesting material for new solar/green technologies towards federal zero net energy goals
- Stimuli-responsive coatings for the development of chemical warfare nerve agent detection
- High temperature resins and high strength fibers for next-gen solid rocket motor case composites
- Metallized composites from additive manufacturing towards structural energetics for propellants with tunable energy output



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Life Sciences Research Center (LSRC)

The Life Sciences Research Center's primary mission is to support the Air Force Office of Scientific Research (AFOSR) and the Defense Health Agency (DHA) through faculty and cadet research efforts. The main objective of the LSRC is to develop basic research within a broad range of biological sciences topics. Multidisciplinary, there are two main research thrusts which include biomedical and Natural Materials and Systems.

CORE COMPETENCIES

- Interrogating select cell lines for microbiome research
- Engineering biology – cultivating/isolating select extremophile cyanobacteria towards creating new synthetic biology tools under various environmental conditions for materials synthesis
- International Genetically Engineered Machine (iGEMs) competition

MAJOR PROJECTS

- Natural Materials and Systems – isolate extremophiles with interesting and robust mechanisms in order to harvest genetic parts from unusual chemistries/phenotypes found in nature, such as desiccation, biostasis, radiation resistance, etc., and impart those phenotypes into different biosystems for materials synthesis and/or synergistic functionalities.
- Biomedical – iGEMs research, develop an inexpensive synthetically (genetically engineered) modified E. coli organism based system to detect Perfluorinated Compound contamination in area water supplies. Microbiome research, investigating candidate intestinal short chain fatty acids and their potential utility

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Warfighter Effectiveness Research Center (WERC)

Since 2015, the WERC's motto has been "developing tomorrow's leaders with today's warfighter research". Cadets, faculty, staff, and external collaborators engaged in this research conduct basic and applied studies in human-machine teaming, trust in autonomy, the science of influence and the will to fight, ethical and trustworthy social robotics, wearable technology, and use of virtual and mixed reality systems in training and operations. As part of the Department of Behavioral Sciences and Leadership, the WERC examines human, team, and organizational performance with these new tools and artificial teammates in laboratory and real-world mission environments. Current collaborators include government laboratories, academia, industry and military operators— all dedicated to the same warfighter-focused approach to science and technology.

CORE COMPETENCIES

- Systematically develop cadets to think more scientifically, innovatively design technology and operate on the battlefields of future conflict
- Fuse interdisciplinary methodologies to understand and develop future human-autonomy systems for effective and ethical performance
- Integrate robust objective, subjective, and physiological measurement of concepts, strategies, and technologies into real-world mission environments
- Understand the social, psychological, and physiological mechanisms of influence and assist with its use in the human/information domain

MAJOR PROJECTS

- Robots as ethical social agents in human-machine teaming contexts
- Autonomous driving using the Tesla Research Vehicle
- Future Warrior: Wearable Technology & Human State Monitoring
- Pilot Training Next – Experimental: Using VR and XR in future training
- Cross-cultural research towards understanding the will to fight and assisting real-world influence operation

The background of the slide is a dark blue anechoic chamber with a grid of pyramid-shaped acoustic absorbers. In the center, two astronauts in flight suits are working on a red model of a spacecraft component mounted on a metal stand. The lighting is dramatic, highlighting the astronauts and the model against the dark, textured background.

OTHER DEPARTMENTAL RESEARCH

Department of Civil and Environmental Engineering (DFCE)

The Department of Civil and Environmental Engineering produces problem solvers, meeting the challenges of environmental degradation, building and improving infrastructure, energy needs, natural disaster responses, sustainable development and community planning by improving the full spectrum of the built environment.

CORE COMPETENCIES

- Fully functional soils laboratory
- Static structural testing capability via a 25-foot-long reaction floor and multiple hydraulic actuators
- A high-bay laboratory space with a 5-ton crane and multiple universal testing machines
- Extensive experience with multiphase flow simulation techniques

MAJOR PROJECTS

- Forest service bridge design and construction
- Screening-level modeling of bioenhanced dissolution in field-scale bioremediation remedies
- Tools for the prediction of PFAS transformation, transport and retention in AFFF source areas
- Use of energy foundations to provide geothermal heating and cooling to buildings
- Integrating responsible engineering and local knowledge to design, implement and evaluate sustainable engineering solutions in Latin America



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Department of Electrical and Computer Engineering (DFEC)

The Electrical and Computer Engineering Department complements its rigorous and diverse course of study with a wide variety of immersive research projects. Each cadet is required to select a capstone project and contribute meaningfully to the advancement of the state-of-the-art in their chosen depth area. Each of the Department's research projects applies directly to a current challenge within the Department of Defense or commercial sector. These projects both integrate concepts from technical courses, while building systems engineering and project management skills, paving the way for success in the world's most technologically advanced Air Force, whether as Pilots, Developmental Engineers, or any other career field.

CORE COMPETENCIES

- Electronic Warfare
- Robotics
- Assistive Technology
- Power Electronics and Power Systems
- Target detection and tracking
- Autonomy
- Machine Vision

MAJOR PROJECTS

- Electronic Cyber Warfare
- Cyber Assessment of Critical Infrastructure Vulnerabilities
- IEEE Autonomous Robotics Team
- Detection, Tracking, and Mitigation of small Unmanned Aerial Systems (sUAS)
- Offensive applications of sUAS

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Department of Economics and Geosciences (DFEG)

The Department of Economics and Geosciences (DFEG) combines economics and geosciences. The use of mathematical models and econometrics develops cadets' skills in critical thinking, scientific reasoning and data analysis. Geography is the study of people, place and their interactions and the use of geospatial tools such as Geographic Information Systems (GIS) and remote sensing to aid in solving problems ranging from geospatial intelligence to environmental studies. The department also supports the Foreign Area Studies and Operations Research majors. DFEG faculty are also involved in research projects for the Office of Labor and Economic Analysis (OLEA).

CORE COMPETENCIES

- Applied Microeconomics including Economics of Education, Environmental, Sports, Defense, Labor and Public Economics
- Experimental and Behavioral Economics
- Physical and Human Geography and Geospatial Science
- Geospatial technologies including Cartography, Geographic Information Systems (GIS), and Remote Sensing

MAJOR PROJECTS

- Publications in academic journals and presentations at scholarly conferences
- USAFA academic probation, academic advising, cadet pay and their effects on student outcomes
- US Thunderbirds performances and USAF retention/reenlistment
- Remote Sensing (including UAS) and GIS Environmental Research

Department of History (DFH)

DFH connects the past and the present, sharpening analytical and critical thinking skills through the study of history. Both faculty and cadets conduct research is vibrant and thoughtfully engages US, military, and global perspectives. Cadet research, which regularly includes travel to archives and historic sites, culminates in a two-semester capstone experience and the writing of a senior thesis. Faculty research not only leads to the production of numerous scholarly works, but also enhances faculty members' teaching and mentoring of cadets.

CORE COMPETENCIES

- Critical thinking and analytical skills.
- Effective spoken and written communication.
- Research opportunities for cadets and faculty mentorship of cadet research.
- Faculty research, publications, participation on editorial boards, and presentations at conferences and public events.
- Faculty affiliations with the American Historical Association, the Society for Military History, the Society for French Historical Studies, the Society for Historians of American Foreign Relations, the Organization of American Historians, the American Society for Ethnohistory, the Society of Civil War Historians, the African Studies Society, and the World History Association.

MAJOR PROJECTS

- 14 CSRP slots for History and FAS-History cadets.
- 22 cadets took part in a two-day Holocaust, Genocide, and Prevention of Mass Atrocities Workshop with the US Holocaust Memorial Museum.
- 11 cadets took part in CSURF 2021: Jackson Ayers, Maria Gasparovich, Lily Selvaggi, Abby Asplund, Andrew Hootman, Hunter Myszka, Cole Resnik, Mark Schell, Audrey Phillips, Angelo Capriola, and Jonathan Myles.
- 2020-2021 Wilson Center China Faculty Fellow
- Faculty publications in Middle East Studies, Journal of Intelligence and Counter-intelligence, War on the Rocks, Journal of Character and Leadership Development, Journal of West African History, Innovations in Higher Education Teaching and Learning, International Journal of Naval History, and The Handbook of Latin American Studies.

Air Force Humanities Institute (AFHI)

This interdisciplinary organization offers a wide array of programs, lectures, interviews, art exhibits, fine art performances, seminars, colloquia, and discussions aimed at fostering cross-disciplinary conversation and exchange. AFHI allows USAFA faculty and cadets a forum for exploring a range of diverse intellectual traditions and paradigms that enrich our understanding the human condition.

CORE COMPETENCIES

- Examining the intersections of art, literature, technology, history, culture, science and ethics
- Promoting interdisciplinary dialogue about perennial questions bearing on the human condition
- Fostering cross-talk between STEM and the Humanities
- Facilitating creativity and ethical reflection through fine art, imaginative literature, history, philosophy and foreign language
- Providing professional development and research opportunities for faculty and cadets'

MAJOR PROJECTS

- Lectures
- Speakers
- Critical Conversations for cadets
- Interdisciplinary faculty conversations & colloquia
- Performing arts presentations & studio art exhibits
- Faculty development seminars
- Returning warrior & veteran outreach



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Department of English and Fine Arts (DFENG)

Research in the Department of English and Fine Arts takes many forms: Faculty publications and conference presentations, cadet research under faculty mentorship, an international footprint with the journal *War, Literature and the Arts*, and a new Digital Humanities Center advancing techniques of archival analysis.

CORE COMPETENCIES

- Research and scholarship for professors and cadets
- Digital Humanities

MAJOR PROJECTS

- 2019: Cadet First Class Manzi Masozera conducted research at the Library of Congress, the National Archives, the National Museum of African American History and Culture, and the African American Civil War Museum. Under the guidance of Professor Greg Laski, Cadet Masozera's research focused on United States Colored Infantry during the Civil War
- 2019: Cadet First Class Sarah Schwartz interned at the Air Force Entertainment Liaison Office in Los Angeles, exploring the intersection of service and public relations
- 2018 Cadet First Class Grace Skidmore conducted archival research in the Vladimir Nabokov Collections at Cornell University, which resulted in her winning the Humanities Division Moore Award for Outstanding Cadet Summer Research
- 2018 Cadet First Class Taylor Yucus attended the American Institute of Political and Economic Systems at Charles University in Prague
- 2018 Cadet First Class Kathleen Kohler researched Samuel Beckett's manuscripts at the University of Reading (UK)

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Department of Foreign Languages (DFF)

Research and faculty development in the Department of Foreign Languages is about encouraging innovative, interdisciplinary research and teaching at once, while paying due attention to the details of a particular topic without losing sight of the larger questions raised by history, literature, philosophy and the study of language and cultures. Today's officers from all Air Force career fields and specialties will find themselves globally engaged. The Department of Foreign Languages & International Programs provides future officers with broad-based, foreign area-related skills for worldwide service commitments.

CORE COMPETENCIES

- Educational and developmental resources for teachers and cadets
- Research publications and scholarly presentations for teachers and cadets
- Faculty hold memberships in various professional organizations including: Colorado Congress of Foreign Language Teachers, Southwest Conference on Language Teaching, American Council on the Teaching of Foreign Languages, and Modern Language Association
- Cadets can study Arabic, Chinese, French, German, Japanese, Portuguese, Russian or Spanish—eight of the most important languages in the world.

MAJOR PROJECTS

- Cadet Summer Language Immersion Program (CSLIP)
- Cadet Semester Exchange Abroad Program (CSEAP)
- Cadet Semester Study Abroad Program (CSSAP)
- Foreign Academy Visit (FAV) Program
- Cultural Immersion Program (CIP)



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Department of Law (DFL)

The Department of Law uses the law as a vehicle to fine-tune cadets' critical thinking and communication abilities, preparing them to think through and develop clear solutions for the complex challenges they will encounter throughout their careers. Along with educating cadets, DFL also has two research efforts – the Law, Technology, and Warfare Research Cell (LTWRC) and the Leadership and Appropriate Dispute Resolution (LADR) Program. The LTWRC researches the law related to the use of technology in military operations. The LADR Program is a center for thought leadership in managing and resolving conflict in the mil-mil, mil-civ, and international domains.

CORE COMPETENCIES

- Critical Thinking
- Effective Communication
- Law of War/International Humanitarian Law
- Legal Use of Technology in Warfare
- Negotiations and Appropriate Dispute Resolution

MAJOR PROJECTS

- Participation in International Humanitarian Law, Negotiation, and Cyber Policy undergraduate competitions
- Collaboration with USSPACECOM and USCYBERCOM on researching the legality of military operations in those domains
- Facilitating undergraduate legal research opportunities
- Leading Air Force wide conflict resolution training and knowledge production



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Department of Management (DFM)

The Department of Management produces critical thinkers who are able to adapt quickly in today's dynamic, technologically complex, global environment—skills that are essential for Air Force officers and future community leaders. Depending on their focus, cadets study traditional business topics like accounting, finance, human resource management, marketing, production & operations, information systems, strategy, operations research, systems engineering and other aspects of management.

CORE COMPETENCIES

- Human Systems – to include Organizational Behavior, Human Resource Management, and Organizational Development
- Financial Systems – to include Financial and Managerial Accounting and Finance
- Material Systems – to include Data Science and Analytics, Operations Research, and Systems and Management Sciences
- Integration of Systems – to include Strategic Management, Innovation, and an international perspective in a systems environment

MAJOR PROJECTS

- Collaboration with local government organizations and nonprofits to improve processes and provide decision support
- Consultation with local nonprofits and social service organizations on marketing, volunteer retention, social media and management
- Review and evaluate institutional marketing strategies to bolster the USAFA brand
- Finance research, including analyzing correlation in investment portfolios and the relationship between student loan debt and bankruptcy
- Research to develop a theoretical understanding of how individuals and systems thrive
- Sports analytics research, including entropy modeling to understand momentum in hockey
- Data analytics research, including data visualization dashboards for pandemic response and assessing the public health effect of university reopening decisions



Department of Mechanical Engineering (DFME)

The Department of Mechanical Engineering develops Air Force problem-solvers to meet the needs of the warfighters through innovative design techniques, infrastructure monitoring and improvements, aging aircraft analysis and solutions and aircraft structural integrity improvement. In addition to consistent faculty research, multiple cadet research opportunities are provided via cadet summer research opportunities, senior capstone projects and independent cadet research endeavors.

CORE COMPETENCIES

- Developing and teaching innovative design methodologies
- Materials characterization including microstructure, properties and corrosion effects
- Fatigue, corrosion and welding effect testing
- Composite structures and additive manufacturing
- Automotive laboratory including chassis dynamometer
- Vibrational and structural response testing under transient loading
- Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD)

MAJOR PROJECTS

- Effects of friction stir welding on metal microstructure, corrosion resistance and mechanical properties
- Fatigue and corrosion characterization and protection, including crack growth and residual stress effects
- Additive manufacturing for ordnance disposal, titanium alloys and supersonic particle deposition for aircraft structural repair
- Cadet capstone competitions resulting in multiple first place finishes for the annual Corrosion Design Competition and the Service Academy Challenge
- Thermodynamic analysis of real-world applications, including aircraft icing, athletic stadium field de-icing, and airbase petroleum oil and lubricant distribution systems
- Dynamic characterization of composite aircraft skin panels



Department of Philosophy (DFPY)

The Department of Philosophy takes great pride in being the only stand-alone philosophy department among U.S. service academies. Like nearly all philosophy departments, DFPY emphasizes critical thinking in several domains, including aesthetics, ethics, applied ethics (e.g. military and STEM ethics), philosophy of language and mind, logic, metaphysics and philosophy of religion. In addition to the philosophy major, the department administers the philosophy minor and religion studies minor.

CORE COMPETENCIES

- Critical thinking in military ethics, especially the just-war tradition; all department members teach and publish in this area
- Cadets hone oral and written communication, critical thinking, and decision-making skills throughout 40 discussion-oriented, writing-intensive lessons

MAJOR PROJECTS

- Publishing textbook in engineering ethics
- Study of the philosophy of religion while growing and sustaining the first studies minor at a U.S. service academy
- Publishing and providing editorial assistance in major disciplinary organs such as the international Journal of Military Ethics
- Hosting the biennial meeting of the International Society for the Philosophy of Architecture
- Co-hosting the International Symposium on Military Ethics (ISME) annual meeting with UCCS

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Department of Political Science (DFPS)

DFPS develops officers who are intellectually agile, who are alert to new domains and new threats, who can adapt to rapidly changing environments, who will question dominant or conventional thinking, and who will be ready as strategic thinkers to lead the Air Force in facing multiple complex challenges. We develop strategic thinkers in part through our research programs, which include our annual Academy Assembly, model experiences (Model NATO/EU), cadet participation in conferences, the Dean's Summer Research Program, the department's Cadet Summer Research Program, and encouragement of faculty members to conduct research that contributes to the body of knowledge in the political science discipline.

CORE COMPETENCIES

- National security and grand strategy
- The institutions and behavior of American government, including civil-military relations
- Political philosophy and methodologies for understanding political science
- International relations
- The political institutions and behaviors of countries around the world

MAJOR PROJECTS

- *American Defense Policy*, published by Johns Hopkins University Press
- Partnership with the Army War College on civil-military relations in the US and abroad
- Book project on space policy
- Minerva grant with the University of California-San Diego and other institutions funding research on economic statecraft
- Brazilian responses to COVID
- Russian strategic culture



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A woman in a military uniform is sitting on the floor in a library, reading a book. She is surrounded by bookshelves filled with books. The scene is dimly lit with a blue tint. A stack of books is visible in the foreground.

THE USAFA OFFICE OF RESEARCH

SERVICES

Col Chris McClernon, Associate Dean of Research, is the Director of the USAFA Office of Research (DFQR). DFQR exists to support researchers as they develop our nation's future leaders. The Office of Research does this by enhancing cadet education, providing DOD warfighter support, opportunities for faculty development, and partnership for technology transfer. Contact DFQR to find out more about additional services offered.

BUDGET OFFICE

DFQR Budget Analysts are responsible for assisting research centers and departments execute nearly \$40M in annual funding, from providing contract support, accepting and obligating funds, processing purchase requisitions, to funds reconciliation, reimbursements and everything in between.

AGREEMENT SERVICES

DFQR provides administrative guidance and support on agreements (CRADAs/MOUs/MOAs/EPAs/etc.) and assists with research and tech transfer tasks, inquires, and deliverables.

PUBLIC RELEASE

DFQR is responsible for approving the public release of USAFA research publications and other external communications. PA numbers are provided after submissions are cleared for public release.

RESEARCH EXCHANGE PROGRAM

DFQR provides guidance and coordination for the Summer Faculty Fellowship Program (SFFP), Engaging Scientists and Engineers Program (ESEP), Administrative Professional Exchange Program (APEP), and the National Research Council/Research Associate Programs (NCR/RAPs).

TECHNOLOGY TRANSFER AND TRANSITION SERVICES

Ms. Teresa Whinnery, T3 Program Manager, offers in-house services to assist researchers in the T3 process. Services include assistance with invention disclosures, patents, and agreements. The Office of Research also coordinates with industry partners for commercialization opportunities.

DFQR DIRECTOR DEPUTY

Mr. Rick Rogers directs the Office of Research Staff in managing the annual research budget, sustaining hundreds of research collaborations, and facilitating technology transfer & transition in support of Air Force Academy research endeavors involving faculty, staff and cadets, often in partnership with government and industry research partners.

AFRL LIAISON

Mr. David Blanks is the Air Force Research Laboratory (AFRL) Liaison to The United States Air Force Academy. He coordinates research activities between USAFA Research Centers and Dean of Faculty entities with AFRL promoting collaborative research and Science & Technology (S&T).

STEM OUTREACH

The mission of the United States Air Force Academy STEM Outreach Program is to offer a variety of products and services locally and nationally that effectively engage, inspire, and attract the next generation of STEM talent. Contact Sandy Lamb, STEM Outreach Coordinator, for assistance.

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**ENHANCING CADET EDUCATION
DEVELOPING FUTURE PROBLEM SOLVERS
PARTNERING FOR INNOVATION SOLUTIONS**