Message From The Dean

I am delighted to share with you several bits of exciting news about the College in this issue of the Embry-Riddle Engineer. Perhaps most exciting is the College and the University Office of Diversity Initiatives selection for one of four ABET President’s Awards for Diversity in Louisville, Ky., on Oct. 29, 2008. Embry-Riddle is committed to diversity in all of its Colleges, and this award is a proud reflection of that commitment.

The ABET President’s Award for Diversity is presented annually to “recognize U.S.-based educational units, individuals, associations, and firms for extraordinary success in achieving or facilitating diversity and inclusiveness in the technology sector of society.” Embry-Riddle was recognized “for the successful, broad, and ongoing spectrum of initiatives, including K-12 Outreach, Bridge Programs, Curriculum Enhancement, Faculty Development, and Work-Life Balance, to attract women to science, math, and engineering, to retain them through graduation, and to support them as they embark on their professional careers.”

I am also very excited to host the 2009 SECME Summer Institute. SECME Inc. “is an alliance to renew and strengthen the professional capacity of K-12 educators, motivate and mentor students, and empower parents so that all students can learn and achieve at higher levels.” SECME’s goal is “to increase the pool of historically under-represented, geographically under-served, and differently abled students who will be prepared to enter and complete post-secondary studies in science, technology, engineering and mathematics (STEM), thus creating a diverse and globally competitive workforce.”

I invite you to read on to learn more about the recent activities and accomplishments of the faculty and students at the College of Engineering.
Embry-Riddle Keeps Top Spot In U.S. News & World Report’s Best College Rankings For Ninth Year In A Row

For the ninth year in a row, Embry-Riddle Aeronautical University has earned the top ranking in the annual “America’s Best Colleges” guide published by U.S. News & World Report magazine.

In the specialty category of “Best Aerospace/Aeronautical/Astronautical Engineering Programs at Schools Whose Highest Degree is a Bachelor’s or Master’s,” Embry-Riddle’s Daytona Beach campus has been number one every year since the category was introduced in 2001. Embry-Riddle’s Prescott, Ariz., campus has been number three in that category since 2004. The U.S. Air Force Academy took second place this year, the U.S. Naval Academy fourth, and Cal Poly – San Luis Obispo fifth.

Embry-Riddle has one of the largest and most well-regarded Aerospace Engineering programs in the nation. The Daytona Beach and Prescott campuses offer a B.S. in Aerospace Engineering. The Daytona Beach campus also offers two different master’s programs in Aerospace Engineering.

“For the ninth straight year, U.S. News has honored Embry-Riddle for outstanding achievement,” said Dr. John P. Johnson, Embry-Riddle president. “This prestigious accomplishment was made possible by top-caliber faculty, staff, and students in our engineering departments and throughout the University.”

Embry-Riddle’s Daytona Beach campus is 12th in the overall category of “Best Universities – Master’s (South),” up one spot from last year. This category lists 121 master’s degree-granting institutions in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia.

In related news, Embry-Riddle also announced plans to offer two Ph.D. programs in 2009, pending accreditation by the Commission on Colleges of the Southern Association of Colleges and Schools.

The University will offer the first Ph.D. in Aviation in the United States through the combined efforts of the Colleges of Aviation at Daytona Beach and Prescott and the Worldwide Campus beginning in May. The Ph.D. in Aviation is primarily an online program with one-week residencies each year.

An August debut is planned for a traditional Ph.D. program in Engineering Physics at the Daytona Beach campus, with special emphasis on space physics, upper atmospheric physics, remote sensing, spacecraft instrumentation, spacecraft systems engineering, and control of aerospace systems. Faculty research in these areas is one of the major strengths of the University.

“These doctoral programs are designed to give both working professionals and research professionals the opportunity to pursue their intellectual interests through rigorous programs and meet their professional goals to prepare them to serve as our aviation, science, and engineering technology leaders of tomorrow,” said Dr. Johnson.

Dr. John Johnson, President
Embry-Riddle, the leader in aerospace and aviation education, is part of a consortium of four universities - Florida State University, University of Central Florida, and University of Florida - that was awarded a three-year $14.5 million grant in July to establish the Florida Center for Advanced Aero-Propulsion (FCAAP). The Center is led by Florida State University with the local units in the three universities as branches of the main Center at FSU. These universities will work collaboratively to develop innovative next-generation technologies for aerospace and aviation commercial use and build closer working relationships with industry leaders.

This funding was in response to a proposal written by four investigators, one from each of the partner Universities. Dr. Reda (Ray) Mankbadi is the principal investigator from ERAU. Dr. Mankbadi is a distinguished professor of aerospace engineering at Embry-Riddle’s College of Engineering, and serves as the Associate Director for FCAAP.

“This program is an exciting and excellent opportunity to enable Embry-Riddle’s faculty and Ph.D. candidates to demonstrate our expertise in aerospace engineering,” said Dr. Christina Frederick-Recascino, vice president for research at Embry-Riddle.

As one of the four key higher education institutions that assisted in making FCAAP a reality, Embry-Riddle’s participation in the program will concentrate on three specific areas of advanced research lead by Dr. Mankbadi:

- Flow control mechanisms, turbulence control, and noise generation in jet engines to improve fuel efficiency and operational performance under various conditions.
- Advanced turbine and alternative power technology – developing the next generation of engines that use renewable energy sources, such as hydrogen. Embry-Riddle researchers also will be studying new cooling technologies that will enable turbine engines to run at higher temperatures to provide more thrust and engine efficiencies.
- Developing analytical tools for the next generation of micro-air vehicles and hypersonic vehicle technologies, as well as other future high-speed aircraft transport.

Dr. Sathya Gangadharan is a Professor of Mechanical Engineering at Embry-Riddle. He has been teaching and conducting research at ERAU since 1990. He is a Licensed Professional Engineer (P.E.) in the State of Florida and a Certified Manufacturing Engineer (C.Mfg.E.).

His areas of interest include Parameter Estimation; Modeling and Design Optimization; Structures and Structural Dynamics; Fluid-Structure Interaction; and Manufacturing. He is currently working on NASA funded spacecraft fuel slosh research and FSGC funded research on vibration control of spacecraft boom structures. He has also advised several NASA Microgravity Student projects. He was a Summer Faculty Fellow at NASA Kennedy Space Center for three years.

Dr. Gangadharan is an Associate Fellow of American Institute of Aeronautics and Astronautics (AIAA); Chair, AIAA National Design Committee of SAC; Senior Member, Soc. of Naval Arch. and Marine Engineers (SNAME); and Member, Society of Manufacturing Engineers (SME). He has worked on many funded design and research projects. He is a National Evaluator for Manufacturing Education Resource Center (MERC) and a reviewer for ASEE and AIAA journals.

Faculty Profile

Dr. Sathya Gangadharan
NASA has been selecting undergraduate student teams from ERAU to experiment in a microgravity environment, 25,000 feet above the Earth. Dr. Sathya Gangadharan of the Mechanical Engineering Department advises engineering teams for the annual NASA Reduced Gravity Student Flight Opportunities Program (RGSFOP).

The RGSFOP allows students the opportunity to fly an experiment of their own choosing in a microgravity environment to test for empirical data on a level unseen on the ground. Students must design, fabricate, and execute a project with NASA and be among a select few chosen out of a substantial pool of teams in order to fly.

NASA operates a modified C-9 aircraft, known as the “Weightless Wonder,” to simulate microgravity by performing parabolic maneuvers. The aircraft experiences brief periods of microgravity as well as periods of hypergravity. For each flight, the students fly 32 parabolic maneuvers over the Gulf of Mexico. Each parabola simulates about 30 seconds of weightlessness. In between each reduced gravity parabola, the aircraft and crew onboard experience as much as 2G’s (twice the normal acceleration of gravity). After 30 parabolas, the aircraft simulates gravity on the Moon and Mars.

In 2008, the ERAU student experiment titled Project FuSSION (Fuel Slosh Simulation of Induced Oscillatory Nutation), was selected by the NASA RGSFOP for microgravity experimentation. Project FuSSION investigates how to predict liquid dynamic behavior within propellant tanks, which cause destabilization of spinning spacecraft. This phenomenon is known as “Fuel Slosh.” Team FuSSION ultimately would like to validate the use of Mathworks SimMechanics modeling software to predict the behavior of fuel slosh and its effects on spacecraft attitude control systems.

Team FuSSION consists of five ERAU engineering students. Team Leader Dillon Sances, a senior in Aerospace Engineering says, “Taking an idea and making it come to life is a great achievement in itself. But getting to make it and then test it in zero-gravity is both an incredible opportunity, and an unforgettable experience!”

For nearly a year, the team has collaborated with ERAU Aerospace Graduate students and NASA engineers at Kennedy Space Center to design such an experiment.

FuSSION fabricated an experimental test structure that allows a mock spacecraft to be spun to a predetermined rate and released into a microgravity environment.

In July 2008, the team traveled to Johnson Space Center in Houston, Texas, for physiological training and two weightless experimental flights. The students received their training at the Mission Control Center (MCC) and Neutral Buoyancy Lab (NBL). At the NBL, the team is outfitted with oxygen regulators and situated in an altitude chamber that simulates the air at 25,000 feet.

Floating in zero gravity is a dream come true for students. Such a rare experience is always remembered and inspiring.

Team FuSSION has also established the ERAU Microgravity Club. This on-campus club serves as a resource for ERAU experimental teams to receive support and mentors.

The microgravity teams also have many educational outreach goals for the community. Team FuSSION is working in accordance with ERAU’s own TeachSpace, and a partnership with Daytona Beach’s Museum of Arts & Sciences. These programs allow the teams to give presentations and educate students of all age groups.
Emry-Riddle has been named one of Central Florida’s Top 25 Companies for Working Families, its first time to make the Top 25 and its fourth straight year on the Top 100 list. The ranking, which is compiled annually by the Orlando Sentinel, was announced at the Top 100 Awards Luncheon held in August at Universal Orlando’s Royal Pacific Resort.

The Top 100 employers are chosen for this honor on the basis of their family-related benefits, work environment, communication network, and training opportunities. The Top 25 list is composed of a select group of 25 family-friendly companies that have 249 employees or fewer, and 25 companies that have 250 employees or more. Emry-Riddle, the global leader in aviation/aerospace education, has 2,000 full-time employees worldwide, 1,255 of them in Central Florida.

Of Emry-Riddle’s newer benefits, the four-day summer workweek is the most popular among employees and their families.

“This is the second year we’ve offered a shortened workweek, and we hope to continue it in the future,” said Irene McReynolds, Emry-Riddle’s vice president of human resources. “With the high cost of fuel, driving to campus 13 fewer days means more money in employees’ wallets, and, needless to say, they love having the extra time to spend with their families.”

Giving employees paid time off to relax with their families is one of the top priorities at Emry-Riddle. Days off each year include 11 holidays, the week between Christmas and New Year’s Day, and up to 36 days of personal leave. Employees can carry a balance of up to 240 hours of personal leave; any additional hours accrued can be rolled over into the employee’s disability leave pool for possible future use.

Emry-Riddle is in the vanguard when it comes to expanding benefits in new directions. Under a group program launched in the last year, employees can look after their “other members of the family” and save money by enrolling with Veterinary Pet Insurance/DVM Insurance Agency (VPI), the nation’s oldest and largest provider of health insurance for pets. The VPI pet insurance policy covers medical problems and conditions related to illnesses and accidents in dogs, cats, and many other pets, treated by any licensed veterinarian of the employee’s choice. An additional optional plan assists dog and cat owners with the cost of regular routine care, with no deductibles.

Another new benefit is the Golden Eagle program, which rewards faculty and staff who’ve given Emry-Riddle 20 or more years of service. These employees are entitled to free parking on campus and discounts for attractions, hotels, and car rentals. In addition, 20-year employees receive free admission to most home sporting events and to campus recreational facilities. Upon leaving Emry-Riddle, Golden Eagle retirees can continue to use the recreational facilities, and their Intranet and email accounts remain active for campus announcements and library access. Some features of this program also apply to spouses.

One of the most popular benefits that’s been in place for many years, McReynolds said, is “free tuition for credit courses and a 25 percent waiver for flight lab fees.” That benefit gives employees and their families access to a world-class education with a broad selection of more than 30 undergraduate and graduate degree programs in aviation/aerospace, engineering, business, and related high-tech fields. Emry-Riddle’s aerospace engineering program is the largest in the nation and is ranked No. 1 in the nation among schools without doctorate programs by U.S. News & World Report. Emry-Riddle’s undergraduate aeronautical science (professional pilot) program is also the largest in the nation. Employees who retire while covered by these plans are eligible for retiree coverage until age 65. Employees can pay for certain medical expenses with pre-tax dollars through a flexible spending account.
Embry-Riddle’s Efforts To Promote Diversity In Engineering Honored With National Award

ABET Inc., the national accrediting agency for engineering education, has honored the College of Engineering and the Office of Diversity Initiatives at Embry-Riddle’s Daytona Beach campus with one of its four national 2008 ABET President’s Awards for Diversity.

Embry-Riddle was honored for its initiatives to attract and retain a cross section of students, especially females, to its degree programs in engineering, a field that is still predominately male, both at the university and nationwide.

“This national honor reflects positively on our university,” said John P. Johnson, president of Embry-Riddle. “I am very proud of our Office of Diversity Initiatives and College of Engineering for their successful efforts to increase the number of women and underrepresented minorities in the college.”

The Embry-Riddle initiatives have been remarkably successful in attracting and retaining female students to the engineering profession. Embry-Riddle enrolls and graduates more female aerospace engineering students than Georgia Tech and Texas A&M, the nation’s second and third largest programs, combined. The diversity emphasis is also paying dividends in mechanical and civil engineering, where female enrollments and graduation rates are near 20 percent.

The initiatives are:

**K-12 Outreach**
- Girls Exploring Math & Science Summer Camp – Offered for the past two years in the local community to girls 8-13 years old.
- Aerospace Program at Campbell Middle School – Involves more than 300 sixth-grade students, of whom 70 percent are African-American and 72 percent are low income, and more than 100 volunteers from Embry-Riddle’s Society of Black Engineers, Women’s Mini-Baja program, and aerospace engineering program.
- Aerospace After-School Club at Cypress Creek Elementary School – Involves 48 elementary school students, of whom 30 are girls, and student volunteers from Embry-Riddle’s College of Engineering.

**College Transition Support**
- Mentoring Programs – Include a new-student mentoring program that pairs female engineering students with volunteer faculty members.

**Focused Curriculum Enhancement**
- Female Initiative: Reaching Success Together (FIRST) – A Boeing-sponsored program that includes field trips to Kennedy Space Center, seminars on career topics, mentoring, and tutoring.
- Women’s Mini Baja SAE Team – The program assembles a team of female student engineers to design, build, and test an off-road Mini Baja vehicle and then compete nationally against other university teams.
- Sponsoring Female Faculty Members in Support of Ph.D. Studies -- The College of Engineering is sponsoring a female faculty member’s work toward a Ph.D. in engineering education through a forgivable loan, release time, and tuition support.
- Highlighting Successful Female Students and Alumni – Successful female students and alumni share their experiences and return to campus as speakers.

Key people who are responsible for Embry-Riddle’s engineering diversity initiatives are Joanne Detore-Nakamura, associate professor of humanities and social studies and director of the Office of Diversity Initiatives; Heidi Steinhauer, assistant professor of engineering; Lisa Davids, assistant professor of engineering and director of Freshman Engineering; Christopher Grant, associate dean of the College of Engineering; Charles Reinholdt, chairman of Mechanical, Civil and Engineering Sciences Department; and Darris White, associate professor of Mechanical Engineering.
Model-Based Software Assurance At NASA

Dr. David Gluch, a professor in the Department of Computer and Software Engineering (CSE), has received an additional $30,000 for continuing work on the research project “Model-Based Software Assurance with the SAE Architecture Analysis & Design Language (AADL).” The project is a collaboration with Embry-Riddle Aeronautical University (ERAU), the Software Engineering Institute (SEI) at Carnegie Mellon University, L-3 Communications, and the Jet Propulsion Laboratory (JPL) at the California Institute of Technology. Dr. Gluch, Dr. Peter Feller (SEI), and Kurt Woodham (L-3) are Co-PIs on the collaboration, which is funded by the NASA Software Assurance Research Program (SARP). In addition to Dr. Gluch, ERAU Master of Software Engineering students Ken Evensen and Cory Carson are working as project team members. The effort builds on an earlier project completed by an ERAU and L-3 team, titled “The Application of SAE Architecture Analysis & Design Language (AADL) to IV&V of NASA Flight Projects,” that was funded by the NASA Independent Verification and Validation (IV&V) Facility at Fairmont, West Virginia.

The objectives of the collaborative project are to demonstrate the effectiveness of model-based assurance using a formal architecture description language, such as the Architecture Analysis & Design Language (AADL), to formulate engineering practices for model-based assurance in verification and validation of NASA mission software, and to transition those practices and technologies into NASA organizations. The project team applied the AADL and model-based assurance practices in modeling and analyzing International Space Station (ISS) software and the JPL Mission Data System (MDS) architecture. In these case studies, the team demonstrated that model-based assurance can be effective in identifying potential problems early in the development lifecycle, well before they might typically surface – such as during system integration and test. Identifying these problems early reduces development and verification costs and helps to ensure overall system quality throughout the development process.

One of the leading causes of general-aviation fatal accidents is incorrect aircraft maneuvering and landing, especially during evening and nighttime hours, according to researchers at ERAU. This is especially critical in remote locations that often depend on air transportation as the only means to handle medical and disaster-related emergencies.

To combat the problem, Embry-Riddle researchers and their partners from the University of Alaska-Anchorage (UAA), the University of North Dakota, and Rensselaer Polytechnic Institute (RPI) are working for the FAA Center of Excellence for General Aviation to improve nighttime safety at small general aviation airports with an innovative, low-cost, and highly portable Remote Airport Light System (RALS) that uses LED lights and retro-reflective markers.

“The lighting system developed by the research team improves the ability of the pilot to identify the airfield, orient the aircraft to landing, and to land safely,” said Dr. Dan Macchiarella, associate professor of aeronautical science at Embry-Riddle’s College of Aviation. “This is a real boon to small, rural airports where pilots are currently landing with no lighting system at all or with the unreliable guidance of improvised systems like smudge pots.”

The need is especially great in Alaska and internationally, he said, where remote airfields that don’t have access to an electrical grid require alternative solutions for the safe landing of aircraft bearing emergency medical and disaster-relief workers and supplies.

Macchiarella recently led Embry-Riddle researchers and pilots in a successful test of the new system, temporarily installed at Massey Ranch Airpark in Edgewater, Fla., which included the landing of aircraft guided by RALS. The evaluation was observed by UAA, RPI, and FAA officials. The next step is installation of the system in Alaska for continued nighttime testing through December.

In the RALS setup, typical edge lights are replaced with reflective panels, similar to the technology on road signs, to assist the pilot in safely landing the aircraft. This kind of marker requires no power and is more brightly visible when lit by an airplane’s landing lights. The system uses low-powered LED lights to mark the corners of the landing strip and flash in synchronization with Global Positioning System (GPS) time to give pilots improved cues for airfield identification and landing.

The RALS idea originated with the FAA Center of Excellence for General Aviation, a research consortium of universities, corporations, and government agencies led by Embry-Riddle. The consortium addresses the needs of general aviation, defined as all aviation except military and commercial enterprises. Embry-Riddle, working with other team members, is also developing guidelines to advise remote airport operators how to use this system.

“In the present economy, airports are looking for ways to cut costs while still maintaining high safety standards,” said Dr. Chris Grant, director of Embry-Riddle’s research team and associate dean of the College of Engineering. “Considering that a standard FAA-approved lighting system can cost anywhere from $100,000 to $1 million, depending on the number of runways and taxiways, our test system is a bargain at only $3,000.”

According to Grant, the highly reliable LED lights have a lifetime of about 25,000 to 30,000 hours, last 10 to 20 times longer than the incandescent bulbs typically used, and reduce energy consumption by about two-thirds.