EMBRY-RIDDLE AERONAUTICAL UNIVERSITY

AERONEWS

Department of Aerospace Engineering at Embry-Riddle Aeronautical University – Daytona Beach

DECEMBER 2015

Erik Lindbergh and Eric Bartsch from Powering Imagination present the Skunk Works HK-36 power glider to Embry-Riddle and work with the students to add the logos to the plane. (p. 5)

Embry-Riddle Aeronautical University's Aerospace Engineering Program named the best in nation for the 16th straight year

Message From the Chair

Dr. Tasos Lyrintzis

It has been a very exciting year! For the 16th year in a row (i.e., since the inception of this ranking), the Best Colleges guidebook published by *U.S. News & World Report* ranks Embry-Riddle's undergraduate aerospace engineering program as No. 1 in the category of non-Ph.D.-granting institutions. Also, Aviation Week has recognized our program in several categories (see details on page 12).

Our department is still growing. As of Fall 2015, we have 1,303 B.S. students, 134 M.S. students, and 21 Ph.D. students. A new program in UAS Engineering started last year and currently has nine students (see details on page 13). It should be noted that 13% of our students are Honors students, more than twice the Embry-Riddle average. Our faculty has grown as well; this year we welcome three new faculty members, Drs. Al-Haik, Moren, and Rollin, who are highlighted herin, for a total of eighteen new faculty in the last five years.

Over summer 2015 two teams advised by Drs. Perrell and Udrea took first place in the NASA Astronautics competitions, and a team advised by Professor Attia took second place in the AIAA Engine Design Competition. Currently, students and professors at the Eagle Flight Research Center (EFRC) are working on both a hybrid and a full-electric airplane. In addition, we have numerous design/build/test projects at both the undergraduate and graduate levels.

We have a significant number of ongoing funded research activities. Current projects include awards from NASA for work on a free-flying unmanned robotic spacecraft for asteroids, an ultra-miniaturized star tracker for small satellite attitude control, thermal management for combat aircraft, control systems of space launch vehicles, and a dual aircraft platform (funded by NASA's Innovative Advanced Concepts Program). Additionally, an AE faculty is studying the spread of the Ebola virus in a project funded by the NSF. Finally, Embry-Riddle (including several AE faculty), in partnership with several other universities, became an FAA Center for UAS.

The partnership with Dassault (for the Dassault Design Institute) continues. We also continue to enjoy a great relationship with Gulfstream that includes a distance education Master of Science program, faculty sabbatical and summer leaves, sponsorship of senior design courses, and other interactions.

A Lyrintzis

Dr. Tasos Lyrintzis
Distinguished Professor, Department Chair

AEROSPACE NEWSLETTER

CONTENTS

Students at work in the Gas Turbine Lab at Embry-Riddle

New Facilities

New Engineering Building - Wind Tunnel

Embry-Riddle Aeronautical University has announced the construction of a new Engineering Building (Advanced Aerodynamics Laboratory) and a state-of-the-art subsonic wind tunnel.

The 50,000-square-foot, $26 million building features 10,000 square feet of flex lease space to meet the needs of future tenants including the following facilities:

- Composites Center
- Multiscale Materials Laboratory
- Large Article Testing Laboratory
- Structural Health Monitoring Facility
- Smart Materials Laboratory
- Space Technologies Laboratory
- Thermal and Energy Laboratory
- Advanced Dynamics and Control Center
- Robotics and Autonomous Systems Facility
- Radar and Communications Laboratory
- Circuits, Sensors and Instrumentation Laboratory
- Computational Sciences Laboratory

This will be the first building of ERAU's 90-acre research park, which will include offices, laboratories, and hangar space with direct taxiway access to Daytona Beach International Airport.

Tenants of the Research Park, including established industry leaders and burgeoning enterprises will have access to the facilities provided within Embry-Riddle's continually expanding areas of research.

A new state-of-the-art subsonic wind tunnel will be located in an adjacent building. Aero Systems Engineering (ASE) is the primary contractor for the new wind tunnel. This tunnel will be focused on supporting the education and research needs of the Department as well as commercial applications. The tunnel will have a 4 ft x 6 ft x 12 ft test section, optimized for the use of advanced optical flow measurement techniques such as particle image velocimetry. The 12-ft-long test section can be replaced with a 20-ft section when required. The tunnel will also have a secondary 10-ft x 14-ft upstream test section. The primary test section will have a flow speed capability up to 230 mph with exceptional flow quality. A six-component balance is used for force and moment measurements, complemented by a comprehensive multi-channel pressure measuring system.

- See more at: **http://news.erau.edu/park**

Artist renderings of the new Engineering Building (Advanced Aerodynamics Laboratory) and Wind Tunnel

Research News

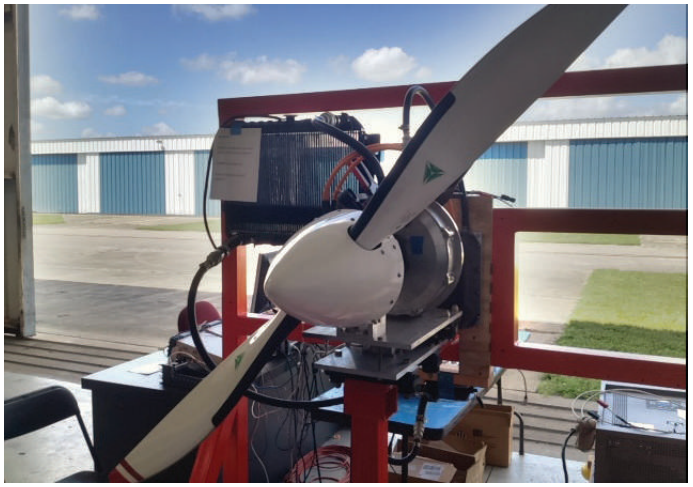
Eagle Flight Research Center, directed by Dr. Pat Anderson, is the university's flight R&D facility. The state-of-the-art center is equipped to conduct a variety of projects.

Battery Centric Alternative Aircraft Propulsion Design Space

The Eagle Flight Research Center has been working on alternative aircraft propulsion schemes since 2009 and NASA's Centennial Challenge, the Green Flight Challenge. Embry-Riddle is now a leading authority in the next evolution of aircraft propulsion, battery centric alternative aircraft propulsion. This signature area now includes the development of a Plug-in Electric Aircraft (PEA) and a Plug-in Hybrid Electric Aircraft (PHEA). With the retirement of the hybrid electric Eco-Eagle, the follow-on research has taken two different branch paths; the Quiet Flight Initiative (QFI), which is emphasizing a PEA design, and a PHEA propulsion system design focused on a higher horsepower configuration, including a turbine core.

The development of the PEA is a hardware-based research project which we expect to fly as a manned demonstrator in 2016. Beyond the airframe and propulsion configuration needed for any aircraft design, the novel part of this design is the development of the battery management system and the motor controller.

The design of the PHEA is the responsibility of a consortium of industry and government partners focused on higher horsepower alternative propulsion systems. Leading industry airframe and propulsion OEMs are currently negotiating to be part of this pre-competitive coalition with ERAU as the lead. Embry-Riddle has worked with the world's leader in battery research, hybrid and To that end, the center has recently signed both an NDA and an MOU with Argonne to leverage ANL's battery and road vehicle experience and ERAU's aerospace capabilities. electric vehicle research, Argonne National Laboratory (ANL). While most people would agree that the end-game for road vehicles is an electric vehicle, in aerospace, PEAs may actually be the stepping stone to PHEV.



EFRC Electric Motor

Research shows that the most critical parameter in the automotive industry is the cost of the batteries, whereas in aerospace weight is the critical parameter. The mass properties of batteries may limit PEA to lower airspeeds, requiring faster aircraft to depend on hybrid systems. Unlike many others that are researching only PEAs, Embry-Riddle has a strong presence in hardware-based hybrid propulsion research.

With three major hardware-based designs in the battery centric alternative aircraft propulsion field, Embry-Riddle is leading the world in the definition of this design space. Following the advent of piston propulsion and jet propulsion, this is the next evolution of propulsion and a signature area of research for Embry-Riddle.

Welcome Dr. Borja Martos

Dr. Borja Martos

Embry-Riddle announces the appointment of Dr. Borja Martos to the Eagle Flight Research Center.

Dr. Martos' area of expertise is in flight testing of aerospace vehicles for performance, flying, and handling qualities, and advanced flight controls. He is an expert in aerospace modeling and simulation, active and passive fuel systems, and 5-DOF and 6-DOF in-flight fly-by-wire simulation aircraft.

He has worked on research projects sponsored by the FAA, NASA, NOAA, DOD, DOE, and several aerospace companies. His most recent research project – "Develop and Flight Test a Low Cost Accurate Angle of Attack Differential Pressure System for Light General Aviation Aircraft" – is funded by the FAA. He holds an FAA Airline Transport Pilot rating, multiple instructor pilot ratings, and has over 2,000 flight hours, primarily in research aircraft.

Next Generation Ag UAV Being Developed with Heurobotics

Researchers in the Department are working to develop a UAV to be used for large-scale agricultural applications. The UAV proposed will fly like a fixed-wing aircraft, taking advantage of fixed-wing aircraft range and endurance characteristics, but will take-off and land vertically, an advantage of helicopters and other rotor-wing devices.

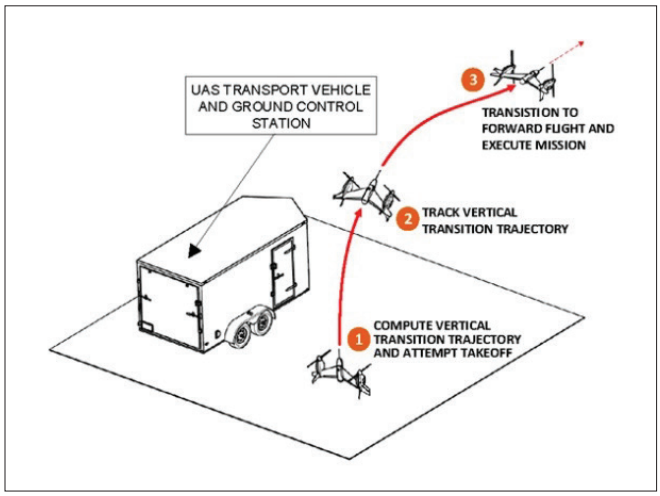
Vehicle Description and Strengths

The vehicle is a 50-pound-class small UAV that can operate as both a rotorcraft in vertical flight and as a fixed wing aircraft in horizontal flight. This is accomplished with a mechanically simple airframe with no major "morphing" airframe parts. The critical enabling technology is the ability to implement advanced control law algorithms that provide autonomous and robust capabilities to transition between these two modes. Furthermore, these control laws will allow the vehicle to "back up" to a vertical landing, even though the vehicle is unstable in this configuration. Recent advances in modern control theory, parameter identification, and high-resolution vehicle modeling enable this.

The vehicle is battery powered with fully electric propulsion, allowing for quiet flight without plumes to distort any sensitive optical systems. Furthermore, it allows for the nearly instantaneous ability to jump off the ground into flight from a deployment area. The Mk.II is a twin-engine aircraft with the propulsion system in wing mounted pods. The two electric motors each drive independent rotor systems that are nearly identical to full-scale manned helicopter systems. This provides full control authority while in the rotorcraft mode by using both cyclic and collective control autonomously. It also provides the same ability as a manned helicopter to autorotate to a controlled landing in the event of a propulsion system failure. As a fixed wing aircraft, the Mk.II relies on a "flying wing" configuration to generate lift and increase efficiency during high-speed and long-duration flight regimes. When operating as a fixed-wing aircraft, the rotors act as propellers to provide forward thrust, and aerodynamic control surfaces are used to control the vehicle's trajectory.

Mission Capabilities

The Heurobotics Mk. II UAV provides flexible sensor mission capabilities. It is designed to operate from areas as small as 10 feet in diameter, without the need for an improved runway or operating area. The Mk. II is designed to be deployed from a small operations trailer. Once it is rolled out, it can takeoff vertically as a helicopter and then transition to fixed-wing flight as depicted in the diagram below.



Mk.II UAV in the vertical takeoff attitude, and in the transition to horizontal flight

The Mk. II UAV

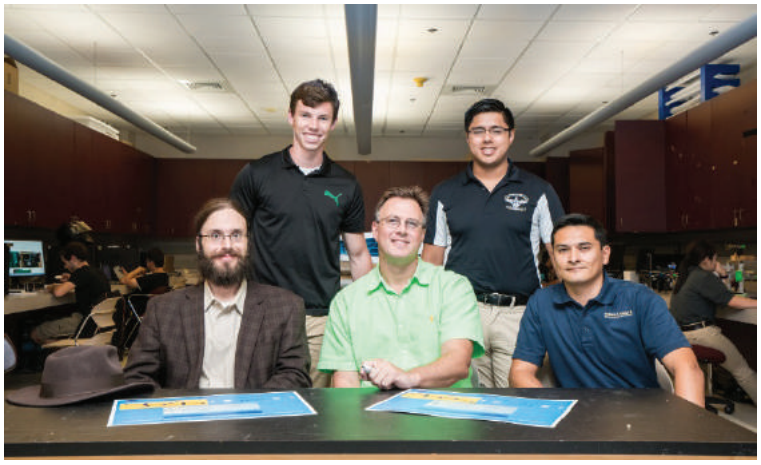
Lockheed Martin's Skunk Works Donates HK36 to EFRC

In February, Lockheed Martin's Skunk Works showed a great amount of generosity to Embry-Riddle. The Advanced Development Division of the aerospace industry leader gave a Diamond HK36 to the Eagle Flight Research Center through a research partnership with the University that Dr. Pat Anderson will be leading over the coming months. The delivery of the aircraft to the EFRC is shown at right.

Dual-Aircraft Platform

NASA Innovative Advanced Concepts Funding $100K Study for Dual-Aircraft Platform (DAP)

Director, Professor Bill Engblom



ERAU Members of DAP Team (from left to right: Dr. Billy Barott; Sean O'Toole; Dr. Bill Engblom, PI; Esteban Sanchez; Dr. Hever Moncayo)

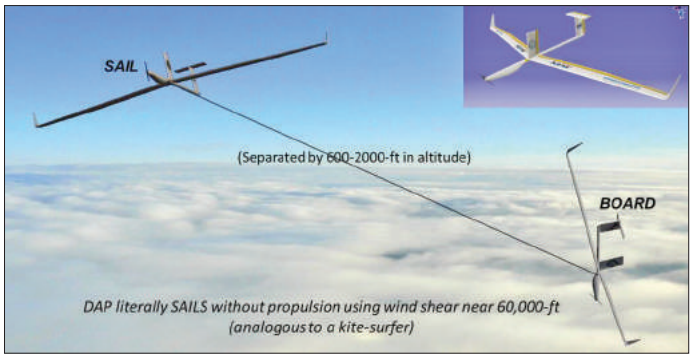
During the 2015-16 academic year, NASA Innovative Advanced Concepts (NIAC) is funding a $100K virtual proof-of-concept Phase I study of the DAP. The research team consists of specialists from ERAU, an atmospheric environments specialist from NASA MSFC (Mr. Ryan Decker), and well-known aircraft designers from Boeing (Mr. Norm Princen, Mr. Blaine Rawdon, Mr. Kushan Patel).

The Dual-Aircraft Platform is a patented concept for achieving a low-cost atmospheric satellite which utilizes wind shear as the primary energy source, and that uses the potential to stationkeep while providing substantially larger amounts of power to its payload than a traditional solar aircraft. DAP consists of two unmanned and autonomous solar aircraft connected via a thin, ultra-strong cable that literally sails without propulsion, using levels of wind shear commonly found in the lower stratosphere (e.g., near 60,000-ft). The two aircraft are positioned at different altitudes, as far as 2,000-ft apart, to encounter substantially different wind velocities. The device operates similar in principle to a kite-surfer in which the upper aircraft, referred to as the SAIL, provides lift for both aircraft and aerodynamic thrust, while the lower aircraft, known as the BOARD, provides an upwind force to keep the platform from drifting downwind. Each aircraft extracts additional energy via solar film and a wind turbine to operate the avionics, flight controls, payload, and for use of propulsion.

The DAP concept is expected to provide substantially larger levels of power to onboard payloads, compared to conventional solar aircraft. Consequently, the primary objective of this year's effort is to directly compare the performance of a conventional solar aircraft with the DAP for a 3-month mission as a communications relay, remaining within 150 miles of Orlando, at an altitude of 50,000-60,000-ft, using physics-based flight dynamics simulations. A related objective is to evaluate new flight operations and controls strategies that may lead to improved DAP performance in these simulations.

Milestones achieved thus far:

- Boeing's aircraft design team has been working with ERAU to configure a new "twin" airframe (shown above).
- NASA MSFC has used Cape Canaveral's 50 MHz Doppler radar data (at 5-minute intervals) plus radiosonde data, to construct 2+ months of detailed, realistic time-varying atmospheric profiles for use in the flight simulations.
- ERAU is refining its novel DAP guidance and control software, and is producing very long duration flight simulations using the aforementioned atmospheric profiles.
- ERAU has configured a communications relay package for use on DAP to evaluate its performance as an "atmospheric satellite."



Ultra-Miniaturized Star Tracker

Director, Professor Troy Henderson

As more CubeSat-class satellites are launched and science instruments are miniaturized, spacecraft pointing knowledge is increasingly important. Perhaps the most accurate attitude determination instrument for a satellite is a star tracker. Dr. Troy Henderson, Assistant Professor of Aerospace Engineering, and a team of students have partnered with Creare to develop an ultra-miniaturized star tracker.

Current state-of-the-art star trackers use multiple glass elements that are heavy and require too much volume to be used on a CubeSat-class satellite. The new design incorporates folded optics, reducing the size and weight of the optics by several orders of magnitude. Dr. Henderson and his team are currently developing and testing algorithms for image processing and attitude determination. This summer they began laboratory testing of an integrated unit. The project will culminate with a high-altitude balloon flight in 2016. The project is currently funded through a Phase II STTR through NASA/Wallops Flight Center.

Simulation-Based Policy Analysis for Reducing Ebola Transmission Risk in Air Travel

Director, Professor Sirish Namilae

Air travel has been identified as a leading factor in the spread of several infections including influenza, SARS, tuberculosis, and measles, a situtation that motivated calls for limitations on air travel during the 2014 Ebola outbreak. This situation, which motivated calls for limitations on air travel during the 2014 Ebola outbreak. However, such limitations carry considerable economic and human costs. The objective of this NSF-funded project is to provide computational tools that will enable policy makers to make rational air-travel related decisions in the course of an infection outbreak.

Reducing the number of passenger-passenger and passenger-surface contacts on an airplane can potentially reduce the spread of infectious diseases like Ebola. Team members developed a pedestrian movement model based on molecular dynamics and applied it to evaluate the movement and contacts among passengers during boarding and deplaning of airplanes. The large number of parameters and inherent uncertainty in pedestrian behavior necessitates the use of massively parallel supercomputers to quantify this uncertainty and to estimate the likelihood of infection risk in various scenarios. For example, one of the policy options relates to the location of vacant seats in an airplane. It is found that placing vacant seats in the aft and center sections of an airplane result in a reduced number of contacts and overall lower infection risk. With collaborators at Florida State University and Arizona State University, we plan to integrate our pedestrian movement model with phylogeographic infection transmission models with a mutual feedback that enables multi-scaling and validation.

Two graduate students in Aerospace Engineering master's and doctoral programs are significantly involved in this project.

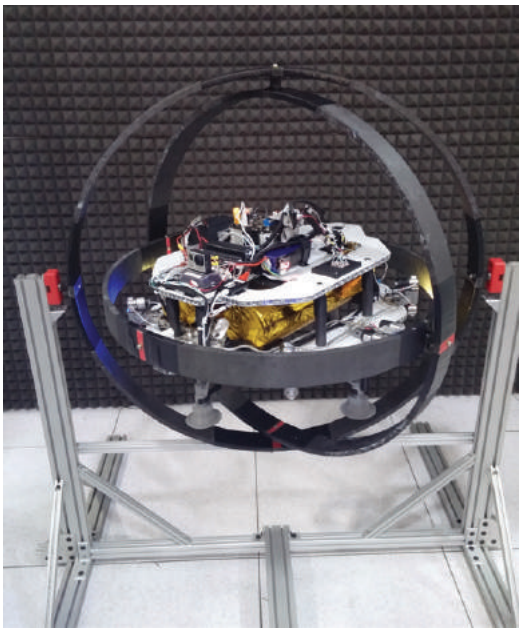
Embry-Riddle and Honeybee Robotics Receive $750K Research Award from NASA to Develop Asteroid Mining Robots

Director, Professor Hever Moncayo

NASA has announced a $750,000 Phase II research award to Embry-Riddle and project partner Honeybee Robotics to develop a small integrated autonomous robotic spacecraft system to support the exploration and mining of asteroids and other planetary bodies and moons.

Dr. Hever Moncayo and Dr. Richard Prazenica, both Assistant Professors of Aerospace Engineering in the College of Engineering, are leading the effort at the Daytona Beach Campus. Also collaborating on this project is Dr. Sergey Drakunov, Professor of Engineering Physics and Associate Dean of the College of Arts and Sciences. Dr. Kris Zacny is the team lead for Honeybee Robotics.

The Embry-Riddle team includes Aerospace Engineering master's degree students Diego Garcia, Chirag Jain, Andres Chavez, Wai Leuk Law, Aerospace Engineering Ph.D. student Andres Perez, and Engineering Physics Ph.D. student Samuel Kitchen-McKinley. The researchers are focusing on an innovative concept based on autonomous small free-flyer prospector spacecraft that can leave from, return, and recharge from a mothership on the planet's or asteroid's surface.



Small autonomous robotic spacecraft

The spacecraft design will use unique technologies, such as MicroDrills and Pneumatic Samplers, previously developed under NASA Small Business Innovation Research project awards by Honeybee Robotics. In particular, the research effort will focus on flight control and guidance under extreme environments, vision-aided navigation approaches, and sampling systems design, testing, and evaluation. The proposed flying scouts spacecraft system was developed, simulated and evaluated during Phase I of the project, and is now being experimentally validated and demonstrated during Phase II through flight-testing on an autonomous research platform.

"This is an important project in our efforts to establish a long term partnership with NASA Centers," said Dr. Moncayo. "Aerospace Engineering students working together with faculty are pushing the boundaries of applied research toward innovative and low-cost technologies for the exploration of extreme environments, not only for space missions, but also for terrestrial applications."

Stability and Flight Readiness of the SLS FCS with Adaptive Augmentation

by Mark J. Balas, Distinguished Professor, Aerospace Engineering Department

Let me introduce you to one of my current Aerospace Engineering research directions in adaptive control. This work has been initiated and funded by the NASA Marshall Space Flight Center (MSFC) in Huntsville, Alabama.

The idea of augmenting an existing well-designed fixed-gain controller with a direct adaptive controller with variable-gains to recover safe operation and improve performance when things go wrong has been around for a while. I first heard it about five years ago talking with Dr. Mark Whorton (then with NASA MSFC, now with Teledyne Brown) in a hallway conversation at an American Control Conference somewhere. Soon after that I began to hear more industry and government lab people talking about how such an adaptive augmentation might improve safety and aid in risk management for missions in poorly known aerospace environments. This was a very positive thing for the application of adaptive control.

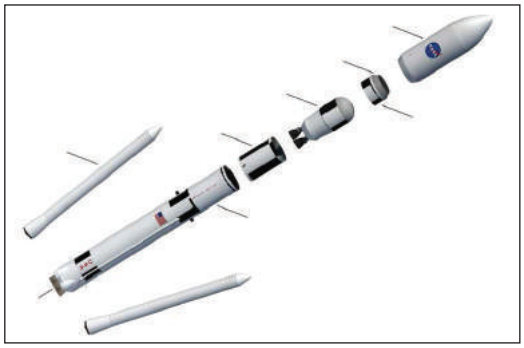
Back in the late 1980s the U.S. Air Force had included an adaptive controller as part of the autopilot for an experimental aircraft called the X-15, and in one of the test flights the pilot Major Mike Adams lost control of the aircraft and the adaptive controller appears to have interfered with his ability to recover control. The plane crashed and Major Adams was killed. At that point the Air Force and the Department of Defense lost all interest in adaptive control and that has suppressed the consideration of applied adaptive systems until fairly recently.

The NASA MSFC Flight Mechanics and Analysis Division has developed an Adaptive Augmenting Control (AAC) algorithm for very large launch vehicles to improve robustness and performance by adapting an otherwise well-tuned classical control algorithm to unexpected environments or variations in vehicle dynamics. This AAC algorithm is currently intended as part of the baseline design for the Space Launch System (SLS) Flight Control System (FCS).

The SLS Adaptive Augmenting Control algorithm update law was developed based on an understanding of typical adaptive control techniques, coupled with practical engineering judgment, but it was not a direct result of theoretical stability analysis. In general, launch vehicles follow a complex trajectory into space orbit. The controllers for maintaining the vehicle on this orbit are designed by linearization at various waypoints along this orbit. When climate conditions and other factors cooperate, these designs work very well and they are supported by various a priori linear system performance tools like gain and phase margins and describing function analysis. There is a long history of successful launch vehicle operation. But obviously in some cases things do go wrong and vehicle operations become unstable.

One of the major impediments for a theoretical analysis of the AAC is the high level of nonlinearity introduced by the adaptive gain update law. Consequently, our approach has been focused on a full nonlinear stability (Lyapunov) theory analysis to prove the convergence of the launch vehicle error dynamics as a result of the adaptive law. I have been aided in this research by one of our AE doctoral students, Francisco Franquiz. We are developing a general nonlinear theoretical stability analysis for the direct adaptive augmentation of existing fixed-gain controllers, and applying this to the specifics of the SLS Adaptive Augmenting Control.

I am especially pleased to be able to participate with NASA MSFC on this topic because we are providing a better risk management approach for the new SLS launch systems that will include a solid nonlinear foundation for stable operation along with their existing history of excellent engineering design and judgment. And it may very well contribute to a renewed interest in the application of direct adaptive control for critical aerospace missions.



SLS 130 Metric Ton Evolved Configuration

Alliance for System Safety of UAS through Research Excellence (ASSURE)

FAA Selects ASSURE Nation's Center for Excellence in UAS

In the near future, the use of unmanned aircraft systems (UASs) is expected to increase exponentially in number and diversity. However, challenges related to operation and integration within the national airspace become critical in the context of increased autonomy and the standard for safety. The attempt to integrate UASs into the National Airspace (NAS), although imminent, still poses significant issues due to the diversity of missions these systems are expected to perform, the high level of performance, and the safety requirements.

To overcome these challenges, the Federal Aviation Administration (FAA) has recently selected the Alliance for System Safety of UAS through Research Excellence (ASSURE) as the nation's new Center of Excellence in Unmanned Aircraft Systems (UAS). As a co-founder of ASSURE, Embry-Riddle will act as the technical lead in UAS airport ground operations and pilot and crew training, as well as co-lead in command and communication research.

Different ongoing and future projects within the Aerospace Engineering (AE) Department provide significant support of the ASSURE goals. AE has actively been involved in UAS flight testing and investigation of technologies necessary to integrate them into the NAS. This includes the development of a surrogate UAS, ground station, and data link system with see, avoid, and communication capabilities. In addition, to guarantee safe operation within the NAS, a UAS must be equipped with enough control authority to avoid or mitigate the effects of various abnormal and potentially dangerous conditions. Research effort toward the implementation and flight testing of advanced UAS intelligent fault tolerance flight control systems are also being performed by AE researchers. This includes the development of guidance, navigation, and control algorithms for autonomous flight vehicles operating in complex, diverse environments that might present stationary and moving obstacles of varying size and complexitywith potentially unavailable GPS.

ASSURE's mission is to provide the FAA with the research it needs to quickly, safely and efficiently integrate unmanned aerial systems into the National Airspace System with minimal changes to the current system. See more at: **http://news.erau.edu/top-news**

Cessna 182 adapted into a Surrogate UAS to support research and testing.

Researches at the Flight Dynamics and Control Research Laboratory to support ASSURE

UAV testbed to support research and development of fault tolerance flight control systems.

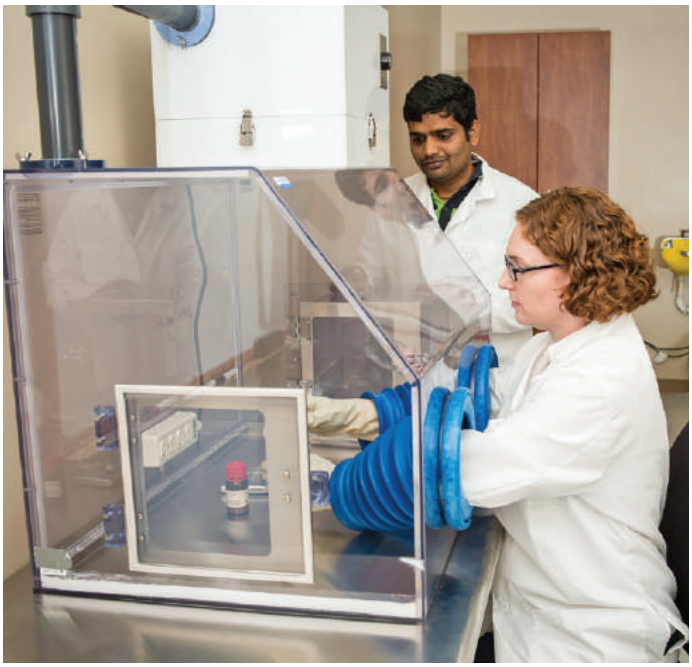
In the near future, the use of unmanned aircraft systems (UAS) is expected to increase exponentially in number and diversity.

Faculty News

Dr. Balas Elected Fellow of ASME

Dr. Mark Balas

Dr. Mark Balas was recently elected to the Fellowship of the American Society of Mechanical Engineers (ASME). The Aerospace Engineering Department is proud of Dr. Balas for his contributions, not only here at Embry-Riddle, but also to the aerospace industry as a whole. His multiple publications speak heavily of his technical expertise, and also testify to his societal merit. Dr. Balas has reinforced that our faculty membership is composed of the finest in academia. On behalf of the Aerospace Engineering Department, we acknowledge and congratulate Dr. Balas for his election to the Fellowship of the ASME. Dr. Balas is also a fellow of the American Institute of Aeronautics and Astronautics (AIAA) and the Institute of Electrical and Electronics Engineers (IEEE), making him one of the very few individuals to have achieved such a rare distinction.



Dr. Virginie Rollin works with a student (Tejas Mehta) in the Scanning Electron Microscope Lab.

Embry-Riddle is a leader of Aerospace Engineering education. A recent alumni survey showed that 96.3% of graduates were either employed (80.5%) or accepted to graduate school (14.8%) one year after graduation.

"The Uncrashable Airplane is Within Reach"

On March 31 of this year, Dr. Anderson was featured on **Avweb.com** with his article titled "The Uncrashable Airplane is Within Reach." The article was posted on **avweb.com** and is recapped below.

How do you teach an airplane not to fly into the ground? If society is ready for the airplane to have the last say, this is an easy fix with today's modern fly-by-wire airplanes. In fact, the newest software load on F16s is constantly comparing the projected trajectory of the aircraft to the digital map of the Earth. In the event that it predicts an impending intersection, the aircraft rolls wings level and pulls up to avoid a crash. Afterward, the airplane releases the control back to the pilot. This is one more step toward "carefree" flight. The pilot only need be concerned with the mission. The pilot no longer needs to worry about overstressing the airplane or having it depart into uncontrolled flight.

This could be implemented on today's commercial airplanes with a software-only modification. Additional control laws could be installed that would not allow the airplane to fly in places where it should not fly. However, you also have to now think of how an ill-willed pilot would defeat this new system. As an example, the airplane could not avoid the terrain if all the engines are shut off. There would be a significant number of flight-critical commands that would have to be left to the computer.

A modern airplane would turn into a UAV with one exception: it would be manned. Society may not be ready for flying in airplanes that have no on-board operators. Future pilots may only take over to troubleshoot the computer when it fails, or when our own failure of imagination presents our well-trained computers with an unanticipated situation.

We are in a time when technology is no longer the limiting factor in the equation, but rather public policy, perception and fear. The technology exists to have the airplane safeguard itself.

The pilot no longer needs to worry about overstressing the airplane or having it depart into uncontrolled flight.

AIAA News

Aerospace Engineering Propulsion Students Score Big at the AIAA Engine Design Competition

The 2014-2015 AIAA Engine Design Competition for Undergraduate Students recently concluded at the Propulsion and Energy Forum, held July 27-29 in Orlando, Fla. This year's RFP was designed to compete against a recent announcement by one of the three major engine makers. Of note, among many requirements, the RFP called for a 15:1 bypass ratio by redesigning a best-selling engine, while leaving the engine core (that is, the high pressure compressor and turbine) and the combustion chamber unaltered. This modification would increase fuel efficiency beyond any of today's operating engines.

Three teams of students from the Aerospace Engineering Department propulsion track participated. The teams were supervised by Professor Magdy Attia, Adjunct Professor Naiara Petralanda, and Tyler Hungtington, a graduate student. Team Triton consisted of Anderson Asalie, Kevin Chung, Tim Parr, and Sachin Patel. Team G-JAM included Angelo Fonseca, Joe Harari, Gaurav Girish, and Michel Metyas, while Team Bypass to the Future consisted of Allie Burns, Nadia Numa, Leah Cornelius, and Klint Martis. In addition to the three Embry-Riddle teams, eighteen other teams competed, including teams from several international universities.

Judging for the competition was in two phases. Phase I, worth 70% of the score, was the evaluation of the written design report. The top five teams were invited to present orally at the P&E forum in Orlando; the evaluation of the oral presentation comprised Phase II. All three Embry-Riddle teams were invited to present in Orlando, with Team G-Jam scoring 2nd and Team Triton scoring 3rd in the written report phase. Overall, Team Triton received 2nd place, while a team from Turkey claimed 1st place. Team Bypass to the Future took 4th place. This is the 5th year Embry-Riddle has participated in this competition; AE students claimed 2nd place in the 2010-2011 competition, and 1st place in the 2012-2013 competition.

Team Triton (from left): Sachin Patel, Timothy Parr, Kevin Chung, Anderson Asalie, and Naiara Petralanda

AIAA Congratulates AIAA SciTech 2015 Twitter Contest Winners

Congratulations to Kevin Leong, a student at Embry-Riddle, (@itsaleongstory) who came in second in the second annual AIAA SciTech Twitter contest at the conference in Kissimmee, Florida.

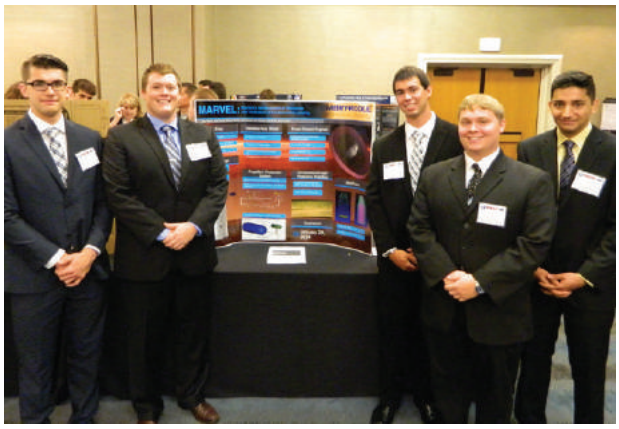
Kevin came in a close second to Jonathan Pelham of Cranfield University (@mro4rpas) who finished the five day conference with 661 original tweets. Following Kevin, in third place, was Tristan Wolfe (@Tristan_Wolfe) of Naval Ships Systems Engineering Station.

AIAA thanks the over 600 participants who collectively sent more than 4,700 tweets.

Pictured from left to right: Jonathan Pelham, AIAA Exec. Director Sandy Magnus, Kevin Leong and Tristan Wolfe.

Student Awards

Embry-Riddle Aerospace Engineering Student Teams Dominate NASA Astronautics Design Competition



Embry-Riddle RASC-AL Team 2015

Two teams of students from Embry-Riddle's Daytona Beach Campus placed first in their categories in the Revolutionary Advanced Aerospace Systems – Academic Linkage (RASC-AL) design competition sponsored by NASA and the National Institute for Aerospace (NIA). One of the teams also placed second overall, earning the opportunity to present a paper detailing their research at the American Institute of Aeronautics and Astronautics Space Conference in Pasadena, Calif., in September.

Sixteen teams competed in the contest, which challenges students to solve real-life space exploration challenges. This year, teams were asked to develop innovative approaches and new technologies allowing astronauts to be less dependent on resources transported from Earth, choosing from four categories: Earth-independent Mars pioneering; Earth-independent lunar pioneering' Mars moons prospector; and large-scale Mars entry, decent and landing (EDL).The teams presented their research and designs for full-scale mission plans before industry and NASA judges during a forum held June 14-17 in Cocoa Beach, Fla.

Placing first in the Mars EDL category and second overall was a team advised by Embry-Riddle Aerospace Engineering professor Dr. Eric Perrell, including Aerospace Engineering seniors Justin Bennett, Nolan Fletcher, Abdul Manarvi, Matt Neiding, James Rogers, Cody Shaw and Jon Willems. The team presented concepts for a pathfinder mission to demonstrate launching a spacecraft from Earth and placing a 20-metric-ton payload for producing oxygen and fuel for later human missions on the surface of Mars.

"The RASC-AL competition was an amazing opportunity for aerospace students to come together and share innovations and ideas that will someday contribute to human space exploration," Fletcher said. "The team and I are grateful to be recognized by industry leaders and to represent our university at such a prestigious event."

Placing first in the Mars Moon Prospector category was a team advised by Embry-Riddle Aerospace Engineering associate professor Dr. Bogdan Udrea, consisting of Aerospace Engineering seniors Justin Bourke and Steven Gosselin. The team's spacecraft was designed to deploy probes for topological and geological surveys of the Mars moons.

Recognition

Embry-Riddle was highly ranked in all three categories of the "Talent Pipeline" of the U.S. aerospace and defense workforce by the 2013 Workforce Study of Aviation Week. Embry-Riddle ranked second in the category of "A&D Companies Preferred Suppliers of Talent," above such distinguished universities as Georgia Tech, MIT, and Purdue. Embry-Riddle was also ranked second in the category of "Alma Maters Most Valued by Employee in Landing a Job/Promotion," and third in the category of "Where the Greatest Number of A&D Hires Came From." Embry-Riddle was the only school to be ranked in all the three categories. In the 2015 workforce study, Embry-Riddle ranked second in the category of "Alma Mater of Young Professionals" above Purdue, Iowa State, Penn State and University of Washington. Most recently, in October of 2015, Embry-Riddle was suggested as the best school for Aerospace Engineering by a *US News and World Report* article for international students.

These recognitions show the quality and level of education of the many talented aerospace engineers who developed their skills at Embry-Riddle.

Embry-Riddle AE Department Displays Outstanding Generosity

In January 2015, Embry-Riddle's Aerospace Engineering Department became a member of an exceptionally rare class; this is the second year that 100% of faculty and staff contributed to the Fund for Embry-Riddle. The Fund is used to stock libraries, build facilities, and fund scholarships. Also, it buys equipment and supplies for labs and supports student projects.

Students are empowered to compete through national competitions involving the building of rockets, airplanes, UAVs, and much more. The faculty and staff of the AE Department are proud of their commitment to students and the University.

A Graduate Program in Unmanned and Autonomous Systems Engineering

Richard Stansbury, Hever Moncayo, Patrick Currier — College of Engineering

Unmanned systems fill a vital role in the education community by providing multidisciplinary learning opportunities within science, technology, engineering, and mathematics. At all academic levels (K-12 and post-secondary), unmanned systems play a role in education as they provide multidisciplinary opportunities to expose students to real-world solutions to technical challenges with a STEM focus. In August 2013, Embry-Riddle's Daytona Beach Campus launched a new Master of Science in Unmanned and Autonomous Systems Engineering (MSUASE) program within the College of Engineering supported by the Aerospace Engineering (AE) Department, Mechanical Engineering (ME) Department, and the Electrical, Computer, Software, and Systems Engineering (ECSSE) Department. The MSUASE program supports a multidisciplinary pool of students with undergraduate degrees across the spectrum of engineering programs. The program is structured to provide a multidisciplinary exposure to topics relevant to the engineering of unmanned and autonomous systems to produce well-rounded systems engineers capable of supporting the industry.

SkyJib Quadrotor to Support GNC Research.

Due to its multidisciplinary nature, the MSUASE Program is structured to provide students with flexible course options while ensuring that all students learn the fundamentals of unmanned systems. Students graduating from the MSUASE program will have the following student outcomes:

- Ability to apply fundamental engineering practices to analyze, design, and support the implementation and development of unmanned and/or autonomous system
- Ability to apply knowledge of advanced topics in unmanned and autonomous systems engineering
- Ability to communicate effectively on issues pertaining to unmanned and autonomous systems

ERAU's Maritime RobotX Entry

Several ongoing and future projects within the College of Engineering present opportunities for MSUASE students due to their focus on the design, development and implementation of guidance, navigation and control of unmanned and autonomous systems. This includes methodologies to improve aviation safety, increase autonomy of unmanned robotic systems, construct space exploration robotic systems, develop sensor fusion and vision-based navigation, and testing of morphing wings using smart materials.

After one year of operation, the MSUASE program has shown continued promise as a new degree program at ERAU that provides a unique multidisciplinary opportunity for both students and program faculty. At the start of the fall 2015 term, the program had 9 students enrolled and graduated its first student in December 2015.

Smart Materials Embedded in a UAV

Alumni Update

Where Are They Now?

Rick Trusis (‘83, DB, Aeronautical Engineering) was appointed vice president of Mid-Cabin Programs at Gulfstream Aerospace Corporation.

Art Schmidt (‘84, DB, Aeronautical Engineering) is senior vice president, head of airline marketing for Aviation Capital.

Benito Avendano (‘02, DB, Aerospace Engineering) was selected for Lockheed Martin’s Program Manager Talent Initiative where Level 4 and 5 program managers are groomed for senior program manager and/or executive roles.

Fabio Miguez (‘03, DB, Aerospace Engineering) was promoted to regional operations manager for FlightSafety. He continues to serve as manager of the company’s learning center in Columbus, Ohio.

Shareef Al Romaithi (‘05, ‘06, DB; ‘14, WW, Aerospace Engineering),
a 31-year-old Etihad Airways First Officer, has become the first Emirati to obtain a Ph.D. in Aviation from Embry-Riddle, which also makes him the youngest holder of this degree in the world.

Johann Schrell (‘08, DB, Aerospace Engineering) ***& Sarah Schrell*** (‘09, DB) welcomed a happy baby boy, Finley Robert Schrell, on Feb. 25, 2015. Johann is a research and development engineer and Sarah is a thermodynamics engineer at UTC Aerospace Systems in San Diego, Calif.

Ashley Getz (‘10, PC) ***& Clay Buerger*** (‘09, DB, Aerospace Engineering) were married on Oct. 4, 2014, in Silt, Colo. Ashley is an office manager and physical therapy aide at PRC Physical Therapy, and Clay is a calibration technician for Encana Oil & Gas.

Rohit Narasimhan (‘11, ‘13, DB, Aerospace Engineering) and ***Srinisha Shankar*** (‘11, DB, Aerospace Engineering) were married in May 2015 in New Jersey. The couple first met in 2007 at Embry-Riddle’s Daytona Beach Campus. They reside in Houston, Texas.

James (‘14, DB, Aerospace Engineering) ***and Adriana (Osegueda) Kimmel*** (‘14, DB, Aerospace Engineering) were married on Jan. 19, 2015, at Walt Disney World in Orlando, Fla. The couple met right before their freshman year in 2010 at the Accepted Students Day at the Daytona Beach Campus. They live in Everett, Wash., where they both work for The Boeing Company as stress analysts.

Michael Abebe (‘08, DB, Aerospace Engineering) and two other entrepreneurs recently launched a Kickstarter campaign to promote their product design, Jungle Bowl. Abebe is an aerospace design engineer for The Boeing Company in Seattle, Wash.

A trio of Embry-Riddle alumni are members of the Stratospheric Explorer (StratEx) team that made history in October 2014 with a record-breaking, near-space dive from a high-altitude balloon at 135,890 feet. Avid skydiver and Google executive Alan Eustace performed the near-space dive.

Ernest Arispe (‘10, WW), ***Jeremy Sotzen*** (‘07, DB, Aerospace Engineering) & ***Robert Redinger*** (‘87, WW) are among those who were nominated for the 2014 National Aeronautic Association’s Robert J. Collier Award for their contributions to the StratEx project. The Collier Award annually recognizes the greatest national achievement in aeronautics or astronautics that improves the performance, efficiency and safety of air or space vehicles.

Classmates ***Austin Burgess*** (‘14, DB, Aerospace Engineering) & Madhav Thaker (‘14, DB, Aerospace Engineering) launched a tech company called LetsHang LLC, which features a mobile app that allows users to meet people in their area who enjoy the same activities.

Axel Garcia Burgos (‘15, DB, Aerospace Engineering) was accepted into a joint two-year master’s degree program between MIT and the Skolkovo Institute of Science and Technology (Skoltech) in Moscow. Burgos will spend two semesters at Skoltech in Moscow and the remaining time at MIT. He will return to NASA each summer to resume his duties as an engineer.

Hussain bin Ibrahim Al Hammadi (‘89, DB, Aeronautical Engineering) was appointed minister of education for the United Arab Emirates. Prior to his appointment, he served in several educational posts, including chairing the board of trustees for the Institute of Applied Technology and the Abu Dhabi Center for Technical and Vocational Education and Training.

Lt. Zachary Smith (‘01, DB, Aerospace Engineering) is a firefighter with the Syracuse Fire Department in New York.

Wess Gates (‘02, DB, Aerospace Engineering) is the founder of Edtric Corporation, a development company focusing on unmanned aircraft systems and based in Signal Hill, Calif.

Allison Odyssey (‘04, DB, Aerospace Engineering) is NewSpace Global’s chief operating officer. She was previously vice president of NewSpace Market Development at Space Florida.

Alumni Update

Where Are They Now?

Justin D. Martin ('14, DB, Aerospace Engineering) is a general engineer at the NextGen NAS Lifecycle Integration Office, tracking and managing the progress of NextGen portfolios as part of the Federal Aviation Administration's effort to improve aviation safety and efficiency. As a student, Martin was a volunteer at the NextGen Florida Test Bed at Embry-Riddle and president of the Daytona Beach Campus Student Alumni Association.

Hitesh Patel ('12, DB)***, Christopher Hockley*** ('06, '10, DB, Aerospace Engineering), ***Christopher Kennedy*** ('12, DB)***, Tim Zuercher*** ('12, DB, Aerospace Engineering) and student ***Gene Gamble*** (Software Engineering) were members of an Embry-Riddle Daytona Beach Campus team that finished fourth overall at the Maritime RobotX Challenge, held in Singapore in October. The event was co-sponsored by the Office of Naval Research and the Association for Unmanned Vehicle Systems International Foundation. Embry-Riddle was one of only three U.S. schools selected to participate in the contest, which showcased the development and demonstration of autonomous surface vehicles (boats). The team received $11,000 in prize money, multiple awards and accolades for good sportsmanship for its efforts.

Retired U.S. Air Force Lt. Col. Brian Duddy ('83, DB, Aerospace Engineering), *Invasion Stripes: The Wartime Diary of Captain Robert Uhrig, USAAF and the Dawn of American Military Airlift*, published in 2013, includes diary entries and letters to the wife of Capt. Uhrig, a maintenance officer for a C-47 squadron that served in North Africa, Sicily and England during World War II.

Keep your fellow Eagles soaring high!

As we transition to a Ph.D.-granting department, we'll need your support to improve the facilities and sponsor worthy students to hold on to our rank as the #1 Aerospace Engineering Department in the nation.

To make a difference, please donate at: http://givingto.erau.edu and click on 'Make a Gift' and select Aerospace Engineering.

EMBRY-RIDDLE Aeronautical University
ALUMNI ASSOCIATION
FOREVER AN EAGLE

Donald J. Pointer Awarded the ERAU Distinguished Alumni Award

Donald Pointer was presented with the ERAU Engineering Distinguished Alumni Award on Nov. 2. Graduating from Embry-Riddle with a B.S. degree in Aeronautical Engineering and from Rider University with an MBA, Donald has been in the aviation industry for over 25 years. Beginning at Physical Acoustics Corporation as a Research Engineer/Manager, he applied the latest computer based NDT methods to various aircraft and rocket acoustic emission applications. He then moved to Dassault, where he has worked for the past 18 years. He held many different positions including Director of Service Engineering for six years and his current position, Director of Marketing Services & Development, where he is involved in a number of business aspects of the company and reports directly to the President and CEO.

Donald is currently Co-Chairman of the Advisory Board for the College of Engineering at Embry-Riddle and is a member of several other industry committees and groups.

Congratulations again to Donald Pointer for receiving the ERAU Distinguished Alumni Award.

Faculty Update

Meet Our New Faculty Members

For a complete list of our Aerospace Engineering Faculty, including bios, go to: http://daytonabeach.erau.edu/college-engineering/aerospace/

Dr. Marwan Al-Haik

Dr. Marwan Al-Haik

Dr. Marwan Al-Haik received his Ph.D. in Mechanical Engineering from Florida State University (FSU) in 2002. He worked as a postdoc at the National High Magnetic Field Laboratory (NHMFL) and the FSU School of Computational Science and Technology (2003-2005). He worked at the University of New Mexico/ Mechanical Engineering Department (2005-2010) as assistant/associate professor. He joined Virginia Tech in 2010 and became a Professor at the Department of Biomedical Engineering and Mechanics. His current research focus is on nanomaterials and nanomechanics with emphasis on composites with improved structural, transport, and energy harvesting capabilities and materials under extreme environments. Dr. Al-Haik is the recipient of the National Science Foundation (NSF) Early Career Award (2009), the Air Force Research Lab (AFRL) summer fellowship (2008), the Virginia Tech Librescu Award (2013), and the State of Virginia Innovation Partnership Award (2013). He has authored one textbook, 70+ refereed journal articles, 80+ conference presentations, and six issued U.S. patents. Prof. Al-Haik was elected an ASME fellow in 2015.

Dr. Claudia Moreno

Dr. Claudia Moreno

Dr. Claudia Moreno earned a Bachelor of Science degree in Civil Engineering, followed by a Master of Science in Structural Engineering from the Universidad del Valle in Cali, Colombia. She also obtained a Master of Science and a Ph.D in Aerospace Engineering and Mechanics from the University of Minnesota, where she worked in the System Dynamics and Controls Laboratory. Dr. Moreno's research interests lie in the field of aeroservoelasticity. They include modeling, flight control, and flutter suppression for very flexible aircraft wings. Her research interests also include structural health monitoring and damage identification, structural and multidisciplinary optimization, and sensor and actuator location in flexible aircraft. Dr. Moreno has been awarded the Amelia Earhart Fellowship for two consecutive years. This fellowship is awarded to women around the world pursuing doctoral studies in aerospace engineering. She also participated in the Asia-Pacific Summer School on Smart Structures Technology held in China. In addition, she obtained the Doctoral Dissertation Fellowship awarded by the University of Minnesota to support her research. Dr. Moreno enjoys salsa dancing in her free time.

Dr. Bertrand Rollin

Dr. Bertrand Rollin

Dr. Bertrand Rollin received his Ph.D. in Mechanical Engineering from the University of Vermont, studying the behavior of small scales of turbulence, and the interplay between passive scalar transport and flow topology. Upon completion of his Ph.D., Dr. Rollin joined Los Alamos National Laboratory as a postdoctoral research associate. His research led to the development of a model for Rayleigh-Taylor & Richtmyer-Meshkov instabilities, and a new initialization strategy for RANS simulations of instability-driven turbulent material mixing. More recently, Dr. Rollin was a Research Faculty at the DoE PSAAP-II Center for Compressible Multiphase Turbulence (CCMT). As the leader of the Macroscale and Mesoscale simulations team, his research effort has focused on solving a problem of explosive dispersal of particles at an unprecedented level of physical details, thereby contributing to progress toward predictive simulation of multiphase flows under extreme conditions. Dr. Rollin's research interests consist of the physics and computational modeling associated with turbulence, mixing, multiphase flows, compressible flows, and reactive flows. Dr. Rollin is a private pilot and a rescue scuba diver.

Aerospace Engineering Colloquium Series

Experts Present to Students and Faculty

Over the past academic year, the Aerospace Engineering Department of Embry-Riddle has brought in multiple experts from different disciplines within aerospace to present to both students and faculty in the AE Colloquium Series.

- Dr. David B. Doman; Principal Aerospace Engineer and Director of Control Science Center, Air Force Research Laboratory
  Dynamics and Control of Flapping Wing Micro Air Vehicles
- Dr. Earl P.N. Duque; Manager of Applied Research, Intelligent Light
  Accelerating the Post-Processing of Large Scale Unsteady CFD Applications via In Situ Data Reduction and Extracts
- Dr. George Flowers; Professor and Dean of Graduate School Mechanical Engineering, Auburn University
  Development, Implementation, and Testing of an Adaptive Disturbance Rejection Controller for Magnetic Bearing Supported Rotor Systems
- Dr. Susan Frost; Research Scientist at NASA Ames
  Natural Systems Inspiration for Aeronautics Applications
- Professor Stewart Glegg; Ocean and Mechanical Engineering Dept., Florida Atlantic University
  The Noise from Wind Turbines and Rotating Blades
- Dr. Ray Hixon; Associate Professor, University of Toledo
  High-Accuracy Computational Schemes for Realistic Unsteady Flows
- Dr. Ratan Jha; Distinguished Professor of Aerospace Engineering and Director of Raspet Flight Research Laboratory, Mississippi State University
  Wavelet Spectral Finite Elements of Wave Propagation Modeling and SHM of Composite Structures
- Professor Edmond Jonckheere; Electrical Engineering Dept., University of Southern California
  Quantum Adiabatic Computations – Differential Topology as One of its Great Many Challenges
- Dr. John L. Junkins; Distinguished Professor of Aerospace Engineering, Texas A&M University
  Astrodynamics for Modern Space Operations: Recent Analytical, Computational, and Experimental Research
- Dr. Richard Liang; Professor and Director, High-Performance Materials Institute, Florida State University
  High-Performance Multifunctional Carbon Nanotube Composites: Challenges and Progresses
- Professor Assimina A. Pelegri; Mechanical and Aerospace Engineering Dept., Rutgers University
  Material Modeling and Characterization of Hierarchical and Random Fiber Composite Structures
- Dr. Mark Whorton; Chief Technologist, Teledyne Brown Engineering
  Technology Challenges for Earth Imaging from the International Space Station

Students test various objects in the wind tunnel and record the results using iPhone video for later analysis.

Faculty Roster

Marwan Al-Haik
Professor (Ph.D., Florida State University)

Richard Anderson
Professor & Director of Eagle Flight Research Center (Ph.D., University of Central Florida)

Magdy Attia
Professor (Ph.D., Texas A&M University)

Mark Balas
Distinguished Professor (Ph.D., University of Denver)

Yechiel Crispin
Professor (Ph.D., Israel Institute of Technology)

John Ekaterinaris
Distinguished Professor (Ph.D., Georgia Institute of Technology)

Bill Engblom
Professor Joint Appointment with Mechanical Engineering Department (Ph.D., University of Texas)

Habib Eslami
Professor (Ph.D., Old Dominion University)

Ebenezer Gnanamanickam
Assistant Professor (Ph.D., Purdue University)

Vladimir Golubev
Professor (Ph.D., University of Notre Dame)

Luis Gonzalez-Linero
Assistant Professor (Ph.D., California Institute of Technology)

Glenn Greiner
Associate Professor & Undergraduate Program Coordinator (M.S., Embry-Riddle Aeronautical University)

Snorri Gudmundsson
Assistant Professor (M.S., Embry-Riddle Aeronautical University)

Troy Henderson
Assistant Professor & Honors Program Coordinator (Ph.D., Texas A&M University)

Dae Won Kim
Assistant Professor (Ph.D., Virginia Polytechnic Institute & State University)

James Ladesic
Professor & Associate Dean of Industry Relations & Outreach (Ph.D., University of Florida)

J. Gordon Leishman
Distinguished Professor (Ph.D., Glasgow University)

Anastasios Lyrintzis
Chair & Distinguished Professor (Ph.D., Cornell University)

Reda Mankbadi
Distinguished Professor (Ph.D., Brown University)

Hever Moncayo
Assistant Professor (Ph.D., West Virginia University)

Claudia Moreno
Assistant Professor (Ph.D., University of Minnesota)

Sirish Namilae
Assistant Professor (Ph.D., Florida State University)

Lakshman Narayanaswami
Professor (Ph.D., Georgia Institute of Technology)

Eric Perrell
Professor and Director of the Graduate Program (Ph.D., North Carolina State University)

Richard Prazenica
Assistant Professor (Ph.D., University of Florida)

Frank Radosta
Professor (Ph.D., University of Florida)

Mark Ricklick
Assistant Professor (Ph.D., University of Central Florida)

Bertrand Rollin
Assistant Professor (Ph.D., University of Vermont)

Virginie Rollin
Assistant Professor (Ph.D., University of Vermont)

Dongeun Seo
Assistant Professor (Ph.D., University of Texas)

David Sypeck
Professor (Ph.D., University of Virginia)

Bogdan Udrea
Associate Professor (Ph.D., University of Washington)

Ali Yeilaghi Tamijani
Assistant Professor (Ph.D., Virginia Polytechnic Institute and State University)

Yi Zhao
Professor and Associate Dean (Ph.D., Louisiana State University)

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