

Lift



THE COMMERCIAL SPACE RACE IS ON

From asteroid mining to space tourism, businesses are accelerating plans for liftoff. But how close are they?

PAGE 12



FROM THE PRESIDENT



As I close out my first year as president of Embry-Riddle, I feel fortunate to work for the world's oldest, largest and most comprehensive aviation and aerospace education institution. Embry-Riddle is a special place, driven by people of great talent and passion.

We've now begun the important work of leveraging that collective talent and passion to take Embry-Riddle to even greater heights. In particular, we've reached out to the entire university community for input on strategic planning. Good progress has been made toward identifying key goals, success metrics and next steps for increasing enrollment; enhancing the student experience; expanding our global influence; growing our research capabilities; and securing resources to fuel our success.

There is still much to do in achieving our goals, but we are building upon a solid foundation. We remain financially strong; enrollment is up; and with more than 80 undergraduate and graduate degrees and a growing number of professional programs, our students around the globe have more choices than ever before. And whatever course of study they choose, they will work with exceptional faculty in technology-rich environments that anticipate the ever-changing research and workforce needs of the industry.

Embry-Riddle's influence is growing all over the globe, especially in those areas where the aviation industry is strongest. In December, I had the privilege of attending the largest graduation ceremony to date

at our Asia Campus in Singapore. Our presence in Central and South America is also growing. In 2017, our Brazil-based team served more than 650 students through professional education, applied research, and local academic and professional opportunities. In November, I addressed graduates of a new Aviation Management Program being offered to managers with Brazil's major airlines.

As Embry-Riddle's progress continues, students will always remain our core mission. At my first State of the University address, I urged all members of the university community to strive to be a pivotal mentor in a student's life — someone our students will remember fondly 10 years from now. Working continuously to have a positive, life-changing impact on our students is at the heart of everything we do.

To all who have welcomed my wife, Dr. Audrey Butler, and me to Embry-Riddle: *thank you*. I look forward to working with you to make a difference in the lives of our Embry-Riddle family.

Regards,

P. Barry Butler, Ph.D.
President, Embry-Riddle
Aeronautical University



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12 The Commercial Space Race

Experts predict new, thriving, wholly commercial space markets



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lift.erau.edu

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HAPPY 40th KLYDE MORRIS!
In homage to the 40th anniversary of the *Klyde Morris* comic strip, which was birthed on the Daytona Beach Campus, Klyde is pictured throughout this issue of *Lift*. Special thanks to Wes Oleszewski ('87, DB) for contributing this exclusive artwork.

ON THE COVER: Illustration by Tim Boelaars

ALTIMETER: HIGH POINTS AT EMBRY-RIDDLE

The Prescott Campus celebrates its 40th anniversary (1978–2018).

All three Embry-Riddle campuses were recognized by the *Military Times* as 2018 Best Colleges for Military Students and Veterans.

Two Daytona Beach Campus research payloads traveled to suborbital space on Blue Origin's New Shepard Rocket on Dec. 12, 2017.

The Prescott Campus Golden Eagles Flight Team won the Region IX National Intercollegiate Flying Association's Safety and Flight Evaluation Conference competition.

The Worldwide Campus in Berlin marked its 10-year anniversary on Nov. 3, 2017.



Growing Up

Asia Campus celebrates largest graduating class ever

Embry-Riddle's Asia Campus in Singapore celebrated its largest graduating class to date with 112 diplomas awarded on Dec. 8, 2017. Keynote speaker Capt. Quay Chew Eng, senior vice president of the flight operations division of Singapore Airlines International Limited and a member of the Embry-Riddle Asia Campus Industry Advisory Board, addressed the graduates and more than 500 guests at the event.

Since its first commencement ceremony in 2012, Embry-Riddle has conferred more than 300 degrees from its Asia Campus, the

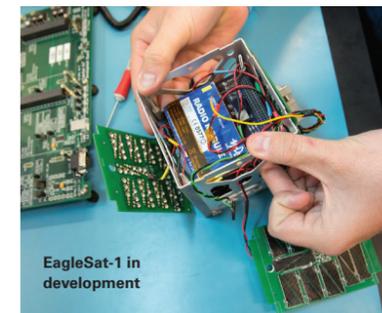
university's first and only location in Asia. The campus works closely with key partners Singapore Aviation Academy, Singapore University of Social Sciences (formerly UniSIM) and ERC Institute in Singapore to deliver doctoral, master's and bachelor's degree programs.

Embry-Riddle President P. Barry Butler, Worldwide Campus Chancellor John R. Watret and Asia Campus Vice Chancellor Graham Hunt were among the dignitaries who attended the ceremony. — *Melanie Hanns*

EAGLESAT-1 BECOMES FIRST EMBRY-RIDDLE SATELLITE TO ORBIT EARTH

On Nov. 18, 2017, engineering students at the Prescott Campus watched as a project five years in the making became a reality. EagleSat-1, a student-designed cube satellite (CubeSat), was launched into space — making it the first Embry-Riddle satellite to orbit Earth.

EagleSat-1 was able to hitch a ride aboard the second stage of the Delta II rocket carrying the JPSS-1 weather satellite for the National Oceanic and Atmospheric Administration, thanks to NASA's Educational Launch of Nano-satellites program.



EagleSat-1 in development

The mission of EagleSat-1 is to study the satellite's orbital decay and demonstrate the use of super capacitors for power rather than traditional rechargeable batteries. The Embry-Riddle EagleSat team estimates its CubeSat will be in orbit seven to nine years.

As of January, the EagleSat team had been unable to contact EagleSat-1 from its ground station on campus. It is, however, being tracked by NORAD, which monitors human-made objects in space. Efforts to contact it will continue this spring. The team has already started to develop a second CubeSat: EagleSat-2.

The current team consists of Steven Buck, Deborah Jackson, Jon Lowe, Madison Padilla and Gary Yale, associate professor of aerospace engineering. About 35 Prescott Campus students have contributed to the EagleSat-1 project over the past five years.

"The students worked incredibly hard to make this day happen," Yale says. "We are all proud of what they've accomplished." — *Jason Kadah*

EAGLESAT-1: DAVID MASSEY



Conceptual rendering of the new Eagle Flight Research Center

A New Home for Innovation

U.S. Department of Commerce invests \$1 million to establish new aviation and engineering research center in Florida

A new project at Embry-Riddle's Daytona Beach Campus is expected to create 387 jobs and spur \$1.6 million in private investment.

Partially funded by a \$1 million grant from the U.S. Department of Commerce through its Economic Development Administration, the project will establish Embry-Riddle's Applied Aviation and Engineering Research Hangar. This facility will be the new home of the Eagle Flight Research Center (EFRC), a hub for engineering research and development.

"Embry-Riddle has a 90-year legacy of innovation, and our research is shaping the future of human mobility," says university President P. Barry Butler. "We are pleased and

honored to receive this research award to advance innovation, economic development and job growth in Florida."

Established in 1998, the EFRC continues to guide aviation technology into the future. "Our continuing research will encompass aviation innovation projects such as alternative propulsion systems, electric and hybrid-electric aircraft, and electric vertical takeoff and landing, or eVTOL aircraft, as well as new fuels," says EFRC Director Richard "Pat" Anderson.

This project was made possible by the regional planning efforts led by the East Central Florida Regional Planning Council. The expected completion date is winter 2019.

— *Ginger Pinholster*

BY THE NUMBERS

Top Aerospace Employers of New Embry-Riddle Graduates

- 1 The Boeing Company
- 2 Lockheed Martin and Northrop Grumman (tie)
- 3 SpaceX

SOURCE: Daytona Beach Campus Career Services First Destination Survey

ALTIMETER (CONTINUED)

A Cray CS cluster "Vega Supercomputer" joined the Embry-Riddle research team. Located in the Lehman Engineering and Technology Center on the Daytona Beach Campus, the supercomputer offers more than 3,000 of the latest generation processing cores.

The Worldwide Campus was named No. 1 for Best Online Bachelor's Programs for Veterans and No. 2 for Best Online Bachelor's Programs, overall, in 2018 by *U.S. News & World Report*.

The Prescott Campus celebrated its most successful fall athletics season ever with four Cal Pac championships and record-setting program wins for women's soccer and volleyball.

The Daytona Beach Campus Women's Cross-Country Team captured the university's first-ever Sunshine State Conference championship during the team's first year of NCAA Division II eligibility.

Daytona Beach Campus Dean of Research and Graduate Studies Michael P. Hickey was named a Fellow of the American Association for the Advancement of Science.

The Daytona Beach Campus' flight operation achieved Stage II International Standard Business Aircraft Operations (IS-BAO) registration on Nov. 14, 2017. The IS-BAO audit is a rigorous safety review that exceeds Federal Aviation Administration requirements. Embry-Riddle is believed to be the only university with Stage II registration.

SPACE TRAFFIC MANAGEMENT

INTERNATIONAL EXPERTS CONVENE AT SPACE TRAFFIC MANAGEMENT CONFERENCE

Top aviation and aerospace executives and representatives from the Federal Aviation Administration, the German Aerospace Center and the U.S. Department of State, among others, gathered

at the Daytona Beach Campus in January to discuss critical topics and changes facing the space industry.

The five-day conference (Jan. 15–19) focused on the theme *Seeking Sustainable Solutions* and was hosted by the Spaceflight Operations program and applied aviation sciences department at the College of Aviation.

"The conference was created to provide a forum for

discourse among academia and leaders of government and industry from multiple disciplines and different aspects of the air/space traffic management set of issues," says Diane Howard, conference chair and assistant professor of Spaceflight Operations at the Daytona Beach Campus.

Conference attendees participated in a variety of roundtable discussions and

international panels. The topics addressed included commercial space transportation and impacts on the National Airspace System; security issues; challenges and benefits of increasing small satellite constellations capacity; integrating satellite-based ADS-B; communication standards for space traffic; government research needs; future models of space traffic management; and international initiatives.

For more, visit commons.erau.edu/stm/2018. — *Deborah Circelli*



FEEDBACK



FROM THE EDITOR

Join us at 7 p.m., Eastern time, Monday, April 9, for *Lift, Off the Page*. Moderated by Marc Bernier, director of the Embry-Riddle Speaker Series, our panel of alumni and faculty space industry experts will take a deeper dive into the spring 2018 *Lift* topic: *The Commercial Space Race*. Attend the discussion in person or watch the livestream. For details and to register, visit alumni.erau.edu/lifttalks.

We need your input! Watch your inboxes for the biennial *Lift* Readership Survey. The survey will be emailed to *Lift* readers in April. It's important for us to hear from you. Your responses help shape future *Lift* content and tell us what we're doing right and where we need to improve. But you don't have to wait for the survey, email us at liftmag@erau.edu.

— SARA WITHROW, EDITOR

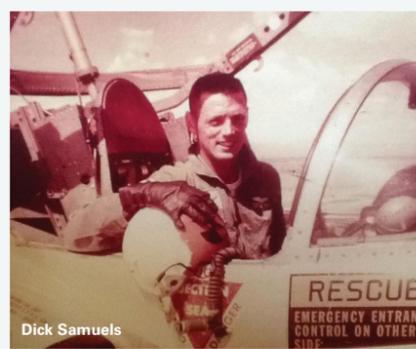
Honoring a Friend and Mentor

In Memoriam [Page 37, fall 2017] lists Robert Wayne Harsha as "Former WW Adjunct Faculty." While he held that very important position at the Worldwide Campus, he was



much more than that in a career that spanned 27 years with Embry-Riddle. Wayne was a full-time associate professor in the Embry-Riddle Worldwide College of Business. He served at various times in a distinguished career as a regional faculty adviser, chair for the Master of Science in Technical Management and Master of Science in Management programs, and chair of the leadership department. Above all, he was a friend, mentor and encourager to numerous Embry-Riddle students, faculty members and administrators, including myself.

Dr. Eugene L. Round
Professor Emeritus
College of Arts and Sciences
Embry-Riddle Worldwide Campus



Dick Samuels

POSTED ON LIFT ONLINE:

Comments Regarding Giving To: The Father of Flight Instructors – Dick Samuels [fall 2017]

Perfect Landing

Because of Dick, my landings straddle the centerline stripe every landing in a jet, a turboprop, a recip twin or a single. Twenty-four years later, I still hear in my mind's ear, "Land STRAIGHT and land on the \$&@?!#% CENTERLINE, GOT IT?!!!" Yep, I've always listened to everything Dick taught me and still do it to this day.

Dick, you always motivated me to fly better, fly tighter, fly like my life depended on it. You were the guy I wanted to be when I grew up someday and became a pilot. You mean the world to all of us, and I'm grateful for all you taught me along the way.

The best darn thing I did in life, next to marrying my best friend, April, and having

two amazing boys, was attending Embry-Riddle's Prescott Campus and learning from the best. You, Sean, Dave Roy and the countless others are why I was able to become a successful pilot who did not give up on his dream to fly after I got the flight bug.

Bob Lenhard ('97, PC)
B.S. Aeronautical Science

Exciting News

I can't think of a more deserving honor. I never had the chance to have Dick Samuels as a "direct" instructor, but I learned from him just by passing him in the stairs. He would ask me little things, and after calling me a "dummy," he would give me some line of thought that I carried with me until his insight — BAM! — hit me like a revelation. Later, long after leaving Prescott and becoming an instructor, his words guided my teaching style ... I caught myself many times repeating those one-liners he gave me.

"When flying you always reach for perfection, even though you know you'll never get there, but you keep trying ..."

YES, SIR ... thank you, may I have another ...

Edgar M. Mora ('88, PC)
B.S. Aeronautical Science

The Honor Is Mine

"... Samuels says he is 'extremely honored' by his students' gesture."

I am extremely honored to have learned from him — some of my best memories and strongest fundamentals were built with him. I know so many pilots who would say the same.

Tara Green ('94, PC)
B.S. Aeronautical Science

EDITOR'S CLARIFICATION: *The article Aerial Precision [fall 2017] failed to mention that Rene Brana ('05, DB) was also a founding member of Aerial Applications.*

TALK TO US

We invite your feedback on *Lift* content or topics related to the university. Letters may be edited for style, length and clarity. Submission does not guarantee publication.

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IN OTHER WORDS

'Never be afraid to shake the snow globe of life.'

BY GREGORY LANDON ASHWORTH ('05, DB)

I didn't mean to end up on TV, and never in a million years did I think I'd be acting alongside Oscar winners. My goal has always been NASA. I wanted to be an astronaut. When I arrived at Embry-Riddle for Summer B as a freshman, I knew I was in the right place and on the right track.

There is no way to guarantee you'll get a flight job fresh out of school in order to build hours, but I had an unconventional approach. I got a job at the Hilton Garden Inn next to the Daytona Speedway. My plan was to work there for three months while I sent out résumés.

One day, a guy walked into the hotel and saw my airplane tie pin. He asked me if I was an Embry-Riddle alumnus, asked if I had my multi, and then he offered me a job flying whale protection missions. Just like that. Right place, right time, with the right degree from the right place.

After flying for six months for the National Oceanic Atmospheric Administration, I got hired by Trans States Airlines. I was well on my way to building up the jet time required by NASA — and that's when I learned that NASA would now only be interested in hiring pilots who were current or former military test pilots. Well ... [insert expletive]. I went back to one of my academic advisers and asked him what to do. "Go get your master's degree in something you enjoy that shows that you're well rounded, then get your M.D. or Ph.D.," he said.

I had done community theater since I was a little kid and was part of the Riddle Players during my time at Embry-Riddle. I quit my airline job and auditioned for one of the top conservatory programs in the country. Miraculously, I was accepted, and in two short years I had my Master of Fine Arts.

But I didn't want to be an actor; I wanted to be an astronaut. I turned down an offer to do the Broadway show *Avenue Q* to start a Ph.D. in physics. I learned things in my Ph.D. program that would only benefit someone interested in teaching about space — or becoming an astronaut. Then, NASA had their budget cut by two-thirds so Congress could fight some wars.

Where did that leave me? With a degree completely useless to my new life path, an incredible story and an excuse to try out Hollywood. In my first two months there, I booked a commercial for American Airlines that paid well because it ran for over a



Gregory Landon Ashworth

'But I didn't want to be an actor; I wanted to be an astronaut.'

year. It took me three years to book my first role on a TV show, *Castle*, and then I booked three more in the following three months.

I've acted alongside Oscar winners, been on set with John Travolta (and had long conversations with him about the airplane he donated to our school) and played killers,

lovers, stoners and everything in between.

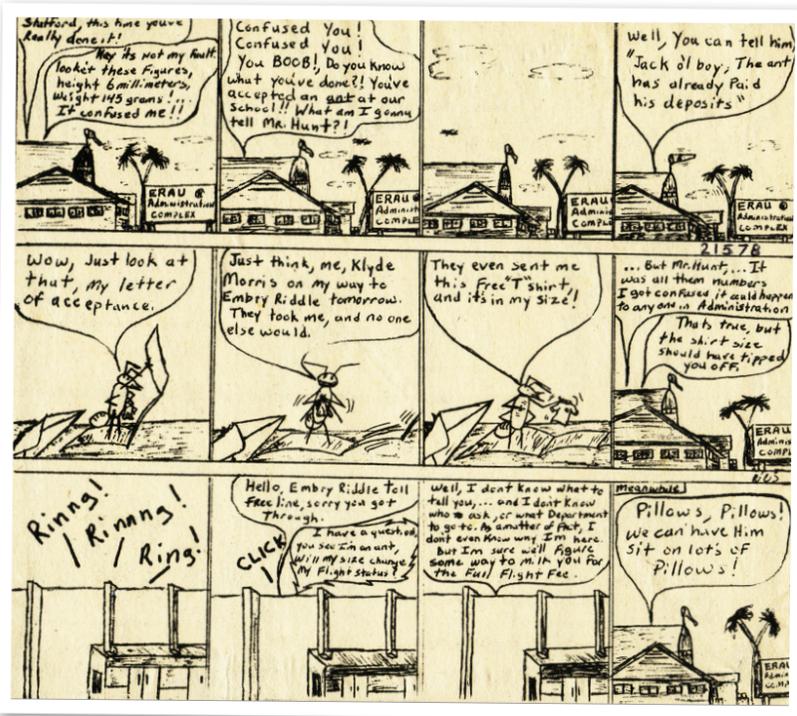
There is no right way into the airlines and no guarantee that you'll want to be what your degree is in. I learned work ethic at Embry-Riddle. You can't "high school study" for an indoctrination oral for an airline. You can't skate through a check ride. You have to outwork, outperform, outrun, outlast and outdo everyone else. Embry-Riddle helped me learn lessons that most actors without a degree in flying airplanes learn. Never be afraid to shake the snow globe of life as you have all the tools within you to do so.

I've since started a production company, and the last film that I wrote, directed and starred in has won best comedy in four large film festivals. I'm still waiting on my chance to be an astronaut, but maybe I'll get to play one on TV. That will be good enough for now.

EDITOR'S NOTE: Ashworth earned a B.S. in Air Traffic Management with a minor in flight in 2005 from the Daytona Beach Campus. He is currently writing a musical about the space race told from the perspective of Apollo 11 astronaut Michael Collins. For more, visit landonashworth.com.

SEND US YOUR STORY *In Other Words* gives you the opportunity to share your industry-related or personal perspective with *Lift* readers. Email submissions/proposals to liftmag@erau.edu.

The first *Klyde Morris* comic strip ran in *The Avion* 40 years ago.



The Aviator Ant

Celebrating the 40th anniversary of the *Klyde Morris* comic strip at Embry-Riddle

BY MELANIE STAWICKI AZAM

In junior high school, Wes Oleszewski ('87, DB) loved aviation, space, drawing cartoons and ants.

"I launched a lot of model rockets, and I put ants in them as passengers," he recalls. "I had a comic strip of ants dying horrible deaths. If you write comics about people getting killed, nobody likes it. But when ants die, nobody cares."

Fast-forward to 1978. Oleszewski is a freshman at Embry-Riddle's Daytona Beach Campus. *The Avion* student newspaper wants to run a comic strip starring an Embry-Riddle student. The "student" just happens to be an ant. There's one problem: Oleszewski can't think of a name for the strip.

"I was on the bus with the cartoon strip in my folder, and the bus pulled onto Clyde Morris Boulevard," he recalls. "That's how the character got its name about five minutes before I turned it in."

On Wednesday, Feb. 15, 1978, the iconic comic strip *Klyde Morris*, which recently celebrated its 40th anniversary, was published in *The Avion* for the first time. Over the years, *Klyde Morris* has chronicled the experiences of an Embry-Riddle student, lampooned the university administration and poked fun at the aviation industry.

"Klyde is an ant in a world of giant people and that is what a lot of people feel like," Oleszewski says. "But Klyde perseveres. He is sort of an 'everyman' ant."

Persistence Pays Off

Oleszewski needed that perseverance himself to earn his college degree and pilot's certificate with meager financial resources. It took him nearly 10 years to graduate from Embry-Riddle, with periods of hiatus in between.

"Everybody said I couldn't do it. I come from a blue collar, formerly industrial part of the country. Neither of my parents finished high school," he says. "I knew when I started Embry-Riddle, I couldn't afford it. But when I got to campus, I decided I am not going to flunk out or quit. When I was out of school, I worked just so I could get back. My goal was to finish what I started."

Klyde Morris continued to run in *The Avion*, even when Oleszewski wasn't a full-time student, meaning thousands of students read the strip over the years. More than 1,200 *Klyde Morris* strips were published continuously in *The Avion* from February 1978 until April 1988.

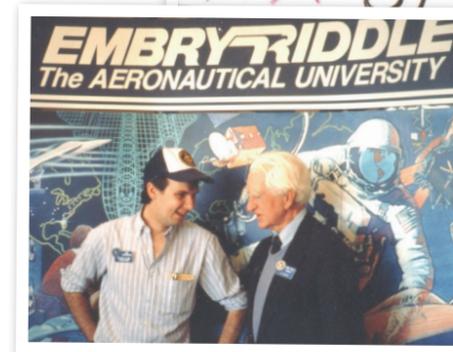
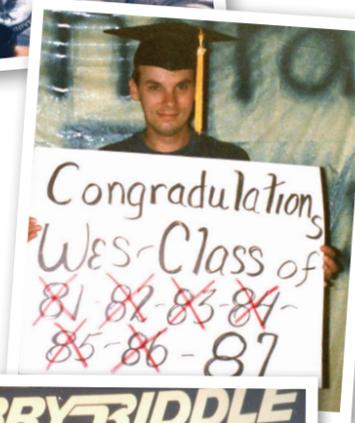
"The staying power of the cartoon comes from my phenomenon of working my way through college," Oleszewski says. "Klyde stayed in *The Avion*, and as a result, a lot of people who went into the aviation industry were Klyde fans."

The comics lampooned university presidents Jack Hunt and Kenneth Tallman, but Oleszewski says he was actually friends with both of them. And sometimes, they even collaborated on topics for the strip. During his time at Embry-Riddle, he met lifelong friends, his future wife, Teresa ('88, DB), and mentors

"The staying power of the cartoon comes from my phenomenon of working my way through college. Klyde stayed in *The Avion*, and as a result, a lot of people who went into the aviation industry were Klyde fans."



Wes Oleszewski created more than 1,200 *Klyde Morris* comic strips during his 10 years at Embry-Riddle.



Wes Oleszewski, left, with Embry-Riddle founder John Paul Riddle.

like Embry-Riddle's founder John Paul Riddle, who attended Oleszewski's wedding.

"John Paul Riddle was always on campus, sitting at a table at the university center and telling stories," Oleszewski recalls. "And he liked my cartoon strip."

Klyde Lives On

After finishing his degree, Oleszewski worked as a commercial and corporate pilot, but continued to draw the *Klyde Morris* strip, focusing more on the aviation and space industry. The strip ran a few years in the university's alumni newsletter, then was launched online in 1999. It was syndicated in 2003 with *Aero-News Network*. Students can still find the strip in *The Avion*, as the artist has gifted a free license to the student publication.

Oleszewski is also a book author. "I was flying a lot and in hotels a lot, and there is nothing to do — so I wrote," he says.

Eventually, he decided to stay home to raise his two daughters and focus on writing full time. "After three furloughs in 11 years, I was done," Oleszewski says. "I've had people tell me they need me writing *Klyde Morris* more than they need me in the cockpit."

Forty years after the launch of his *Klyde Morris* strip, Oleszewski has been able to combine all of his passions again. He is currently working on his 24th book, plus he works as a spaceflight analyst and a cartoonist for *Aero-News Network*, which continues to publish *Klyde Morris*.

"The strip very often kind of writes itself," Oleszewski says. "I have a very active imagination and memories of my own experiences."

Oleszewski says he was never bitter about his long tenure as an Embry-Riddle student because the experiences he had made him who he is today. "I see finishing Embry-Riddle as my single greatest accomplishment," he says.

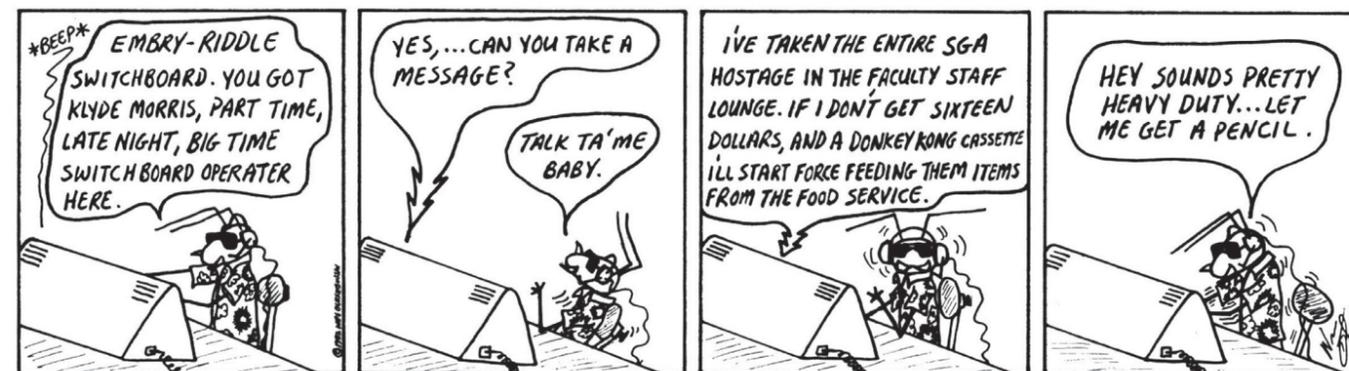
Did You Know?

→ The Daytona Beach Campus student newspaper, *The Avion*, was founded in the spring of 1969. The newspaper's first editor was Linda Colgan ('71, DB).

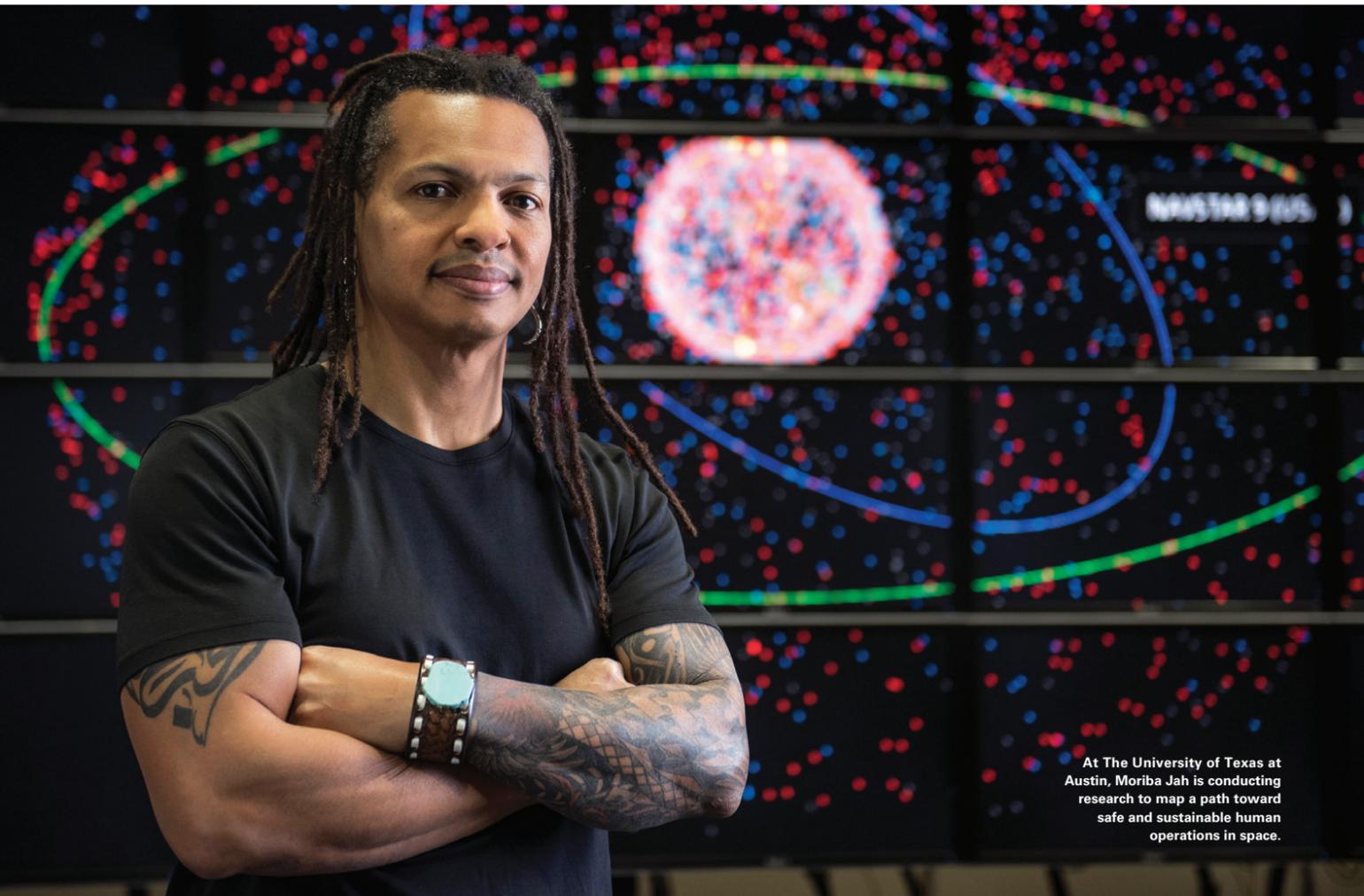
→ Reporters and photographers at *The Avion* have been covering spaceflight and launch events since the Apollo program.

→ *The Avion* is a division of the Student Government Association.

Read *The Avion* at theavion.com.



COURTESY OF WES OLESZEWSKI



At The University of Texas at Austin, Moriba Jah is conducting research to map a path toward safe and sustainable human operations in space.

Space Junk(ie)

From a bullied child to an accomplished astrodynamacist, **Moriba Jah** is a lead researcher on orbital debris

BY ALAN MARCOS PINTO CESAR

Getting accustomed to watching *Scooby Doo* in Spanish was the least of Moriba Jah's ('99, PC) challenges at age 6. Moving from California to Venezuela multiplied the typical new kid troubles, and Jah endured more than his share of childhood bullying as a result. "I was a foreigner and learning a new language. There were different cartoons, different customs, different everything. It's not easy for a kid," he says.

But through it all — and with the support of his late parents, mother Elsie Turnier de Marquez, stepfather Jorge Marquez Lupi and father Abraham Jah — he developed an animated personality and a dogged determination that resulted in many career successes. Today, Jah is a leading voice in the discussion over human-made orbital debris.

Flight Back to the States

As a U.S. citizen attending a military high school in Venezuela, Jah couldn't join the Venezuelan military like his classmates. His second choice, the U.S. Marines, was also a no-go, thanks to another barrier.

"I was 17 years old. My mom wouldn't sign any of the documents unless I was going into the Air Force or the Navy," Jah says. "I just wasn't a boat dude, so I went into the Air Force."

Jah was working as a security policeman at Malmstrom Air Force Base in Montana when he took a course in aviation law through the Embry-Riddle Worldwide Campus. That introduction led him to study at the Prescott Campus when he left the service.

A Beacon in the High Desert

In Prescott, Arizona, Jah found a new direction when he took a course with Ron Madler, who had been teaching there for only about a year. "He was into orbital mechanics, and quickly my interests shifted from aircraft to satellites," Jah says.

Madler provided a positive environment and mentorship on his path forward. "I had a lot of other people around me at the time saying this isn't for me. I'm a nontraditional student; I didn't take calculus; I'm not really what an engineer looks like," Jah says. "Out of all the negativity, Ron was a lighthouse in the darkness for me. That made all the difference. I found another lighthouse at the University of Colorado at Boulder in the late George Born and built upon that. The opportunities and mentoring that I got from Ron and George are the things I built the rest of my career upon."

DIY Internships

Madler, now dean at the College of Engineering at the Prescott Campus, remembers Jah as a student with a clear vision of his future in space. "Moriba took great initiative. He found somebody at Los Alamos National Labs and did all the work to set up a summer internship there with their space division. He did the same thing with Jim Wertz at Microcosm."

Madler cites Jah's personality for his success in these ventures. "He was able to overcome that barrier that faculty often put up with our students in terms of maintaining a professional distance," Madler says.

Shifting to Earth Orbit

The research Jah did with Madler through the Arizona Space Grant Consortium sparked his interest in graduate school, which led him to study under Born at the University of Colorado at Boulder, culminating in a job at NASA's Jet Propulsion Laboratory (JPL). He worked at JPL for seven years as a spacecraft navigator, analyzing tracking data on specific satellites for Mars missions and predicting their trajectories.

MERRICK ALES

Jah half-jokingly says that the character of Rich Purnell, played by Donald Glover in the 2015 science fiction movie *The Martian*, is modeled after him. "The only person in *The Martian* that is an astrodynamacist is a black dude with short dreadlocks. There was only one of those at JPL, and that was me."

His 10-year stint at the Air Force Research Laboratory (AFRL), following JPL, brought his personal mission closer to Earth. He worked to track and understand the population of roughly 23,000 human-made objects (larger than 10 cm) in Earth's orbit, of which only approximately 1,500 are working satellites. This human-made orbital population became his primary concern. Jah decided that the nontransparent nature of the Department of Defense's tracking operations could be a problem for private entities wanting to enter orbit. His research, now as an associate professor at The University of Texas at Austin, centers on establishing a more reliable and accessible "data lake" on space objects and events, and setting up a framework conducive to discovering key insights regarding how objects in space behave. His hope is that this data will inform space policy and regulations to maximize orbital safety and long-term sustainability of space activities.

"I'm a non-traditional student; I didn't take calculus; I'm not really what an engineer looks like."
— MORIBA JAH

Driven by Altruism

Jah has more than 75 published scientific papers to his name and has given lectures and TED Talks on the subject of space situational awareness and astrodynamics. His credentials amplify his voice, but his motivation is bigger than himself.

"It's been a long road, but I feel blessed, guided to do this sort of work. My soapbox is one of altruism. There's nothing wrong with profit, but I want to have a voice for the community and thus operate from a nonprofit vantage point," Jah says. "I want to do things that are beneficial to humanity, which has an ever-increasing reliance upon space activities, services and capabilities. This is how I am called to make a contribution." ✨

WEB EXCLUSIVE

At The University of Texas at Austin, Moriba Jah leads a research program called Advanced Sciences and Technology Research in Astronautics (ASTRIA), which he developed while working at AFRL. Learn more at lift.erau.edu/space-junkie.



Four Embry-Riddle alumni support space science research aboard the Stratospheric Observatory for Infrared Astronomy project



FLYING OBSERVATORY

BY SARA WITHROW

It's 7:55 p.m. Eastern time on Thursday, Oct. 5, 2017. Navigator Jeff Wilson ('97, WW) sits in tense anticipation as he waits for confirmation that the 747 he's flying has reached its rendezvous point.

Years ago, Wilson was a navigator on B-52 bombers for the Air Force. His military training and experience prepared him well for tonight's mission. The target: Triton, a unique moon 2.6 billion miles from Earth in a retrograde orbit around the planet Neptune.

It's a make-or-break mission with a two-minute window of opportunity. Triton's occultation, an eclipse-like event where the moon passes between the Earth and a faraway star, will cast a fast-moving shadow in a narrow path over the Atlantic Ocean.

It's Wilson's job to make sure that the Stratospheric Observatory for Infrared Astronomy (SOFIA), a modified 747 Special Performance (SP) aircraft equipped with a 2.5-meter, 17-ton infrared telescope, is there to intercept the shadow at the right time.

SOFIA, a space science partnership between NASA and the German Aerospace Center (DLR), has a distinct advantage over ground-based telescopes. It flies at an altitude of 39,000 to 45,000 feet, which is above 99 percent of the water vapor in Earth's atmosphere. This gives the telescope a clearer view of astronomical events.

Moments later, Wilson gets the confirmation he's waiting for. The science director announces the mission's success. The occultation was captured and recorded, including the all-important central flash,

when the light of the eclipsed star is focused and intensified through Triton's atmosphere.

Wilson and the entire SOFIA crew celebrate with handshakes and pats on the back.

His third occultation to navigate for NASA, Wilson says midflight changes are common. For Triton's occultation, the original plan moved about 400 nautical miles, he says.

"It's a lot like a bomber," he says. "You basically have a target time, and you have to make your target time precise. Because we fly at a high altitude, you have like a 10-knot window in speed to work with. You have to think ahead, and you have to use geometry, because you can't use air speed."

He adds, "It's stressful, it's challenging, but it's rewarding at the same time."

SOFIA Eagle Team

While they weren't on the aircraft for this mission, three other Embry-Riddle alumni are also instrumental members of the SOFIA team: avionics specialist Andrea Davis Muir ('12, WW), aircraft mechanic Mike Woodworth ('10, WW) and research pilot Dean Neeley ('03, WW).

Neeley piloted SOFIA on other science missions earlier in the week and flew the test flight the night before Triton's occultation. In addition to SOFIA, Neeley flies several other highly modified scientific research aircraft for NASA, including the single-seat Lockheed ER-2 high-altitude science jet, the Gulfstream G-II mission support aircraft and the C-20A (G-III) science platform aircraft that carries the NASA Jet Propulsion Laboratory's synthetic aperture radar.

"They're Frankenstein aircraft," Neeley says. "None of the controls are standard. You have to get in there, take a deep breath and take it slow. It's not like getting in the Cessna you get in every day, where you can do it blindfolded."

Woodworth's and Muir's jobs kick in before and after each flight. They help ensure that the aircraft and its avionics systems are maintained and performing at optimal levels.

"We don't want to lose out on any science because of a maintenance issue," Woodworth says.

Muir says the most challenging part of her job is learning all of the different systems that SOFIA has installed. "SOFIA isn't just a 747SP aircraft; it's a whole observatory. Every modification includes different subsystems that need to be installed, modified and checked before and after every flight."

Learning the Neighborhood

The data SOFIA captured will be used to further study and characterize Triton's atmosphere.

"During an occultation, the way the background star dims is a sensitive probe of the density and composition of the foreground object's atmosphere. It can also give us very sensitive measurements of Triton's size and shape," says Terry Oswalt, chair of the physical sciences department and professor of engineering physics at Embry-Riddle's Daytona Beach Campus.



Dean Neeley



Andrea Davis Muir



Mike Woodworth, right



Jeff Wilson

Woodworth says SOFIA's missions are important because "they broaden our understanding of our neighborhood, the solar system."

Inspiring Students

All four alumni had the opportunity to visit the Daytona Beach Campus during the days before and immediately following Triton's occultation, which was SOFIA's first scientific mission over the Atlantic Ocean. Regularly stationed in Palmdale, California, NASA selected the Daytona Beach International Airport as a temporary home base for SOFIA's East Coast operation.

More than 2,000 Embry-Riddle students, faculty and staff toured the aircraft and learned more about the flying observatory from NASA representatives during its five-day stay.

Maggie Gallant, a graduate student at the Daytona Beach Campus, was impressed. "SOFIA is one of the greatest crossovers between engineering and space science," she says.

Woodworth would agree. "I love the fact that I work on a national treasure," he says.

Contributors: Ginger Pinholster and Deborah Circelli



WATCH

SOFIA crew members discuss their roles aboard NASA's flying observatory and other important NASA research projects: lift.erau.edu/videos-spring-2018.



CLOCKWISE FROM TOP LEFT: DARYL LABELLO; SUBMITTED; NASA; DAVID MASSEY

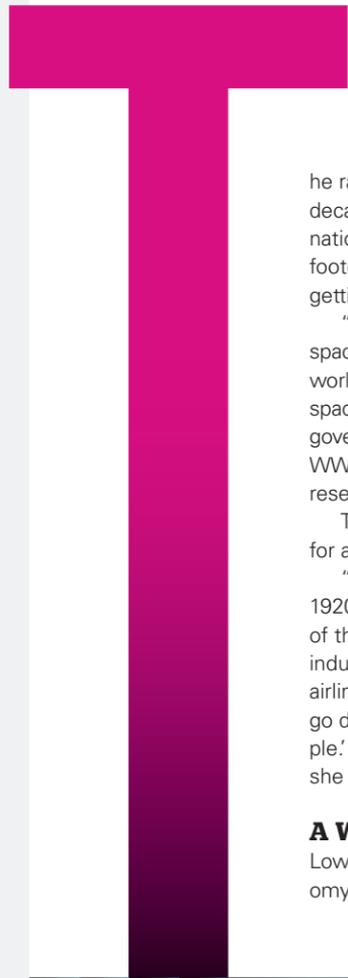
NASA



THE COMMERCIAL SPACE RACE

Embry-Riddle faculty and alumni space industry experts predict new, thriving, wholly commercial space markets

By ALAN MARCOS PINTO CESAR, SARA WITHROW and MELANIE STAWICKI AZAM
Illustrations by TIM BOELAARS



he race to commercialize space is accelerating. For decades, governments — intent upon establishing a national presence in this new frontier — have mostly footed the bill. But now, commercial enterprises are getting into the act in a big way.

“The amount of revenue generated by commercial space activities now exceeds that being spent by the world’s governments. This is a dramatic shift from early space activities, in which revenue was closely tied to government expenditures,” says Sonya McMullen (’00, WW), a Worldwide Campus assistant professor who researches the commercial space industry.

This new space revenue reality is setting the stage for a wave of pure space commercialization.

“I think we’re right at that barnstorming era — 1920s or so, and right at about the 1930s, in terms of the government airmail contracts for the aviation industry,” McMullen says. “The government told the airlines, ‘We don’t want to subsidize you forever, so go develop bigger airplanes where you can carry people.’” That’s what’s happening with the space industry, she says. “I think we’re at the tipping point.”

A Wide Open Space Market

Lower entry costs are fueling the new space economy, according to Kelly Whealan-George (’15, DB),

associate professor and chair of the economics discipline for the Worldwide Campus.

“There’s a lot of venture capitalists out there,” she says. “It’s now [a] space jam; everyone is getting into the business. Why? Because it’s more affordable — and when it’s more affordable, it opens up the market.”

And an open market is usually a growing market. In her 2013 study, Whealan-George predicted that the global space industry would grow 18 to 40 percent by 2030, depending upon certain key economic drivers, such as geopolitical and socioeconomic developments. So far, her projections appear to be on track.

With a total estimated \$339 billion in economic activity (according to the 2017 Satellite Industry Association’s *State of the Satellite Industry Report*), the space industry has grown 7 percent from 2013 to 2016.

McMullen says private launch businesses, like SpaceX, have disrupted the space economy by breaking the long-standing \$10,000-per-pound cost barrier. “That’s dirt cheap,” she says, “especially when you consider that it cost more than \$1 billion to launch the last space shuttle [in 2011].”

Money maker

At 77 percent of the total global space economy, satellites are the driving force propelling the industry.

IS MARITIME LAW AN OPTION FOR SPACE?

Edward Ellegood (’15, DB), publisher of the *Florida SPACePORT* and a business development analyst at Saalex Solutions, says there are arguments for using maritime law for space operations. “In shipping, it is common practice to flag your vessel in a country that has laws favorable to your operations,” he says.

Countries like Luxembourg are developing legal frameworks that encourage space enterprise on this model. As of November 2017, the space industry represented 2 percent of Luxembourg’s annual gross domestic product. The country is attracting foreign business, as well. The asteroid mining

company, Planetary Resources, established a European headquarters in Luxembourg after the country invested nearly \$28 million in its research and development.

This tiny European country may become a leading “flag carrier” in the new space economy.

“The big commercial items are always going to be telecom. They have a satellite asset, they buy a ride on a rocket, and they have users on the ground. That’s how they generate their money,” says Ryan Kobrick, assistant professor of commercial space operations at the Daytona Beach Campus.

According to the 2017 Satellite Industry Association’s report, satellite numbers have increased by 47 percent in the past five years, thanks in large part to small or very small satellites in low Earth orbit (LEO).

“The small satellite industry is hugely growing,” says Robyn Ringuette (’97, DB), vice president of Liquid Propulsion at Virgin Orbit, a recent spinoff of Virgin Galactic. Satellites have gotten smaller and cheaper to build and launch, Ringuette says, reducing business risk and enabling more companies to enter the market.

Virgin Orbit plans to further cut costs of satellite launches with its LauncherOne program, which is set to deploy for the first time in 2018. LauncherOne will offer low-cost, quick-turnaround launch services to the small-satellite industry, with fewer restrictions on launch timing, Ringuette says.

Instead of launching from a fixed site in Florida or California, LauncherOne will detach from the wing of a Boeing 747-400, called “Cosmic Girl,” while it’s flying 35,000 feet over the ocean. Once released, the LauncherOne rocket will carry the satellites into orbit.

Another innovation is taking a strength-in-numbers approach. This year, several companies have plans to begin installing in LEO huge groups or “constellations” of satellites that number in the thousands, McMullen says. These could provide global phone, internet and/or imaging services with no service interruption as early as 2022.

“More people in the world have cellphones than there are toilets,” McMullen says. The profit potential is huge, especially because it’s cheaper than ever before to build and launch satellites, she says.

Space Clutter

But there may be a problem: space debris.

“I think it’s important that we’re aware of orbital crowding,” Kobrick says. “Companies that are making the jump to making these constellations for things like global internet have a huge responsibility in leading how that is done.”

The U.S. Strategic Command tracks about 1,500 functioning satellites orbiting Earth, but there are millions of human-made objects and debris up there, says Moriba Jah (’99, PC), an astrodynamist and associate professor at The University of Texas



47%

Increase of satellites in the past five years, according to the 2017 Satellite Industry Association’s *State of the Satellite Industry Report*.



at Austin. Industries and governments alike are concerned about the growing space trash problem. [See sidebar: *Trash in the Global Commons*.]

Tow Trucks in Space

Scott Weintraub (’16, DB), president and CEO of Weintraub, which is located in Embry-Riddle’s Research Park in Daytona Beach, Florida, says his company plans to stop the space debris epidemic. The solution: Hercules II, an on-orbit robotic services space tug that can dock, repair, refuel and maneuver other spacecraft in LEO. Weintraub expects to launch its first operational vehicle in 2022 and a second vehicle with robotic arms by 2024.

“For nonspace people, I call it a tow truck,” Weintraub says. “Imagine if every time your car breaks down, you have to buy a new one. You can’t take it to a mechanic. It stays on the road where it stopped. That’s the analogy in space right now.”

In addition to Hercules II, Weintraub is designing a fleet of modular satellites with standardized connectors. Weintraub says on-orbit services like his could conceivably extend a satellite’s average life span to 100 years.

“We can stop the space debris problem if we change the way satellites are manufactured — meaning they’re no longer replaced, they’re just fixed and reused. And when they do die, we would have the option to go to them and send them to burn up in Earth’s outer atmosphere or to the sun.”

“Just as barnstorming was for aviation, [space tourism] is about building excitement for the industry and raising money to continue to develop new aircraft.” — SONYA MCMULLEN

Space Tourism

Space tourism is another market on the horizon, and it's garnering attention from a wealthy, thrill-seeker niche of the population. A 2012 study by the Tauri Group titled, *Suborbital Reusable Vehicles: A Ten-Year Forecast of Market Demand*, estimates “40 percent of the interested high-net-worth population, or 3,600 individuals,” would fly within the first 10 years of space tourism becoming operational. The study included surveys of 200 people with a net worth of \$5 million or more.

But high ticket costs could be an issue in making the business case for space tourism, Kobrick says. A 10- to 11-minute space experience presently costs around \$150,000 to \$200,000. “They need to get it down to where a trip to space is like an expensive family vacation, like taking a family to Australia. That's what's going to make a difference — if the vehicles are ready, of course.”

Jeffrey Osterlund ('89, DB), senior manager for Space and Missile Operations engineering capability integration at The Boeing Company, agrees. “I would buy a ticket, but I don't have that disposable income,

and 99 percent of the population doesn't have that disposable income,” he says.

“[Still] the space tourism market is young, and we know from experience that as markets mature, they open for a variety of reasons to more people. There is no reason to think that space tourism or any other commercial space endeavor will not proceed in the same way as it did for commercial aircraft in the 20th century.”

Osterlund, who works directly on the CST-100 Starliner spacecraft, says tourism isn't the only outlet for space transportation vehicles. The Starliner is in development for NASA's Commercial Crew program, but it's also a potential platform for space tourism and for private transportation to space habitats for research and other purposes. Its inaugural mission is set for the fourth quarter of 2018.

“We've been in discussions with global partners in providing transportation services for them, to fly them up to a destination and then fly them back,” Osterlund says.

To date, no commercial space tourism missions have flown, but Virgin Galactic predicts a 2018 launch of its human transport vehicle, SpaceShipTwo. Blue Origin is also planning a manned launch of its New Shepard capsule in 2018.

But Edward Ellegood ('15, DB), publisher of the *Florida SPACERePORT* and a business development analyst at Saalex Solutions, cautions: “It's been a decade since the first flights were proposed to have taken place. Virgin Galactic and XCOR, which is now out of business, and a handful of others, were all expected to have flown for years now. For various reasons it hasn't happened, primarily because of safety.”

Kobrick agrees. “The joke in the industry is that suborbital tourism is always two years away.”

While its future as a viable space market remains uncertain, McMullen says space tourism is much more than a joyride. “Just as barnstorming was for aviation, it's about building excitement for the industry and raising money to continue to develop new aircraft,” she says.

Powering Space

Another industry garnering lots of investor attention is mining in space. Joe Landon ('01, DB), chief financial officer for Planetary Resources, says his company plans to mine natural resources, primarily water, from asteroids; convert that water to fuel; and set up outposts in space to power the developing space industry. And it will all be done robotically.

“Basically, we want to open gas stations in space,” Landon says.

SPACE INDUSTRY PARTNER

Embry-Riddle is preparing the next generation of space industry leaders for takeoff and partnering with businesses in research and development that will grow the space economy.

The university offers a variety of space-related degree programs that include astronomy and astrophysics, astronautics (aerospace engineering), space physics and spaceflight operations. Additionally, faculty and students are researching and developing new technologies, including space robotics and control systems, small satellites (CubeSats) and advanced rocket propulsion systems.

Embry-Riddle is an active partner with Polar Suborbital Science in the Upper Mesosphere (PoSSUM), a nonprofit organization that conducts upper-atmospheric and space technology research. The university hosts training sessions for PoSSUM scientist-astronaut candidates and helps test emerging technologies for its bioastronautics program.

Specialized facilities, such as the Prescott and Daytona Beach campus observatories, the Cosmic Ray Lab, the Laser Interferometer Gravitational Wave Observatory (LIGO) Lab and the Laboratory for Exosphere and Near-Space Environment Studies are creating new knowledge to help achieve the next great step for humankind in space.

A leader in the discussion of emerging space markets and related issues, Embry-Riddle hosts the annual Space Traffic Management Conference (see Page 2). And its Spaceflight Operations, Aerospace Engineering and Engineering Physics Industry Advisory Boards, which include space industry professionals, offer regular insight that informs the university's program offerings, research and curricula. The university also collaborates with the Space Generation Advisory Council to promote space activities and strengthen the space workforce through education and career development.

For more, visit erau.edu/degrees/space.



WATCH
We asked Embry-Riddle alumni what they think about the developing commercial space industry. Here's what they had to say: lift.erau.edu/videos-spring-2018.

Planetary Resources is targeting late 2020 for the launch of its first asteroid exploratory mission. The company estimates that there are more than 16,000 near-Earth asteroids that share a similar orbit, with an estimated 2 trillion tons of water available in the form of ice.

Beyond creating fuel, long-term plans include mining asteroids for structural and precious metals, which would be used for construction in space and in-space manufacturing of equipment, Landon says.

“Mining resources to ship to Earth wouldn't be cost effective,” he says. Rather, he explains, as the space economy develops and millions of people begin to work and live in space, there will be a need to have fuel and resources available in space, since it will be too costly to ship everything from Earth.

Point-to-Point Orbital Transportation

A space market that's a little closer to home involves suborbital and orbital point-to-point travel. Oscar Garcia ('04, DB), partner, chairman and CEO of InterFlight Global, chairs the Standards Working Group for the Federal Aviation Administration's (FAA) Commercial Space Transportation Advisory Committee (COMSTAC), which is working to develop standards for this industry. Given the existing demand for long-distance air travel, he sees disruptive potential for the point-to-point transportation market.

“When you're talking about transporting people on Earth very far, very quick and using flight trajectories that reach space to do so, the size of that economy alone, in time, could be another half a trillion dollars — as big as the whole space economy today, combined. That's a game-changer,” Garcia says.

Several companies, including SpaceX with its Big Falcon Rocket, are working to develop spacecraft that could transport people from a departure point on Earth to anywhere in the world in less than 45 minutes.

Garcia expects supersonic (speeds above Mach 1) and hypersonic (Mach 3 and above) aircraft to become operational first, paving the way for suborbital and orbital point-to-point transportation. “By 2025, we should have a couple of commercial aircraft types flying supersonically all over the world,” Garcia says.

Once supersonic aircraft become commonplace and are successfully integrated into the airspace and airport systems, orbital and suborbital transportation models will fully evolve, he predicts. Garcia, who turns 50 this year, says he expects to see suborbital and orbital point-to-point, high-speed transportation operating in his lifetime.

In addition to his work with COMSTAC, Garcia is an executive committee member of ASTM Committee F47, which is developing standards for commercial

\$150,000

Approximate current cost of a 10-minute spaceflight experience.



EMERGING SPACE MARKETS

What's in store for the space economy over the next 30 years? Based on current industry projections and activities, the next space boom might look like this:

WEB EXCLUSIVE

Visit *Lift* online and see what other space markets are on the horizon: lift.erau.edu/emerging-space-markets.

spaceflight. "We are cautiously optimistic that the way to future regulations will be guided by industry consensus standards as a means for regulatory compliance, like aviation is doing more and more with the FAA," he says.

Legal Hurdles

Garcia says the regulatory framework for point-to-point suborbital and orbital transportation will likely be an extrapolation of existing international air commerce laws. "I expect the speed of technology there and the speed of regulation and global consensus to be pretty much aligned."

Unfortunately, that's not the case for some other emerging space businesses, he says.

Antiquated U.N. treaties that date back to the 1960s need to be updated, he says. "The treaties were signed so long ago in the Cold War context that they never predicted a commercial space economy."

The treaties are rather general, agrees Diane Howard, assistant professor of commercial space operations at the Daytona Beach Campus and organizer of Embry-Riddle's annual Space Traffic Management Conference. This is why there is a need for countries to put national space laws into place, she says.

In mature space markets, like satellite telecommunications, there is a solid regulatory framework. For emerging markets, like space tourism, the United States has taken a relatively hands-off approach to commercial space regulation in order to encourage investment and innovation, she says.

While some risk is necessary for industry growth, Howard says there is also a need for legal certainty. For example, private businesses, like those involved in space mining ventures, want legal assurance that their investments are sound and protected under the law, she says.

Landon says the 2015 Spurring Private Aerospace Competitiveness and Entrepreneurship (SPACE) Act provided Planetary Resources with the affirmation it needed to continue its research and development. The act essentially allows U.S. citizens to own, transport and sell resources obtained during commercial operations in space.

With the original idea for the law coming from the U.S. Homestead Act of 1862, the SPACE Act stipulates that the company or entity that arrives first at a particular asteroid has the right to non-interference from others, Landon says. "We believe that there

UP TO 40%

Potential growth in the global space industry by 2030, as predicted by Kelly Whealan-George, associate professor at Embry-Riddle.



2018

Companies deploy large constellations of low Earth orbit microsats, delivering communications and imaging services as early as 2019.

2019

The first space tourists enjoy the effects of zero gravity and views of Earth from low Earth orbit.

2020

The first on-orbit robotic servicing spacecraft begin providing satellite life-extension services and relocation to select customers.

2025

Supersonic commercial aircraft return to the airspace and dramatically decrease air travel times.

2040

Passengers regularly fly halfway around the world in less than an hour on point-to-point orbital flights.

2050

Robots mine water from asteroids and begin in-space fuel refining activities to power the space industry.

are no remaining legal or regulatory hurdles for us to begin conducting our business."

Planetary Resources is working to build consensus for this law among other countries, as well. Luxembourg has already passed similar legislation.

Is Space the New Wild West?

While laws exist for space activities, the problem is, "they're ambiguous," Ellegood says. "There isn't even a common, accepted, universal government definition of where space begins."

Additionally, there is little, if any, policing of the existing treaties and legislation.

"There's no enforcement that I know of that will deter or have consequences, other than condemnation from the global community," Garcia says. "For example, in 2007, China blew up a satellite with a missile and created thousands of big objects [space debris] and all they said was, 'Sorry.' A cheap shot up there can do a lot of damage to everyone."

Government funds have helped fuel the commercial space race, but given the growing geopolitical tensions, national alignments could ultimately prove hazardous to business.

"Local rivalries between countries, no matter how big or small, are the biggest stumbling blocks to a smooth launch of mankind's economy into space," Garcia says. "Right now, the biggest stumbling block is trust between the United States and China, and then Russia and then everybody else."

Human Returns on Investment

In light of these issues, Howard says there is a need for space diplomacy among all stakeholders or "space actors," so that the U.N. mandate that space activities serve the interest and benefit of all humankind is upheld.

McMullen agrees. Putting economics aside, the human benefits of a thriving global space economy are nearly limitless, she says.

"Today, you have people in the middle of nowhere, in Africa, building dams because they can access YouTube to see how to build a dam, or a water filtration system, or an irrigation system — because now they have access to information. Imagine what that information will do for places that are really oppressed. The sociological potential of just getting information to people — there's a lot of hope, I think, from that." 🌟

TRASH IN THE GLOBAL COMMONS

There's a huge amount of human garbage orbiting Earth. The U.S. Strategic Command (USSTRATCOM) tracks about 23,000 human-made objects in orbit that are bigger than a softball — about 10 cm in diameter. Of these, only about 1,500 are functioning satellites, says Moriba Jah ('99, PC), an associate professor at The University of Texas (UT) at Austin who is tracking orbital debris. Even the smallest objects — of which there are millions — can cause significant damage to spacecraft because they travel at speeds of up to 17,500 miles per hour.

Jah likens Earth's orbit to a global commons (not in a legal sense), where countries and companies acting in self-interest don't always concern themselves with the impact of their collective actions. "At this point it's the spray and pray model: They're throwing things up there and hoping they make sense," Jah says.

The space junk tracked by USSTRATCOM consists mostly of pieces of deteriorated satellites, some of which have been in orbit for decades. Aaron Rodzinak ('94, PC), a spacecraft systems engineer at Ball Corporation, says NASA got serious

about orbital crowding in 2009 when a Russian military satellite crashed into a commercial American satellite. His company works with NASA's Jet Propulsion Laboratory every few months to alter orbits on programs like CloudSat (a NASA Earth observation satellite) to prevent it from being damaged by debris clouds.



NASA's debris mitigation guidelines, issued in 2011, include directions on preventing satellite explosions and implementing disposal orbits at end-of-life. Other countries and the European Space Agency have issued similar guidelines. NASA must follow its own rules, but private companies do so voluntarily.

"In practice, countries work together to avoid collisions because

it is mutually beneficial," Rodzinak says. "But there is currently no controlling authority for our final frontier ... yet."

Jah, who worked on the Air Force Research Laboratory's space object detection, tracking, identification and characterization algorithms for 10 years, is conducting research at UT Austin to provide a public, transparent and data-rich object catalog that will lead to informed policy decisions over space activity.

The Department of Defense's (DoD) space debris database lacks transparency in its methods, he says, for understandable reasons. This leads to ambiguous conclusions. "Whenever someone is launching rockets into space, they go to that public catalog. The DoD will provide warnings, but then it's 'Brace yourself.' The math and physics are simplified, and there's no realistic and consistent measure of uncertainty."

Jah has a solution. "I'm trying to create a 'data lake' that's open and accessible and will allow people to add to and retrieve from it. People will be able to use that data lake to draw their own conclusions, and we can all compare conclusions and see which ones agree and which ones don't," he says.

"My motto for my research is: If you want to know it, you have to measure it. If you want to understand it, you have to predict it. If you can't predict it, you don't really know what's going on."



Photo Finish

Alumnus **Ben Cooper** is the go-to photographer for historic rocket launches



BY LACEY MCLAUGHLIN

If you've seen an official photograph of a launch at Cape Canaveral, Florida, there's a good chance it was taken by Embry-Riddle alumnus Ben Cooper ('08, DB).

While earning a bachelor's degree in aerospace engineering, Cooper attended launches and built up a photography portfolio that eventually landed him a position with the NASA photography team. Today, industry leaders such as SpaceX, United Launch Alliance and Orbital-ATK contract him to document and publicize their launches, as well.

As a student, Cooper was on staff at *The Avion*, the student newspaper at the Daytona Beach Campus, for more than four years. A lifelong shutterbug originally from Brooklyn, New York, his career as a launch photographer blends his technical and spatial visualization skills with his fascination for aerospace.

Since 1999, he has photographed more than 190 missions and launches. The job requires expert precision and as many as 25 cameras (per launch), rigged with remote sensors and set to capture a variety of angles and views. Here, Cooper offers insight into his job and his journey.

I WAS ALWAYS INTERESTED in aviation and astronomy as a kid. I also liked photography. I got my first camera at 8 years old, and I was doing darkroom work by the time I was 13.

I BECAME REALLY interested in seeing a space shuttle launch in person. In high school, my dad took me to see one. The launch was aborted just 7 seconds before liftoff, and we did not stay to see it go off a few days later. Still, the experience changed my life. We tried not once, but twice more, before finally seeing one go off on our third trip. After that, I wanted to see more, of course, and Dad let me go on my own. I knew then that I wanted to work for NASA, and I thought that engineering was the way to go.



"I can mentally work out things like the trajectories, positions in the sky, angles, etc., beforehand in my head. That's where I feel my engineering background definitely comes into play."

— BEN COOPER



ALMOST EVERY GREAT SHOT I've taken involved planning in advance. Sometimes it takes more than one try, but much of the time, you only get one try. And it's those times, when you nail it on the first try, that you really feel good. Anticipating the exact lighting conditions, even precisely where the sun will be in the sky, is a factor, as is the weather, the rocket's trajectory and other things.

I HAVE A VERY TECHNICAL MIND. I can mentally work out things like the trajectories, positions in the sky, angles, etc., beforehand in my head and easily visualize all of this when setting up the cameras. That's where I feel my engineering background definitely comes into play.

NO ONE IS ALLOWED closer than a few miles from the launch pad. All of the photos you see of launches taken from near the launch pad are taken by remotely operated cameras that are set up ahead of time. Generally, I set up anywhere from one to three days before a launch.

THE BIGGEST RISKS of the job are losing camera equipment due to exposure to the rocket or the weather. Extreme heat from the rocket at launch and flying debris are some things I deal with regularly.

THE SETUP CAN BE FUN. I've walked into swamps with alligators, snakes and spiders many times. I've

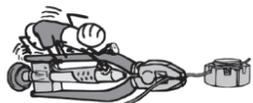
literally set up camera tripods in the water to get the shot I want. None of that bothers me, though. The hard part is dealing with the mosquitoes and the humidity.

SEEING A TOTAL SOLAR ECLIPSE was another goal of mine when I was young. It's something everyone should see at least once in their lifetime. Total eclipses are magical, but they only take place every couple of years in a narrow band across the globe that you have to travel to get to. "Eclipse chasers" are die-hards who travel to try and see them all. I've traveled to see six so far. 🦋

See more of Cooper's work at launchphotography.com.

Embry-Riddle alumnus Ben Cooper has photographed more than 190 missions and launches since 1999, including this SpaceX Falcon 9 rocket launch on Oct. 30, 2017, carrying Koreasat-5A, a South Korean communications satellite.

SPACEX





Donna Roberts and Sergio Del Bianco

Passing On a Love of Learning

Worldwide Campus professor creates scholarships for military veterans

BY MELANIE STAWICKI AZAM

With eight university degrees and 30 years spent living abroad, Donna Roberts ('10, WW) has always had a love of learning.

An associate professor and chair of the social sciences and economics department and undergraduate research at Embry-Riddle's Worldwide College of Arts and Sciences in Germany, Roberts says she wanted to help students who share her passion for education, especially those in the military.

That is why she and her husband, Sergio Del Bianco, made a generous planned gift to Embry-Riddle, creating an endowed scholarship in their names to help students longterm. The couple, who met in Italy and have been together 22 years, are also funding a term scholarship to immediately help undergraduate or graduate students with financial need.

"Valuing education so much, I wanted to give back to something that is meaningful to me," Roberts says. "Education opens doors and changes people's lives in tangible ways."

AS A NOT-FOR-PROFIT, HIGHER EDUCATIONAL INSTITUTION, EMBRY-RIDDLE RELIES ON AND DEEPLY APPRECIATES CONTRIBUTIONS FROM ITS ALUMNI, FRIENDS AND PARTNERS. ALL CONTRIBUTIONS TO EMBRY-RIDDLE ARE TAX-DEDUCTIBLE TO THE FULLEST EXTENT ALLOWED BY LAW.



The couple also wanted to help students who are serving their country. The endowed and term scholarships will have a preference for Worldwide Campus applicants who are active duty or military veterans.

An American in Europe

An only child growing up in upstate New York, Roberts was always curious about the world. She moved to Europe in 1987 and began working for the University of Maryland (UMD) in Heidelberg, Germany, in 1991.

"I was the first person in my family to have a passport and go that far away," she says. "I just fell in love with Europe and wanted to stay."

She earned a bachelor's degree in psychology and a master's degree in counseling from UMD, then worked as a counselor for the Army Community Services Family Advocacy Program. In 1997, she moved to Aviano, Italy, and got a job with the University of Oklahoma (OU). She earned master's degrees in both adult and higher education and human relations from OU.

"I was just interested in taking classes; then before you know it, there was a diploma in my hand," she says of her multiple master's degrees.

Embry-Riddle Journey

Roberts began working for Embry-Riddle's Worldwide Campus in Italy in 2003, eventually becoming the chair of sociology and psychology for the College of Arts and Sciences. She earned master's degrees in both aeronautical science and business administration in aviation at Embry-Riddle.

"I wanted to expand my horizons and understand the aviation environment a bit more," says Roberts, who has now worked nearly 15 years for Embry-Riddle.

After 10 years in Italy, she moved back to Germany to become the regional associate dean for the Worldwide Campus' European Region, then was promoted to the dean of academics for the International Region. In her present roles, Roberts teaches, develops curriculum and writes everything from textbooks to monthly psychology columns for online pop culture magazines. Her students come from around the world, bringing a diversity of backgrounds and experiences.

"Embry-Riddle students are people who are going to change the world, and we want to help them reach those goals," Roberts says. 🦋

"Embry-Riddle students are people who are going to change the world, and we want to help them reach those goals."

— DONNA ROBERTS



Partners for Success

Gulfstream Aerospace supports students with contributions and expertise

BY MELANIE STAWICKI AZAM

Gulfstream Aerospace Corporation is a longtime supporter of Embry-Riddle student projects and programs. In 2018, the corporation helped fund improvements to the Senior Aircraft Design Lab and provided financial assistance for co-op interns and other student-focused priorities.

"We love seeing the students excel and succeed, and we love seeing a school that we have such a great relationship with grow," says Cassie Batayias, Gulfstream college programs manager and a member of the College of Business Industry Advisory Board at the Daytona Beach Campus.

Gulfstream's support dates back to 1984; however, its 2018 gift is its largest to date.

James Scott, director of development at Embry-Riddle, says this recent gift will help the university purchase new equipment, including 3-D printers for the Daytona Beach Campus' Senior Aircraft Design Lab. The new technology will complement the design course curriculum and enhance learning for senior students, who are completing capstone projects, according to Scott.

In addition to partnering with the university through philanthropy, Gulfstream employees donate their time and expertise. Each year, Gulfstream engineers work directly with students to help

them define their capstone projects. They regularly conference with students over the phone, and at the end of the term, the engineers visit the campus for face-to-face meetings with students.

"There is another gift they have given without hesitation for more than 15 years and that is valuable time doing design evaluations," says Jim Ladesic, professor of aerospace engineering and associate dean of the College of Engineering at the Daytona Beach Campus. "Our students learn from them and they [Gulfstream employees] get to know our students. Gulfstream has been a great friend and colleague in trying to work collectively together."

The 2018 Gulfstream gift will also help support the Career Services Co-Op Assistance Award Program, which assists students with co-op or internship expenses; the Society of Women Engineers club; and the Veteran Student Services office (VSS). VSS provides resources to more than 650 GI Bill-eligible students.

The Business Eagles program will also receive Gulfstream funds this year. This College of Business program aims to help launch high-performing students into competitive aviation and aerospace careers.

Batayias says roughly 400 Embry-Riddle alumni now work at Gulfstream. "We have some wonderful history with the university," she says. 🦋

Creating Local Connections

Prescott Campus planetarium named for local donors

BY MELANIE STAWICKI AZAM

Longtime Prescott, Arizona, resident Jim Lee is eager to see Embry-Riddle's Prescott Campus and the local community become more connected. That is why he and his wife, Linda Lee, who are both prominent real estate developers, decided to make a substantial gift to the Prescott Campus' new STEM (Science, Technology, Education and Mathematics) Education Center.

"The future of the Embry-Riddle Prescott Campus can't be separated from the future of Prescott," says Jim, who sits on the Prescott Campus steering committee for campus buildings and is a member of its board of visitors.



Jim and Linda Lee, left, at the grand opening of the STEM Education Center.

The center's planetarium was recently named the Jim and Linda Lee Planetarium in the couple's honor. The only Arizona planetarium north of Phoenix, it can seat 125 people for presentations in full 360-degree high definition. It is open to the public and is designed for frequent community use.

"We are so pleased to have the support of this prominent local couple as we move forward," says Prescott Campus Chancellor Frank Ayers. "The Jim and Linda Lee Planetarium will delight students and residents alike with a variety of presentations."

Jim says he is excited to use the new state-of-the-art STEM Education Center and Planetarium, which celebrated its grand opening on Oct. 6, 2017, to bring more visibility to Embry-Riddle's Prescott Campus and better link the community and local K-12 students with the university.

"There will be programs for the general public," Jim says. "It is very important to bring students from the area to the university to see what is available."

The two-story, \$22 million STEM Education Center contains more than 20 laboratories supporting degrees in everything from aerospace engineering to forensic biology. The center and planetarium will become a resource for local schools and an epicenter for community engagement events year-round. "We are very fortunate and pleased to have Embry-Riddle in our community," Jim says. 🦋



Thierry Saint Loup at the Experimental Aircraft Association's AirVenture in Oshkosh, Wisconsin.

For the Record

Thierry Saint Loup's world record for aeroplane efficiency can be traced back to his days at Embry-Riddle

BY SAM MITTELSTADT

When Thierry Saint Loup ('99, DB) enrolled at Embry-Riddle's Daytona Beach Campus, his sights were set on becoming a corporate pilot. He would soon discover he was destined for that and more — including a role in developing the university's Eagle Flight Research Center (EFRC) and an engine that would power his world record-setting flight in 2016.

An Unexpected Detour

In 1998, Peter S. Pierpont, then head of the engineering department at Embry-Riddle, received a call from a French company called SMA asking if the university would be interested in a research project involving a jet-fuel-burning piston engine for aircraft. The super-efficient engine had been developed by SMA with the help of some heavy hitters — including the Formula 1 engineering team from Renault Sport — but this project would mark the first time it was tested outside the company's factory. SMA needed research to back its application on a variety of aircraft, including the development of a supplemental certificate (STC) in the United States.

At the time, "engineering was not expected to be part of my career path," recalls Saint Loup. "I wanted to be a pilot." The French-born student had already earned his single-engine commercial pilot's certificate in Clearwater, Florida, before enrolling at Embry-Riddle, where he focused on earning his airframe and powerplant certification, as well as multi-engine and instrument ratings. He was also president of the aerobatic club, of which Pierpont was the faculty adviser.

"One day I was in his office, talking about a project for the club, and he said, 'Hey, Thierry — you're French, you have a pilot certificate, you're working on your A&P ... I think you could be a good candidate to work on this new project.' I said, 'Why not?'"

DAVID MASSEY

THIERRY SAINT LOUP

Saint Loup was joined by Richard "Pat" Anderson, a professor of aerospace engineering at Embry-Riddle, and the project ended up being the genesis of the EFRC at the university.

The team built and tested the engine and demonstrated its capabilities on Capitol Hill, at the Pentagon and at the Experimental Aircraft Association's AirVenture in Oshkosh, Wisconsin, Saint Loup says.

"That was a startup, blazing new ground," says Anderson, now the director at EFRC. "We were biting off something that was truly different, combining engineering and aviation. And Thierry was in a particularly unique position — helping flight-test the aircraft, but also interfacing with the client because he spoke French."

Setting a Record

Before the STC for the engine could be completed, though, the project returned to its home base — followed shortly thereafter by Saint Loup, who earned his bachelor's degree in aviation technology in 1999.

"In 2000, because of all the knowledge and experience I had acquired working on the program at the university, I was hired by SMA," he says. "I ended up writing the engine installation manual, and the FAA approved the 230 HP engine installation on the Cessna 182 in 2006. We started doing engine conversions in the United States and the rest of the world."

Fast-forward to 2016, when Saint Loup was contacted by Ross McCurdy, a high school science teacher and pilot who hoped to be the first to complete a coast-to-coast flight powered by bio-jet fuel. After verifying the compatibility of the fuel with the engine specifications to meet FAA requirements, Saint Loup joined McCurdy for the western portion of the flight from Grand Prairie, Texas, to Santa Monica, California, and back.

"It dawned on me that maybe we could set a world record for efficiency along the way. It was a record I meant to get since it was established by the Fédération Aéronautique Internationale (FAI) in 2008. The FAI, the world's governing body for air sports, already listed records for speed, distance, altitude and payload, but it only recently had developed the category of efficiency," Saint Loup says. "Unfortunately, only a triangular course would qualify for the world record, so Ross and I decided to plan another flight to make history."

On July 12, 2016, the pair flew a Cessna 182 from Caldwell, New Jersey, to Buffalo, New York, then to Portland, Maine, before returning to Caldwell. Distance: 848 nautical miles. Flight time: 9.1 hours. Fuel used: 56 gallons — or 6.18 gallons per hour, compared with a typical engine's 8 to 10 gallons per hour range. The flight set the first world record for aeroplane efficiency in the C-1-c class.

"A slight mistake or a bad GPS recording and we would have failed," Saint Loup says.



"A slight mistake or a bad GPS recording and we would have failed. But everything lined up beautifully."



"But everything lined up beautifully — from the weather to the air traffic controllers to the aircraft to the ground support team and recording equipment."

Looking into the Future

Saint Loup's company continues to improve the efficiency and reliability of aircraft with engines based on compression-ignition technology. An

engine version of 330 to 400 HP is in development next. SMA also developed a modular high power density engine that offers record-breaking power output for hybrid applications, as well as the pure generation of electricity in larger commercial aircraft.

Saint Loup says his Embry-Riddle education has helped guide the forward momentum he's making as vice president of SMA Engines, a subsidiary of Safran Aircraft Engines, and as director of Safran's Flight Test Center in San Antonio, Texas. "Embry-Riddle was a cornerstone in my life," he says. "Had I not attended the school, I would never have been exposed to the technology that I was. It absolutely changed my life and my future." ✈️

Thierry Saint Loup, left, and science teacher Ross McCurdy used just 6.18 gallons of fuel per hour on their record-setting flight in a Cessna 182.



WATCH

Thierry Saint Loup, vice president of SMA Engines and director of Safran Aircraft Engines' Flight Test Center in San Antonio, Texas, talks about his experience as a student at Embry-Riddle and his world-record flight: lift.erau.edu/videos-spring-2018.



ALUMNI NEWS

MESSAGE FROM THE ALUMNI ASSOCIATION

This past year has been iconic for our Embry-Riddle family. Our new president, P. Barry Butler, has been at the helm for 12 months now and counting. Under his leadership, there is a renewed spirit of collaboration and a positive energy infusing our campuses and strengthening the university's global influence and reputation.

Welcoming New Alumni Around the World

New Embry-Riddle offerings remain focused on meeting the needs of the aviation and aerospace industries — worldwide. In December, we celebrated 30 new graduates of Embry-Riddle's Worldwide Campus in Central and South America. Representing Brazil's four major airlines, the students traveled to the Daytona Beach Campus to complete their professional aviation management program requirements and receive their certificates. The course was tailor-made to fulfill the growing demand for aviation professionals in Brazil.



Our Asia Campus in Singapore continues to grow in numbers and status. In December, the campus welcomed 112 new graduates, its largest graduating class to date. Since its first commencement ceremony in 2012, Embry-Riddle has conferred more than 300 degrees from its Singapore Campus. Both President Butler and Worldwide Campus Chancellor John R. Watret attended the momentous event. And in February, I had the opportunity to meet some of our distinguished Asia Campus alumni (See photo).

While our global focus is important, we're not ignoring our industry's needs here at home. A partnership between Embry-Riddle and Northrop Grumman that launched in January 2017 is filling an educational gap in the United States for airworthiness engineering (See Page 28).

The wings of Embry-Riddle's alumni network stretch far and wide. We are proud and we should be. Our graduates are in demand in all areas of expertise. Our alumni are leaders of companies, organizations, commands, projects and divisions that are keeping the world safe and taking us to exciting new horizons.

Calling All Eagles

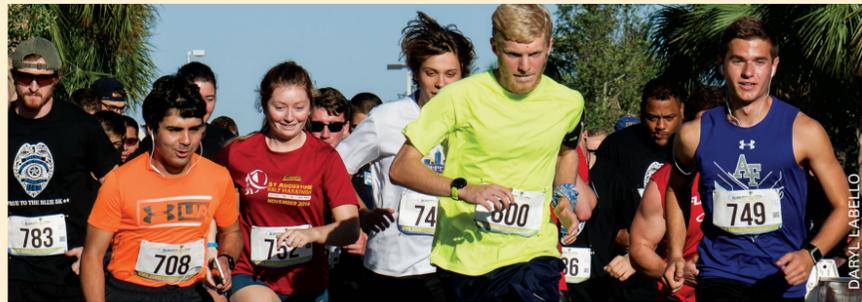
We encourage you to stay connected and take advantage of our growing alumni base. This past year we brought more Embry-Riddle Eagles together than ever before, and we want to thank all who participated. I invite you to join us in 2018 at one (or more) of our 100-plus events. Find an upcoming event near you at alumni.erau.edu/events.

Respectfully and *Forever an Eagle*,

Bill Thompson ('87, PC)
Executive Director

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instagram.com/erau_alumni/



Alumni Homecoming Weekend

DAYTONA BEACH, FLORIDA

Oct. 12-14, 2017

Highlights included a 5K benefiting the Ashley Guindon Memorial Scholarship; fly-in appearances by two F-16s, piloted by U.S. Air Force Lt. Col. Mike Driscoll ('97, '11, DB) and Capt. Luke Weyhmuller ('08, DB), among other aircraft; the inaugural Blue, Gold and Black Reunion; the grand opening of the Delta Chi Fraternity House; and a concert on the quad featuring singer/songwriter Rachel Platten.



October West and Wings Out West

PRESCOTT, ARIZONA

Oct. 5-7, 2017

Featured events included the Wings Out West Air Show with performances by Matt Chapman, Bill Stein and Skip Stewart; eagleNIGHT at the Hassayampa Inn; the 28th Annual Alumni Golf Tournament; the grand opening of the new STEM Education Center and the Jim and Linda Lee Planetarium; Friday Fair with fireworks; and the Chancellor's Alumni Hall of Fame Reception and Awards Dinner.

Filling the Airworthiness Gap

Embry-Riddle and Northrop Grumman partner to enhance workforce education

BY SARA WITHROW



COURTESY NORTHROP GRUMMAN CORPORATION

Embry-Riddle and Northrop Grumman have teamed up to fill a national gap in the area of airworthiness engineering education through a unique professional program.

"It's the first of its kind in the United States," says Glenn Greiner, an associate professor of aerospace engineering and the program coordinator for Embry-Riddle.

The Certificate of Study in Airworthiness Engineering (CSAE) launched in January 2017 and celebrated its first graduates this April.

Created specifically to fill the needs of Northrop Grumman engineers, the 15-month program blends live and recorded online coursework. In addition to the certificate, students earn 12 graduate-level credits, which can be applied toward a master's degree at Embry-Riddle's Worldwide and Daytona Beach campuses.

"We are proud of the partnership with Northrop Grumman resulting in offering this innovative program," says Maj Mirmirani, dean of the College of Engineering at the Daytona Beach Campus.

The program is already earning industry kudos. The Engineers' Council recognized the program and the Northrop Grumman/Embry-Riddle partnership with a 2017 Distinguished Engineering Project Achievement Award.

The plan is to possibly expand and develop the curricula into a full master's degree in the future, Greiner says.

While the first cohort of CSAE students were all Northrop Grumman employees, in January 2018 Embry-Riddle began offering the airworthiness engineering program to all students, regardless of employer.



Kurt Lawson

A Timely Solution

Recent CSAE graduate Kurt Lawson, an engineering manager at Northrop Grumman's facility in Rolling Meadows, Illinois, was already an Embry-Riddle graduate when he joined the program. He earned a bachelor's degree in aeronautical engineering in 1993 from the Prescott Campus. Lawson says the CSAE was the perfect next step for his professional development.

"Until the CSAE program launched, there was no formal course of study in airworthiness. Our customers are placing increased emphasis

on airworthiness as a separate discipline," he says. "We need both broad expertise and up-to-date knowledge to execute these programs. CSAE offers a focused solution for industry to bring engineers up to that common baseline."

The evolving airworthiness environment heightens the need for this type of training, Lawson adds. "Airworthiness has changed more in the last five years than the prior 20 years, so timeliness is critical," he says. "During the CSAE program, the Federal Aviation Administration issued a major rewrite for airplane airworthiness standards (FAR Part 23) and issued Technical Standard Order - C211 for Detect and Avoid, which is a key technology for unmanned systems. The CSAE cohort covered both of these changes, literally, as they happened."

Stephen Cook, Northrop Grumman technical fellow in the Northrop Grumman Office of Independent Airworthiness and the company's CSAE representative, says Embry-Riddle was the "right fit" to customize and deliver the advanced education for their employees. "The vision of the program is to build a stronger airworthiness skillset by creating a more formalized airworthiness career pipeline," he says. "We liked the fact that Embry-Riddle has a strong background in aviation and aircraft maintenance. That was a big differentiator for us."

In addition, the university had a successful track record in establishing professional programs to meet industry needs. In 2010, the university launched a Multidisciplinary Master of Science in Engineering program that was tailor-made for Gulfstream Aerospace.

"We're a global company," Cook says. "From our perspective there was a gap in formal airworthiness education in the United States. This was an area in which we could show leadership and help to fill that gap." 🐦



Arlando Teller and
Laura Tyler Perryman



Prescott Campus Pioneers

Two alumni honored at 2017 Chancellor's Alumni Hall of Fame dinner

BY MELANIE STAWICKI AZAM

Arlando Teller ('95, PC) vividly recalls nervously typing his admissions application to Embry-Riddle's Prescott Campus.

"I was unsure and I was leaving the nest," says Teller, who is believed to be the first Navajo and one of the first American Indians to graduate from the Prescott Campus. "But I knew I wanted to go to school here."

Laura Tyler Perryman ('88, PC) is one of the youngest graduates to have completed an undergraduate degree at the Prescott Campus. She earned her B.S. in Aerospace Engineering when she was just 19 years old.

Both Teller and Perryman were inducted into the Prescott Campus Chancellor's Hall of Fame on Oct. 6, 2017, during the annual OctoberWest Alumni Homecoming festivities. Prescott Campus Chancellor Frank Ayers established the Alumni Hall of Fame to recognize the significant contributions of prominent Prescott Campus alumni to their profession, the community, the campus and the university.

"I was humbled to be named to the hall of fame, especially as a woman in the predominantly male sector of engineering and sciences," Perryman says.

Careers of Service

Teller has led a career dedicated to improving transportation for the Navajo Nation. As deputy division director at the Navajo Division of Transportation, he oversees the Navajo Nation's airport infrastructure and airport system, along with thousands of miles of road maintenance, multi-modal planning, highway safety and project management. He has also been instrumental in creating a partnership between the Navajo Nation, Armstrong Consultants Inc. and Embry-Riddle that provides scholarships for Navajo teenagers to attend Embry-Riddle's career exploration summer programs.

Perryman's career has focused on improving lives. She is the founder, co-inventor and CEO of Stimwave Technologies, a privately held medical device company in Pompano Beach, Florida. Stimwave develops, manufactures and commercializes wirelessly powered, microtechnology neurostimulators that provide a pain management solution to patients in more than 38 countries. After her father died at age 58 from advanced-stage type 2 diabetes, Perryman felt compelled to investigate ways to use technology to improve medical care.

"Success for me is really based on how I can improve technology to help others," Perryman says.

Hall of Fame Distinction

Ayers says both Teller and Perryman are examples of Prescott Campus alumni whose professional contributions are making a difference in their respective communities and industries.

"Arlando Teller's outreach on behalf of Embry-Riddle and his stewardship of aviation within the Navajo Nation has been long-standing and exemplary," Ayers says. "Perryman's commitment to use the engineering skills she gained at Embry-Riddle to help others suffering long-term pain management issues is representative of the service our graduates provide to our nation and society as a whole."

Before founding Stimwave, Perryman was an executive working in the technology and internet sectors. She held engineering and program management positions at Rocketdyne, Seiko-Epson, Rockwell Semiconductors and Disney Imagineering, as well as completed professional campaign management consultancy engagements with Major League Baseball, Body Makeover, Suzuki, First Alert and Goldman Sachs.

After graduating from Embry-Riddle with a B.S. in Aviation Business Administration, Teller gained valuable experience managing multi-modal transportation projects for planes (airport planning at Phoenix's Sky Harbor), trains (BART to San Jose), automobiles (corridor management plans), pedestrians (Safe Routes to School with Oakland) and marine transport (the Vallejo Ferry System). Teller grew up on the Navajo Nation in a single-parent household, alongside grandparents, one of whom was a World War II Navajo code talker. Wanting to return to the reservation to help his community, Teller began working in 2009 as a senior transportation planner for the Navajo Nation Division of Transportation. 🦅

CONNOR MCSHANE

Flying High

Prescott Campus Golden Eagles inducted into the International Air & Space Hall of Fame

BY JASON KADAH



Embry-Riddle's Golden Eagles are the winningest intercollegiate flying team of the last two decades, including 31 consecutive regional championships and 11 national championships.

In honor of this record, the Prescott Campus flight team was inducted into the International Air & Space Hall of Fame at the San Diego Air & Space Museum on Nov. 9, 2017. Since 1963, the hall of fame has honored more than 200 of the world's most significant pilots, crew members, visionaries, inventors, aerospace engineers, business leaders, preservationists, designers and space pioneers.

The current team has 27 active members, four coaches and one adviser.

"This honor recognizes years of sacrifice and hard work," says Head Coach Sam Morris ('16, PC). "Teams throughout the years have truly created a legacy that each team is expected to uphold or raise. It means that the current and future teams are setting out to do what their founders desired and that they truly epitomize the creed they follow."

Golden Eagle alumnus William "Bill" Bayliss ('07, '14, PC) would agree. He was chief pilot and president for the Golden Eagles in 2007 and 2008, when the flight team won its first back-to-back national championships. Bayliss was one of several alumni who attended the hall of fame ceremony in San Diego.

"It was an absolute honor to represent the team and all of the hard work, dedication and, of course, teamwork, that has brought 11 national championships back to the Prescott Campus," Bayliss says. "We alumni are looking forward to the team winning the first three-peat [three consecutive championship wins] in a few months."

CONNOR MCSHANE

Making the Team

To become a Golden Eagle, applicants are required to go through a six-week tryout period. Upon selection, the team trains several days a week, as well as most weekends, for competition, which culminates with more than 30 collegiate flight teams ultimately vying to become the National Intercollegiate Flying Association's Safety and Flight Evaluation Conference (NIFA SAFECON) champions.

"It was an absolute honor to represent the team and all of the hard work, dedication and, of course, teamwork, that has brought 11 national championships back to the Prescott Campus."

— WILLIAM BAYLISS

"The common saying during our practices is 'give it your all and then do a little bit more,'" says Ryan O'Connor, current Golden Eagles team member. "This mentality and the resulting tradition of excellence has been a common theme among every team member throughout the years."

The naming of the Golden Eagles Flight Team to the International Air & Space Hall of Fame is an honor that is shared by the entire university community, says Prescott Campus Chancellor Frank Ayers.

"While the recognition clearly reflects the dedication and expertise of our flight team members, it also reflects positively on the commitment to excellence present across all disciplines at Embry-Riddle," Ayers says. 🦅



CAREER CORNER

2018 Industry/Career Expos

THURSDAY, MAY 31
Fort Walton Beach, Florida

WEDNESDAY, JUNE 20
San Diego, California

FRIDAY, SEPT. 7
Seattle, Washington

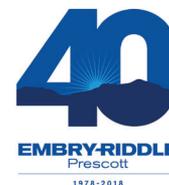
THURSDAY, OCT. 4
Prescott, Arizona

THURSDAY, OCT. 11
Daytona Beach, Florida



For additional information and job resources, visit careerservices.erau.edu.

MAKE CONTRAILS TO CAMPUS THIS FALL!



OctoberWest and Wings Out West Air Show

PRESCOTT, ARIZONA

Oct. 4-6, 2018

It's our anniversary.

Celebrate it!

#PrescottProud



Alumni Homecoming Weekend

DAYTONA BEACH, FLORIDA

Oct. 11-13, 2018

Experience the new four-story, 177,000-square-foot student union building.

Dates and events are subject to change. For up-to-date information: alumni.erau.edu/homecoming



EVENTS ON THE RADAR



APRIL 9

Lift, Off the Page: The Commercial Space Race
Daytona Beach, Florida
Livestreamed
alumni.erau.edu/lifftalks

APRIL 10-12

Aviation Week's MRO America
Orlando, Florida
Alumni Reception, April 10

APRIL 10-15

Sun n' Fun Fly-In & Expo
Lakeland, Florida
Alumni Reception, April 11

MAY 5

Prescott Commencement
Prescott, Arizona
Lift Off Reception, April 24

Worldwide Campus Commencements

Daytona Beach, Florida, and Prescott, Arizona
Lift Off Receptions, May 4

MAY 7

Daytona Beach Commencement
Daytona Beach, Florida
Lift Off Reception, May 2

MAY 12

Worldwide Campus Commencement
Seeheim, Germany

JUNE 2

Worldwide Campus Commencement
Pensacola, Florida

JUNE 22

Worldwide Campus Commencement
San Diego, California
Lift Off Reception, June 21

JUNE 30

Worldwide Campus Commencement
Okinawa, Japan

JULY 23-29

EAA AirVenture
Oshkosh, Wisconsin
Alumni BBQ, July 25

AUG. 15-17

Organization of Black Aerospace Professionals
Houston, Texas
Alumni Reception, Aug. 16

SEPT. 8

Worldwide Campus Commencement
Seattle, Washington
Lift Off Reception, Sept. 7

SEPT. 14

Worldwide Campus Commencement
Honolulu, Hawaii

SEPT. 30-OCT. 3

Air Traffic Control Association Conference and Exposition
National Harbor, Maryland
Alumni Reception, Oct. 1

OCT. 1-5

Human Factors and Ergonomics Society International Annual Meeting
Philadelphia, Pennsylvania
Alumni Reception, Oct. 2

OCT. 4-6

Industry/Career Expo & OctoberWest/Wings Out West
Prescott, Arizona

OCT. 11-13

Industry/Career Expo & Alumni Homecoming Weekend
Daytona Beach, Florida

OCT. 16-18

NBAA-BACE
Orlando, Florida
Alumni Reception, Oct. 16

OCT. 18-20

Society of Women Engineers
Minneapolis, Minnesota
Alumni Reception, Oct. 19

OCT. 20-21

Wings Over Houston Air Show
Houston, Texas

NOV. 7-11

Society of Hispanic Professionals
Cleveland, Ohio
Alumni Reception, Nov. 9

For the most up-to-date list of events, visit alumni.erau.edu/events.

CLASS NOTES

To share your Class Notes with *Lift* and your fellow alumni, join Embry-Riddle's online community at alumni.erau.edu/join today; or submit your announcements through email to eralumni@erau.edu. For guidelines, visit alumni.erau.edu/notes_guidelines.

Career News

1970s

Phil Woodruff ('71, DB) received the National Aeronautic Association's (NAA) Wesley L. McDonald Distinguished Statesman of Aviation Award at the NAA's fall awards ceremony on Nov. 29, 2017. The award honors those who have made significant contributions to aeronautics in the United States. As director of education for the Federal Aviation Administration, Woodruff's efforts led to the creation of new aviation education programs in every state, including opening more than 100 Aerospace Education Resource Centers for teachers and Aviation Career Education Academies for youth.

Mark Bushnell ('79, DB) retired from Continental Airlines/United Airlines, where he worked as an aircraft maintenance technician and a field planner for more than 27 years at Newark Liberty International Airport. Prior to Continental, he was in production support with Textron Lycoming in Stratford, Connecticut, for more than eight years.

1980s

Dennis Jones ('80, DB) was named managing director of the National Transportation Safety Board (NTSB). He is the first African-American to

hold this post. He started at NTSB as an intern in 1979 and has investigated more than 1,000 aviation accidents, including Malaysia Airlines Flight MH370, which disappeared in 2014 over the Indian Ocean.

C. Jeffrey Knittel ('80, DB) is chairman and CEO at Airbus Americas, located in Herndon, Virginia. Formerly chief executive of C2 Aviation Capital and president of CIT Transportation Finance, he brings more than 25 years of global aerospace leadership experience to the position. Prior to leading C2 Aviation Capital, Knittel served in a series of senior leadership positions at CIT Group since joining the company in 1986. Knittel is a trustee of the National World War II Museum in New Orleans, a member of the Board of the USO of Metropolitan New York and a member emeritus of the Wings Club Board of Governors. Previously, he also served as a member of the Embry-Riddle Board of Trustees.

Mackenzie Ogweng ('83, DB) completed Embry-Riddle's Aviation Safety Program Management and Aircraft Accident Investigation and Management professional courses.

Ogweng is a board member of the Uganda Civil Aviation Authority.

John McGraw ('84, WW), the founder and principal of John McGraw Aerospace Consulting, will receive a Technology & Engineering Emmy from the National Academy of Television Arts and Sciences on April 8. The award recognizes his contributions to the advancement of drone cinematography technology.

1990s

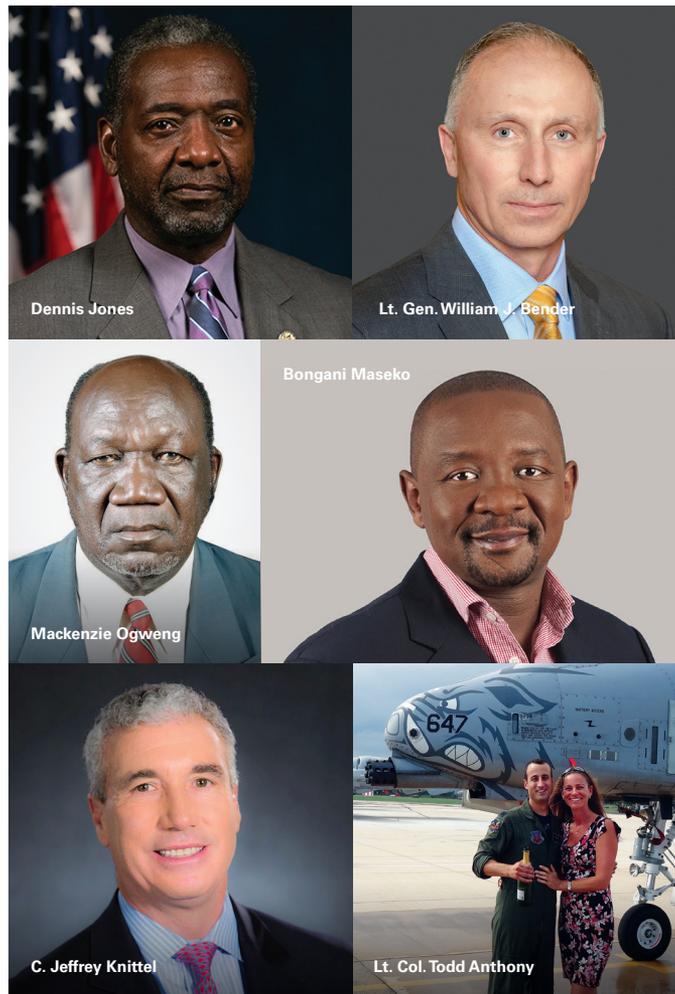
Lt. Col. Todd Anthony ('90, DB) retired from the Air National Guard on June 30, 2017, after serving 26 years at three guard units. He flew KC-135 and A-10 aircraft. He now lives in Harrison Township, Michigan, with his fiancée, Jennifer Lepez. Based in Detroit, Anthony flies the A-330 for Delta Air Lines.

Retired U.S. Air Force Lt. Gen. William J. Bender ('90, WW) was hired as strategic account executive, government relations, for Leidos, a Reston, Virginia-based company that designs and develops high-tech products for national security, health and infrastructure industries.

Eric Cowdin ('91, PC) is the race engineer for the No. 14 ABC Supply Chevrolet in the 2018 Verizon IndyCar Series, driven by Tony Kanaan for the AJ Foyt Racing team. Cowdin previously worked for Chip Ganassi Racing, KV Racing Technology, Team Penske and Andretti-Green Racing.

Cedric Rockamore ('92, '96, WW) was named vice president of American Airlines' Dallas/Fort Worth (DFW) Hub Operations.

Ted Hartselle ('93, WW), who formerly worked on the space shuttle program, was recognized by the National Space Club Florida Committee for lifelong achievement and contributions to the U.S. space program. Hartselle worked from 1980 to 2011 on the program and was a contractor launch pad operations engineer. He is now a professor at Eastern Florida State College in Cocoa, Florida.





Maj. Jeffrey Mullins

Lt. Garrett Hopkins

Lt. Col. John Grabowski, left

Tora Gore

Ryan DeMoore

Steven Scates

Joshua Kutryk

Capt. Abby Hall

Umar Farouk Idris

He is also a two-term councilman for the City of Rockledge, Florida, and the Lt. Governor for the seven Kiwanis Clubs of Brevard County.

Bongani Maseko ('93, DB) was appointed chair of Airports Council International. Maseko is CEO and executive director of Airports Company South Africa Limited.

Tora Gore ('94, '04, DB) retired on Oct. 1, 2017, from the U.S. Air Force.

Terry J. Mularkey ('94, WW), executive director of development at Nova Southeastern University, was recertified as a Certified Fund Raising Executive.

Steven Scates ('94, PC) is now chair of the flight department at Embry-Riddle's Prescott Campus. Scates has accrued more than 20 years of experience in airline, corporate and flight training settings.

Lt. Col. John Grabowski ('95, PC) was promoted to lieutenant colonel in the U.S. Army Corps of Engineers. He is the incoming deputy commander for cyber transformation at Fort Gordon, Georgia. He is responsible for communicating, coordinating and sharing up-to-date information with senior commanders on 60 to 80 construction projects at Fort Gordon with a projected investment of about \$2 billion.

Natasha Parks ('98, DB) joined the executive board for the International Institute of Space Commerce as a corporate liaison for the southeastern United States.

2000s

Ryan DeMoore ('00, DB) is manager of aviation tax and financial reporting solutions at Satcom Direct, a provider of aviation and global communication

technology services and solutions. He leads the company's managed services practice, which assists clients with financial and operational compliance, including IRS and SEC reporting. He also assists with the design of the company's flight department management software solutions.

U.S. Marine Corps Maj. Jeffrey Mullins ('06, WW) and **Navy Lt. Garrett Hopkins** ('09, WW) were selected for the U.S. Navy Blue Angels' 2018 air show season. Mullins is an F/A-18 Hornet pilot currently assigned to Marine Aircraft Group 31, Beaufort, South Carolina. Hopkins is a maintenance officer currently assigned to Strike Fighter Wing Pacific Detachment, Fallon, Nevada.

Yuka LaTulippe ('08, WW) joined World Fuel Services in Webster, Texas, as manager of application development. LaTulippe oversees

end-to-end software development for the Business Aviation, Colt International division.

2010s

Aaron P. Hascher ('10, WW), who is an operations duty manager with Memphis-Shelby County Airport Authority, recently earned his Airport Certified Employee credentials in Airport Operations and Safety Management Systems through the American Association of Airport Executives.

CAMPUS LEGEND

BFTS	No. 5 British Flying Training School
MC	Miami Campus
DB	Daytona Beach, Florida
PC	Prescott, Arizona
WW	Worldwide Campus

MULLINS, HOPKINS: U.S. NAVY BLUE ANGELS; GRABOWSKI: U.S. ARMY CORPS OF ENGINEERS; GORE: JAMAL D. SUTTER/413TH FLIGHTTEST GROUP; KUTRYK: CANADIAN SPACE AGENCY; THE APPEARANCE OF U.S. DEPARTMENT OF DEFENSE (DOD) VISUAL INFORMATION DOES NOT IMPLY OR CONSTITUTE DOD ENDORSEMENT

Joshua Kutryk ('10, WW) was named a new astronaut candidate recruit for the Canadian Space Agency. Kutryk is an air force pilot out of Cold Lake, Alberta. He will move to Houston to start a two-year training program.

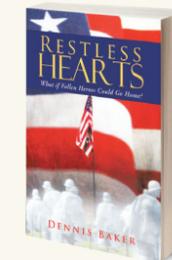
U.S. Air Force Capt. Abby Hall ('12, DB) represented the Air Force, which won the Armed Forces Volleyball Tournament in Jacksonville, Florida, in May 2017, and played on the All-Armed Forces Team, representing the United States, which won a silver medal in the World Military Volleyball Championship in June. Hall is a program manager and director's action group chief at the Air Force Life Cycle Management Center at Wright-Patterson Air Force Base in Ohio. She is a former Eagles Volleyball player and 2017 inductee to the Embry-Riddle Athletics Hall of Fame. This is her third consecutive year as a member of the All-Air Force team. She is currently the only member of the 11-player team who is not a graduate of the U.S. Air Force Academy.

Lt. Col. Jaime R. Harvey ('12, WW) is the incoming president of the Aerospace Physiology Society. She is the executive officer to the U.S. Air Force chief of safety and branch chief at the U.S. Air Force Headquarters in Washington, D.C.

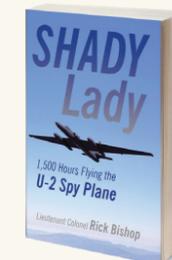
Marcos Bertamini ('13, WW) was promoted June 23, 2017, to international wide-body captain with Cathay Pacific Airways. Bertamini has been a pilot with Cathay Pacific in Hong Kong for more than 10 years and previously served as a Marine Corps officer and naval aviator. Additionally, Bertamini was elected to the English Schools Foundation Board of Governors in Hong Kong in September 2017. The foundation is the largest provider of English-medium international education in Hong Kong with 22 schools and 17,500 students.

Dan Brooks ('14, WW) was promoted to product owner at CAMP Systems International. He is responsible for the CAMP Inventory application as well as other major products. CAMP Systems is a provider of aviation management products and services.

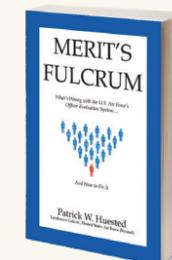
EAGLE AUTHORS ON THE BOOKSHELF



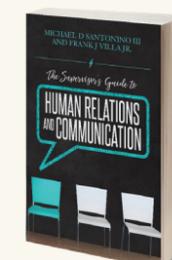
Dennis Baker ('96, WW) authored *Restless Hearts: What if Fallen Heroes Could Go Home?* His book was published by Abbott Press in 2014. Baker is a retired Navy commander and former adjunct instructor for Embry-Riddle's Worldwide Campus. He currently serves as president of the Florida Veterans Foundation.



Retired U.S. Air Force Lt. Col. Richard "Rick" Harris Bishop ('71, DB) authored *Shady Lady*, published by Crécy Publishing in July 2017. Bishop takes the reader into the world of high-altitude reconnaissance with a revealing and detailed account of the trials and challenges of flying a machine known as the most dangerous aircraft in the world: the U-2 Dragon Lady. Bishop served as a pilot and later commander of the 99th Strategic Reconnaissance Squadron (U-2 program), before retiring from the Air Force in 1991.



Retired U.S. Air Force Lt. Col. Patrick W. Husted ('90, PC) authored *Merit's Fulcrum: What's Wrong with the U.S. Air Force's Officer Evaluation System ... And How to Fix It*, published in August 2017 by RJ Communications. Husted is the owner of Deep Oak Consulting, a leadership and management training firm based in New Mexico.



Michael D. Santonino III and **Frank J. Villa Jr.** co-authored *The Supervisor's Guide to Human Relations and Communication*, published in October 2017. Santonino is a management practitioner with more than 15 years of experience working for military defense contractors and commercial corporations. He is an assistant professor for Embry-Riddle's College of Business at the Worldwide Campus.



Astrid Zajdband authored *German Rabbis in British Exile: From 'Heimat' into the Unknown*, published by De Gruyter Oldenbourg in 2016. Inspired by a book she inherited from her grandmother, which was published by a Jewish rabbi in 1935 in the midst of the Nazi regime, Zajdband explores the history of the German rabbinate, its exile to Great Britain, and the German-Jewish heritage and its influence on the Anglo-Jewish landscape today. Zajdband is an adjunct assistant professor for the department of business administration at Embry-Riddle's Worldwide Campus in Berlin.

ARE YOU AN AUTHOR?

Eagle Authors features traditionally and self-published books authored by Embry-Riddle alumni and faculty. To have your book considered, email liftmag@erau.edu.

Umar Farouk Idris ('15, '17, DB) is a software engineer at Intel, where he performs platform evaluation and competitive assessment enabling various business units.

Reed Ridder ('16, DB), who was an Embry-Riddle men's basketball standout from 2013–16, has signed with CB TerrAlfas of Spain's EBA League. CB TerrAlfas is in the Spanish fourth league, located in the port city of Alicante.

Kimberly Shaffer ('16, WW) participated as a Global Innovation Fellow at the inaugural U.S.-China Forum on Entrepreneurship, Innovation and Economic Opportunities, held Dec. 5–8, 2017, in Shenzhen, China. Representing ExplorMor, a business that promotes cognitive enriched learning through technology, she presented on the use of augmented reality in science, technology, engineering, art and mathematics education. Shaffer is the director of marketing at ExplorMor and a management consultant and translator for her family's international business, Shaffer and Associates.

Marriages/Engagements

2000s

Jonathan P. Rupp ('06, DB) and Sarah Ward were married on Nov. 11, 2017, at West Milford Farm in Cumming, Georgia. Rupp is a pilot for Jet Methods, a private jet air charter company.

2010s

John Garza ('12, PC) and **Cassie Lacey** ('11, '12, PC) were married on June 9, 2017, in Tucson, Arizona. The couple met at Embry-Riddle's Prescott Campus in 2009. Lacey graduated with a B.S. in Applied Meteorology and an M.S. in Safety Science, and Garza graduated with a B.S. in Aviation Business Administration. Lacey played volleyball and Garza was on the wrestling team. After college, the couple moved to Oregon for a few years, then moved to Tucson. Lacey is an engineer at Raytheon and Garza is a middle school physical education teacher.



Family News

Melissa (Andrzejewski Pemberton) Burns ('13, WW) and Trent Burns welcomed Isla Sky Burns on Nov. 5, 2017, at Tree of Life Birth Center in Deland, Florida. Melissa is a professional aerobatic pilot, display skydiver and B.A.S.E. Jumper, and performs in airshows for audiences worldwide.

Other

First Officer **Eric Sinn** ('95, DB), Capt. **Anthony Green** ('83, DB) and First Officer **Costas Sivyllis** ('12, DB) recently flew together on a long-haul United Airlines Boeing 767-400 flight. "While it's common to fly with another ERAU graduate, getting the 'hat trick' of all three of us hasn't happened in a long time," says Sivyllis, who shared the photo.

Michael Dee ('97, DB), director of flight training, **Stephanie Henderson** ('07, '11, DB), first officer, and **Mohamed Farag** ('16, DB), pilot, all employees of Republic Airways, visited the Daytona Beach Campus this past fall.

Mario Borda ('02, DB), **Oscar Garcia** ('04, DB) and **Sakeer Sheik** ('02, DB) reconnected at the 2017 Daytona Beach Campus Homecoming Weekend in October. Borda is CEO of Interflight Law and a Boeing 787 captain; Garcia is chairman and CEO of Interflight Global; and Sheik is CEO of Titan Aviation. They are all graduates of the Embry-Riddle Executive Master in Business Administration (EMBA) program, which was offered by the university from 2000–04. Other EMBA graduates who Skyped in for the occasion were **Fred Messina** ('02, DB), senior vice president at Booz Allen Hamilton; **George H. Snyder Jr.** ('02, DB), president and CEO of GHS Aviation Group; and **Scott Wargo** ('89, WW; '02, DB), general manager at Sargent Aerospace. Garcia says the EMBA degree helped propel him and his classmates to the top of their respective careers.

U.S. Air Force Capt. Paul Barbour • Nov. 20, 2017

Capt. Paul Barbour ('09, PC), 32, died when his T-38C Talon Jet Trainer crashed between two subdivisions near Lake Amistad in Del Rio, Texas. A co-pilot was able to eject from the same aircraft and sustained non-life-threatening injuries.

Barbour was the air crew flight equipment flight commander with the 47th Operations Support Squadron and an instructor pilot with the 87th Flying Training Squadron at Laughlin Air Force Base, Texas. He was a resident of Van Nuys, California.

"Paul was an exceptional pilot and officer and an outstanding representative of our university," says Embry-Riddle Prescott Campus Chancellor Frank Ayers. "He graduated in the fall of 2009 with a major in aeronautics and was commissioned a second lieutenant in the Air Force at that time."

Barbour's name will be placed on a brick at the Prescott Campus military memorial, located adjacent to the College of Security and Intelligence.

William "Bill" Vann Cheek, J.D. • Nov. 30, 2017

William "Bill" Cheek was a decorated Korean War veteran and one of the few U.S. Marines who survived the 1950 battle of the Chosin Reservoir in North Korea. The Marines who fought in this campaign are often referred to as the "Frozen Chosin," because the battle was fought in subzero temperatures during the coldest winter North Korea had experienced in 100 years.

"Bill was one of my heroes," says Richard Bloom, chief academic officer at the Prescott Campus in Arizona. "I had many a long talk with him about Korea, his very productive life, and his courage and persistence to withstand the unimaginable."

After earning a law degree, Cheek practiced law in New Mexico and spent 20 years working as chief legal counsel for Alaska Airlines in Seattle, before coming to the Prescott Campus in 1988. At Embry-Riddle he held a number of positions including Aviation Business Administration (ABA) faculty, ABA department chair and campus grants coordinator. He was also the founder and managing partner of William V. Cheek & Associates, a consulting firm. He retired from Embry-Riddle in February 2009.

"Bill Cheek was well-respected and loved by his business students and the entire campus community," says Bill Thompson ('87, PC), executive director of alumni relations.

Arnold B. Leonora • Sept. 29, 2017

Arnold B. Leonora ('86, DB) served on the Embry-Riddle President's Advisory Board and was active in Embry-Riddle's Atlanta Alumni Network. He was born in Willemstad on Curaçao, the main island of the Netherlands Antilles.

He came to the United States to study at Embry-Riddle's Daytona Beach Campus, where he served as Student Government Association president and was a member of the Brothers of the Wind student club. After graduation, Leonora became an investment banker with the Bank of Boston and Merrill Lynch.

In 1989, he started his own business, Air Transport Group Private Equity. He was CEO, president, treasurer and secretary, and most recently served as its chief financial officer (CFO) and principal accounting officer. Since 2006, he was CEO of Harvard Holdings International and served as its CFO, president, secretary, principal accounting officer and treasurer. He had also been the CEO and president for ABL Hotel Properties since 1998.

HELP US MEMORIALIZE EMBRY-RIDDLE EAGLES Notify the alumni relations office at eralumni@erau.edu if you are aware of any classmates who have died. For obituaries and up-to-date death notices, visit alumni.erau.edu/passings.

In Memoriam

1940s

Blaine Harris Schultz ('43, BFTS) Nov. 24, 2016

Retired U.S. Air Force Maj. Charles "Chuck" Neyhart ('44, BFTS) Nov. 12, 2017

Arthur John "Clem" Thurgood ('44, BFTS) July 25, 2017

Peter Brannan ('45, BFTS) June 24, 2017

Fred R. Birdsong ('48, MC) June 19, 2017

1950s

James A. Cooper ('51, MC) Aug. 4, 2017

Billy J. Thayer ('56, MC) Nov. 17, 2016

Anthony M. Ungaro ('56, MC) May 29, 2017

1960s

Herman D. Fentress ('66, DB) Aug. 21, 2017

1970s

James A. Henderson ('71, DB) (First chief pilot for the Daytona Beach Campus) July 11, 2017

John A. "Jack" Mullican ('71, DB) Oct. 1, 2017

1980s

Retired U.S. Air Force Maj. James L. "Larry" Jackson ('83, WW) Sept. 14, 2017

Clark A. "Skip" Knarr ('83, DB) Aug. 31, 2017

Gerald R. Fox ('84, '86, WW) Sept. 4, 2017

David A. Hanahan ('85, '92, DB) Sept. 4, 2017

Richard "Dick" Dolloff II ('86, DB) Aug. 15, 2017

1990s

Virginia State Trooper Lt. Henry Jay Cullen III ('91, DB) Aug. 12, 2017

Charles Wesley "Wes" Fowler ('93, DB) Aug. 19, 2017

Retired U.S. Navy Cmdr. Roberto Miguel Martinez ('93, DB) May 11, 2017

Craig Chilcote ('94, PC) May 22, 2016

Colin N. Guerra ('94, DB) Feb. 7, 2015

Retired U.S. Air Force Lt. Col. Devery S. Miller ('94, WW) Oct. 14, 2017

Rita A. Ferencak ('95, PC) May 29, 2017

U.S. Navy Lt. Cmdr. James "Jim" V. Celani Jr. ('97, DB) June 11, 2017

Retired U.S. Air Force Maj. David Arlen Smithhart ('97, WW) Sept. 28, 2017

Michael Antinori ('99, DB) Sept. 30, 2016

2010s

George M. Noble Jr. ('05, '10, WW) May 14, 2017

Benjamin Joseph Moore ('11, PC) Sept. 29, 2017

William D. Price ('13, DB) July 9, 2017

Victor Ngie Ming Wong ('17, DB) June 30, 2017

OTHER

Colton Butterfield (DB Student) Sept. 29, 2017

Irene Leverton (Aviation pioneer and one of the Mercury 13 women) July 23, 2017

Romeo F. Thomas Jabro (PC Mathematics Professor) June 19, 2017

Jake Vernon (DB Student) July 27, 2017

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I can realize my dreams and engage in
experiences and opportunities that only
Embry-Riddle can provide.”

Madison Dietrich
Class of 2020

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