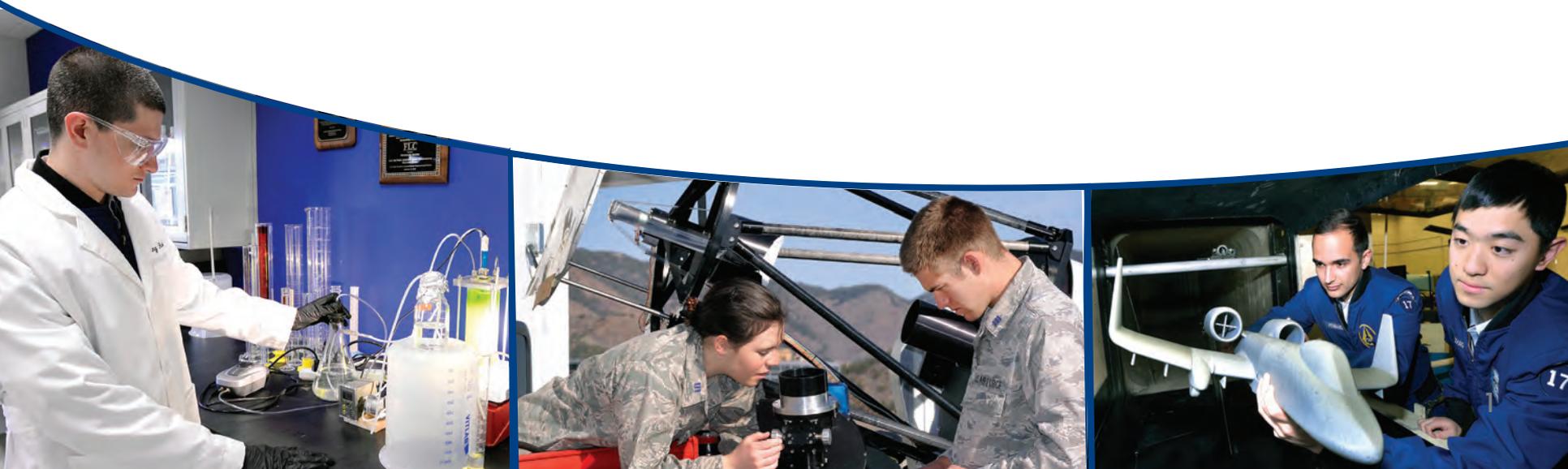




U.S. AIR FORCE
ACADEMY

2015-2016 Research Directory



United States Air Force Academy

2015-2016 Research Directory

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A Letter From the Superintendent

Our mission at the United States Air Force Academy is to educate, train, and inspire men and women to become officers of character motivated to lead the United States Air Force in service to our nation.

Research at the Academy is essential to achieving this mission and provides cadets with the knowledge, skills, and responsibilities necessary to succeed as leaders in our Air Force.

Our vibrant program continues to provide meaningful impact to the Air Force through study in air, space, cyber, training, policy, law, human performance and many other areas.

Research is a staple of our educational program. With increasingly diverse interdisciplinary programs encompassing more than 20 research centers, the Academy is enhancing cadet education to inspire students to be problem solvers.

In 2016 I want to highlight cadet research that has been enhanced by partnerships. Our partnerships are both internal and external encompassing research not only between disciplines at the Academy, but also industry, universities, and other government partners. By teaming with complementary research partners, we can examine multiple facets of a problem and come up with a well-rounded way forward.

Partnerships with industry give cadets real-world experience working with emerging technologies. Cadets in the Department of Electrical and Computer Engineering, the Department of Behavioral Science and Leadership, the Department of Management, and our Systems Engineering program have

collaborated with FalconWorks, a USAFA partner, and Falci Adaptive Biosystems, a Non-Profit from Englewood, CO., on a project called NeuroGroove. Their mission is to enhance mobility and comfort for individuals who suffer from spinal cord injuries.

Our research programs at the Academy are built on a foundation of topics and inquiry that prepare cadets to support the Air Force mission by providing cadets with curriculum with a wide range and depth of experiences and capabilities. Academy research supports that effort with a curriculum that provides a rich set of experiences and capabilities.

In addition to our rich external partnerships with industry, our cadets also engage in academic partnerships with local colleges.

Cadets in the Department of English and Fine Arts are participating in the Democratic Dialogue Project in cooperation with Colorado College. The project aims to encourage debate and idea sharing on American foreign policy, democracy, and ways to enrich civil-military relations.

This annual research report is only a snapshot of our diverse, innovative, and critically important research programs. I commend the work of our faculty for the guidance to our cadets, and to our cadets, congratulations on another successful year in Academy research.

A handwritten signature in black ink, appearing to read 'Michelle D. Johnson'.

Lt Gen Michelle D. Johnson
Superintendent, USAFA

Partnerships: Enhancing innovative research

This year's directory will:

- Highlight a few of the USAFA research partnerships.
- Show how USAFA cadets have grown as Airman researchers.
- Provide contact information, core competencies and major projects for each USAFA research center and institute.



Interdisciplinary
Partners

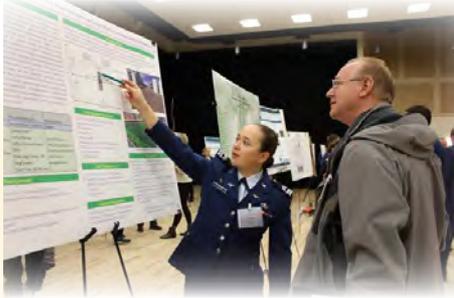
University
Partners

AF
U.S. AIR FORCE
ACADEMY

DoD
Partners



for cadet education and faculty development.



Interagency Partners



Industry Partners

Partner benefits:

- Expose cadets to the way policy and technical problems are solved.
- Improve creative solutions through diverse experiences.
- Collaborations lead to diverse solutions for complex warfighter problems.
- Enhance faculty development opportunities.

NEUROGROOVE

PROJECT PARTNERS:

- DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
- DEPARTMENT OF MANAGEMENT
- DEPARTMENT OF BEHAVIORAL SCIENCES AND LEADERSHIP
- FALCONWORKS
- FALCI ADAPTIVE BIOSYSTEMS

Interdisciplinary and Industry Partners

Cadets in the Department of Electrical and Computer Engineering (DFEC), the Department of Behavioral Science and Leadership (DFBL), the Department of Management (DFM), and several Systems Engineering students embedded in these departments have collaborated to tackle a research opportunity presented by local industry, called NeuroGroove.

This year, Academy research was approached by FalconWorks, an Academy partner, and Falci Adaptive Biosystems, a non-profit, to start a research initiative aimed at improving mobility and independence for patients who suffer from spinal cord injuries.

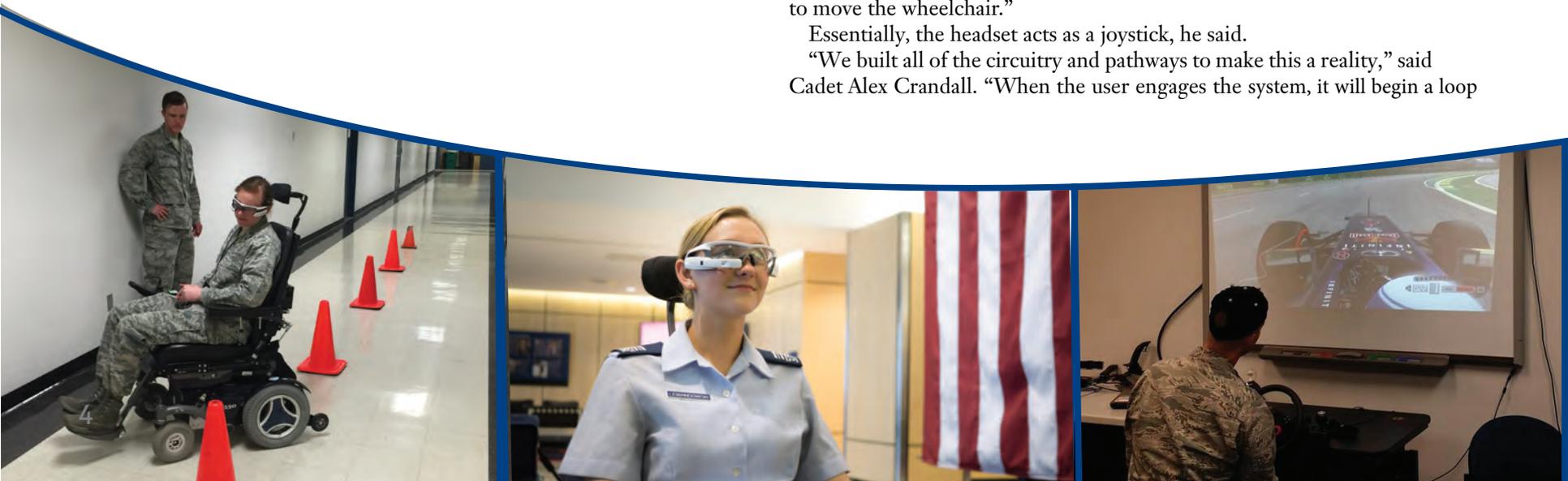
“The challenge is to take off-the-shelf smart glasses technology and create an interface between the headset and the simulator/wheelchair,” said Capt. Jeffrey Falkinburg, a USAFA instructor. “Our cadets are working on the control box that supports that interface.”

NeuroGroove successfully integrated sensor enabled glasses with an electric wheelchair, providing independent mobility using head movements, he said.

“The headset is linked to an Android app, created by cadets, which talks over Wi-Fi to the control system on the wheelchair,” said Falkinburg. “The headset interprets head movements then sends that information to the control system to move the wheelchair.”

Essentially, the headset acts as a joystick, he said.

“We built all of the circuitry and pathways to make this a reality,” said Cadet Alex Crandall. “When the user engages the system, it will begin a loop





loop that conducts resource checks and controls to ensure user safety.”

While cadets in Civil and Environmental Engineering built the circuitry, cadets in the Department of Behavioral Sciences and Leadership researched the human interaction with this interface.

“Cadets did an evaluation of different hands free devices,” said Dr. Vic Finomore, an instructor and the team mentor. “After their analysis, they built a simulator to test their findings.”

The team considered an optical head tracker, smart glasses, a tongue drive system and a face controller, he said.

“The investigation will continue over the next several years with how to utilize these devices to efficiently operate the wheelchair and driving simulator which will lead to control of a vehicle and other assistive tools that use Bluetooth and WiFi to control electronic devices,” said Finomore.

Not only did cadets research products to enhance mobility, but they also developed the simulator software.

“I developed the code to integrate the software to the simulator,” said Cadet Jedrick Lyon, a systems engineering computer science major who worked on the DFBL team. “It allows us to test a wide range of software in a controlled, safe, and flexible environment.”

Communication between collaborating departments can sometimes become difficult; cadets in the DFM were able to take on a project management role to keep the project scope and team coordination on track.

“When we first started the project, it took a while to get embedded with the team,” said Cadet Joseph Gould, a management major. “We learned a lot from each trying to go our own directions, and are now a lot more collaborative.”

While project management was the most recent scope, that may change as the project develops.

“A huge part of project management is communication,” said Maj. Nicholas Braun, a management instructor. “This year we worked on linking people and teams. Going forward we may take on an entrepreneurial role aiding in the solicitation of funding and technology transfer of this product.”

While challenging, cadets found this collaboration between centers and local industry rewarding, said Cadet 1st Class Erica Lewandowski, NeuroGroove team lead for DFEC.

“Doing research and development of cool new technologies is challenging enough, but the important part is the impact,” said Lewandowski. “This is different than other engineering projects; we are creating a tangible product that will actually improve the quality of life for a lot of disabled people.”

NeuroGroove Research will continue during the 2016-17 school year.



AERODYNAMICS OF THE DRAGON

PROJECT PARTNERS:

- DEPARTMENT OF AERONAUTICS
- NASA
- SPACEX

Interagency Research Partners

Cadets in the Department of Aeronautics are evaluating the aerodynamics of the Space Exploration Technologies Corporation (SpaceX) Dragon Crew Capsule for the National Aeronautics and Space Administration (NASA).

Data from this investigation will be used in the design of launch abort and re-entry flight profiles and to provide direct input to the certification of the Dragon Crew Capsule.

“The United States has relied on the Russian Soyuz capsule to transport astronauts to the International Space Station since retirement of the Space Shuttle. This has been expensive and doesn’t allow for much flexibility,” said Dr. Thomas Yechout, a Department

of Aeronautics professor. “NASA is now looking to private companies to develop alternative space transport systems, and one of the candidates is the Dragon Crew Capsule.”

One of the Academy efforts supporting development of the Dragon was wind tunnel testing to provide NASA with the calibration data to support incorporation of a Flush Air Data System (FADS), he said.

“A four percent scale model of the Dragon capsule was created based on dimensions sent by NASA,” said Cadet Nicholas Carpenter, an aeronautics major. “The model was then tested in the subsonic wind tunnel here at the Academy.”



The wind tunnel is capable of speeds up to 60% the speed of sound or about 450 miles per hour, said Yechout.

The FADS System consists of an array of ports in the heatshield, which measure pressures from the oncoming air.

“The team developed the algorithms to reduce the pressure data into four primary flight parameters custom tailored to the Dragon capsule,” said Carpenter. “These parameters included the angle of attack, angle of sideslip, the Mach number and the static pressure.”

Those predictions will be used to help determine the attitude and airspeed of the capsule as it is descending through the atmosphere, said Carpenter.

The team is also challenged to test different methods to implement FADS by changing the shape of the array of ports on the heatshield.

“One was a cruciform, or cross-shaped pattern and the other was an annular, or circular shaped pattern,” said Carpenter.

The differences between the cruciform and annular patterns are important because NASA wants to know which method is more accurate at determining the four data point parameters, he said.

“The cruciform appeared to be the more accurate method in determining the air data state of the capsule,” said Carpenter. “This is due to the assumption that the capsule will re-enter the atmosphere at a low angle, with the air coming nearly head on into the heatshield.”

Carpenter and his team found that while the cruciform pattern worked better because of the location of the ports on the heatshield, both patterns were valuable in different re-entry patterns.

“Our recommendation to NASA and SpaceX is that instead of choosing one or the other perhaps it would be best to integrate both approaches simultaneously or to investigate new port locations and data reduction algorithms for increased accuracy in the results,” said Carpenter.

According to Yechout, the first commercial crew rotation mission using Dragon capsule is scheduled for late 2017, if SpaceX achieves NASAs human spaceflight certification.

DEMOCRATIC DIALOGUE PROJECT

PROJECT PARTNERS:

- DEPARTMENT OF ENGLISH AND FINE ARTS
- COLORADO COLLEGE

University Partners

United States Air Force Academy cadets and students from Colorado College are working together in an academic forum to encourage mutual understanding by discussing topics from the military and civilian perspective.

The Academy Department of English and Fine Arts in cooperation with Colorado College have set up the Democratic Dialogue Project (DDP), which aims to encourage debate and idea sharing on American foreign policy, democracy, and ways to enrich civil-military relations.

“Our goal is to create a space for the

future leaders of the civilian world and future leaders of the military world to engage in meaningful dialogue around contentious issues,” said Dr. Elizabeth Coggins, the Colorado College co-facilitator for the project. “If these students learn how to disagree, and agree, on tough issues early on, they will be more likely to continue engaging in this sort of important dialogue throughout their lifetimes.”

According to Coggins, Colorado College students and cadets come together throughout the academic year to discuss hard hitting topics





like the place of religion in public discourse and the relation between military power and diplomacy, to name a few.

Dr. Greg Laski, an assistant professor in the Academy's Department of English and Fine Arts, said "College is in part a preparation for democratic dialogue, and so we feel this exchange really matters for building a robust citizenry."

Cadet Christopher Bloch, who participated in the forum, said that tackling these issues while in an academic setting has enhanced mutual understanding for participants.

"This project gives me a unique opportunity to diversify and challenge my

own perspective in an academic environment," he said.

"As a group we are able to tackle and discuss controversial topics such as drone warfare and women in combat roles in a respectful and thought provoking manner."

Funding for the DDP is provided by the Mellon Foundation to promote cross-institutional academy cooperation.

This is part of a nationwide grant to military academies and liberal arts colleges local to those academies, said Laski.

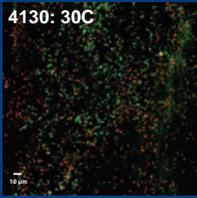
The DDP is an annual cooperation between the Academy and Colorado College, now beginning its third year.

**DEMOCRATIC
DIALOGUE
PROJECT**

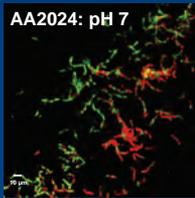
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Debate on U.S. involvement in Syria

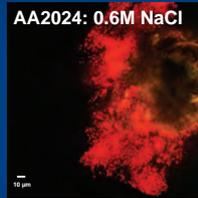
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MAIN SPACE • SNACKS PROVIDED



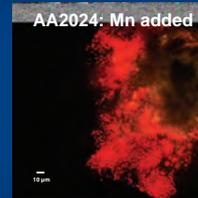
4130: 30C
Growth: +++
Living: ++
Morphology:
Scattered



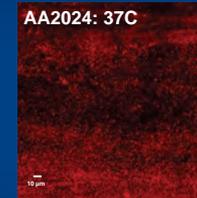
AA2024: pH 7
Growth: ++
Living: +++
Morphology:
Stringy



AA2024: 0.6M NaCl
Growth: ++++
Living: +
Morphology:
Fuzzy



AA2024: Mn added
Growth: +++
Living: -
Morphology:
Stringy



AA2024: 37C
Growth: ++++
Living: -
Morphology:
Fuzzy

BACTERIAL EFFECTS ON CORROSION FATIGUE

PROJECT PARTNERS:

- DEPARTMENT OF ENGINEERING MECHANICS, CENTER FOR AIRCRAFT STRUCTURAL LIFE EXTENSION
- DEPARTMENT OF BIOLOGY

Industry Partners

While running a routine test, cadets in the Center for Aircraft Structural Life Extension (CAStLE) may have discovered an environmentally effective way to combat corrosion fatigue.

Researchers and cadets in the CAStLE research center study a full spectrum of material degradation issues and their impact on structural integrity to improve the lifespan of our aging fleet of aircraft and safely answer modern day readiness challenges.

“In 2011, now 1st Lt. Benjamin Hoff, saw growth on a corrosion fatigue test,” said Sarah Galyon Dorman, a contract senior research scientist in CAStLE. “The result appeared to be a five to six time increase in fatigue life of our sample when we had growth.”

This increase was on the level of the best synthetic chemical inhibitor, chromate, but the question remained: how would a bacteria inhibit fatigue or crack extension?

“Corrosion fatigue testing is when a material is stressed in an environment

detrimental to the material,” said Galyon Dorman. “This case test was being completed using a high strength aluminum alloy in a mild sodium chloride solution.”

According to Galyon Dorman, the rate of crack length extension per stress cycle is measured by a direct current potential drop system which determines the change in crack length using an electrical current passed through the sample.

The sample area was swabbed and samples were collected, which revealed the presence of the bacteria *Ralstonia Pickettii*.

“For many years it was accepted that all bacteria had negative consequences for corrosion and corrosion fatigue,” Galyon Dorman said. “More recently it has been documented that a variety of bacteria can protect against general surface corrosion.”

With 20 research centers and two institutes, Air Force Academy Research is fully equipped to support interdisciplinary research when



a mystery arises. Because of the presence of bacteria, they enlisted the help of the faculty and cadets in the Department of Biology.

“They had some contamination in the lab that seemed to have an effect on the fatigue testing of the aluminum,” said Lt. Col. Marcus King, an assistant professor in the Department of Biology. “There appeared to be some bio-film formations, basically secretions by the bacteria that coat surfaces.”

The mystery continued when the specimen did not yield conclusive results.

“After an initial test to identify the microbe that came back as *Ralstonia pickettii*, they have not been able to isolate it again,” said King. “It is possible that the bacteria could be *Sphingomonas paucimobilis* as those two bacterial species are similar biochemically.”

The next step took cadets from CASTLE into the biology lab to create a clean space and run further tests.

“We wanted to ensure that we were comparing only the effect of the bacteria on corrosion fatigue,” said Cadet 1st Class Johannes Weinberg, who most recently worked on the project. “We had cultures of these bacteria grown in the lab and then placed them into the corrosion fatigue

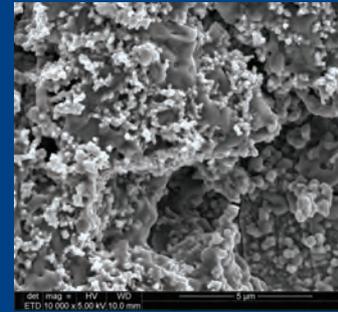
test to set-up a sterilized environment.”

Samples were placed in a sterilized salt water environment and the crack growth measured with the direct current potential drop system, simulating the initial test, he said. This time though, bacteria was purposefully introduced and tested.

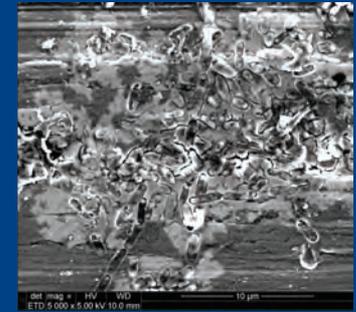
“Initial testing appears to show that given more time, there was a significant improvement in the fatigue life of the aluminum samples inoculated with the bacteria,” said Weinberg. “In several tests the fatigue life appeared to double.”

Though there has been an increase in the resistance to fatigue damage of the aluminum in a low chloride environment, King brought forward a possibility beyond bacteria. There is flocculent material that appears on the metal during testing that could be a different compound.

“We have yet to determine that it is truly bacterial growth,” said King. “I have tried to put it on a petri dish and I haven’t been able to get it to grow, so we will likely take it to the



4130-Broth



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department of Chemistry to run more tests.”

The research is ongoing, but hopes are high that this could be a new way to combat corrosion fatigue.

“We are hoping that this research can be used to help develop a new coating or storage environment for aircraft,” said Weinberg. “This could lead to a substantial increase in the fatigue life of aircraft structures.”

INTEGRATED MINIATURIZED ELECTROSTATIC ANALYZER (iMESA)

PROJECT PARTNERS:

- DEPARTMENT OF PHYSICS
- SPACE PHYSICS AND ATMOSPHERIC RESEARCH CENTER
- DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
- JOHNS HOPKINS UNIVERSITY
- UTAH STATE UNIVERSITY

DoD Partners

Through partnerships with internal departments, universities and government agencies, cadets in the Academy's Department of Physics and Department of Electrical and Computer Engineering are working to refine a tool that measures space weather.

Just like forecasting the weather on earth, forecasting the weather in space is vitally important for planning and projecting requirements for operations.

"The Integrated Miniaturized Electrostatic Analyzer (iMESA) is making measurements of the charged particle population, we are like a weather station that flies on a satellite," said Dr. Geoff McHarg, director of the Space Physics and Atmospheric Research Center. "We like to tout the iMESA as a low impact way to measure the space environment locally."

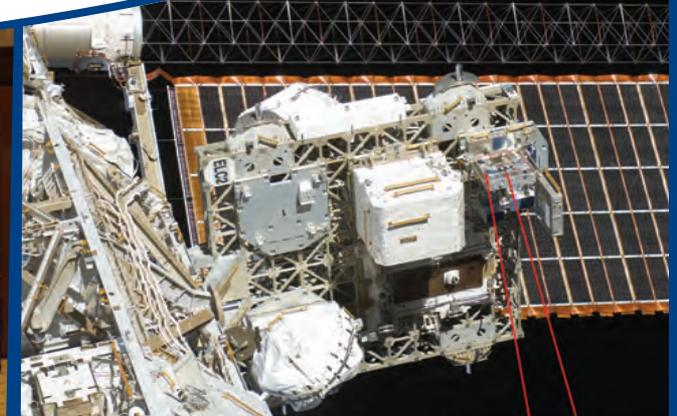
The iMESA instrument measures both low- and high-energy particles.

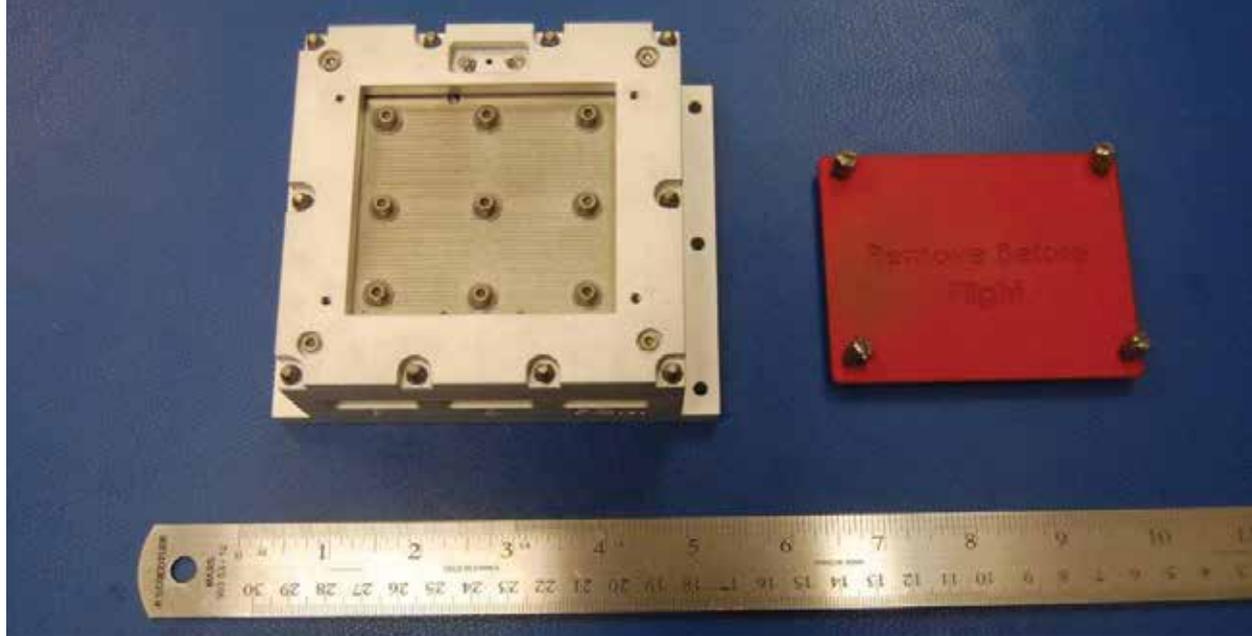
According to McHarg, the low energy plasma particles, can affect radio communications with GPS and communication satellites. Higher energy particles which make up the Van Allen radiation belts can actually damage satellites.

Currently, most space weather tracking is done by remote measurements that rely on line of sight and ground stations to garner information on potentially hazardous space weather. McHarg contends that adding the local measurements provided by iMESA could enhance our ability to forecast.

The first iMESA is already aboard a DoD Space Test Program (STP) satellite, STPSat-3, which launched in 2013.

"We get data back every week," McHarg said. Cadets can send





commands and download data as needed from any computer.

Downloaded data from iMESA is compared against remote measurements of space weather data provided by the Johns Hopkins Applied Physics Lab (APL). The university created an operational instrument called the Special Sensor Ultraviolet Spectrographic Imager (SSUSI) that is a payload on the Defense Meteorological Satellite Program (DMSP) satellites.

“They measure the same type of data parameters that we do,” said McHarg. “It is tricky to line up the data though, because they are on totally separate satellites.”

McHarg also worked with Utah State University to determine the impact of multiple iMESAs in orbit. Using this model, researchers at the two universities published a paper in Radio Science which showed that incorporating data from a constellation of iMESA instruments would improve the space weather forecast by a factor of six.

While physics majors are performing design,

analysis, and calibration, cadets in the Department of Electrical and Computer Engineering work on the building and development of iMESA.

Cadet John Terragnoli, a computer engineering major, is working on a program to imitate the host satellite to improve the effectiveness of iMESA.

“Whenever an instrument such as iMESA is attached to a host satellite we need to ensure that it can communicate properly with the satellite,” said Terragnoli. “My job was to imitate the host satellite by building a simulation program that we could use to test the payload.”

Terragnoli and electrical engineering major Cadet Sean Bapty, also worked on electrical noise testing in older iMESA models. The level of noise indicates how clear the signal is.

“We tried to record the noise to see if it was predictable,” said Terragnoli. “If the noise is predictable you can subtract it out.”

Cadets recently started this project and will continue research into the next academic year.

Cadets are intricately involved in all levels of research with iMESA, including securing a spot on a launch vehicle. In order to get a ride on the rocket, cadets have to pitch their ideas to senior military leaders. The Space Test Program then racks and stacks the payloads based on reliability, military relevance and scientific intent.

“So far, cadets have done a great job,” McHarg said. “We’ve never been turned down for a launch. It’s an important part of the cadet education, and they get to experience senior-level briefs and how they work.”

Four more iMESAs are expected to launch by 2018. Two iMESAs will be attached to STPSats 4 and 5 and are expected to launch in 2018.

Another two will be attached to a Green Propellant Infusion Mission (GPIM) satellite and an Orbital Test Bed (OTB) satellite, and will launch in March 2017.

Department of Aeronautics (DFAN)

Director: Dr. Tom McLaughlin

Email: Tom.Mclaughlin@usafa.edu

Telephone: 719-333-3564



Overview: The Aeronautics Research Center 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 such 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.

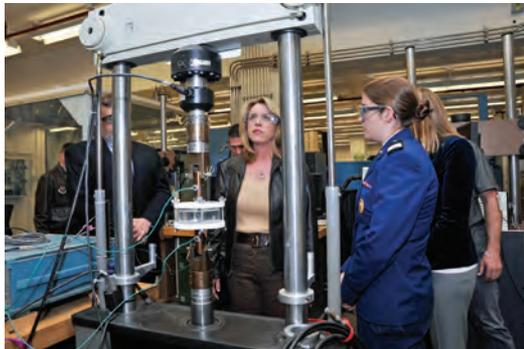
Core Competencies:

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



Major Projects:

- Virgin Galactic LauncherOne fin study
- A10 engine flow distortion measurement
- SpaceX Dragon air data sensor algorithms
- Supersonic flight control research
- Quiet propeller design and test
- UAS hybrid propulsion development
- Air-deployed UAS design/build/fly
- NATO RTO tailless aircraft control
- Parachute canopy and suspension research
- GEODDS dome wind load testing
- Aircraft optical dome fluid-structure



Major Projects:

- Aircraft Structural Integrity Program (ASIP) support for T-38, KC-135, and A-10 fleet
- Multi-aircraft structural teardown analyses of KC-135, T-38, C-130, and B707
- Educational outreach programs for OSD (course, science centers, student design challenges, etc.)
- OSD Technical Corrosion Collaboration

Department of Engineering Mechanics- Center for Aircraft Structural Life Extension (CASTLE)

Director: Dr. Greg Shoales

Email: Gregory.Shoales@usafa.edu

Telephone: 719-333-6213

Overview: The Center for Aircraft Structural Life Extension (CASTLE) has a two-fold mission in support of aging structures and material degradation. First, to perform a wide range of research and technology development projects focused on delivering critical science and technology (S&T) products required to understand material degradation in structures and systems to 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.

Core Competencies:

- ✓ 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
- ✓ Educational outreach & curricula development
- ✓ Service loads and environment measurement and structural impact analysis





Major Projects:

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

Space Systems Research Center (SSRC)

Director: Lt Col Todd Nathaniel

Email: Todd.Nathaniel@usafa.edu

Telephone: 719-333-3315



Overview: The Space Systems Research Center designs, builds, tests, and flies five cadet-built, Department of Defense-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/simulation



Astronomical Research Group and Observatory (ARGO)

Director: Dr. Devin Della-Rose

Email: Devin.Della-Rose@usafa.edu

Telephone: 719-333-3266

Overview: The Astronomical Research Group and Observatory, based at the USAFA Observatory, houses 61- and 41-cm telescopes, and supports the worldwide Falcon Telescope Network (FTN). ARGO conducts near-Earth research including resolved and non-resolved space object tracking, and deep-space research including asteroid tracking, astronomical spectroscopy and photometry, and exoplanet studies. ARGO also supports the other DFP research centers and grant work. Finally, ARGO hosts STEM outreach activities at the observatory for Scout groups, school groups, and teachers.

Core Competencies:

- ✓ Space object tracking, identification, photometry, and spectroscopy
- ✓ Astronomical photometry and spectroscopy



Major Projects:

- Search for exoplanets using the FTN
- Spectroscopy of exoplanetary host stars
- Light curve photometry of binary stars and supernovae
- Hazardous near-Earth asteroid tracking
- One-meter telescope acquisition

Center for Space Situational Awareness (CSSAR)

Director: Dr. Francis Chun

Email: Francis.Chun@usafa.edu

Telephone: 719-333-2601



Overview: 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.

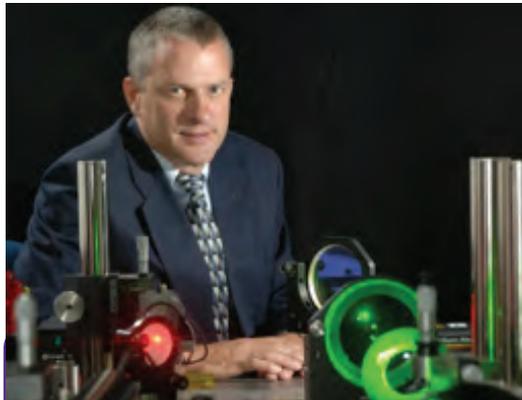
Core Competencies:

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



Major Projects:

- Development of the Academy's global Falcon Telescope Network
- Spectral measurements of solar panel glints from geosynchronous satellites
- Two-channel polarimetry to determine horizontal/vertical polarization states from un-resolved satellite optical signatures
- Long-term photometric observations of inactive geosynchronous satellites for debris monitoring



Laser Optics Research Center (LORC)

Director: Dr. Randy Knize

Email: Randy.Knize@usafa.edu

Telephone: 719-333-2579

Overview: 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 modelling
- ✓ 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





Space Physics and Atmospheric Research Center (SPARC)

Director: Dr. Geoff McHarg

Email: Matthew.McHarg@usafa.edu

Telephone: 719-333-2460



Major Projects:

- Delivery of two Integrated Miniaturized Electrostatic Analyzer (iMESA) instruments for the DoD Space Test Program
- Started investigations into the design of an energetic charged particle analyzer

Overview: 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



Department of Computer Science - Academy Center for Cyberspace Research (ACCR)

Director: Dr. Barry Fagin

Email: Barry.Fagin@usafa.edu

Telephone: 719-333-7623



Overview: The Academy Center for Cyberspace Research conducts research in a wide range of research areas within the field of Computer Science in support of the Air Force, Department of Defense and other government and commercial sponsors. ACCR seeks to develop cadets as cyber innovators by participation in and exposure to research projects in the domain of cyberspace. Current research focus areas for ACCR include cyberspace education and training, cyber-warfare topics and information assurance.

Core Competencies:

- ✓ Cybersecurity education
- ✓ Malware analysis
- ✓ Provably secure internet software

Major Projects:

- Malware Similarity Detection
- Cyberdeception
- Intrusion Detection for SCADA Systems
- IRONSIDES – A provably secure DNS server

High Performance Computing Research Center (HPCRC)

Director: Lt Col Andrew Lofthouse

Email: Andrew.Lofthouse@usafa.edu

Telephone: 719-333-9526

Overview: 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 storage systems
- ✓ Partnerships with local universities for HPC research
- ✓ Expertise in Computational Fluid Dynamics



Major Projects:

- Computational aerodynamic modeling of full-aircraft for Air Force and DoD
- Reduced-order modeling for stability and control characteristics for NATO air vehicles
- Computational modeling of the USAFA Mach 6 Ludwig Tube and hypersonic vehicles
- Efficient use of next-generation, highly parallel computers



Center of Innovation (Col)

Director: Dr. Terry Pierce

Email: Terry.Pierce@usafa.edu

Telephone: 719-333-9429

Overview: The Center of Innovation is a unique multi-agency research collaboration between the Department of Homeland Security (DHS) and the Department of Defense (DoD). COI focuses primarily on early-stage research engagements with major, market shaping companies on disruptive technologies. The center pursues this course of action for two primary reasons; large corporations possess the scale and ecosystem to support large government agencies such as the DoD and DHS, and the government can gain early insights into how disruptive technologies may enhance their mission environment, or conversely, how emerging technologies may adversely impact their mission environment.

Core Competencies:

- ✓ Public-Private Partnership environment

Major Projects:

- Anti-malware research focused on code reuse versus variant detection. The defining features of this research have been speed and accuracy
- Re-architect Software Guard Extensions, a new capability coded in the 6th generation Intel Corporation microprocessor, Skylake





Center for Physics Education Research (CPER)

Director: Dr. Kimberly de La Harpe
Email: Kimberly.deLaHarpe@usafa.edu
Telephone: 719-333-3411



Overview: The Center for Physics Education Research engages in pedagogical innovation and the thoughtful application of technology to the learning experience by developing and evaluating effective teaching strategies using research-based approaches.

Core Competencies:

- ✓ Developing research-based educational resources
- ✓ Assessing effectiveness of educational approaches
- ✓ Providing resources and support for the Just-in-Time Teaching pedagogy

Major Projects:

- Innovative Classroom Pedagogies
- Just-in-Time Teaching
- Flipped Learning
- Worked-Examples



Department of Management (DFM)

Director: Capt Jessica Schroeder
Email: Jessica.Schroeder@usafa.edu
Telephone: 719-333-7970



Overview: The Department of Management develops and inspires Air Force leaders to manage complex systems of people, resources, and technology. DFM strives to be the renowned center of management education and expertise for the Air Force.

Core Competencies:

- ✓ Marketing strategy
- ✓ Diversity and inclusion
- ✓ Project management
- ✓ Operations research
- ✓ Portfolio management

Major Projects:

- Review and evaluate marketing strategies to increase attendance for athletic events
- Use Appreciative Inquiry to build upon organizational strengths in multiple key areas
- Collaboration with CEA Medical Manufacturing for medical manufacturing process improvement

Eisenhower Center

Director: Mr. Deron Jackson

Email: Deron.Jackson@usafa.edu

Telephone: 719-333-2270



Overview: 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 Academy's Eisenhower Center provides cadets and faculty with unique opportunities to participate in research and policy discussions on the future of American security 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 America's national security 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 academic experts and defense policy makers.

Core Competencies:

- ✓ National security policy, with an emphasis on deterrence theory, particularly in the space and cyber domains
- ✓ Supports research and scholarship related to challenges to U.S. security



Major Projects:

The Eisenhower Center for Space and Defense Studies held its sixth Space Forum on Oct. 29, 2015 in Arnold Hall. The Space Forum consisted of six panel discussions with topics ranging from national security, the commercial space industry, science and exploration, challenges from China and Russia, and managing the orbital environment. The final panel brought together five science fiction writers who talked about the relationship between creative thinking and ideas for new technology.



Scholarship of Teaching and Learning (SoTL)

Director: Dr. Lauren Scharff

Email: Lauren.Scharff@usafa.edu

Telephone: 719-333-3277

Overview: The Scholarship of Teaching and Learning Program represents a growing 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, organization of materials and use of group work.

Core Competencies:

- ✓ Educational resources for evidence-based teaching approaches
- ✓ Research method design and ethics approval for educational research

Major Projects:

- Team-based Learning in Economics and in Aeronautics
- Characterization of Capstone Design Experiences in Engineering
- Evaluating the Flipped Classroom: A Randomized Controlled Trial
- Teaching and Assessing Respect for Human Dignity through Case Studies, Lab Demonstrations and Field Trips





Oral History

Director: Dr. Robert P. Wetteman Jr.

Email: Robert.Wetteman@usafa.edu

Telephone: 719-333-2878



Recent Interviews:

- The last two Cadet Wing Commanders:
Mark Caldwell and Kristov George
- Gregg Popovich, 1970 USAFA graduate and head coach of the San Antonio Spurs
- Bart Holaday, 1965 USAFA graduate and a venture capitalist and philanthropist

Overview: The USAFA Center for Oral History, working in cooperation with the Office of the USAFA Command Historian and the Center for Character and Leadership Development, is dedicated to preserving yesterday for tomorrow's profession of Arms. The USAFA Center for Oral History exists to collect, preserve, and disseminate the personal memories, reflections, and lessons offered by leaders of character from the U.S. Air Force Academy and the U.S. Air Force. Its higher purpose is to support the education and inspiration of future generations of leaders, centered on cadets at USAFA, but limited only by the availability of curated content.

Core Competencies:

- ✓ Oral history interviewing and digital preservation of archival materials
- ✓ Preservation/dissemination of USAFA Heritage



Human Performance Lab

Director: Ms. Dyana Bullinger

Email: Dyana.Bullinger@usafa.edu

Telephone: 719-333-7704



Overview: 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 1,800 cadets and approximately 100 faculty and staff members annually while also hosting and conducting informational and educational tours for more than 100 high schools, college universities, elite athletes, professional sport teams and military personnel.

Core Competencies:

- ✓ Training and enhancing vision for sports performance
- ✓ Specialized vision training to aid in concussion recovery
- ✓ Interval and maximal effort training to further adapt the skeletal muscle and improve athletic performance

Major Projects:

- 1.5 mile Altitude Dose research study to determine if a significant difference in aerobic performance exists between 5 different altitudes
- A three year study to investigate the benefits offered by PX3's Bite Regulator technologies in reducing concussions among USAFA athletes
- Falcon Fuel
- An internship program for senior level undergraduate or graduate students, in the field of exercise physiology, from around the country

Department of English and Fine Arts (DFENG)

Air Force Humanities Institute

Director: Dr. Tom McGuire

Email: Thomas.McGuire@usafa.edu

Telephone: 719-333-8524



Overview: This organization offers a wide array of programs, lectures, interviews, art exhibits, and discussions aimed at fostering interdisciplinary conversation and exchange. AFHI allows USAFA faculty and cadets a forum for exploring a broad range of intellectual traditions and paradigms that enrich our understanding the human condition.

Core Competencies:

- ✓ Examining the intersections of art, literature, technology, science, and ethics



Major Projects:

- Lectures
- Speakers
- Interdisciplinary conversation



Department of Foreign Languages (DFF)

Director: Dr. Ismenia Sales de Souza

Email: Ismenia.DeSouza@usafa.edu

Telephone: 719-333-1787

Overview: 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.

Core Competencies:

- ✓ Educational and developmental resources for teachers and cadets
- ✓ Research publications and scholarly presentations for teachers and cadets

Major Projects:

- Cadet 1st Class Susan Hurtado, Cadet 2nd Class Samuel Burton, and Cadets 3rd Class Nestor Hernandez and Kimberly Soltero presented a research paper at the XXI International Conference of Hispanic Studies in Merida Mexico (March 2016)





Department of Military and Strategic Studies (DFMI)



Director: Lt Col Mike Martindale
Email: Michael.Martindale@usafa.edu
Telephone: 719-333-9435

Overview: The Department of Military and Strategic Studies Center for Airpower Studies produces cognitively agile, action oriented thinkers to meet the challenges in translating strategic guidance into operational and tactical successes to meet national security policy goals with the military instrument of national power. The center develops strategic and critical thinking through education in the rational, responsible, and restrained use of military power in a variety of violent and non-violent contexts and conducts innovative research into the effective use of air, space, and cyberspace powers in the joint warfighting environment.

Major Projects:

- Developing Modeling and Simulation software which allow replicable strategy analysis and quantitative data gathering on key airpower variables
- Developing strategies to defeat 5th generation aircraft with 3rd generation fighters
- Game theory model for determining states likely to start a space war

Core Competencies:

- ✓ Cadet Battle Laboratory to provide environment for presenting and solving strategic and operational challenges
- ✓ Facilities to provide environment for translating strategic guidance into kinetic and non-kinetic tactical action
- ✓ Warfare simulation processes and software for qualitative and quantitative comparative strategy research and analysis
- ✓ Interactive educational environment for collaborative learning



Department of Philosophy (DFPY)

Director: Dr. Brent Kyle
Telephone: Brent.Kyle@usafa.edu
Telephone: 719-333-1590

Overview: 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, logic, metaphysics, mind and philosophy of religion.

Core Competencies:

- ✓ Critical thinking in military ethics, especially the just-war tradition; all department members teach and publish in this area



Major Projects:

- Publishing textbook in engineering ethics
- Study of the philosophy of religion while growing and sustaining the first religious 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

Institute for National Security Studies (INSS)

Director: Dr. Jim M. Smith

Email: James.Smith@usafa.edu

Telephone: 719-333-7144



Overview: The USAF Institute for National Security Studies (INSS) has been located within the Air Force Academy faculty for almost 25 years. INSS has focused continuously on arms control, strategic stability, and strategic security, advising the USAF arms control community on current and emerging issues of interest to them. USAF sponsorship to INSS today comes from HAF/A10S, the Strategic Stability and Countering WMD Division of the HAF/A10, Deputy Chief of Staff for Strategic Deterrence and Nuclear Integration. Other core sponsors include the Defense Threat Reduction Agency (DTRA) and broader Defense strategic research community.

Core Competencies:

- ✓ Strategic policy and strategy research and analysis
- ✓ Arms control and strategic stability, strategic deterrence and assurance, proliferation and countering weapons of mass destruction, and emerging strategic security challenges



Current Projects:

- Reconceptualizing Strategic Stability:
 - Phase One: Russia, China, Bilateral, and Multilateral Stability
 - Phase Two: NATO/Europe, Northeast Asia, and Regional Strategic Conflict
 - Phase Three: Middle East, South Asia, and Regional Strategic Conflict
- Future of Arms Control
- China's Nuclear Future
- Countering WMD Challenges and the Emerging Strategic Environment
- Regional Strategic Challengers, Conflicts, and Concepts of Escalation



Institute for Information Technology Applications

(IITA) Director: Gen James P. McCarthy (Ret)

Email: Jim.McCarthy@usafa.edu

Telephone: 719-333-8255

Overview: The Institute for Information Technology Applications engages in multidisciplinary research at the US Air Force Academy (USAFA) to research and develop products with information technology that would benefit education and operations at the Academy, the Air Force, and the Department of Defense.

Core Competencies:

- ✓ RQ-11 Raven UAS Fleet with designated air space
- ✓ Trained cadet and officer UAV Operators
- ✓ UAV Battle Lab to exercise command and control
- ✓ Software Development Team for Mission Planning

Major Projects:

- USAFA participation in DoD's counter UAS exercise Black Dart
- Simulation of UAV command and control dilemmas in the UAV Battle Lab
- Modification of PEPS Falcon View Mission Planning Software





Life Sciences Research Center (LSRC)

Director: Dr. Don Veverka

Email: Don.Veverka@usafa.edu

Telephone: 719-333-9670



Major Projects:

- **Biosystems** - isolate extremophiles with interesting and robust extracellular electron transfer capabilities to potentially power remote sensing devices
- **Human Performance** - Interrogate known mitochondrial metabolic phenomenon that are still not well understood in terms of electron transfer mechanisms which control organism survival and viability
- **Biomedical** - identifying secreted proteases from *Aeromonas sobria* that affect avian influenza virus infectivity

Overview: The Life Sciences Research Center's primary mission is to support the Air Force Office of Scientific Research (AFOSR) and Air Force Surgeon General (AF/SG) 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 three main research thrusts which include biomedical, biosystems, and human health/performance areas.

Core Competencies:

- ✓ Screening methods for detecting bacterial agents that can activate/deactivate avian flu viruses and interrogating select cell lines for microbiome research
- ✓ Cultivating/isolating select extremophile organisms as a source of alternative energy production for biosensing capabilities
- ✓ Cellular lipid and protein analysis for investigating molecular redox mechanisms

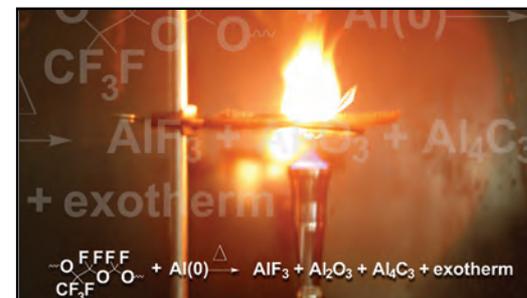


Chemistry Research Center (CRC)

Director: Dr. Scott Iacono

Email: Scott.Iacono@usafa.edu

Telephone: 719-333-6005



Overview: The research team in the Chemistry Research Center (CRC) at the US Air Force Academy focuses on preparing functionalized polymer and hybrid polymer composites directed toward developing next-generation, high-performance materials to meet operational Air Force and Department of Defense mission partner needs. In order to accomplish a portion of this, the CRC has had proven success by 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

Major Projects:

- 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

Department of Civil and Environmental Engineering (DFCE)

Director: Dr. Karen Henry

Email: Karen.Henry@usafa.edu

Telephone: 719-333-7726



Overview: 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:

- ✓ Testing capability to construct experimental earth structures through a large field site
- ✓ 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



Major Projects:

- Forest Service Bridge Design and Construction
- Application and Predictive Modeling of Human Hand Fingerprinting on Surfaces
- Screening-level Modeling of Bioenhanced Dissolution in Field-Scale Bioremediation Remedies
- Computational Modeling of Wheel Loading on Soil
- Use of energy foundations to provide geothermal heating and cooling to buildings



Academy Center for Unmanned Aircraft Systems Research Department of Electrical and Computer Engineering (DFEC)

Director: Dr. George York

Email: George.York@usafa.edu

Telephone: 719-333-4210

Overview: 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 Unmanned Aerial Vehicles (UAVs) 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 UAVs
- ✓ 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 5 University Counter-UAS demonstration at USAFA
- Developed Range-Sensor and Image-based Navigation for GPS denied environments
- DARPA Unmanned Capture-the-Flag Competition, a drone war fielding 25 autonomous USAFA UAVs vs 25 USMA/USNA UAVs

Major Projects:

- High temperature testing of state of the art additive manufactured titanium alloys
- Effects of friction stir welding on microstructure, corrosion resistance and mechanical properties
- Effects of heat treat parameters on properties and microstructure of knife steel
- Characterization of fatigue loading on beneficial residual stresses
- Fatigue crack growth in aerospace aluminum alloys
- Corrosion effects and corrosion protection for aerospace and terrestrial applications
- Supersonic particle deposition for aircraft structural repair
- Additive manufacturing techniques for explosive ordnance disposal using directed water charges
- Cadet capstone competitions resulting in multiple first place finishes for competitions such as the annual Corrosion Design Competition and the annual Service Academy Challenge
- Thermodynamic analysis of multiple real-world applications, including athletic stadium field heating for de-icing, and airbase petroleum oil and lubricant (POL) storage/distribution systems

Department of Engineering Mechanics (DFEM)

Director: Col Tom Yoder

Email: Thomas.Yoder@usafa.edu

Telephone: 719-333-6213



Overview: The Department of Engineering Mechanics 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. DFEM runs the Center for Structural Life Extension (CASTLE), the largest research center at USAFA. 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:

- ✓ Materials characterization including microstructure, properties, and corrosion effects
- ✓ Mechanical testing including fatigue, corrosion, and welding effects
- ✓ Composite structures and additive manufacturing laboratories
- ✓ Automotive laboratory including chassis and engine dynamometers
- ✓ Dynamic testing including vibrational and structural response under transient loading
- ✓ Parallel high performance simulations including Finite Element Analysis (FEA) and thermal/fluid Computational Fluid Dynamics (CFD)



Warfighter Effectiveness Research Center (WERC)

Director: Maj Chad Tossell

Email: Chad.Tossell@usafa.edu

Telephone: 719-333-3132

Overview: The Warfighter Effectiveness Research Center is the research arm of the Department of Behavioral Sciences and Leadership, and is dedicated to facilitating faculty and cadet research that enhance warfighter effectiveness. Current collaborators include government laboratories, academia, industry, and military operators--all dedicated to the same warfighter-focused approach to Science & Technology. Current research themes include focused efforts in Socio-Cultural, Applied Psychology and Experimental Psychology disciplines.

Core Competencies:

- ✓ Enable the warfighter
- ✓ Facilitate faculty & cadet research
- ✓ Establish & maintain a world-class Behavioral Science research facility
- ✓ Be the Air Force's model for efficient, effective, affordable warfighter research



Major Projects:

- Human-Machine Teaming
- Social Implications for RPAs
- Concussion Research
- Respect for Human Dignity
- Evidence-based Leadership

Center for Character & Leadership Development (CCLD)

Director: Dr. David LaRivee (acting)

Email: CCLD.Director@usafa.edu

Telephone: 719-333-8727



Overview: 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 Arm and the changing demands of military leadership and character development. Supports 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:

- Achieving full operational capability of Polaris Hall
- Collection and publication of character- and leadership-related oral history and the Journal of Character and Leadership Integration
- Alignment and full implementation of donor-funded research agenda
- Liaison with Air Force and national character- and leadership-developing organizations
- Conduct of the annual National Character and Leadership Symposium



Air Force CyberWorx

Director: Col Jeff Collins

Email: Jeffrey.Collins@usafa.edu

Telephone: 719-333-4170

Major Projects:

- Carnegie Mellon's Design Thinking Executive Course
- Inaugural Design Project - Cyber Risk Presentation
- Renovation of Interim Library Space

Overview: CyberWorx is a partnership of Airmen, industry, and academia reimagining how technology enriches and protects our nation, businesses, and lives. As a human-centric design center, we seek out unique ways to apply current and future technologies to create solutions that connect to people in meaningful ways. Our calling is to transfer, license, and share promising prototypes, solutions, and knowledge with our partners to create value for the warfighter and the economy.

Core Competencies:

- ✓ Design Thinking
- ✓ Cadet Education
- ✓ Public/Private Partnerships

The USAFA Office of Research

Supporting Your Research

The USAFA Office of Research exists to support the researcher as they develop career officers and operations ready warfighters through access to federally developed technology, STEM education, national security and job growth.

Visiting Researcher Programs

Engineer and Scientist Exchange Program and Administrative Professional Exchange Program - A DoD effort to promote international cooperation in military research, development, and acquisition through the exchange of defense scientists and engineers. It provides on-site working assignments for US military and civilian engineers, scientists and administrative professionals for a 12 month period.

Air Force Science & Technology Fellowship Program - Provides USAFA labs an opportunity to bring on postdoctoral and senior scientists and engineers for 12—24 month periods to assist with research and contribute to overall efforts of the laboratories.

Summer Faculty Fellowship Program (SFFP) - USAFA researchers can bring on SFFP fellows for collaborative research over a summer period of 8-12 weeks.

Publicity

Exclusive Events - Coordination and execution of private events with targeted industry to include small group or individual tours with current or potential donors/partners.

Col Mark Reimann
Associate Dean of Research
719-333-4195

Dr. Jim Solti
Chief Scientist
719-333-4195

Mr. Tom Fulton
Deputy Head of Research
719-333-2847

Ms. Michelle Alvarez-Rea
Research Programs, Events & Tours
719-333-3273

Ms. Dayo Aladeniyi
Technology Transfer
719-333-3311

Ms. Lauren Slipek
STEM Outreach
719-333-8990

Ms. Jennifer Kuster
Publicist
719-333-0725

Ms. Lisa Potvin
Chief Budget Officer
719-333-8318

Staff Sgt Prince Bandong
Budget Analyst
719-333-1589

Ms. Andrea Osteros
Budget Analyst
791-333-2868

Ms. Laurie Young
Budget Analyst
719-333-1951

Technology Transfer

Commercial Test Agreements - Agreements to extend services from a USAFA laboratory to a third party for the testing of materials, equipment, models, computer software and other items for an appropriate fee.

Cooperative Research and Development Agreement (CRADA) services - Legal agreements between a USAFA laboratory and a nonfederal party to offer both parties the opportunity to leverage each other's resources when conducting research and development; resulting royalty income is shared between the inventors and the laboratory.

Educational Partnership Agreement (EPA) - A formal agreement to transfer equipment from a USAFA laboratory to a K-12 facility or any non-profit institution that is dedicated to improving science, mathematics and engineering education. EPAs increase awareness and visibility of military developed technologies and increase potential for commercialization of military technology.

Partner Intermediary Agreements

USAFA has long term partnerships with state non-profits through the use of Partnership Intermediary Agreements (PIAs). PIAs facilitate and accelerate technology transfer between the lab and private companies. These intermediaries help companies identify federal technologies to be licensed and commercialized. USAFA currently has 2 intermediaries – Rocky Mountain Innovation Partner (RMIP) and the Center for Technology, Research and Commercialization (CTRAC).

United States Air Force Academy Research

Enhancing cadet education

Developing future decision makers

Partnering for innovative solutions



U.S. AIR FORCE
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