UNDERGRADUATE RESEARCH ABSTRACTS

EMBRY-RIDDLE DISCOVERY DAY 2019

PRESCOTT, ARIZONA

DISCOVERY DAY SCHEDULE OF EVENTS

FRIDAY, MARCH 29, 2019

POSTER DISPLAY

AC1-Atrium | 11 a.m. - 3 p.m.

Poster Presentations & Demonstrations

AC1-Atrium | 1 - 3 p.m.

Air Force ROTC Undergraduate Research and Leadership Presentations

The Lower Hangar | 10am - noon, 1-3pm

Parents' and Family Reception and Poster Session

Eagle Gym | 7 - 9 p.m.

SATURDAY, MARCH 30, 2019

URI Oral Presentations

Preview Day Welcome

Activity Center | 9 - 9:30 a.m.

Academic Program Meetings

College of Engineering

Activity Center | 9:45 - 11 a.m.

College of Aviation

Davis Learning Center | 9:45 - 11 a.m.

College of Arts and Sciences

Eagle Gym | 9:45 - 11 a.m.

College of Security and Intelligence

The Hangar | 9:45 - 11 a.m.

DR. FRANK AYERS

Chancellor,

Embry-Riddle Aeronautical University – Prescott

WELCOME TO DISCOVERY DAY 2019

Thanks to all of you who are making this, our seventh annual Discovery Day, a great success. It is our privilege to support the efforts of our students through our Ignite and Eagle Prize initiatives, as well as through their classwork and special projects. We take time to celebrate their work every spring during Discovery Day. Today you will see the best work of our students, faculty and staff on display and will have an insight into what makes them such a special group. Take the time to ask each of our project teams to explain the what, why and how of their projects and be prepared to understand how the leaders of tomorrow are preparing today. To our students, we realize that these projects are how you express yourselves through imagination and creativity. To our faculty and staff, thanks for taking the time to work together with these amazing young scholars. Finally, to our parents, thanks for entrusting these great young people to our care. I look forward to wandering around all day and hope to see you at each of the Discovery Day venues.

Warm Regards,

Dr. Frank Ayers

Chancellor, Embry-Riddle Aeronautical University
Prescott, Arizona

ANNE BOETTCHER

Director,

Undergraduate Research Institute and Honors Program

It has been an exciting year for our Embry-Riddle Prescott undergraduates, as is reflected in the breadth and depth of the presentations and demonstrations included in our 7th Annual Discovery Day. During the 2018-2019 Academic Year, the Undergraduate Research Institute was able to award a total of 20 Ignite research/scholarship grants and 11 Eagle Prize competition grants. For Ignite, projects ranging from one focused on social media and censorship in China to one focused on paradrogue aerodynamics. Eagle Prize teams will compete or have already competed in regional and national competitions including the including Model NATO, NASA MicroG NExT, and SAE Aero Design West. In addition, our students have been conducting independent and team research projects through course-based and student organization opportunities. Linked to their research and scholarship, these students have been active in numerous outreach efforts with regional middle and high schools, as well as the Prescott community as a whole.

I am repeatedly impressed with the insight, dedication, and determination of our students, faculty and staff. Through their combined efforts, our students are gaining the skills needed to be successful in their chosen career paths.

Thank you for helping us celebrate the accomplishments of our students.

Anne Boettcher
Director, Undergraduate Research Institute and Honors Program
Embry-Riddle Aeronautical University
Prescott, Arizona

UNDERGRADUATE RESEARCH INSTITUTE ADVISORY BOARD

Akhan Almagambetov, Electrical, Computer & Software Engineering; Daniel Dannelley, Mechanical Engineering; Tyrone Groh, Intelligence Studies and Global Affairs; Michelle Hight, Aeronautical Sciences; Brennan Hughey, Physics; Liza Kiesell, Humanities and Communication; Wahyu Lestari, Aeropace Engineering; Patricia Watkins, Hazy Library and Learning Center; Johnny Young, Applied Aviation Sciences

UNDERGRADUATE RESEARCH INSTITUTE

Anne Boettcher, Director; Ginger MacGowan, Administrative Assistant; and Mitchell Caughron and Rebekah Francis, Student Research and Outreach Coordinators

A special note of thanks to all of our mentors!

INVITED ORAL PRESENTATIONS

TOP AIR FORCE ROTC BRIEFING, MARCH 30

Megan Chavez, Mayra Bibiano, Eve Zapien Ramos and Hannah Sexton;

Aerospace Engineering Department, College of Engineering

Vicky Ross;

Computer, Electrical, and Software Engineering Department, College of Engineering;

Jada Jacobs;

Behavioral and Social Sciences Department, College of Arts and Sciences,

Isa LoPiccolo-Kleine

Intelligence Studies and Global Affairs Department, College of Security and Intelligence

Davis Leaning Center (DLC) | 11:15am-12:00pm

URI ORAL PRESENTATIONS, MARCH 30

Preview Day Welcome
Daniel Dyck
Mechanical Engineering Department, College of Engineering
Activity Center | 9 - 9:30 a.m.

Academic Program Meetings

College of Engineering

Daniela Baroni, *Aerospace Engineering Department*

Activity Center | 9:45 - 11 a.m.

College of Aviation

Christina Roberts, *Applied Aviation Sciences Department*

Davis Learning Center | 9:45 - 11 a.m.

College of Arts and Sciences

Bethany Davis, *Biology and Chemistry Department*

Eagle Gym | 9:45 - 11 a.m.

College of Security and Intelligence

Alexandra Armstrong, *Intelligence Studies and Global Affairs Department*

The Hangar | 9:45 - 11 a.m.

POSTERS AND DEMONSTRATIONS PRESENTATIONS

(Number Corresponds to Poster/Demonstration Number)

FRIDAY, MARCH 29, 2019

AC1-Atrium, 11 a.m. - 3 p.m. | Eagle Gym, 7 - 9 p.m.

1. **Airline Revenue Management with a Focus on the Practice of "Overbooking"**

   Jerome Lim

   Mentor: *Jules Yimga*

2. **EVA Camera Attachment Mechanism for the Micro-G NExT Challenge**

   Daniela Baroni, Philip Elterman, Ryan Bertucci, Sean Prendergast, Alex Lubiarz, Sean Rager, and Aidan Moore

   Mentor: *Kaela Martin*

3. **CubeSat-sized Pulsed Plasma Thruster**

   Charles Long, Gabriel Roper, and Christopher Bowers

   Mentor: *Daniel B. White*

4. **Design and Construction of a Thrust Stand for Low Power Electric Propulsion**

   John Norton, Jordan Cabrera, Tyler Hoover, Parker Ayars, and Kimiya Ghobadi

   Mentor: *Darrel Smith*

5. **High Precision Measurements Using an Optical Cavity**

   Travis Hansen and Sidney Matilla

   Mentors: *Michele Zanolin and Malik Rakhmanov*

6. **Pulsar Detection at Embry-Riddle**

   William Hosea

   Mentor: *Andri Gretarsson*

7. **Coherent Captain Mills: The Search for Sterile Neutrinos**

   Ashley Elliott, Jeramy Gordon, Jonah Greenwood, Rachel Lake, Ryder Moreno, Emily Strawn & Kate Walker

   Mentor: *Darrel Smith*

8. **Potential Leadership Problems in a Newly Formed Space Force**

   Zackary Goodman, Eric Malmquist, Heather McGraw, and Callum Seeley

   Mentor: *Lt. Col. Marella Tobolt Big Mountain*

9. **Creation of the Space Force**

   Daniel Griffith, Olivia Bosma, Evan Chinn, Austin Witthun, and Tanner Grevesen

   Mentor: *Lt. Col. Marella Tobolt Big Mountain*

10. **Color Plunder: A Study in Iterative Design and Playtesting**

    Joshua Snow, Deon Martinez, Bradley Lehmann, and Davis Butler

    Mentor: *Ashish Amresh*

11. **Board Game Design, Trophies and Rangers**

    Thomas Hernandez, Garrett Smith, and William Wyrick

    Mentor: *Ashish Amresh*

12. **Advancing Professionalism and Utilizing Knowledge Outside the Classroom**

    Andrew Recker, Ryan Herga, Alan Tomaszycki, Jacob Henry, Michaela Adams and Kevin Hood

    Mentor: *Radhakrishna Sampigethaya*

13. **Cyber Capture the Flag 2019**

    Kevin Hood, Michaela Adams, Maxime Dowla, Jacob Henry, and Alan Tomaszycki

    Mentor: *Radhakrishna Sampigethaya*

14. **Social Media and Internet Service Censorship by the Chinese Government**

    Alexandra Armstrong

    Mentor: *Hong Zhan*

15. **Eagle Eye Intelligence: Transitioning to a Four-Week Intelligence Article Publication**

    Zach Coffee and Cade Seely

    Mentor: *Dale Avery*

16. **Washington D.C. Model NATO Competition**

    Marc Rego, Stefan Johnson, Takashi Quinlan, Mackenzie Creighton, James Ritchey, Mason Russell, Kaylee Coffman, Shannon McGirk, Colin Molitor, and Niklas Becker-Brown

    Mentor: *Brooke Shannon*

17. **Enriched Cultural Knowledge in Mainland China and Taiwan**

    Nicole Wood and Alexis Macias

    Mentor: *Hong Zhan*

18. **Leadership in Isolation**

    Tim Peterson, Thorin Compy, Christina Roberts, and Kailie Strom

    Mentor: *Lt. Col. Marella Tobolt Big Mountain*

19. **Evaluating the Effectiveness and Effects of Fear-based Leadership**

    Peter Hoffend and Seung Woo Ban

    Mentor: *Lt. Col. Marella Tobolt Big Mountain*

20. **Understanding the Subconscious Impacts of External Factors on Interviews**

    Jonathan A. Woods, Sawyer B. Krueger, Mark Dehoff, and Joshua D. Vaughan

    Mentors: *Karen Meunier and Lt. Col. Marella Tobolt Big Mountain*

21. **Flight Problems: The Dangers of Lap Children in Commercial Aviation**

    Calissa Spooner

    Mentors: *Brent Bowen and Jacqueline Luedtke*

22. **Review of the 2010 Northern Arizona Tornado Outbreak**

    Paige Swenson

    Mentor: *Curtis James*

23. **Investigations of Precipitation Partitioning Between Arizona and New Mexico During the North American Monsoon**

    Cynthia Kobold

    Mentor: *Mark Sinclair*

24. **The effect of PCR replication on species richness estimates using environmental DNA and 16S rRNA vertebrate metabarcoding**

    Courtney Turner-Rathbone and Bethany Davis

    Mentors: *Catherine Benson, Hillary Eaton, and Matthew Valente*

25. **Linking Technology and Wildlife Conservation: Applications for Unmanned Aircraft Systems**

    Christina Roberts and Jacquelynn Rollins

    Mentors: *Catherine Benson and Johnny Young*

26. **Africa Greenhouse Project**

    Megan Chavez, Mayra Bibiano, Eve Zapien Ramos, Hannah Sexton, Vicky Ross, Jada Jacobs, and Isa LoPiccolo-Kleine

    Mentors: *Lt. Col. Marella Tobolt Big Mountain and Matthew Valente*

27. **VEX Robotics Program at Embry-Riddle Aeronautical University**

    Braxton Kendall

    Mentor: *Joel Schipper*

28. **Autonomous Robot for Intelligent Ground Vehicle Competition**

Robbie Shaw, Hunter Smatla, Mitchell Schilling, Brendan Stoutenburgh, Emmanuel Jefferson, Eli Celaya, Anna Stoneman, and Joshua Snow

Mentor: *Douglas Isenberg*

29. **Damage Monitoring in Repaired Carbon Fiber Reinforced Polymer (CFRP) Composites using Digital Image Correlation**

Rachael Bradshaw and Joseph Gentile

Mentor: *Wahyu Lestari*

30. **Initial Design of a High-Altitude Balloon Controlled Ascent System**

Xander Pickard, Michael Fusco, Thomas Montano, Austin Macosky, and Anthony Holman

Mentor: *Douglas Isenberg*

31. **Research on Shape-Based Approximation Methods for Initial Conditions for Low-Thrust Spacecraft Trajectory Optimization**

Andrew Gifford

Mentor: *Bradley Wall*

32. **Houston, We Don't Have a Problem: Designing Tools to Develop Intuition**

Maciek Czyz

Mentor: *Kaela Martin*

33. **Investigation of Flow Coefficients in Liquid Propulsion Components & Systems**

Anthony Bernard, Pratik Bhargava, Killian Conlon, Deborah Jackson, Jonathan Noble, Johnathan Ornelas, Justin Petersen, Xander Pickard, and Daniel Svitek

Mentor: *Daniel Dannelley*

34. **Performance Analysis of Size Scaling on Hybrid Rocket Motors**

Benjamin Treece, Daniel Griffith, Joshua Chandley, and Baxter Elwood

Mentor: *Michael Fabian*

35. **Study of Cavitating Venturis for Liquid Rocket Applications**

Daniel Dyck

Mentor: *Brenda Haven*

36. **Design and Fabrication of a Cryogenic Liquid Rocket**

Nate dePutter

Mentor: *Michael Fabian*

37. **Single-Stage Bismuth Fed Stationary Plasma Thruster**

Alexis Hepburn

Mentor: *Daniel White*

38. **Carrier-Based Reconnaissance and Attack RC Aircraft Design**

Paul Sanders, Elizabeth Mitchell, Callie Swafford, Trevor Lau, Joseph Grosjean, Max Eisenstadt, Ariana Anderson, Steven Hicks, Simon Zemana, Katherine Rocha, Benjamin Sagar, Pratik Bhargava, Gavin McDaniel, and Matthew Robinaugh

Mentors: *William Crisler, David Lanning Jr., and Jacob Zwick*

39. **Albatross: High Altitude UAV for Emergency Cellular and Internet Coverage**

Salma Benitez, Zachary Ontiveros, Evan, Cole Zenker, Kevalya Sheth, Olivia Bosma, Jonathan Crossley, Andrew Carlson, Cole Zink and Sanjar Rizaev

Mentors: *Jacob W. Zwick and Matthew J. Haslam*

40. **Venturi Industries - Project Kingfisher**

Alexander San Miguel, Veronica Norkus, Zane Zylstra, Trace Sheerin, Lance Mitchell, Jason Fung, Corey Blythe, Preston Vargecko, Cole Macklin, and Yoav Zimron

Mentor: *Jacob Zwick*

41. **UAS Paradrogue Aerodynamics Research: Wind Tunnel Testing**

Forrest Mobley, Miguel Alejandro Recabarren Rodriguez and Jordan Secchitano

Mentor: *Shigeo Hayashibara*

42. Design, Simulate, Build, and Fly a Heavy Lift Aircraft

Jiyoung Hwang, Phillip Nielson, Nathaniel Scott, Anthony Pirone, Carter Greene, Colin Williams, Sam Rice, Peter Kantorczyk, Jiwan Karunatilake, Jeffery Chen, Eric Tomas, Jessica Millard, Matt Ibanez, Jacob Woodruff, and Evan Stuart

Mentor: *Shigeo Hayashibara*

43. Comparing the Electrical "Bleedless" System with the Traditional Pneumatic Bleed System

Yingyi Shen

Mentor: *Michelle P. Hight*

44. The Effectiveness of Title IX Legislation at American Universities

Corrine K. Girard and Kerrigan E.M. McDonald Ortega

Mentors: *Suzie Roth and Lt. Col. Marella Tobolt Big Mountain*

45. Leadership in Communication: Effectiveness in the Use of Technology

Patricia Sablan, Katherine Mosley, Nicole Niemynski, Taylor Tavares, and Jacob Rensel

Mentor: *Lt. Col. Marella Tobolt Big Mountain*

46. Leadership Approach to Military Pilot Retention

Dean Podaras, Brandon Ward, and Christian West

Mentor: *Lt. Col. Marella Tobolt Big Mountain*

47. Aerodynamic and Structural Analysis of a Levitated Annular Rotor System Designed for a Novel Air Vertical Takeoff and Landing Vehicle

Jeffrey Ryan

Mentor: *William Crisler*

48. Eagle Aero Sport - Student Built Aircraft

Rachael Bradshaw and Nick Bartholet

Mentors: *Wallace Morris II and Brian Davis*

49. Micro Air Vehicle Platform Design

Joseph Grosjean, Carter Greene, Collin Williams, Max Eisenstadt, and Evan Stuart

Mentor: *Akhan Almagambetov*

50. Stall Hysteresis Research Project

Cole Zenker, Jesse Ingraham, and Thorne Wolfenbarger

Mentor: *Wallace Morris II*

51. Automotive Applications of Fuel Saving Vortex Generators

Alexander San Miguel, Jack Garcia, and Harold Dzigiel

Mentor: *Wallace Morris II*

52. AZLoop - Arizona's SpaceX Hyperloop Competition Team

Akhil Gampala, and Leon Brown III

Mentors: *Michael Fabian and Samuel Siewert*

53. Formula SAE

Robert Graham, John Rees, and Jacob Killian

Mentor: *Michael K Fabian*

SOCIAL MEDIA AND INTERNET SERVICE CENSORSHIP BY THE CHINESE GOVERNMENT

IGNITE GRANT AWARD

Alexandra Armstrong

Intelligence Studies and Global Affairs Department, College of Security and Intelligence

Mentor:
Hong Zhan

Humanities and Communication Department, College of Arts and Sciences

America's basic rights are founded on the principle of freedom of speech. This allows America to thrive off of input, while keeping government power in check. Tools such as impeachment, petitions and protests allow American citizens the power to change their government. However, the country with the largest population in the world, has been restricting speech rights of their citizens since the earliest measures of time. Early emperors burned books and buried scholars to quite literally, bury those philosophical treaties. In today's era, social media and internet services are censored through, "the Great Firewall" of China. While China has never placed a "freedom of speech" clause in their constitution, there is a growing unrest with citizens on the consequences of vocalizing their opinions. If a Chinese citizen posts a photo of their president in an unflattering manner, they risk spending up to two years in jail for offending the "honor and interest of the state". Research has speculated on different reasons as to why the censorship is so strict, such as restricting western influence, maximizing ecommerce, or influencing cultural development. This research explores the history of Chinese censorship, current restrictions, why the government is monitoring so closely, and the implications of breaking the censorship laws.

POSTER PRESENTATION

EVA CAMERA ATTACHMENT MECHANISM FOR THE MICRO-G NEXT CHALLENGE

EAGLE PRIZE AWARD

Daniela Baroni, Philip Elterman, Ryan Bertucci, Sean Prendergast, Alex Lubiarz, Sean Rager, and Aidan Moore

Aerospace Engineering Department, College of Engineering

Mentor:
Kaela Martin

Aerospace Engineering Department, College of Engineering

Project CAM (Camera Attachment Mechanism) was created to design and build a solution for the Micro-g NExT design challenge presented by the Neutral Buoyancy Lab at Johnson Space Center. The purpose of the challenge is to create a mechanism that will attach to three different interfaces located on the International Space Station. The design proposed by the team, referred to as CAM, will be divided into two subsystems: the arm, and the base. The arm will hold the camera provided by NASA and allow for adjustable placement, and the base will contain the mechanism that will attach to the three interfaces. The combined subsystems will satisfy the requirements set by the design challenge and the requirements defined by Project CAM. Project CAM has been chosen to participate in the challenge, therefore the team will test CAM in the Neutral Buoyancy Lab at Johnson Space Center in June of 2019.

POSTER PRESENTATION

ALBATROSS: HIGH ALTITUDE UAV FOR EMERGENCY CELLULAR AND INTERNET COVERAGE

The Albatross will be designed to fly and operate in a disaster-stricken area. The aircraft will be solar-powered and will serve as a platform for a telecommunications array that will provide cellular phone coverage and reliable internet connectivity for the disaster-stricken area. To provide these services, the aircraft will be designed to loiter at an altitude of 65,000 ft. and have an endurance of one week. If the area of operation requires services for a longer time, a second aircraft shall be launched that will reach cruise altitude before the first aircraft begins its descent. This process will be repeated until the disaster area has repaired its telecommunications infrastructure.

POSTER PRESENTATION

Salma Benitez, Zachary Ontiveros, Evan, Cole Zenker, Kevalya Sheth, Olivia Bosma, Jonathan Crossley, Andrew Carlson, Cole Zink and Sanjar Rizaev

Aerospace Engineering Department, College of Engineering

Mentor:
Jacob W. Zwick

Mechanical Engineering Department, College of Engineering

Matthew J. Haslam

Humanities and Communication Department, College of Arts and Sciences

INVESTIGATION OF FLOW COEFFICIENTS IN LIQUID PROPULSION COMPONENTS & SYSTEMS

IGNITE AWARD

The ERAU H2O flow project is developing a test stand which can be used to research the flow characteristics of liquid rocket engine injectors, valves, and associated hardware. These flow characteristics, such as discharge coefficients and injector spray patterns, need to be known and optimized in order to successfully hot-fire a liquid rocket engine. This component level test stand will also allow propulsion groups to acceptance test hardware before installing it in the hot-fire test stand, allowing groups to catch failures before they could potentially cause significant damage. These objectives originated from problems encountered by the former capstone, Mercury Propulsion, and E-Prize group, 45kBiProp.

POSTER PRESENTATION

Anthony Bernard, Pratik Bhargava, Killian Conlon, Deborah Jackson, Jonathan Noble, Johnathan Ornelas, Justin Petersen, Xander Pickard, and Daniel Svitek

Aerospace Engineering Department, College of Engineering

Mentor:
Daniel Dannelley

Mechanical Engineering Department, College of Engineering

EAGLE AERO SPORT - STUDENT BUILT AIRCRAFT

EAGLE PRIZE AWARD

Eagle Aero Sport is an undergraduate engineering team comprised of students from multiple majors across the Prescott, AZ campus. The team is building an experimental Van's RV-12 aircraft and is modifying the plane to add real time flight test instrumentation for research. These instruments will gather data for aerodynamic, structural, as well as aircraft performance experiments. To do this, the team is divided into four sub-teams: build, business, engineering, and safety. Each of these teams is critical to the success of the project. Build focuses on the installation of parts on the aircraft and skinning of the body and wings. Engineering creates and installs gauges, creates instrumentation mounts, creates wiring diagrams and integrates instrumentation. Business organizes fundraisers and writes a monthly newsletter. Safety holds the team to OSHA standards in the hangar. All the research and knowledge gathered by Eagle Aero Sport represents a rare asset which, we hope, will become more common-place as it is incorporated into Embry-Riddle's curricula, enhancing the student and faculty experience.

POSTER PRESENTATION

Rachael Bradshaw

Aerospace Engineering Department, College of Engineering

Nick Bartholet

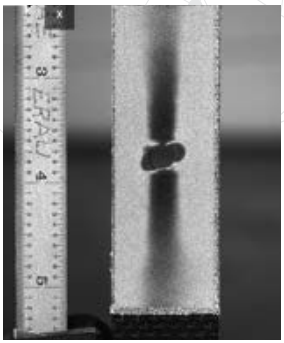
Aviation Sciences Department, College of Aviation

Mentor:
Wallace Morris II

Aerospace Engineering Department, College of Engineering

Brian Davis

Computer, Electrical, and Software Engineering Department, College of Engineering



DAMAGE MONITORING IN REPAIRED CARBON FIBER REINFORCED POLYMER (CFRP) COMPOSITES USING DIGITAL IMAGE CORRELATION

ARIZONA SPACE GRANT AWARD

Rachael Bradshaw and Joseph Gentile

Aerospace Engineering Department, College of Engineering

Mentor:
Wahyu Lestari

Aerospace Engineering Department, College of Engineering

Increased use of carbon fiber reinforced polymer (CFRP) composites in primary structural components of aircraft requires better understanding of their behavior, especially in the presence of damage. Reliable monitoring methods, providing stress or strain distribution data after damage and repair, are critical to safety and successful applications of CFRP composites for high-performance structures. This research will improve knowledge and demonstrate reliability of repaired CFRP composites. CFRP samples having adhesively bond repaired damage will be tested under uniaxial tensile loading. The strain f i eld on the samples will be monitored using a digital image correlation (DIC) technique. This method will capture the strains over the entire surface of interest. The work will also provide data that shows how strain within a damaged sample is distributed, and how it affects the residual strength. Therefore, it is essential the behavior of a repaired carbon sample is known to improve the life of each repair and the design that it is a part of.

POSTER PRESENTATION

AFRICA GREENHOUSE PROJECT

In various parts of Africa, many communities are facing a food shortage as well as a poverty crisis. Both of these problems have their own set of factors which contribute to their roots in many communities; however, they are both deeply interconnected. With the help of EPI-USE and Elephants, Rhinos, and People (ERP), we plan on implementing two sustainable greenhouses at two different locations: the Madikwe Game Reserve and the Vaalwater Community. The Madikwe Game Reserve greenhouse aims to empower the local people by creating jobs that would help establish an income source for the local communities in the area. On the Vaalwater community, the greenhouse will serve to generate a large yield of crops that are high in carbs and protein for the Vaalwater community. With these two greenhouses, we hope to generate income for the local communities near the Madikwe Game Reserve, as well as produce a stable source of food for the Vaalwater community. On campus, we plan on implementing a prototype greenhouse in order to test different crop growing methods. Some of these methods include aquaponics as well as traditional soil growth. These results will be incorporated into our design for South Africa.

POSTER PRESENTATION
AIR FORCE ROTC UNDERGRADUATE RESEARCH AND LEADERSHIP PRESENTATION

Megan Chavez, Mayra Bibiano, Eve Zapien Ramos and Hannah Sexton

Aerospace Engineering Department, College of Engineering

Vicky Ross

Computer, Electrical, and Software Engineering Department, College of Engineering

Jada Jacobs

Behavioral and Social Sciences Department, College of Arts and Sciences

Isa LoPiccolo-Kleine

Intelligence Studies and Global Affairs Department, College of Security and Intelligence

Mentors:

Lt. Col. Marella Tobolt
Big Mountain,

Air Force Reserve ROTC

Matthew Valente

Biology and Chemistry Department, College of Arts and Science

EAGLE EYE INTELLIGENCE: TRANSITIONING TO A FOUR-WEEK INTELLIGENCE ARTICLE PUBLICATION

Zach Coffee and Cade Seely

Intelligence Studies and Global Affairs Department, College of Security and Intelligence

Mentor:
Dale Avery

Intelligence Studies and Global Affairs Department, College of Security and Intelligence

Eagle Eye Intelligence is a student organization that publishes a weekly intelligence publication of briefs and articles on security and intelligence topics based on current events. Starting this semester, Eagle Eye began a new process to help sharpen the analytical skills of its members. Eagle Eye employs a four-week process beginning with requirements, and following the intelligence cycle through collection, analysis, and dissemination. Teams start with an issue or topic they are interested in, and then focus their topic over the 4 weeks into an analytical article that answers a key intelligence question. That piece is then sent out with Eagle Eye's regular publication, and the cycle is staggered so one article is ready to publish per week. Eagle Eye's editor and chief and President oversee each stage of the process. To help increase the quality of analysis for the publication, Eagle Eye practices a variety of structured analytic techniques such as: star bursting, red team, and SWOT analysis. Eagle Eye also develops student's technical skills through briefs on cyber intelligence and visuals used in articles using ArcGIS and Tableau. Some recent article publications include: A forecast for the upcoming Brexit deadline, an analysis of critical infrastructure in India and Pakistan, and an analysis of the current state of OPEC.

POSTER PRESENTATION

HOUSTON, WE DON'T HAVE A PROBLEM: DESIGNING TOOLS TO DEVELOP INTUITION

ARIZONA SPACE GRANT AWARD

Maciek Czyz

Aerospace Engineering Department, College of Engineering

Mentor:

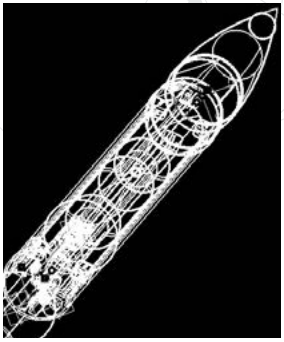
Kaela Martin

Aerospace Engineering Department, College of Engineering

Students studying astronautical engineering are expected to be capable of calculating an orbital trajectory based on initial conditions or data, but that doesn't mean they have an intuitive feel for how each parameter affects the final orbit. By manipulating aspects of a spacecraft such as its launch conditions, thrust vector, or time of flight and immediately seeing the results of their manipulation, students can develop a sense of how various conditions affect spaceflight and make use of that intuition in the classroom and workplace.

The purpose of this project is to develop a tool that allows for easy to use and easy to understand demonstrations of orbital mechanics. We start with a simple n-body propagator, using our solar system as the model, to establish baseline trajectories with just the initial conditions. Initial conditions will be linked to launch conditions, providing students with an understanding of how the spacecraft started its journey. Once basic orbits are established, we introduce more complicated maneuvers such as thrusting and gravity assists to provide broader intuition on deep space travel. Once students have used this software they should have a much deeper understanding of how the elements of spacecraft and mission design work together to create an orbital trajectory and be capable of designing a basic deep space mission using the tools provided.

POSTER PRESENTATION



DESIGN AND FABRICATION OF A CRYOGENIC LIQUID ROCKET

EAGLE PRIZE AWARD

Nate dePutter

Aerospace Engineering Department, College of Engineering

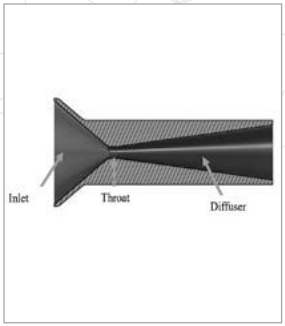
Mentor:

Michael Fabian

Aerospace Engineering Department, College of Engineering

Amateur rocketry consists largely of rockets powered by solid propellant grains. The rocket industry is moving increasingly towards all-liquid rocket designs. This project aims to build a foundation for future Prescott Campus liquid rocket design teams, by designing a bi-propellant liquid rocket inclusive of tanks, plumbing, structure, electronics, and recovery system. This work is in association with the Tiber Designs Senior Capstone team, which will be designing and fabricating a keralox engine for the rocket. The rocket will be launched to altitude 45K feet at the Friends of Amateur Rocketry launch facility. This rocket features propellant tanks designed, fabricated and hydro-tested on campus; carbon fiber tubular skin fabricated on campus by students, and other unique design features. Instrumentation and pressure-related safety systems are integrated into a system of Swagelok plumbing fixtures that include Inconel burst discs, pressure transducers and an electrically actuated emergency de-pressurization solenoid. The recovery system consists of two parachutes: a drogue chute that deploys near apogee and a primary 20-foot chute that deploys 1K feet above the ground. If successful this will be one of fewer than 10 universities in North America to successfully fly a cryogenic bi-propellant liquid rocket.

POSTER PRESENTATION



STUDY OF CAVITATING VENTURIS FOR LIQUID ROCKET APPLICATIONS

IGNITE GRANT AWARD

Daniel Dyck

Mechanical Engineering Department, College of Engineering

Mentor:

Brenda Haven

Mechanical Engineering Department, College of Engineering

Cavitating venturis are flow devices used to establish a constant mass flowrate primarily for rocketry applications. Liquid rocket engines require precise oxidizer and fuel mass flow rates in order to generate the desired thrust and operate at a safe temperature. Cavitating venturis can establish these mass flow rates by utilizing the cavitation phenomena. By increasing the fluids velocity to the point where the static pressure is less than the fluids vapor pressure, dual phase flow is created. The dual phase flow lowers the speed of sound and a choked flow condition occurs. This establishes a constant mass flow rate while also decoupling the upstream pressure from any downstream pressure oscillations. The goal of this project is to better understand the effect of the pressure ratio upon cavitation inception, as well as the effect of different flow regimes upon the venturi's discharge coefficient. Finally, this project seeks to understand the effects of design and manufacturing upon the venturi's accuracy in regard to setting a desired mass flow rate.

POSTER PRESENTATION

COHERENT CAPTAIN MILLS: THE SEARCH FOR STERILE NEUTRINOS

The observation of neutrino oscillations confirms that the active neutrinos (ν_e, ν_μ, ν_τ) are comprised of three mass eigenstates with Δm^2 values between 10^{-3} to 10^{-5} eV^2. However, a persistent phenomenon has been observed at LSND, MiniBooNE and other short-baseline experiments (SBE) where $\Delta m^2 \sim 1eV^2$ is not compatible with the current mixing between mass eigenstates. However, a 4th neutrino, a sterile neutrino (ν_s) that doesn't participate in weak interactions could explain the phenomena observed as SBE's. An experiment has been constructed at TA-53 at Los Alamos National Laboratory to investigate this large $\Delta m^2 \sim 1eV^2$ and determine conclusively whether or not this large Δm^2 is due to a "new" sterile neutrino.

POSTER PRESENTATION

Ashley Elliott, Jeramy Gordon, Jonah Greenwood, Rachel Lake, Ryder Moreno, Emily Strawn and Kate Walker

Physics and Astronomy Department, College of Arts and Sciences

Mentor:

Darrel Smith

Physics and Astronomy Department, College of Arts and Sciences

AZLOOP - ARIZONA'S SPACEX HYPERLOOP COMPETITION TEAM

EAGLE PRIZE AWARD

AZLoop is a collaboration between Embry-Riddle Aeronautical University and Arizona State University, consisting of both graduate and undergraduate students. The objective of AZLoop is to design, test, and build a small-scale prototype of a high-speed vacuum tube pod with the intent of competing at the SpaceX Hyperloop Pod Competition IV. In July 2018, AZLoop competed against hundreds of international teams for a spot at Competition III and performed against the top 19 teams. AZLoop has recently been accepted for a position at Competition IV and is moving into the testing and manufacturing phase. The goal for Competition IV is to achieve maximum velocity and safely stop within the 1.25 km long, vacuum-pressure test track developed and built by SpaceX in Hawthorne, CA. The team intends to accomplish this through a combination of powerful electric propulsion, a continually variable transmission system, and high-speed short-distance braking. The team has demonstrated its ability to work across long distances, under extreme pressure, and within strict constraints. The AZLoop team hopes that the Hyperloop project will use cutting-edge technology to usher in a new era of high-speed land travel.

Akhil Gampala and Leon Brown III

Aerospace Engineering Department, College of Engineering

Mentors:

Michael Fabian

Mechanical Engineering Department, College of Engineering

Samuel Siewert

Electrical, Computer and Software Engineering Department, College of Engineering

POSTER PRESENTATION AND DEMONSTRATION

RESEARCH ON SHAPE-BASED APPROXIMATION METHODS FOR INITIAL CONDITIONS FOR LOW-THRUST SPACECRAFT TRAJECTORY OPTIMIZATION

Andrew Gifford

Aerospace Engineering Department, College of Engineering

Mentor:

Bradley Wall

Aerospace Engineering Department, College of Engineering

In the realm of low-thrust spacecraft trajectories, there are many different ways to solve for optimal trajectories. Given a set of boundary conditions, such as the initial position, final position, and time of flight (Lambert's problem), there is no trivial solution to finding the optimal route. There are currently several solutions to the boundary conditions problem of low-thrust spacecraft trajectories used as a starting point for optimization methods. These methods facilitate the ability to look through the large sample sizes of options that are inherent in low-thrust trajectory problems and make an accurate, near-optimal initial guess. The initial guess can then be processed using an optimization model such that the ideal solution may be acquired. Shaped-based approximation methods used to find a viable initial guess use the method of defining a curve and then designing a control for the thrust such that a spacecraft follows that shape. One can then simulate the trajectory and use the results in an optimization algorithm. During the course of this research, a variety of shape-based approximation methods will be tested against different sets of initial conditions. The shapes used will come from different literature that defines different available shapes as well as a new shape that will developed during the course of this research.

POSTER PRESENTATION

THE EFFECTIVENESS OF TITLE IX LEGISLATION AT AMERICAN UNIVERSITIES

Title IX is a federal law that is enacted on college campuses across America, designed to protect people from sex-based discrimination in education programs. Title IX records cases of assault, bullying, theft, harassment, stalking, and more. In conjunction with the Cleary Act, Title IX is essential in recording and reporting cases on misconduct to the general public. However, loopholes in legislation allow cases to not be prosecuted to their fullest extent, leaving victims without the closure they desire and perpetrators without the punishment they deserve. The Effectiveness of Title IX Legislation at American Universities will investigate the laws and policy behind Title IX. It will seek to propose changes to the Title IX Program at Embry-Riddle Aeronautical University to ensure that the program is running as effectively and inclusively as possible, so that students who are seeking help feel included and respected no matter what circumstances they are facing.

Corrine K. Girard

Applied Aviation Sciences Department, College of Aviation

Kerrigan E.M. McDonald Ortega

Intelligence Studies and Global Affairs Department, College of Security and Intelligence

Mentors:

Suzie Roth

Christine and Steven R. Udvar-Hazy Library and Learning Center

Lt. Col. Marella Tobolt
Big Mountain

Air Force Reserve ROTC

POSTER PRESENTATION
AIR FORCE ROTC UNDERGRADUATE RESEARCH AND LEADERSHIP PRESENTATION

POTENTIAL LEADERSHIP PROBLEMS IN A NEWLY FORMED SPACE FORCE

The creation of a modern, separate military branch dedicated to the frontiers of space, has created lots of discussion. This project will be reviewing the evolution of suggested Space Force programs over the last decade. The strengths and weaknesses of each plan will then be compiled and compared to the current plan to create a separate Space Force, as signed by President Donald J. Trump on February 19, 2019. The future budget for the current plan is expected to be released soon and will be analyzed. It is also expected that leadership problems will be found inherent with creating a new military division. These problems will be examined and suggestions on how to avoid growing pains for above leadership problems will be presented.

Zackary Goodman and Eric Malmquist

Aerospace Engineering Department, College of Engineering

Heather McGraw

School of Business, College of Arts and Sciences

Callum Seeley

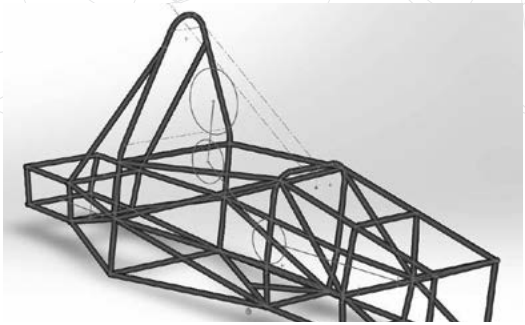
Aeronautical Science Department, College of Aviation

Mentor:

Lt. Col. Marella Tobolt Big Mountain

Air Force Reserve ROTC

POSTER PRESENTATION
AIR FORCE ROTC UNDERGRADUATE RESEARCH AND LEADERSHIP PRESENTATION



FORMULA SAE

EAGLE PRIZE AWARD

This project explores the concepts of automobile design by designing a race car to compete in the Formula SAE competition. The project will consist of researching other university's designs, improving on these designs in the fields of propulsion and aerodynamics, building the newly designed car, testing the car, improving the car, and finally racing the car in the Formula Student competition against other universities from around the world. ERAU is a university focused on aerodynamics, thus our focus will be on improving the overall aerodynamics of the car to give us an advantage in the competition. We will do this by making the overall shape of the car as aerodynamic as we can, using composites and other advanced building materials. This project also gives students hands-on experience in designing, building, testing, and modifying a large engineering system, which will develop skills the students will utilize beyond graduation.

POSTER PRESENTATION

Robert Graham, John Rees, and Jacob Killian

Aerospace Engineering Department, College of Engineering

Mentor:

Michael K Fabian

Mechanical Engineering Department, College of Engineering

CREATION OF THE SPACE FORCE

The purpose of our research project is to identify the best way to create the new military force commonly known as the Space Force. There are many ideas of how to go about doing this, which we will cover in our research. We will also cover some of the problems encountered during the creation process of other branches such as the Air Force. The Air Force faced a lot of resistance to new ideas when they were created, the space force will most likely face similar issues. The Space Force will need to come up with solutions to avoid an insubordination situation similar to what happened with some leaders of the early Air Force. One major point of discussion is the decision between creating a separate department of the military or a service branch under the umbrella of the Air Force. We will be looking into the political and legislative side of this discussion and attempt to answer the question: Should Space fall under the domain of the Air Force, or should it be categorized separately under a new domain and department?

POSTER PRESENTATION
AIR FORCE ROTC UNDERGRADUATE RESEARCH AND LEADERSHIP PRESENTATION

Daniel Griffith, Olivia Bosma, and Evan Chinn

Aerospace Engineering Department, College of Engineering

Austin Witthun

Aeronautical Science Department, College of Aviation

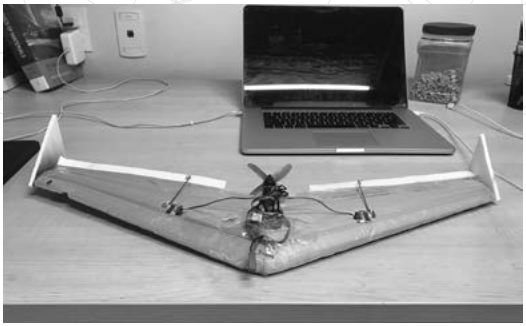
Tanner Grevesen

Intelligence Studies and Global Affairs Department, College of Security and Intelligence

Mentor:

Lt. Col. Marella Tobolt
Big Mountain

Air Force Reserve ROTC



MICRO AIR VEHICLE PLATFORM DESIGN

IGNITE GRANT AWARD

Modern military Micro Air Vehicles (MAV) are packed with cutting-edge technology and high-performance materials which contribute to the exorbitant cost of these tools. This project seeks to significantly reduce the cost of military MAVs by using consumer grade materials and electronics, while still maintaining functionality.

The performance goals for the aircraft are a one-hour flight time, autonomous capabilities including auto-takeoff and landing, along with waypoint navigation. The aircraft will carry a small camera to relay a live video feed back to the operator. The airframe will be constructed from Expanded Polypropylene (EPP), a very tough foam which will reduce damage from crashes, transport, and landings. The EPP foam will be covered in a thin laminate to decrease the parasitic drag on the aircraft.

Several airframe design and component selection iterations have occurred during this project leading to the final aircraft design. Currently, the new design is being manufactured with flight testing scheduled soon after.

POSTER PRESENTATION

Joseph Grosjean, Carter Greene, and Collin Williams

Aerospace Engineering Department, College of Engineering

Max Eisenstadt

Mechanical Engineering Department, College of Engineering

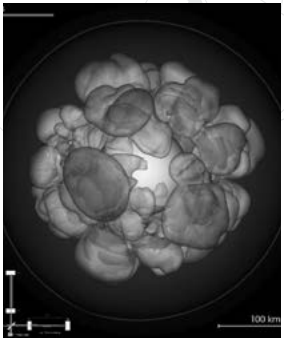
Evan Stuart

Applied Aviation Sciences Department, College of Aviation

Mentor:

Akhan Almagambetov

Electrical, Computer and Software Engineering Department, College of Engineering



HIGH PRECISION MEASUREMENTS USING AN OPTICAL CAVITY

IGNITE GRANT

After the Gravitational Wave detections from both Binary Black Hole (BBH) mergers and from a Binary Neutron Star (BNS) merger, the next and most pressing Gravitational Wave signal will come from Core-Collapse Supernovae (CCSNe). In order to detect such signals, development on the laser interferometers is necessary. The aim of this research is to develop and optimize techniques specific for frequencies in the hundreds of hertz where Gravitational Waves from CCSNe contain a majority of their energy.

POSTER PRESENTATION

Travis Hansen and Sidney Matilla

Aerospace Engineering Department, College of Engineering

Mentors:

Michele Zanolin

Physics and Astronomy Department, College of Arts and Sciences

Malik Rakhmanov

Department of Physics and Astronomy, College of Sciences, The University of Texas Rio Grande Valley

SINGLE-STAGE BISMUTH FED STATIONARY PLASMA THRUSTER

IGNITE GRANT AWARD

This research conducts initial design, manufacturing, and testing of a miniaturized, single-stage Stationary Plasma Thruster (SPT) type Hall thruster, that is dimensionally consistent with the current CubeSat Design Specification requirements. Consideration will be provided to the thermal specifications to be compliant with future integration into CubeSat module applications. The target input power for this engine will be approximately 100 W. Argon will be used for primary testing, progressing to a bismuth direct feed system. The thruster will take advantage of a solid (LaB6) cathode as its electron source. The magnetic circuit will be powered by a stand-alone power supply. The exploratory design will focus exclusively on synthesizing a procurable and realizable plasma accelerator stage. After further maturation, attention will be given to creating a feed system suitable for canisterized spacecraft applications. Engine success, as based on the long-term mission objective, will be contingent upon having a firing time between 1 and 2 kh, corresponding to a propellant throughput of approximately 2 to 2.5 kg. Testing will need to demonstrate that the erosion rates observed on the thruster metallic structures, ceramic channel walls, and cathode are broadly consistent with these mission requirements.

Alexis Hepburn

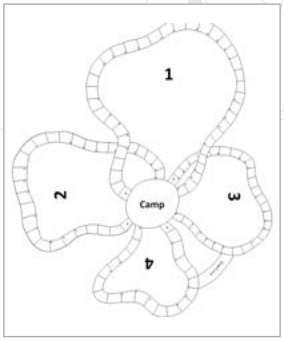
Aerospace Engineering Department, College of Engineering

Mentor:

Daniel White

Mechanical Engineering Department, College of Engineering

POSTER PRESENTATION



BOARD GAME DESIGN, TROPHIES AND RANGERS

EAGLE PRIZE AWARD

This project was developed by three students in the Simulation Science, Games, and Animation degree program. The purpose of the assignment was to get to learn the process to properly design a game. With various requirements and playtesting, this end product was achieved. Trophies and Rangers is a board game played with two to four players. The goal of the game is to be the first player to reach twenty Trophy Points. Trophy Points are gained by the player defeating monsters along the four different paths available to them and returning to camp. The players move along the paths with a six-sided die, and attack with a ten-sided die.

Thomas Hernandez, Garrett Smith, and William Wyrick

Mathematics Department, College of Arts and Sciences

Mentor:

Ashish Amresh

Mathematics Department, College of Arts and Sciences

POSTER PRESENTATION

EVALUATING THE EFFECTIVENESS AND EFFECTS OF FEAR-BASED LEADERSHIP

Leadership that induces fear primarily consists of inducing scenarios or situations that inspire action through fear of failure or negative repercussions. This technique is commonly used on both a macro and micro scale to induce change or action. This research-based study focuses on both the effects of large-scale leadership with respect to informational or social campaigns (e.g. environmentalism) to evaluate the effectiveness of such strategies and observe additional effects of such leadership on the individual and collective. Understanding the implications of using fear as a motivational method will help to maximize positive outcomes and benefits, with the ability to mitigate undesirable side-effects of using this style of leadership.

POSTER PRESENTATION
AIR FORCE ROTC UNDERGRADUATE RESEARCH AND LEADERSHIP PRESENTATION

Peter Hoffend

Aerospace Engineering Department, College of Engineering

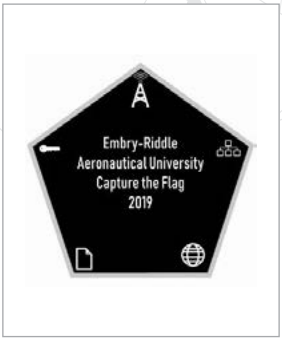
Seung Woo Ban

Applied Aviation Sciences Department, College of Aviation

Mentor:

Lt. Col. Marella Tobolt
Big Mountain

Air Force Reserve ROTC



CYBER CAPTURE THE FLAG 2019

IGNITE AWARD

The research objective is to develop a Capture the Flag (CTF) competition to educate local high school students about the world of cyber security. College students around the world compete in cybersecurity related competitions which teach new skills while providing networking with companies and opportunities for internships and jobs. Providing a similar experience for local high school students offers similar benefits at an early stage in their career. Our team is creating a jeopardy-style competition which involves tasks to complete in a wide range of cybersecurity categories. The competition is designed for students of different experience levels in the field. Students will be exposed to five categories: cryptography, network scanning, network traffic analysis, website exploitation, and log analysis. Each category offers an introduction to cybersecurity while requiring students to use critical-thinking. The competition will take place October 2019 in conjunction with the Embry- Riddle annual career fair. This will allow high school students to interact with employers and explore possibilities within the cybersecurity industry. Utilizing mentors within the competition establishes a hands-on experience, providing the best possible learning experience within a STEM environment.

POSTER PRESENTATION

Kevin Hood, Michaela Adams, Maxime Dowla, and Jacob Henry

Cyber Intelligence and Security Department, College of Security and Intelligence

Alan Tomaszycki

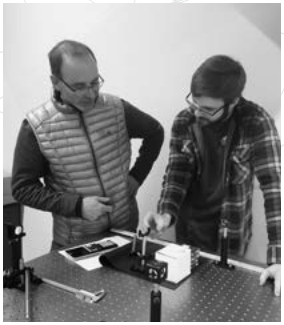
Cyber Intelligence and Security Department, College of Security and Intelligence

Aeronautical Science Department, College of Aviation

Mentor:

Radhakrishna Sampigethaya

Cyber Intelligence and Security Department, College of Security and Intelligence



PULSAR DETECTION AT EMBRY-RIDDLE

IGNITE AWARD

Pulsars are neutron stars that are rotating very rapidly about their rotational axis. They have a period of oscillation that can vary between a few milliseconds to a few seconds, with the majority of them having a period around 1 second. As the pulsar rotates, it emits electromagnetic radiation that can only be seen when the radio beam crosses over Earth, which creates a lighthouse effect. The pulsar of interest for this project is B0329+54, which is known as the loudest pulsar in the northern hemisphere, meaning that this pulsar emits the biggest signal in the northern hemisphere. By knowing its position in the sky, and by using a sensitive antenna, we can collect data regarding the intensity of the signal over time. Then, by using PRESTO, which is software designed to detect pulsars, the data can be searched for peaks, which correspond to the pulses. The end goal of this research project is to be the first person at Embry- Riddle to detect a pulsar.

William Hosea

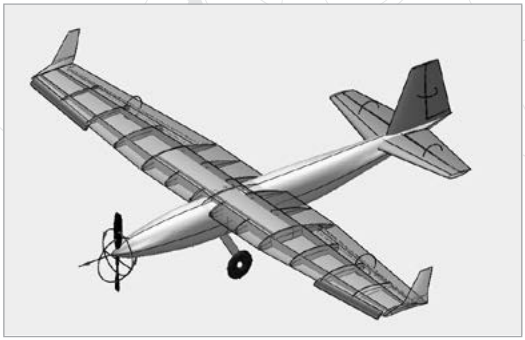
Physics and Astronomy Department, College of Arts and Sciences

Mentor:

Andri Gretarsson

Physics and Astronomy Department, College of Arts and Sciences

POSTER PRESENTATION



DESIGN, SIMULATE, BUILD, AND FLY A HEAVY LIFT AIRCRAFT

EAGLE PRIZE AWARD

The SAE Aero Design West Competition challenges undergraduate students to design, build, and fly (DBF) an RC aircraft with maximum passengers and luggage possible. Power is limited to 1,000 W, maximum takeoff weight is 55 lbs, and maximum wing span is 12 feet. ERAU's SAE DBF team, Eaglenautics, was founded in 2017 with the intent of applying computer simulations to DBF activities, emphasizing the use of modern engineering methods such as Computational Fluid Dynamics (CFD), aircraft optimization, and Finite Element Analysis (FEA). These methods support and validate the aircraft design process while utilizing ERAU's Advanced Computing and Simulation Laboratory's High-Performance Computers (HPC), allowing students to effectively meet or exceed the given challenges, save time, and conserve money and effort. Effectively designing and manufacturing a heavy lift aircraft and competing with other groups will give students practical experience in solving engineering problems, as well as providing them with experience and knowledge necessary to contribute to larger projects. The Eaglenautics team has designed a 40lb, 12-foot wingspan aircraft carrying 36 tennis ball passengers with 18 lb. of steel-plates as luggage. The team will compete at the April 2019 SAE Aero Design West competition in Van Nuys, CA.

Jiyoung Hwang,

Aerospace Engineering Department, College of Engineering and Applied Aviation Sciences Department, College of Aviation

Phillip Nielson, Nathaniel Scott, Anthony Pirone, Carter Greene, Colin Williams, Sam Rice, Peter Kantorczyk, Jiwan Karunatilake, Jeffery Chen, and Eric Tomas

Aerospace Engineering Department, College of Engineering

Jessica Millard, Matt Ibanez, and Jacob Woodruff

Mechanical Engineering Department, College of Engineering

Evan Stuart

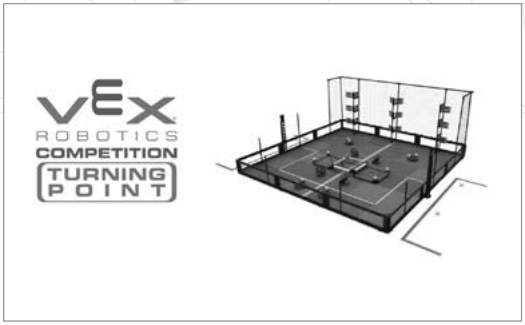
Applied Aviation Sciences Department, College of Aviation

Mentor:

Shigeo Hayashibara

Aerospace Engineering Department, College of Engineering

POSTER PRESENTATION



VEX ROBOTICS PROGRAM AT EMBRY-RIDDLE AERONAUTICAL UNIVERSITY

EAGLE PRIZE AWARD

Braxton Kendall

Aerospace Engineering Department, College of Engineering

Mentor:

Joel Schipper

Electrical, Computer & Software Engineering Department, College of Engineering

The VEX Robotics program at Embry-Riddle Aeronautical University competes as a part of VEX U competitions, hosted by VEX Robotics Competition. The VEX Robotics program competes with more than 300 teams from all around the world. Based on VEX Robotics Competition for middle and high school students, the VEX Robotics program is allowed more customization and greater flexibility than other grade levels while providing the effective costs and real-world limitations of a restricted development environment. This Year's VEX Robotics Competition is called Turning Point. The object of the game is to attain a higher score than the opposing Alliance by high scoring or low scoring caps, toggling flags, and by alliance parking or center parking robots on platforms. Prescott's two teams (gold and blue) compete against each other and other regional teams, with the end goal of competing at VEX World Championships in April, to attempt to win the 2019 VEX University World Championship.

POSTER PRESENTATION

INVESTIGATIONS OF PRECIPITATION PARTITIONING BETWEEN ARIZONA AND NEW MEXICO DURING THE NORTH AMERICAN MONSOON

ARIZONA SPACE GRANT AWARD

By accessing gridded data from 1948 – present, including SSTs, precipitation measurements and multi-level atmospheric data from NOAA archives, the goal of this research is to accurately differentiate between monsoon precipitation over Arizona and New Mexico and to identify the moisture sources and climate linkages for each. Moisture flux analyses are used to determine the origin of moisture for the two regions. Correlation analysis will identify the relation between monsoon precipitation and sea surface temperatures, along with linkages to El Nino Southern Oscillation (ENSO) and other indices of low-frequency variability. Results of this research may improve situational awareness and lead times for the monsoon and its impacts in order to protect life and property.

POSTER PRESENTATION

Cynthia Kobold

Applied Aviation Sciences Department, College of Aviation

Mentor:

Mark Sinclair

Applied Aviation Sciences Department, College of Aviation

AIRLINE REVENUE MANAGEMENT WITH A FOCUS ON THE PRACTICE OF "OVERBOOKING"

IGNITE AWARD

Jerome Lim

School of Business, College of Arts & Sciences

Mentor:

Jules Yimga

School of Business, College of Arts & Sciences

This research empirically investigates whether airlines frequently engage in the practice of overbooking flights, and if it affects the demand for their services. The airline industry has changed significantly over past decades, with low-cost carriers now controlling a larger portion of the overall market, resulting in customer demand for lower fares. These two factors have largely resulted in the commoditization of base fares, leaving airlines to focus on identifying and managing new opportunities to grow revenue, profit, and productivity, and further differentiate their brands in the marketplace. Recent airline revenue management studies have emphasized two major elements; inventory control and overbooking, both calculated to help increase revenue and now considered a fundamental practice in airline revenue management. This analysis looks into a next-generation revenue management system to facilitate quick responses to competitive price, schedule, and operational changes, enabling decision analysis for the retailing and merchandising facets of their operations, and assisting airline personnel in understanding passengers' requirements.

POSTER PRESENTATION

CUBESAT-SIZED PULSED PLASMA THRUSTER

IGNITE AWARD

While many pulsed plasma thrusters have been built over the years, none have been built in the form factor of a CubeSat module before. This is useful in many deep space applications, as it adds utility not currently offered on any other orbital maintenance system. This flexibility allows mission specialists to send CubeSats out of the asteroid belt and perform missions that cannot currently be achieved with the current orbital maintenance modules that are available. This also can be used for the final orbital maneuvers. This module consumes less space than other systems, while also being less hazardous to itself and other modules, due to the solid-state nature of the technology.

POSTER PRESENTATION

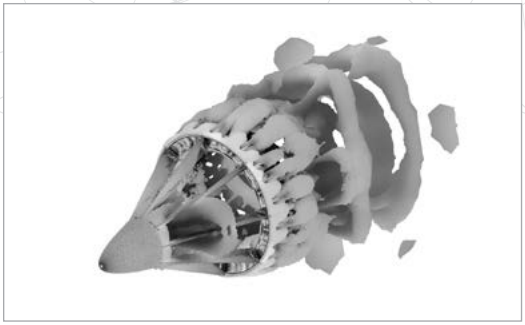
Charles Long, Gabriel Roper, and Christopher Bowers

Electrical, Computer & Software Engineering Department, College of Engineering

Mentor

Daniel B. White

Mechanical Engineering Department, College of Engineering



UAS PARADROGUE AERODYNAMICS RESEARCH: WIND TUNNEL TESTING

IGNITE AND ARIZONA SPACE GRANT AWARDS

Aerial refueling, though possible throughout a majority of the last century, continues to be limited in various ways including the restriction to manned aircraft. To gain insight on aerial refueling for unmanned aerial systems (UAS), an aerial refueling system known as the "probe-and-drogue" or paradrogue is being simulated and modeled using computational fluid dynamics and wind tunnel testing. Paradrogues, which are particularly useful for low-velocity aerial refueling, are attached to the end of refueling hoses and employ a special ring-shaped chute or drogue to create drag, thus pulling the hose back and stabilizing it for the receiving aircraft to connect with it for fuel transfer. Geometric traits of the paradrogue, including the chute, will be altered individually to ascertain the effects these traits have on the drag characteristics of the paradrogue, as well as the flow field directly behind it known as the wake field. By understanding these effects, the paradrogue and the complex flow field it creates will lead to a better understanding of aerial refueling dynamics as well as characteristics of complex bluff bodies.

Forrest Mobley, Miguel Alejandro Recabarren Rodriguez and Jordan Secchitano

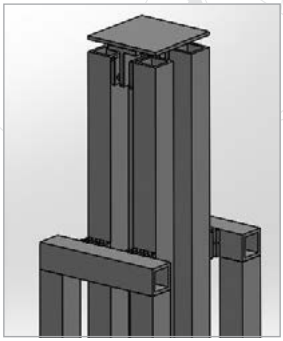
Aerospace Engineering Department, College of Engineering

Mentors:

Shigeo Hayashibara

Aerospace Engineering Department, College of Engineering

POSTER PRESENTATION



DESIGN AND CONSTRUCTION OF A THRUST STAND FOR LOW POWER ELECTRIC PROPULSION

IGNITE AWARD

This electric propulsion (EP) project is focused on designing, constructing, testing, and optimizing a simple electrothermal propulsion system. The goal, by optimizing design parameters such as propellant mass flow rate, power supplied, nozzle shape/length, and tangentially injected propellant, is to optimize thrust and specific impulse performance levels. EP devices typically have very low thrust outputs, and ERAU Prescott currently has no equipment capable of making accurate thrust measurements in the low ranges of EP devices. Electric propulsion systems are critical to extending the life of satellites and other spacecraft, and are an increasingly important in research by space industry companies. Primary goals include enhancing student understanding, and forming a basis for future students to allow continued growth of various electric thruster projects on campus. With the capability to take thrust measurements, thrust improvements may be correlated to design changes, and our thrusters may be compared to those in current use, or in those in testing at other universities. A more thorough understanding will be possible of electric thrusters and the variables contributing to a more effective thruster, and eventually comparisons of various types of thruster will also be possible.

POSTER PRESENTATION

John Norton and Jordan Cabrera

Physics and Astronomy Department, College of Arts and Sciences

Tyler Hoover and Parker Ayars

Aerospace Engineering Department, College of Engineering

Kimiya Ghobadi

Mechanical Engineering Department, College of Engineering

Mentor:

Darrel Smith

Physics and Astronomy Department, College of Arts and Sciences

LEADERSHIP IN ISOLATION

The purpose of this project is to collect research on the leadership interactions and understand what aspects of leadership would emerge and be most effective in an isolated colony, such as Mars. Research on isolated communities is important for current and future space exploration, as well as certain situations on Earth. Leadership occurs in many daily interactions and understanding it in the context of isolated areas can help improve performance in teams and aid in mission completion by applying this knowledge to everyday interactions. Working on these ideas in the context of space exploration presents some unique challenges. Most space environment situations are not testable on Earth leaving people with fears about how to solve unpredictable problems.

POSTER PRESENTATION
AIR FORCE ROTC UNDERGRADUATE RESEARCH AND LEADERSHIP PRESENTATION

Tim Peterson and Thorin Compy

Aerospace Engineering Department, College of Engineering

Christina Roberts

Applied Aviation Sciences Department, College of Aviation and Intelligence Studies and Global Affairs Department, College of Security and Intelligence

Kailie Strom

Intelligence Studies and Global Affairs Department, College of Security and Intelligence

Mentors:

Lt. Col. Marella Tobolt
Big Mountain

Air Force Reserve ROTC

INITIAL DESIGN OF A HIGH-ALTITUDE BALLOON CONTROLLED ASCENT SYSTEM

IGNITE AWARD

The High-Altitude Balloon Controlled Ascent System (HABCAS) is an innovative approach to near-space research using cost-effective latex weather balloons. The system, as currently conceived, entails release of gas and release of ballast mass, along with data transmission and termination through a 2.4 GHz radio link. A dynamical model of the balloon has been developed from governing equations. The dynamical model will be used to develop the control system requirements and the mechanical requirements. A previously developed empirical model for pressure of a small-scale balloon (i.e., 100 grams) proves inaccurate above burst altitude, indicating that beyond an altitude of 18 km this model cannot be reliably scaled to a large-balloon (i.e., 3000 grams). A large-balloon model will be found experimentally over the course of several flights planned in late March and April 2019.

POSTER PRESENTATION

Xander Pickard

Mechanical Engineering Department, College of Engineering

Michael Fusco, Thomas Montano, Austin Macosky, and Anthony Holman

Aerospace Engineering Department, College of Engineering

Mentor

Douglas Isenberg

Mechanical Engineering Department, College of Engineering

LEADERSHIP APPROACH TO MILITARY PILOT RETENTION

A challenge that our military faces is pilot retention, these pilots go through the most elite training the world has to offer to then separate after their initial commitment ends. Our team has evaluated what some of the causes are and what we assessed could be implemented to improve this. This research will aid training cost as not as many pilots would separate therefore not as many pilots would be consistently needed to replace them. Congressional bonuses to incentivize staying in the military have not worked thus far, our research team developed a new approach to build upon this bonus and help develop an identity as an Air Force pilot which will aid pilot retention. The military pilot lifestyle is highly demanding, pilots are gone for extensive periods of time while their days home are limited due to excessive hours; changes thus far have not worked to the extent of the goal. Through our research, we have concluded what needs to be implemented to aid the retention of pilots in our military.

POSTER PRESENTATION
AIR FORCE ROTC UNDERGRADUATE RESEARCH AND LEADERSHIP PRESENTATION

Dean Podaras and Brandon Ward

Aeronautical Science Department, College of Aviation

Christian West

Aerospace Engineering Department, College of Engineering

Mentor:

Lt. Col. Marella Tobolt
Big Mountain

Air Force Reserve ROTC

ADVANCING PROFESSIONALISM AND UTILIZING KNOWLEDGE OUTSIDE THE CLASSROOM

Embry-Riddle Aeronautical University is known for being a "hands-on" school. However, skills learned inside the classroom must be applicable outside the classroom. The ERAU Cyber Defense Club is leading the charge in taking classroom knowledge to competitions and conferences nationwide. Members of the club have participated in national competitions in Tucson, San Francisco, Orlando, and online. Conferences, including RSA, prove essential to networking, learning about certifications and using industry tools. By attending these events, essential skills are developed which cannot be learned in a classroom. Networking, professionalism, and industry tools become second nature to students who attend these events with the club. As a result, multiple students have received job and internship offers for the summer of 2019. Having the opportunity to use skills taught inside the classroom in a productive and fun environment has made a big impact on the College of Security and Intelligence.

POSTER PRESENTATION

Andrew Recker, Ryan Herga, Alan Tomaszycki, Jacob Henry, Michaela Adams and Kevin Hood

Cyber Intelligence and Security Department, College of Security and Intelligence

Mentor:

Krishna Sampigethaya

Cyber Intelligence and Security Department, College of Security and Intelligence

WASHINGTON D.C. MODEL NATO COMPETITION

EAGLE PRIZE AWARD

Students researched the countries of Lithuania and Bulgaria and their policy towards various international issues relating to the interests of the North Atlantic Treaty Organization, or NATO. Among these were topics such as Resetting the Relationship with Russia, Militarization of Space, Cyber Defense, and Relations with China and India. Then on February 14, students attended a four-day conference in Washington DC in which they participated in a simulation of the subcommittees of NATO. These subcommittees include the North Atlantic Council, Political Affairs, Military, Nuclear Planning, Partnerships and Cooperative Security, and Emerging Security Challenges. Alongside other participating schools, students debated and then ultimately wrote NATO policy towards their committee's issues, requiring complete consensus to pass. Finally, the North Atlantic Council went line by line and approved the written policy as a final communique, which was then sent to the real NATO headquarters in Washington D.C.

Marc Rego, Stefan Johnson, and Takashi Quinlan

Aerospace Engineering Department, College of Engineering

Mackenzie Creighton, James Ritchey, Mason Russell, Kaylee Coffman, Shannon McGirk, and Colin Molitor

Intelligence Studies and Global Affairs Department, College of Security & Intelligence

Niklas Becker-Brown

Applied Aviation Sciences Department, College of Aviation

Mentor:

Brooke Shannon

Intelligence Studies and Global Affairs Department, College of Security and Intelligence

POSTER PRESENTATION

LINKING TECHNOLOGY AND WILDLIFE CONSERVATION: APPLICATIONS FOR UNMANNED AIRCRAFT SYSTEMS

The goal of this project is to integrate expertise across two degree programs on campus, Wildlife Science and Unmanned Aircraft Systems (UAS), to develop a research program focused on applying technological solutions to problems in wildlife conservation. UAS can aid wildlife biologists in a variety of ways, for example, they can be used to track animals over long distances, deploy remote sensing technology to characterize wildlife habitats, and for security purposes to combat poaching and wildlife trafficking. We propose four pilot studies to provide familiarity with these applications. First, we will use Telonics GPS and Iridium satellite collars to track the movements of cattle on a local ranch, which will allow us to practice GPS tracking techniques. In return for providing cattle for the first study, we will use UAS to monitor the integrity of fence-lines on the ranch, which has practical applications for rangeland management. Third, we will use multispectral cameras to characterize forest habitat at the Watson Woods Riparian Preserve, which is a 126 acre forest restoration in the heart of Prescott. Finally, we will use UAS to monitor waterfowl populations at the Willow/ Watson Lakes Important Bird Area. We received funding in support of this research from EPI-USE, Inc. in March 2019 and plan to begin these projects during the Fall 2019 semester.

Christina Roberts

Applied Aviation Sciences Department, College of Aviation and Intelligence Studies and Global Affairs Department, College of Security and Intelligence

Jacquelynn Rollins

Biology and Chemistry Department, College of Arts and Sciences

Mentors:

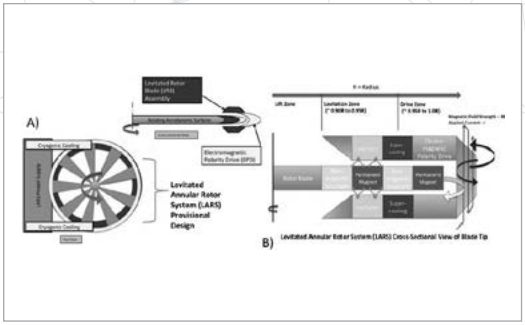
Catherine Benson

Biology and Chemistry Department, College of Arts and Sciences

Johnny Young

Applied Aviation Sciences Department, College of Aviation

POSTER PRESENTATION



AERODYNAMIC AND STRUCTURAL ANALYSIS OF A LEVITATED ANNULAR ROTOR SYSTEM DESIGNED FOR A NOVEL AIR VERTICAL TAKEOFF AND LANDING VEHICLE

IGNITE AWARD

Jeffrey Ryan

Aerospace Engineering Department, College of Engineering

Mentor:

William Crisler

Aerospace Engineering Department, College of Engineering

The Levitated Annular Rotor System (LARS), designed by KRyanCreative LLC, is a propulsion system for an air vehicle capable of extreme heavy lift. The LARS would allow for efficient delivery of electromagnetic energy to enable the near frictionless rotation of rotor blades. The net gains in power allows for a significant increase in lift compared to vertical lift aircraft used today. The structure used to support tip driven rotor systems is projected to undergo a significant amount of stress that proves to be the main difficulty with the design. This project is a paper study of KRyanCreative LLC's proposed design in order to refine engineering parameters and better understand the structural limits of the system. The study will be conducted in conjunction with KRyanCreative LLC and the end goal will be to apply for a small business innovation research grant through the National Science Foundation.

POSTER PRESENTATION

LEADERSHIP IN COMMUNICATION: EFFECTIVENESS IN THE USE OF TECHNOLOGY

In everyday activities, communication continues to be the foundation of any person's success or failures. The process of how information is communicated to how information is perceived is a skillset that a leader strives to excel in. The strength in practical communication skills develops not only the person but the team as well. It builds up morale and brings structure to the functions of the organization. Our research will center on how leaders in our daily lives are communicating and how we can bring that skill to be even more effective. This research is inspired by personal experience with common issues of how information is communicated and perceived via technology.

POSTER PRESENTATION
AIR FORCE ROTC UNDERGRADUATE RESEARCH AND LEADERSHIP PRESENTATION

Patricia Sablan

Physics and Astronomy Department, College of Arts and Sciences

Katherine Mosley

Applied Aviation Sciences Department, College of Aviation

Nicole Niemynski and Taylor Tavares

Global Security and Intelligence Studies Department, College of Security and Intelligence

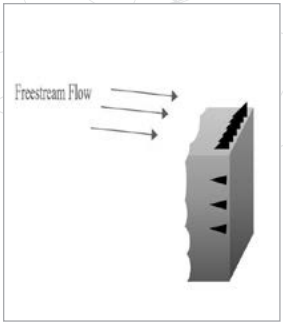
Jacob Rensel

Aeronautical Science Department, College of Aviation

Mentor:

Lt. Col. Marella Tobolt Big Mountain

Air Force Reserve ROTC



AUTOMOTIVE APPLICATIONS OF FUEL SAVING VORTEX GENERATORS

IGNITE AWARD

The goal of this project is to investigate the effects of VGs on the reduction of aerodynamic drag of popular consumer vehicles. The use of vortex generators (VGs) may reduce the aerodynamic drag of consumer automobiles resulting in better fuel economy without significantly impacting normal operation, noise, or the aesthetics of the vehicle. A simplified car geometry with and without VGs will be tested in the wind tunnel to observe if drag is reduced. Full scale versions of the VGs will also be attached to full scale vehicles in order to evaluate their actual effect on fuel consumption and the feasibility for consumer use.

POSTER PRESENTATION

Alexander San Miguel, Jack Garcia, and Harold Dzigiel

Aerospace Engineering Department, College of Engineering

Mentor:

Wallace Morris II

Aerospace Engineering Department, College of Engineering

VENTURI INDUSTRIES - PROJECT KINGFISHER

Project Kingfisher is an unmanned aerial vehicle (UAV) that can serve as an economical Lethal Miniature Aerial Munitions System (LMAMS) for military applications, or as an Intelligence, Surveillance, and Reconnaissance (ISR) platform for civilian use. The versatility of Project Kingfisher is due to its modular payload features, six mile range, 60 second deployment time, and its ability to be transported by a single person in a 45-liter backpack. The UAV will enable ground infantry to eliminate non-line-of-sight insurgents without endangering themselves during combat situations. The UAV can also be used by police or firefighters to spot dangerous suspects or gain knowledge of a fire respectively, without jeopardizing the safety of ground personnel.

POSTER PRESENTATION

Alexander San Miguel, Veronica Norkus, Zane Zylstra, Trace Sheerin, Lance Mitchell, Jason Fung, Corey Blythe, Preston Vargecko, and Cole Macklin

Aerospace Engineering Department, College of Engineering

Yoav Zimron

Mechanical Engineering Department, College of Engineering

Mentor:

Jacob Zwick

Aerospace Engineering Department, College of Engineering

CARRIER-BASED RECONNAISSANCE AND ATTACK RC AIRCRAFT DESIGN

EAGLE PRIZE AWARD

The 2018-2019 American Institute of Aeronautics and Astronautics (AIAA) Design/Build/Fly (DBF) competition requires design and manufacture of a multi-role aircraft to support aircraft-carrier-based operations. The aircraft must carry a removable, rotating rotodome, transitioning from flight configuration to a 3 ft wide, stowed configuration, and carry and drop attack stores. These capabilities and the flight performance are evaluated in three flight missions and one ground mission, at competition in Tucson, Arizona. The driving factor for the aircraft design was simplicity and manufacturing capability. The ERAU Prescott DBF team did not consider score maximization as an element in aircraft design, but rather chose a design that would be relatively simple and easy to build and test many times with a small team. Many design elements thus rely heavily on the use of the four-axis hotwire CNC foam cutter and the two-axis laser cutter, to quickly cut foam, balsa, and plywood parts designed with CAD software. The resulting aircraft satisfies all explicit and derived requirements, and will be compete in the 2019 AIAA DBF Competition on April 11, 2019. All designs are a product or ERAU undergraduate student work, with the assistance of ERAU faculty, per written competition requirements.

Paul Sanders, Elizabeth Mitchell, Callie Swafford, Trevor Lau, Joseph Grosjean, Max Eisenstadt, Ariana Anderson, Steven Hicks, Simon Zemana, Katherine Rocha, Benjamin Sagar, Pratik Bhargava, Gavin McDaniel, and Matthew Robinaugh

Aerospace Engineering Department, College of Engineering

Mentors:

William Crisler, David Lanning Jr., and Jacob Zwick

Aerospace Engineering Department, College of Engineering

POSTER PRESENTATION

AUTONOMOUS ROBOT FOR INTELLIGENT GROUND VEHICLE COMPETITION

EAGLE PRIZE AWARD

IGVC (Intelligent Ground Vehicle Competition) is a nationwide event that offers students an interdisciplinary engineering experience that drives for innovation of mobile autonomous technology. The primary event in this contest pits a robot against grassy terrain marked with faint borders and littered with large obstacles for the machine to independently maneuver around. The primary challenges associated with this event are chassis and software. For simplicity, the robot body will consist of a welded metal frame that maneuvers via differential steering. A full Computer-Aided Design (CAD) model is currently in development, which will allow for detailed simulation and analysis of chassis performance prior to fabrication. On the software side, vision processing and path-planning algorithms will be implemented through OpenCV and Robotic Operating System (ROS) library interfacing, running on a raspberry-pi/Arduino hardware combination. Additionally, the robot is projected to make use of Light Detection And Ranging (LIDAR) sensory, which employs laser imaging techniques for accurate terrain mapping.

POSTER PRESENTATION

Robbie Shaw, Hunter Smatla, Mitchell Schilling and Brendan Stoutenburgh

Mechanical Engineering Department, College of Engineering

Emmanuel Jefferson, Eli Celaya, and Anna Stoneman

Electrical, Computer & Software Engineering Department, College of Engineering

Joshua Snow

Mathematics Department, College of Arts and Sciences

Mentor:

Douglas Isenberg

Mechanical Engineering Department, College of Engineering

COMPARING THE ELECTRICAL "BLEEDLESS" SYSTEM WITH THE TRADITIONAL PNEUMATIC BLEED SYSTEM

Traditionally, most turbojet and turboprop powered aircraft are designed to incorporate a bleed air system. A bleed air system consists of a network of valves, ducts and regulators to distribute pressured air throughout the aircraft. Bleed air originates from the compressor section of the engines and/or the Auxiliary Power Unit (APU) and is utilized for various functions on board the aircraft such as pressurization, air conditioning and the anti-ice systems. However, with the revolutionary design of the Boeing 787, the bleed air system has been replaced by two electric motor-driven compressors that eliminates the need to extract air from the engine compressors. This presentation compares the two types of pressured bleed air systems by examining their respective designs and benefits, along with potential drawbacks.

POSTER PRESENTATION

Yingyi Shen

Aeronautical Science Department, College of Aviation

Mentor:

Michelle P. Hight

Aeronautical Science Department, College of Aviation

COLOR PLUNDER: A STUDY IN ITERATIVE DESIGN AND PLAYTESTING

The goal of the project was to use the Iterative process to create a board game and test it in at least four versions, improving it every time. Our project started as a game about taking territory in a grid and whoever got the most by the end was pronounced the winner of that game. But as we continued to improve and perfect our game we added new mechanics and we faced the difficulties of making a "good" game with balanced mechanics but also making the game and mechanics appealing. After six iterations we decided the game, while very well polished at this point, was not going to get better from more changes.

POSTER PRESENTATION

Joshua Snow, Deon Martinez, Bradley Lehmann, and Davis Butler

Mathematics Department, College of Arts and Sciences

Mentor:

Ashish Amresh

Mathematics Department, College of Arts and Sciences

FLIGHT PROBLEMS: THE DANGERS OF LAP CHILDREN IN COMMERCIAL AVIATION

Calissa Spooner

Behavioral and Social Sciences Department, College of Arts and Sciences

Mentors

Brent Bowen

Safety Science Department, College of Aviation

Jacqueline Luedtke

Applied Aviation Sciences Department, College of Aviation

The U.S. Department of Transportation maintains an ongoing database with the sub-category titled 'Flight Problems.' This factor among others comprise a component of the Airline Quality Rating. Specifically addressed in this paper is the reported dangers regarding our youngest air travelers. In the United States it is legal for children under the age of twenty-four months to fly in commercial aircraft on the lap of a parent or guardian, while being unsecured or unrestrained. This rule is dangerous to children and has been proven time and time again that it results in the unnecessary death and injury of children. Throughout the history of aviation safety many efforts have been made to improve the safety of passengers, to ensure their survival in the unlikely event of an incident or accident. However, there have been no improvements, regulations, or laws put in place to ensure the safety of our Nation's youngest fliers. Although many leaders in the aviation safety industry have tried to change this, nobody has been successful. The dangers of lap children in commercial aviation will be analyzed, through historical research, reviewing key accidents, and investigating NTSB reports and a policy research construct will be used as a proposal for the development of advocacy for regulatory change.

POSTER PRESENTATION

REVIEW OF THE 2010 NORTHERN ARIZONA TORNADO OUTBREAK

ARIZONA SPACE GRANT AWARD

The tornado outbreak that occurred on 6 October 2010 in Northern Arizona was the largest single-day tornado outbreak event on record west of the Continental Divide. There were 11 confirmed tornadoes, ranging from EF0 to EF3 damage. This research project, funded by NASA Space Grant, seeks to achieve a better understanding of the physical mechanisms contributing to this event in terms of (1) the synoptic-scale storm environment and (2) the topographic influences leading to tornadic development. Tornado damage points and tracks are superposed with the cores of rotating storms in the Doppler radar data. The results indicate a strong relationship between terrain features, terrain slope and elevation to the development of rotation in supercell storms and subsequent tornadic development.

Paige Swenson

Applied Aviation Sciences Department, College of Aviation

Mentor:

Curtis James

Applied Aviation Sciences Department, College of Aviation

POSTER PRESENTATION

PERFORMANCE ANALYSIS OF SIZE SCALING ON HYBRID ROCKET MOTORS

IGNITE AWARD

Hybrid rocket motors are a form of propulsion that combine the principles of liquid engines and solid motors. They offer the low cost and relative simplicity of solid motors while maintaining the liquid engine's ability to be throttled. Despite these advantages relatively little research has been conducted on the internal mechanics of hybrid motors. This lack of research has led the industry to exclude hybrid propulsion systems from large-scale launches, namely in the area of space exploration. This project aims to fill in a portion of this research gap by using a combination of computer simulation and experimental testing to collect data on how size scaling affects the performance of hybrid motors, and to use that data to create a more accurate simulation model. By more closely representing real world results this data will reduce the time, cost, and safety hazards of preparing a hybrid propulsion system for launch. The lasting result of this research will be making hybrid motors and their associated benefits more accessible for future propulsion systems. The test will include four rocket motors; the first motor's purpose is to acquire experimental values for the hybrid motor simulation. The other three motors will each increase in scale in order to test the effect scale has on a hybrid motors output.

POSTER PRESENTATION

Benjamin Treece and Daniel Griffith

Aerospace Engineering Department, College of Engineering,

Joshua Chandley

Intelligence Studies and Global Affairs Department, College of Security and Intelligence

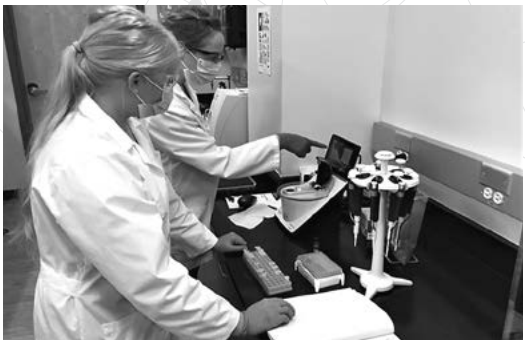
Baxter Elwood

Physics and Astronomy Department, College of Science

Mentor

Michael Fabian

Mechanical Engineering Department, College of Engineering



THE EFFECT OF PCR REPLICATION ON SPECIES RICHNESS ESTIMATES USING ENVIRONMENTAL DNA AND 16S RRNA VERTEBRATE METABARCODING

URI SIG GRANT AND ARIZONA SPACE GRANT AWARD

eDNA is a relatively new but promising tool for characterizing biological communities. Currently, the two most common eDNA analyses used by biologists are qPCR and metabarcoding. qPCR is more established, using primers to target a single species. Metabarcoding targets multiple species using one primer set. This allows metabarcoding to more broadly characterize community assemblages and potentially detect rare or low-density species. As a new technology, several methodological questions need to be answered. For example, standard protocol uses only a fraction of DNA extracted from a sample, in PCR reactions. Are rare species thus going undetected? To address this, we examined whether we might find different species in one versus two PCR replicates from the same eDNA sample. Duplicate 4L water samples were collected from seven sites on Fossil Creek, AZ. Samples were filtered, DNA was extracted, PCR was performed in duplicate using primers that amplified a hypervariable region of the 16S rRNA gene that can be used to identify vertebrate species. Sequencing was performed on a Illumina MiSeq FGX Forensic Genomics System. Sequence analysis identified 14 vertebrate species, including six fish, six mammals, and two herpetofauna. The most common species were found in every PCR replicate, whereas sequences associated with rare species were often found in only one of the two PCR replicates.

POSTER PRESENTATION

Courtney Turner-Rathbone and Bethany Davis

Biology and Chemistry Department, College of Arts and Science

Mentor:

Catherine Benson, Hillary Eaton, and Matthew Valente

Biology and Chemistry Department, College of Arts and Science

ENRICHED CULTURAL KNOWLEDGE IN MAINLAND CHINA AND TAIWAN

IGNITE AWARD

Studying Chinese culture and the Mandarin Chinese language is integral in today's global environment. There are specific cultural differences and similarities between mainland China and Taiwan through economics, politics, and international relations. On an international scale, cultural differences between countries and territories are especially important for intelligence analysts to understand. These differences can start tariff restrictions, military action, and full-out war if not acted on before it is too late. The researchers hope to enhance their knowledge of Chinese culture through literary research and analysis of data collected through surveys, field observations, and interviews while studying abroad in Kaohsiung, Taiwan, summer 2019. This research will assist future study abroad programs to enrich the lives of students studying Chinese. Additionally, through conducting this research, the researchers will improve their language proficiency and analyst skills to identify conflict on global issues.

Nicole Wood and Alexis Macias

Intelligence Studies and Global Affairs Department, College of Security and Intelligence

Mentor:

Hong Zhan

Humanities and Communications Department, College of Arts and Science

POSTER PRESENTATION

UNDERSTANDING THE SUBCONSCIOUS IMPACTS OF EXTERNAL FACTORS ON INTERVIEWS

When an investigator looks at their role in interviewing witnesses and suspects, they understand how important it is to present themselves in a way that will make the subjects comfortable. The human brain is a powerful tool but can be easily and subtly manipulated through changes to various factors in a room. Understanding how the brain processes information can have a major impact on the success of an interview. Research that has already been conducted on external factors has been mostly limited to proxemics and changes to defense strategies for different offenses. Fast food chains are a great example of how external factors can be used to provoke certain feelings. Fast food chains often paint their buildings in bright colors such as red which can stimulate the adrenal gland and yellow which can cause a release of serotonin. Our research focuses on external factors that affect rapport building in an interviewing environment. This research has the potential to subtly change the way the interview rooms are presented. Establishing a better understanding of external factors in an interview will have a direct impact on an investigation's success.

POSTER PRESENTATION
AIR FORCE ROTC UNDERGRADUATE RESEARCH AND LEADERSHIP PRESENTATION

Jonathan A. Woods

Applied Aviation Sciences Department, College of Aviation

Sawyer B. Krueger

Aerospace Engineering Department, College of Engineering

Mark Dehoff

Intelligence Studies and Global Affairs Department, College of Security and Intelligence

Joshua D. Vaughan

Mechanical Engineering Department, College of Engineering

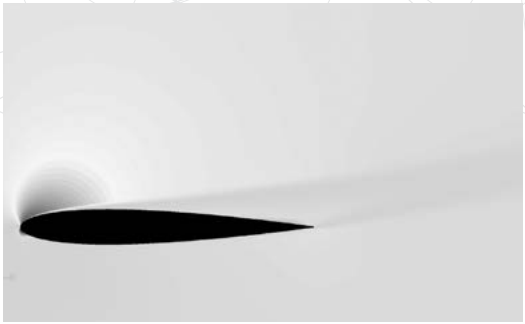
Mentors:

Karen Meunier

Intelligence Studies and Global Affairs Department, College of Security and Intelligence

Lt. Col. Marella Tobolt
Big Mountain

Air Force Reserve ROTC



STALL HYSTERESIS RESEARCH PROJECT

IGNITE GRANT

Airplane stall is a pilot's worst enemy. Last year, the AOPA Air Safety Institute published a report outlining the effects of stall and spin on aviation accidents in the twenty-first century. They found that stall was responsible for almost 25% of fatal airplane accidents between the years 2000 and 2014. In 2002 alone there were 195 reported aviation accidents due to stall, 90 of which were fatal. They also showed that stall-induced plane crashes were more than 50% more likely to result in fatalities than other accidents. These statistics underline the danger of stall and justify further research into its causes. Despite great interest in stall prevention, the science behind it is not yet fully understood. One of its mysterious characteristics, called "stall hysteresis", is an aerodynamic anomaly which occurs during a pilot's recovery from stall, where lift is inexplicably lost, and the effects of the stall intensified. A more complete understanding of this phenomenon may provide the missing link necessary for the development of a more accurate model of stall. This experiment explores the hypothesis that stall hysteresis is a product of a factor called "circulation parameter", which causes the flow of air around a wing to behave as if the wing were substantially deformed. This research will test this idea, by studying the flow over this deformed shape, called the "effective body" and comparing it to the flow about a wing experiencing stall hysteresis.

Cole Zenker, Jesse Ingraham, and Thorne Wolfenbarger

Aerospace Engineering Department, College of Engineering

Mentor:

Wallace Morris II

Aerospace Engineering Department, College of Engineering

POSTER PRESENTATION

THANK YOU TO OUR DONORS

Dr. Anne Boettcher and Mr. Daniel Martin

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