



FALL 2015

AEROCONTACT

AEROSPACE ENGINEERING

A. JAMES CLARK SCHOOL *of* ENGINEERING

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COMPETITION KEY
TO STUDENT SUCCESS
AT MARYLAND



MARYLAND WINS ROBO-OPS
Sets New Course Record

AEROCONTACT

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CHAIRMAN'S CORNER



NORMAN WERELEY

What an incredible year in the department! At the A. James Clark School of Engineering, we believe that competition is a critical component of our students' academic experience. These hands-on experiences offer students the opportunities to take what they learn in the classroom and build on that knowledge base through unique hands-on opportunities to foster collaboration, creativity, and problem solving.

As you'll see in this issue of AeroContact our students rose to the challenge, winning our first Revolutionary Aerospace Systems Concepts - Academic Linkage (RASC-AL) Exploration Robo-Ops Competition, placing first for the 7th time at the RASC-AL Student Design Competition, and landing first place for the 12th time in the American Helicopter Society's Annual Student Design Competition. In addition, leaning on our expertise in unmanned aerial systems, we fielded a

new team, Maryland UAS, to compete in the Association for Unmanned Vehicles Systems International (AUVERSI) Student Unmanned Air Systems (SUAS) Competition. While it takes passionate and dedicated students to achieve such success, it also requires faculty, like this issue's Faculty Spotlight David Akin, to support and mentor students along the way. For more than 20 years, Akin has used competitions and design challenges to foster student excitement and collaboration for solving engineering challenges in space—from designing rovers and robotic assist vehicles to habitats on Mars and lunar resupply hubs.

Beyond competitions, our students were recognized for their academic success through scholarships and fellowships. This year, we had three graduate students selected for the prestigious Zonta International Amelia Earhart Fellowship, two NASA Space Technology Research Fellowships, and a National Defense Science and Engineering Graduate Fellowship. These awards attest to our graduate students' academic excellence and drive in furthering the field of aerospace engineering.

Our faculty continue to drive research efforts at Maryland, and this year, three faculty were awarded Office of Naval Research's Defense University Research Instrumentation Program (DURIP) awards. Assistant Professor Derek Paley received a three-year Office of Naval Research Grant, and the American Institute of Aeronautics and Astronautics National Capital Section recognized both Paley and Assistant Professor Anya Jones for their contributions to science and engineering.

We are pleased to welcome Dr. Olivier Bauchau to the department as the first Igor Sikorsky Distinguished Professor in Rotorcraft. Bauchau brings thirty-plus years of experience in the rotorcraft field to the university—building upon our track record of pioneering rotorcraft research—and he is a widely recognized scholar in aeromechanics of rotorcraft, multibody and structural dynamics, composite structures, and wind turbine systems. This professorship is made possible through philanthropic support from Sikorsky. Partnerships like these show that through support from corporate partners, alumni and friends, we can continue to expand horizons here at Maryland, enhancing the breadth and depth of resources and opportunities for faculty and students.

We hope you enjoy reading this issue of Aerocontact, and if you have any news to share, please, send me an email!

Norman M. Wereley

Minta Martin Professor and Chair
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DEAN DARRYLL PINES, PROFESSOR EMERITUS JOHN ANDERSON,
ALUMNUS MICHAEL GRIFFIN (PH.D. '77), ASSOCIATE PROFESSOR
JEWEL BARLOW, AND MINTA MARTIN PROFESSOR AND CHAIR
NORMAN WERELEY AT THE 2015 UMD ALUMNI ASSOCIATION
HALL OF FAME INDUCTION, AT WHICH GRIFFIN WAS AN
HONOREE.



UMD FLIES HIGH WITH MILESTONE 50TH HIGH-ALTITUDE BALLOON LAUNCH

On Saturday, October 10th, the University of Maryland Maryland Space Grant Consortium Balloon Payload Team, led by Professor Mary Bowden, celebrated its 50th tracked high-altitude balloon launch. Since the program began in 2003, there have been 49 tracked balloon launches that took student-designed and built payloads to the edge of space. Inset: View at 94,000 feet from the 50th launch payload.

go.umd.edu/50th-balloon-launch

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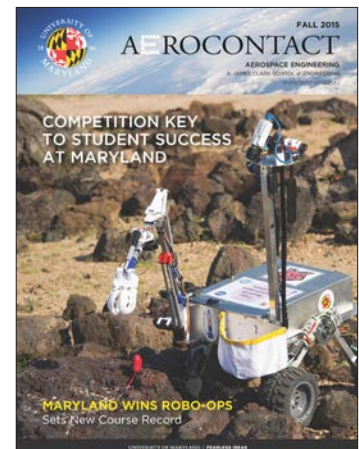
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2015

The UMD team wins Robo-Ops and sets new course record. Read more on page 2.

Image credit:
Bill Stafford/NASA



ON THE WEB AT
AERO.UMD.EDU

Competition is Key to Student Success at Maryland

UMD TEAM WINS ROBO-OPS

Sets New Course Record!

The University of Maryland team beat out seven other universities to win first place in the 2015 RASC-AL Exploration Robo-Ops Competition (Robo-Ops). Robo-Ops is an engineering competition, sponsored by NASA and organized by the National Institute of Aerospace, that challenges undergraduate and graduate students to create a multi-disciplinary team to build a planetary rover prototype and demonstrate its capabilities through a series of field tests at the NASA Johnson Space Center's Rock Yard.

The UMD team's rover, dubbed 'Frigg,' was designed and developed by students in Associate Professor David Akin's spring 2015 Planetary Rover Development course. During competition, Frigg had to collect a variety of 'samples'—color coded rocks—while navigating a course that simulates rocky fields, lunar craters, sand dunes and a Mars hill. Teams could also earn bonus points for returning with the rocks to the starting point on top of Mars Hill, for collecting at least one rock from each of the four terrains and for acquiring an "alien life-form."

Sounds simple enough, except that Frigg was being controlled remotely from a home campus "Mission Control Center" using a commercial broadband wireless uplink, and students navigated the course using only the data they received through a streaming video feed from on-board cameras. In Texas, a three-person 'pit crew' team monitored the rover and provided on-site support.

Maneuvering a robot through a rock yard over 1400 miles away is no easy feat, and before Frigg even hit the ground in Houston, the students spent the days leading up to the

ABOVE AND RIGHT: FRIGG IN THE ROCK YARD AT NASA'S JOHNSON SPACE CENTER. LEFT: STUDENTS MONITOR FRIGG'S PROGRESS, GUIDE ITS DRIVERS, AND COMMUNICATE WITH THEIR TEAM IN TEXAS FROM A REMOTE COMMAND CENTER IN UMD'S SPACE SYSTEMS LABORATORY NEUTRAL BOUYANCY RESEARCH FACILITY.

PHOTO: BILL STAFFORD/NASA



competition fine tuning their driving skills, working out last minute kinks and making sure that everything was operating as smoothly as possible.

Junior Shaheer Khan, who worked on the software team and was Frigg's primary driver, spent most of that week honing his driving skills.

"I spent hours and hours every day practicing driving the rover remotely, working with our arm operator Elena [Shrestha] to get the sample acquisition time down as low as possible," Khan said. "We practiced maneuvering and picking up rocks on sand dunes and gravel, in between, under and over big rocks, and every other possible situation we could think of!"

Their diligence paid off. The team not only successfully navigated Frigg to first place, but they set a new course record for points with a score of 102, beating out West Virginia University's 2014 Robo-Ops' record of 99.

Competition adds a whole new motivator, according to aerospace engineering senior Lemuel Carpenter.

"So many students stuck around after finals just to put in the extra time and effort to help improve Frigg all the way up until [we] had to start driving it down to Texas," said Carpenter, who was head of the mechanical/structural team and served as part of the Texas pit crew. "It's always a nice feeling when all of your hours on a project pay off."

In addition to securing first place and a new course record, the team won recognition for 'Best Climbing Ability' and for having the most weight loss in their rover over the past year. Frigg was the third lightest robot in the competition which allowed the team to compete on day two rather than day one.

"This was utterly crucial," explained Khan. "It allowed us to simply observe and plan during the first day, and to show up the next day with a solid game plan."

Once the hour-long competition in the Rock Yard began, rover drivers were not allowed to know the time or score, explained graduate student Chris Carlsen. Carlsen, a machinist and mechanical design advisor for the team, along with



PROFESSOR DAVID AKIN AND STUDENTS MARLIN BALLARD, JUSTIN KANGA, AND LEMUEL CARPENTER

fellow graduate student mentor Kate McBryan, coordinated maps and schedules during the event to determine targets and update time estimates.

"I would simply relay the next target to Kevin [Davis], who was acting as our communications officer, and he would guide [the drivers] along," Carlsen said. "Unknown to our pilots, we finished with 30 seconds to spare and 102 points worth of rocks. We put out our best effort and performed even better than expected."

What's next for the UMD Robo-Ops Team? According to Carlsen, the team wrote code during the course of Frigg's development that they will be contributing later this year to the Robot Operating System's open source project.

"Now that we have raised the bar for next year," Carlsen added, "We look forward to showing the world just how unstoppable a terrapin is."

2015 ROBO-OPS TEAM

FACULTY ADVISOR: Associate Professor Dave Akin

STUDENTS: Marlin Ballard (Houston team), Lemuel Carpenter (Houston team), Justin Kanga (Houston team), Daniel Arble, William Beckman, Robert Brown, Joshua Drubin, Zeyad Emam, Joshua Kaffel, Shaheer Khan (robot driver), Joshua Pugh, and Elena Shrestha (robot arm operator)

GRADUATE STUDENT MENTORS: Christopher Carlsen (overall systems mentor), Kevin Davis (software mentor), Nicholas D'Amore, Donald Gregorich, Nicholas Limparis, and Katherine McBryan



Team Takes First Place in RASC-AL

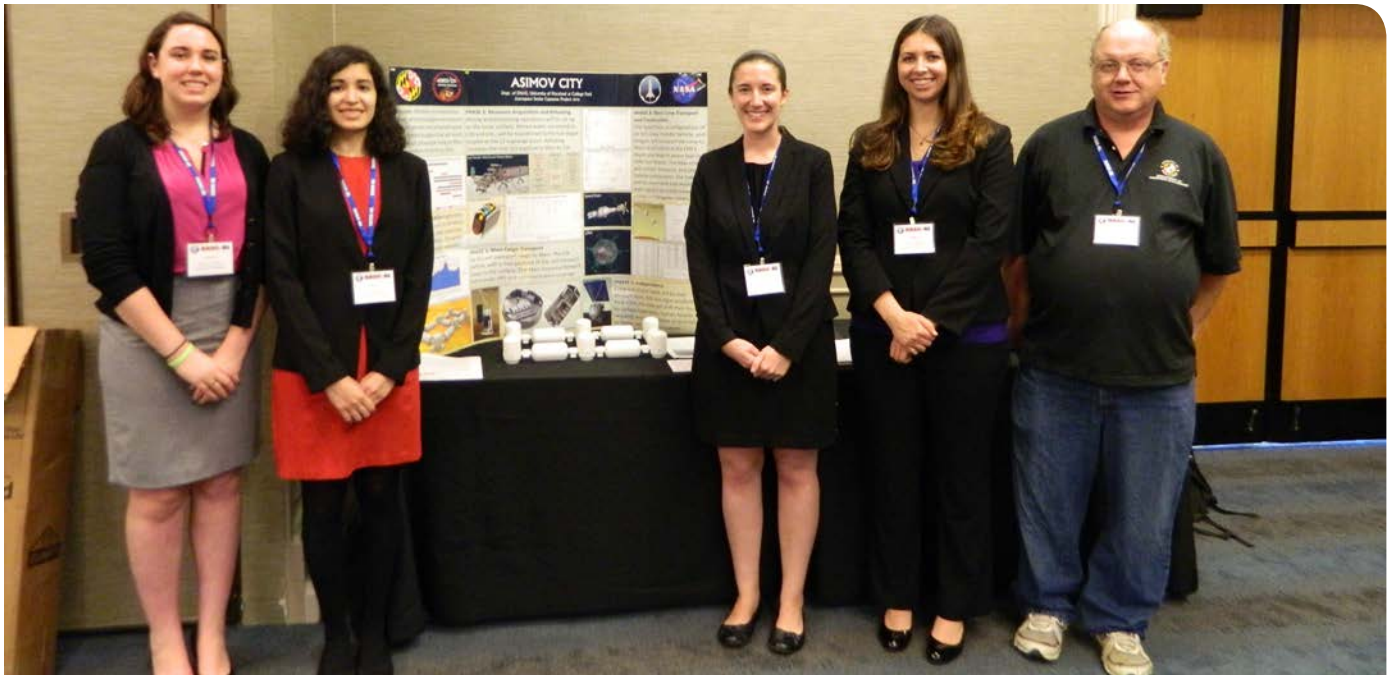


PHOTO: COURTESY OF RASC-AL AND NIA

University of Maryland students won the 2015 Revolutionary Aerospace Systems Concepts - Academic Linkage (RASC-AL) student design competition. The competition, sponsored by NASA and managed by the National Institute of Aerospace, provides university-level engineering students the opportunity to design human-scale architecture concepts based on NASA engineering challenges and offers NASA access to new research and design projects by students.

Through RASC-AL, student teams and their faculty advisors work to develop mission architectures that employ innovative solutions in response to one of the four following themes: Earth Independent Mars Pioneering Architecture, Earth Independent Lunar Pioneering Architecture, Mars Moons Prospector Mission or Large Scale Mars Entry, Descent and Landing (EDL) Pathfinder Mission.

This year's competition challenged students to design a mission with supporting technologies that would enable astronauts to be less reliant on resources transported from Earth.

The UMD team, led by Associate Professor Dave Akin and comprised of students in Aerospace Engineering's ENAE 484 class, not only won first place overall with their Mars exploration themed project "Asimov City, Mars: Developing a

"This project taught me so much, not just about engineering, but about teamwork and systems integration, and having professionals tell us that what we did was so impressive felt really good."

Samantha Walters (B.S. '15)

FROM LEFT TO RIGHT, THE FOUR STUDENTS WHO REPRESENTED THE TEAM AT COMPETITION, SAMANTHA WALTERS, ISABEL MARTINEZ, APRIL CLAUS, AND JACLYN RUPERT WITH ASSOCIATE PROFESSOR DAVE AKIN

Permanent Earth-Independent Settlement on Mars," but the team also placed first in the undergraduate category.

"Incredible kudos go to the competition team of Jaclyn Rupert, April Claus, Isabel Martinez and Samantha Walters, and all of the other 29 students in ENAE 484," Akin said, "And to Dr. Mary Bowden and Dr. Andrew Becnel who teamed with me in mentoring the project."

The team's project outlined a Mars settlement that incorporated the moon as a fueling stop for Mars-bound spacecraft, and they developed a strategy for creating fuel from lunar surface materials.

"Some of the teams had ideas that NASA might be able to use as we venture out beyond low-Earth orbit," said Pat Troutman, Human Exploration Strategic Analysis lead at NASA's Langley Research Center in Hampton, Virginia in a NASA press release. "The judges and I were impressed by the students' engineering skills and innovative thinking."

The 33-student team put in long hours through the course of a single semester to complete their project, and according to team member and recent grad April Claus (B.S. '15), it seemed like an impossible task.

"It was a huge team effort," said Claus, who is now working at Space-X. "Our success at the competition was the perfect end to our space track experience. I've never worked harder on a project, but I've also never been prouder of the

outcome.”

Claus worked on the team as a member of the Power-Propulsion-Thermal group and evaluated various power systems and performed trade studies to determine the optimal system. Once they settled on a nuclear powered system as their approach, she spent much of the remaining semester getting as up to speed as possible on nuclear engineering and reactor design. In addition, she worked on payload and propellant massing.

Team member Samantha Walters, who spent most of her time on the mission architecture and launch scheduling, systems integration and refueling operations, agreed that it was also one of the most challenging, but rewarding, projects she worked on as an undergrad.

The experience should serve Walters well. Walters, who graduated in August, will be working for NASA's Jet Propulsion Laboratory next year as an operations engineer.

Jaclyn Rupert (B.S. '15) wore many hats on this year's team—such as leading the Crew Systems sub team and Crew Transport Vehicle (CTV) focus group as well as co-leading the Steering Committee to name a few. In addition, she worked on some of the project's technical aspects such as inflatables optimization, habitat and CTV restocking, mass/volume breakdowns, risk analysis, and the crew Mars module layouts.

While the entire experience of developing their project was one of the most rewarding and educational experiences she's had, what she enjoyed the most was the camaraderie between all the competitors and judges at RASC-AL during the forum.

“It really demonstrated that while it was indeed a competition,” Rupert explained. “Our love of space and the advancement of space exploration was really what was important at the end of the day, and was a common thread that we all shared.”

Since graduating, Rupert has taken a position with Sikorsky Aircraft in West Palm Beach, Fla. as a Flight Test Engineer working primarily on the CH-53K helicopter.

As part of their win, the team presented their design project to industry experts at the American Institute of Aeronautics and Astronautics Space 2015 conference in Pasadena, Calif. held August 31 through September 2.

The 2015 RASC-AL featured 16 teams, representing universities including Virginia Tech, University of Colorado, Georgia Tech, University of Illinois, University of Texas and Penn State.

New Student Team Designs and Builds Unmanned Aerial Vehicle for AUVSI Competition

Maryland UAS (Unmanned Aerial Systems) is the school's newest competition team, and 19 students from across engineering, computer science, and mathematics worked together to compete in the Association for Unmanned Vehicles Systems International's (AUVSI) Student Unmanned Air Systems (SUAS) Competition held June 17-22.

The AUVSI SUAS Competition challenges student teams to create a UAV capable of flying autonomously, navigating a course and use onboard payload sensors to complete tasks. In addition to a successful flight, students have to submit a paper on their work and give a presentation about their project to a panel of judges.

“This year, there was a lot of learning just about the rules and the competition,” said Allison Thompson, an aerospace engineering senior. “We're putting together both a system as quickly as possible, but also building a great team who can move forward, and we're learning a lot about team work and cooperation.”

During the process, students not only learned the ropes in engineering, but learned a lot about what it means to build an effective team. According to Thompson, “There's a lot of real world experience that has to come together before the great engineering starts.”

“For the students, it's a great time to be in the front row seat in a field that is really hot right now,” says faculty advisor Assistant Professor Mumu Xu. “We still don't know what all of the rules are right now [for UAS], so we can be a lot more creative, and make up some of our own rules.”

The team finished 22nd overall out of 50 teams, and placed seventh in the poster competition.


The department would like to thank Millennium Engineering and Integration Company in Arlington, Va. for their support of this year's competition team.

BY THE NUMBERS

14 Number of years Maryland has competed in RASC-AL

with **7** wins

and **5** second place finishes




Team Lands First Place in AHS Student Design Competition



PHOTO: COURTESY OF 2015 AHS DESIGN TEAM

2015 AHS STUDENT DESIGN TEAM (FROM LEFT TO RIGHT) BRANDON GUDENIUS, DAIGO SHISHIKA, CHRIS BOGDANOWICZ, STACY SIDLE, BRANDYN PHILLIPS, JUSTIN WINSLOW, AND XING WANG. WHILE PHILLIPS WAS NOT A MEMBER OF THE DESIGN TEAM, HE PROVIDED VALUABLE ASSISTANCE ON BUILDING A WORKING PROTOTYPE OF THEIR VEHICLE DESIGN.

A Maryland design team lands first place yet again in the Graduate category of the American Helicopter Society (AHS) 32nd Annual Student Design Competition. This year's competition, sponsored by The Boeing Company, challenged students to design small unmanned aerial systems (UAS) capable of providing rapid aerial delivery of small cargoes, ranging from less than a pound to twenty pounds, from a larger cargo vehicle or central warehouse.

This year's team included graduate students Stacy Sidle, Chris Bogdanowicz, Brandon Gudenius, Daigo Shishika, Xing Wang, and Justin Winslow. Their proposed design, dubbed AirEZ, outlined a "fully developed logistics system that can be implemented using available state-of-the-art technology" and it has the ability to "hover, transition quickly

into high-speed forward flight, and efficiently transition back to hover for landing."

In addition, AirEZ is equipped with an advanced sensor system that allows it to navigate crowded airspace, like an urban setting, autonomously. The team's delivery system was capable of making deliveries within the prescribed range within two-hours and for less than \$10 per package by using a simple structural design that can be inexpensively mass produced.

The team's faculty advisors are Distinguished University Professor Inderjit Chopra and Senior Research Scientist V.T. Nagaraj. This year is the 12th win for Maryland in the last 15 years of AHS Student Design Competitions. UMD placed ahead of both Georgia Tech and Rensselaer Polytechnic Institute in this year's Graduate category.

The AHS Student Design Competition challenges students to design a vertical lift aircraft that meets specified requirements, providing a practical exercise for engineering students at colleges and universities around the world and promoting student interest in vertical flight technology.

Winning teams receive a cash award, and AHS invites two members of each first-place team to attend AHS International's 72nd Annual Forum and Technology Display—held May 17-19, 2016 in West Palm Beach, Florida, USA—to present the details of their designs.



ILLUSTRATION OF AIREZ IN FLIGHT.

Robert Fievisohn is Blowin' Up at Maryland!



Many students enter a Ph.D. program to learn how to conduct research, but sometimes students bring an impressive research background to their school work. Robert Fievisohn is that kind of student. Working under the advisement of Associate Professor Ken Yu, Fievisohn's focus is on Rotating Detonation Engines (RDEs)—an engine concept that uses detonation combustion instead of deflagration combustion.

Fievisohn joined the Air Force to support pursuing his undergraduate degrees in Aeronautical Engineering and Applied Mathematics and Statistics at Clarkson University. Upon graduation in 2008, his first assignment was to attend the Air Force Institute of Technology for an M.S. in aeronautical engineering while researching Pulse Detonation Engines (PDEs) for his thesis.

"Going to the Air Force Institute of Technology gave me the opportunity to work on computational fluid dynamics (CFD) and detonation propulsion together," said Fievisohn, "Pulse Detonation Engines seemed like a very interesting and exciting technology to work on." Two of Fievisohn's main

influences, Dr. Fred Schauer of the Air Force Research Laboratory (AFRL) and Dr. John Hoke of Innovative Scientific Solutions Incorporated (ISSI), had just completed a successful flight test of a PDE engine in 2008. Upon receiving his Master's in 2012, Fievisohn researched RDEs while working as a Combustion Engineer at AFRL. "I eventually shifted from computational to experiments later on at AFRL to broaden my engineering abilities," said Fievisohn. Promoted to Branch Chief in 2013, he was responsible for managing a research program with \$165 million in funding and almost 100 staff members.

Fievisohn left the Air Force after serving five years and applied to Maryland's aerospace engineering Ph.D. in fall 2013. The following spring he won a National Science Foundation Fellowship. "Winning the NSF fellowship meant that I could set my own goals and priorities for my research," said Fievisohn, "I ended up taking a significant amount of time to develop my research with few initial results; however, all of the work is paying off now."

The development of RDEs could have broad implications for propulsion systems. Any standard engine that uses a continuous, constant-pressure combustion system could be replaced by the pressure-gain combustion system that a RDE represents. The much faster flame speeds (up to 1.5-2 km/s) allow for much higher power densities than what is currently seen in engines. This could lead to smaller, more powerful engines, meaning increases in power-to-weight ratios. Fievisohn's research has focused on fundamentally understanding how RDEs operate. He is conducting theoretical studies into the flow structure and how that affects performance and operability and developing a simplified model that will allow him to conduct large parametric performance studies.

In transitioning to graduate studies at Maryland, Fievisohn found that his experience in the Air Force helped him better understand the research process.

"I think my time as a lab supervisor helps me explain to the other graduate students what is going on in the higher levels of the research hierarchy," said Fievisohn. "At those levels you can see how all the small parts that everyone works on can come together. I think this informs how you view other people's projects and how you go about your own project."

Fievisohn is still considering his many post-graduation options, but thinks he would like to run a research lab focused on propulsion and energy technology development.

Earlier this year, the American Institute of Aeronautics and Astronautics (AIAA) awarded Fievisohn an AIAA Foundation Martin Summerfield Propellants and Combustion Graduate Award. This award is given in honor of Martin Summerfield [1916-1996], an American physicist and rocket scientist, to graduate students doing excellent research in the air and space sciences. Official recognition was made during the Awards Presentations Ceremony held at the AIAA Propulsion/Energy Forum in July.

Three Students Awarded Zonta International Amelia Earhart Fellowships

Established in 1938, Zonta International created the Amelia Earhart Fellowship as a living memorial to Zonta International member and aviatrix Amelia Earhart and to encourage women to expand their career options beyond traditional boundaries. Aerospace engineering has come a long way since Amelia Earhart first inspired generations of both aviation pioneers and women with her transatlantic solo flight in 1932. We think she would be thrilled to see the latest generation of women propelling the field forward.

Three graduate students who exemplify the spirit of Earhart have been awarded Amelia Earhart Fellowships by Zonta International. Camli Badrya, Elaine Petro, and Elena Shrestha were three of 35 women selected globally to receive the fellowship this year. Zonta International's Amelia Earhart Fellowships support women pursuing doctoral degrees in aerospace-related sciences and provide \$10,000 stipends to cover study and research-related expenses.

Badrya is currently pursuing her Ph.D. under the mentorship of Professor James Baeder with a research focus on investigating flow at low Reynolds number numerically using computational fluid dynamics to solve the Navier-stokes equations. She and her colleagues are looking at very small scale of flappers, such as insect wings, which rely on highly unsteady phenomena to fly and differ from conventional aerodynamic flyers.

Born and raised in Daliet el-Carmel in Israel, Badrya received her B.Sc. from the Technion, Israel Institute of Technology before coming to Maryland in 2011 as a Fulbright Scholar to complete her master's degree in Aerospace

Engineering.

"At some point it is also very important for me to return to my home country and act as a mentor to young women looking to pursue careers and education in STEM fields," added Badrya. After graduation, she wants to continue enhancing her knowledge and expanding her experiences by continuing research in either industry or academia.

Petro, who completed her B.S. at Maryland in 2010, is currently pursuing her Ph.D. under the guidance of Keystone Associate Professor Raymond Sedwick. She returned to Maryland in 2013 after working three years for NASA Goddard Space Flight Center as a full-time engineer.

She currently works in the Space Power and Propulsion Laboratory investigating the feasibility of replacing traditional propellants for a helicon thruster with water vapor. Water vapor is an ideal propellant because it is very easily storable and plentiful throughout the solar system for refueling. She is also designing an ion acceleration stage to elevate helicon thruster performance to be competitive with the state of the art in electric propulsion.

BRIDGING THE PAST TO THE PRESENT: AMELIA EARHART FELLOWS CAMLI BADRYA, ELAINE PETRO, AND ELENA SHRESTHA STAND IN FRONT OF A 1924 BERLINER HELICOPTER NO.5 (THE FIRST CRAFT TO DEMONSTRATE CONTROLLED HELICOPTER FLIGHT) AT THE COLLEGE PARK AVIATION MUSEUM.



"I am extremely grateful for being named an Amelia Earhart fellow," Petro said, "It is an honor to be selected among so many other accomplished current and former fellows and to be a part of an organization dedicated to improving the lives of women in many different ways around the world." Petro is the first member in her family to pursue a doctoral degree, and she says that the encouragement and support from an organization such as Zonta is invaluable to helping her achieve her goals.

For Shrestha, early trips to NASA and participating in FIRST Robotics during high school fired-up her interest in robotics and flight. "To me, Aerospace Engineering fulfilled my interest in robotics and fascination with flight," Shrestha says.

Since coming to Maryland as an undergrad in 2008, Shrestha has become a dedicated engineer exploring the development of the cyclocopter, a revolutionary cycloidal rotor micro-air vehicle (MAV), and in 2011, the rotorcraft community recognized her work with an American Helicopter Society International Vertical Flight Foundation Undergraduate Scholarship.

She has spent her time in the Alfred Gessow Rotorcraft Center (AGRC), where her research experience as an undergraduate led to a journal publication, three professional conference publications, and first place at the 2012 AIAA region I-MA student conference in the undergraduate category. She interned with Sikorsky Aircraft Corporation, and began graduate studies at UMD fall of 2012 under the guidance of AGRC Director and Distinguished University Professor Indrajit Chopra and Moble Benedict.

"I think that it is a very exciting time to be working on UAVs," Shrestha says. "Especially with such a novel concept like the cyclocopter, which has the potential to revolutionize the field of rotary-based unmanned aerial vehicles."

SPECIAL THANKS

We would like to thank our friends at the **COLLEGE PARK AVIATION MUSEUM** for allowing us to use their wonderful museum as a backdrop for this article's photo.

The museum, a Smithsonian affiliate, is located right down the street from campus, next to the College Park Airport, the world's oldest continuously operating airport. The museum interprets the nationally significant history at this "field of firsts" where the Wright Brothers taught America's first military officers how to fly; the first altitude records were set by military aviator Hap Arnold; the first testing of machine guns from an airplane were conducted; and the first controlled helicopter flight occurred as well as several other firsts. Planes in the collection include reproductions of the Wright-B and the Curtis Pusher to the original Berliner Helicopter (seen at right), in which the first controlled vertical flight occurred at the College Park Airport.

Visit them today, or learn more at:
www.collegeparkaviationmuseum.com



Carter and DeCicco Receive NASA Space Technology Research Fellowships

Graduate students Dylan Carter and Anthony DeCicco have been awarded NASA Space Technology Research Fellowships (NSTRF) for the 2015-2016 year. NSTRF Fellowships sponsor U.S. citizen and permanent resident graduate students who show significant potential to contribute to NASA's goal of creating innovative space technologies for our Nation's science, exploration and economic future.



DYLAN CARTER

Carter is currently a Ph.D. candidate working with Assistant Professor Christine Hartzell, and is studying the behaviors of triboelectric charging within granular systems in order to develop new methods for electrostatic beneficiation of lunar and Martian regolith in partial- and micro-gravity environments.

He received both his B.S. (2013) and his M.S. (2015) from the University of Maryland. Carter's master's project in modeling of tribocharging in granular media will form the foundation of the work he will do on regolith beneficiation under the NSTRF award.



ANTHONY DECICCO

DeCicco is also pursuing his Ph.D. under the mentorship of Hartzell. With his recent acceptance of the NSTRF, DeCicco will be researching a method to despin asteroids for planetary defense and the control of asteroids for future resource acquisition.

DeCicco received his M.S. in Mechanical Engineering from Worcester Polytechnic Institute in Massachusetts. The summer before attending the University of Maryland, he worked at NASA Marshall Spaceflight Center to develop the next generation of impact resistant composite fuel tanks, which could reduce the empty weight of fuel tanks by as much as 40% enabling larger payloads to orbit.

Shumway Awarded NDSEG Fellowship



NATHAN SHUMWAY

Graduate student Nathan Shumway has been awarded a National Defense Science and Engineering Graduate (NDSEG) Fellowship. NDSEG Fellowships are awarded through the U.S. Department of Defense to support the increase in number and quality of our nation's scientists and engineers.

Shumway is currently working on his Ph.D. under the mentorship of Assistant Professor Stuart Laurence and is researching untethered dragonfly flight and their response to gusts.

Most recently, he and Laurence received an Outstanding Paper Award from the American Institute of Aeronautics and

Astronautics (AIAA) Ground Testing Technical Committee (GTTC) for their paper entitled "Methods for Identifying Key Features in Schlieren Images from Hypersonic Boundary-Layer Stability Experiments" at the 53rd AIAA Aerospace Sciences Meeting.

He received his B.S. in Mechanical Engineering from Rose-Hulman Institute of Technology, where he was involved with the Design Build Fly team, InterVarsity Christian Fellowship and the local chapter of Pi Kappa Alpha. Since he enjoyed his opportunities to do experimental research as an undergraduate student, he chose to pursue a Ph.D. at Maryland.

Chambers Awarded STLE Scholarship



JONATHAN CHAMBERS

Graduate student Jonathan Chambers received a scholarship from the Society of Tribologists and Lubrication Engineers (STLE), Philadelphia Chapter. The scholarship

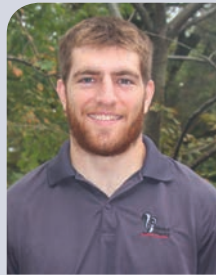
recognizes students who have demonstrated exceptional academic success and accomplishments.

Chambers is a third year graduate student studying under the mentorship of Department Chair, Minta Martin Professor Norman Wereley. His research is in the application of pneumatic artificial muscles (PAMs) and the characterization of magnetorheological (MR) fluids. PAMs are devices that extend or contract by filling a pneumatic bladder with pressurized air and are used in applications such as trailing edge flaps in rotorcraft and robotics.

Chambers hopes the STLE scholarship will let him expand his academic experiences through greater involvement in engineering activities and volunteer opportunities in the Washington D.C. engineering community. Chambers was a member of the 2014 American Helicopter Society Student Design Competition, and he credits this experience with helping him both build relationships within the department and expand his involvement in activities beyond of the department.

In the future, Chambers would like to do research in the field of human assistive devices. In particular, applications that could aid people with physical disabilities and help people perform tasks that are otherwise physically strenuous or impossible.

Barkley and Hersey Awarded L-3 Scholarships



BRETT BARKLEY



SEAN HERSEY

Graduate students Brett Barkley and Sean Hersey received L-3 Graduate Scholarships for the 2015-2016 school year. The L-3 Scholarship provides both a stipend, and opportunities to engage with L-3 experts working in the students' fields.

Barkley is a first year master's student studying in the Collective Dynamics and Control Laboratory under the advisement Professor Derek Paley. The title of his thesis work is "Cooperative Search and Tracking of Multiple Mobile Targets on Partially Occluded Road Networks Using Fixed Wing UAVs." The purpose is to investigate the use of cooperative algorithms to balance finding new targets with tracking known targets in environments with highly variable visibility. He completed his undergraduate work in 2015 from UMD and Elon University.

Hersey, originally from Connecticut, completed his B.S. at Maryland in 2012. Hersey is now a graduate research assistant under the advisement of Professor Roberto Celi, and he will be obtaining his master's degree this December. From there he aims to continue on to his Ph.D. His research includes the optimization and study of the advanced rotorcraft configurations for the Future Vertical Lift and Joint Multi-Role military helicopter programs. Currently his research focuses on the extraction of linear dynamic inflow models from free vortex wake models so that the controllability of these advanced configurations can be

assessed.

Student Wins Poster Session at NASA's Thermal and Fluids Analysis Workshop

Graduate student Allison Porter took second place in the 2015 Thermal and Fluids Analysis Workshop (TFAW) poster competition. TFAW is sponsored by the NASA Engineering and Safety Center (NESC) and hosted by the Goddard Space Flight Center (GSFC).

Porter is a Ph.D. candidate working under the advisement of Professor Raymond Sedwick. The title of her poster was, "Thermal Management and Deployment of a Thin-walled Enclosure for a High-temperature Superconducting Coil."

Students Work on New Horizon Mission

Undergraduates Priya Dharmavaram and Graeme Keleher worked at the Johns Hopkins University Applied Physics Laboratory (APL) as flight controllers in the New Horizons Mission to Pluto this year. As part of their experience at APL, they've toured the Goldstone Ground Station, part of NASA's Deep Space Network (DSN) in Calif.

New Horizons had its closest approach encounter with Pluto and its surrounding moons in July following its nine and a half year, 3-billion-mile journey. Both students were involved with the tremendous excitement of receiving a signal in the New Horizons Mission Operations Center at APL from the spacecraft that the craft had survived the closest approach and had performed all of its science acquisition tasks.



PRIYA DHARMAVARAM IN THE NEW HORIZONS MISSION OPERATIONS CENTER AT THE JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LAB.

PHOTO: JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY

Bogdanowicz and Lind Win Department's Graduate Student Research Awards Competition

Graduate students Christopher Bogdanowicz and Andrew Lind won the Aerospace Engineering Department's Graduate Student Research Awards Competition in the M.S. and Ph.D. categories.



ANDREW LIND

Lind began his Ph.D. program working with Assistant Professor Anya Jones in fall 2011. Lind's research focuses on the aerodynamics of helicopter rotor blade airfoils in reverse flow—

where air travels from the trailing edge to the leading edge. His work is aimed at developing rotor blades for high-speed helicopters that can be used during EMS, search-and-rescue and combat operations.

He has performed wind tunnel experiments at both the University of Maryland and the United States Naval Academy on static and oscillating airfoils in reverse flow. He has also studied the effect of trailing edge shape on reverse flow stall characteristics, unsteady wake regimes, and oscillating airfoil behavior.

In addition to research, Lind is passionate about teaching, and he recently served as co-instructor (with Jones) of the ENAE 414 Aerodynamics II course as part of the Clark School's Future Faculty Program. He also served as co-advisor for two undergraduate honors students who graduated this spring.



CHRISTOPHER BOGDANOWICZ

Christopher Bogdanowicz started the master's program in fall 2013 with Distinguished University Professor Inderjit Chopra in the Alfred Gessow Rotorcraft Center (AGRC).

His research involves the design, manufacturing and testing of a small-scale unmanned aerial vehicle. The vehicle—that

Chris built—allows for maneuverability in hover and efficient forward flight.

Throughout his time at the AGRC, Bogdanowicz has designed and built numerous test apparatuses that have allowed for the investigation of low Reynolds number propeller and wing performance and aerodynamic interactions. His experimentation has helped create a unique, lightweight and efficient micro air vehicle. Bogdanowicz also went on to win the master's category at the college-level, winning a cash prize of \$1000.

Celebrating Honors and Awards Winners

The 2015 A. James Clark School of Engineering Honors and Awards Ceremony recognized students from all majors for their academic accomplishments and contributions to the Clark School, the University of Maryland, and the campus community.

The Department of Aerospace Engineering Gessow Achievement Awards were presented to graduating seniors in the department who attained the highest overall grade point average.

- **SAMANTHA DAMICO** (Elaine Gessow)
- **ANDREW MILLS** (Alfred Gessow)

The Robert M. Rivello Scholarship Award and the Joseph Guthrie Memorial Scholarships were presented to those juniors in the department who attained the highest overall academic average.

- **MATTHEW HERON** (Rivello)
- **ZACHARIAH BROWN** (Guthrie)
- **BRANDON DRAPER** (Guthrie)
- **JAMES HAZELRIG** (Guthrie)

The American Institute for Aeronautics and Astronautics (AIAA) Outstanding Achievement Award was presented to the student who made the most outstanding contribution through scholarship and service to the student branch and to the department.

- **LAUREN TROLLINGER**

The Department Chair's Award was presented to the student who made the most outstanding contribution through scholarship and service to the department

- **LAUREN TROLLINGER**



FROM LEFT TO RIGHT, SAMANTHA DAMICO ('15), ANDREW MILLS ('15), MATTHEW HERON ('16), ZACHARIAH BROWN ('16), BRANDON DRAPER ('16), JAMES HAZELRIG ('16), LAUREN TROLLINGER ('15), AND MINTA MARTIN PROFESSOR AND CHAIR NORMAN WERELEY

Congratulations to Our 2015 AEROS and ASPIRE Recipients

The Aerospace Engineering Research Opportunity Scholars (AEROS) program was developed to encourage the brightest students to engage in more in-depth research and cultivate stronger ties with their research advisors. The AEROS program provides funding support for motivated undergraduate students interested in spending the summer between their junior and senior years working closely with a Department of Aerospace Engineering faculty member on scholarly research projects.

For 2015, the department honored nine scholars, three of whom were financially supported by endowed funds, like those provided through the John Anderson Research Scholarship Fund. All scholars, research advisors and sponsors were invited to participate in several events throughout the summer to help foster a support network as the scholars pursued their research projects.

The department would like to continue expanding the AEROS program and offer more funding opportunities for motivated and innovative undergraduate students to engage in research at the university.

- **IGNACIO ANDREU**
(Anderson Scholar)
- **ZACHARIAH BROWN**
- **JOSEPH COZZO**
- **NATHANIEL KRUDER**

- **NATHAN LAUER**
(Sikorsky Scholar)
- **KYLE MEYERS**
- **ATIF SALAHUDEEN**
(Gessow Scholar)
- **MATTHEW SHUMATE**
(Gessow Scholar)
- **DANIEL VILLALOBOS**
(Sikorsky Scholar)

Two additional Aerospace Engineering students received summer research funding through the ASPIRE program created by the Maryland Technology Enterprise Institute (Mtech). ASPIRE seeks to broaden the educational experience of undergraduate engineering students through direct involvement in real-world engineering projects.

- **EHIREMEN EBWELE**
- **FRANK CIANCARULO**

Spooner Wins 2015 Winston Family Best Honors Thesis Award



HANNAH SPOONER

recognized with a Faculty Mentor Award.

Senior Hannah Spooner won the Best Honors Thesis Award as part of the 2015 Winston Family Best Honors Student Paper Awards. In addition, Spooner's mentor, Assistant Professor Anya Jones, will be

Spooner's project, "Methods of Quantifying Leading Edge Vortex Burst on Rotating Wings," used qualitative flow visualization and quantitative Particle Image Velocimetry (PIV) techniques to examine the leading edge vortex structure that forms on flapping wings. Working in Jones' Low Reynolds Number Aerodynamics Lab, Spooner developed a statistical and mechanical method that could be used as a potential tool to find when and where this vortex may burst.

Spooner worked with aerospace engineering graduate students Gino Perrota, Field Manar and Peter Mancini and postdoc Albert Medina. She credits them for helping her brainstorm through some of the research questions she encountered during her project.

"I'd really just like to say how valuable experiences outside of the classroom—like research—were for me," Spooner said. "Engineering problems in class are so different from solving real world problems: being able to approach both types of problems is an indispensable skill. It gave me the chance to interact with others on a level that goes beyond what's necessary just to complete a homework assignment or study for a test."

After graduation this spring, Spooner went to work for Cessna Aircraft Company as an airframe engineer in conceptual design.

CONGRATULATIONS
2015 GRADUATES!



Gladys Palacio

PUSHING THE BOUNDARIES



Senior Gladys Palacio is the type of student who not only does it all, but does so with contagious enthusiasm. Originally from Bayamón, Puerto Rico, Palacio never considered pursuing aerospace engineering until she attended the SER-QUEST Program, a summer high school program hosted by University of Maryland's (UMD) Center for Minorities in Science in Engineering. During the summer program, she worked on a project in the department's Space Systems Lab which sparked her excitement for aerospace engineering.

"I am incredibly grateful for that experience because it reminded me the curiosity I always had towards planes and rockets when I wanted to be a pilot or an astronaut as a little kid," explained Palacio. "It is all thanks to that [experience] I am currently studying aerospace engineering here at UMD."

Since arriving at UMD, Palacio has been actively involved in both the Department of Aerospace Engineering and the Clark School of Engineering. As part of the ENAE100 Introduction to Aerospace Engineering course her first year, Palacio became a member of the High Altitude Balloon Payload Project.

Along with mechanical engineering student Jessica Slike, Palacio designed a cut down mechanism that served as a tool to separate the supersonic payload from the rest of the balloon payload system. Through this project and her efforts, the team was able to write a scientific paper and present it at UMD's Undergraduate Research Day.

In addition to research, Palacio has been actively involved in leadership and service positions through the Society of Hispanic Professional Engineers (SHPE), Clark School Ambassadors, and Women in Aeronautics and Astronautics (WIAA). In SHPE, Palacio served two years as Junior Chair where she was responsible for coordinating STEM activities for middle and high school students.

"I first got involved with SHPE because I wanted be surrounded with students with my same Hispanic culture. The

reason I became Junior Chair was to help the Hispanic community to discover their potential in STEM," said Palacio. "I had received so many opportunities and support in my life that I wanted to share that with other Latinos in middle and high school."

In addition to her SHPE activities, Palacio was an integral part of establishing the new Women in Aeronautics and Astronautics (WIAA) organization earlier this year at Maryland, and she currently serves as the group's inaugural President. Palacio is thankful for the opportunity to work with an executive board and organization which strives to empower current and future female Aerospace Engineering students.

According to Palacio, one of the best pieces of advice she ever received was to find different mentors to help guide and support different aspects of her life. Taking this message to heart, Palacio quickly found a mentor in Professor Mary Bowden. In Palacio's own words, "Dr. Bowden has helped me through a lot of the struggles of studying Aerospace by giving me advice, support, and chocolate. She has guided me through my academic career and has given me opportunities to grow."

Palacio was selected for the Boeing Diversity Mentor Program where she was paired with Maria Cardwell, manager at the Boeing Company in BCA Structures Safety and Airworthiness. Palacio credits Cardwell with helping her define her future goals and improve her leadership skills.

In terms of her future goals, Palacio says she wants to "break the barriers that have been laid between our world and the universe."

During the past two summers, Palacio interned in Boeing's Space Launch System (SLS) program working on rockets being designed for future Mars missions. This experience ignited a passion for thermodynamics and fluid analysis, which she aims to translate to a career creating aircraft and space vehicles that go faster, push the boundaries, and shorten space travel times. Based on her tremendous accomplishments and the enthusiasm she has exhibited thus far, the outer reaches of space are no limit to her potential.



AT RIGHT: PALACIO (CENTER RIGHT) WITH FELLOW FOUNDING WOMEN IN AERONAUTICS AND ASTRONAUTICS MEMBERS

David Akin

SPACE IS ABOUT MATH, SCIENCE, & ENGINEERING

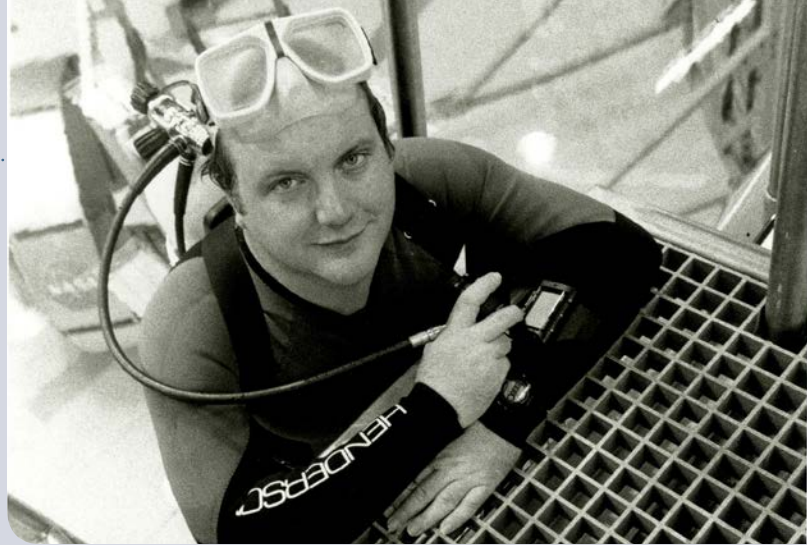
Growing up on the doorstep of Cape Canaveral, Florida sits not surprising Associate Professor David Akin developed a lifelong love of space. “I could just walk out of my house and watch the space launches,” said Akin. Then mix the thrill of space exploration with an appetite for making things, and the life of an aerospace engineer seemed like a match made in heaven.

“I was always putting things together and taking them apart. Seeing how I could change or improve it,” said Akin. Going on to explain how he built models, he added, “I never built one according to instructions. I always thought what if I did this, or put it together this way.”

It’s no surprise that he has built the dream workspace for space-oriented engineering here at the University of Maryland. Akin heads up the Space Systems Laboratory, which features the Neutral Buoyancy Research Facility (NRBF)—a 370,000 gallon tank used to simulate the weightlessness of space, and the only facility of its kind on a college campus—and the Advanced Robotics Development Laboratory.

The tank was born from Akin’s work at the Massachusetts Institute of Technology (MIT). Taking over some projects in MIT’s Space System Laboratory during his graduate years, Akin began running a series of experiments in neutral buoyancy work. The only problem? MIT didn’t have a neutral buoyancy facility, and Akin and his colleagues had to rely on the campus swimming pool to complete their experiments.

Through his work at MIT, Akin caught the attention of NASA, and the organization ultimately granted him a million dollars in funding to establish a dedicated neutral buoyancy facility. With no place to put it on MIT’s already full, urban campus, Akin moved the Space Systems Laboratory to Maryland and by 1992 the facility was up and running.



In the years Akin has been at Maryland, he has expanded the space-related aerospace engineering programs and worked on projects that span the areas of space robotics and satellite servicing missions to human factors and space suit design. He has actively pursued participating in NASA competitions as a way to provide students opportunities to learn beyond the classroom. For more than twenty years at Maryland, Akin has successfully incorporated design competitions like the Revolutionary Aerospace Systems Concepts - Academic Linkage (RASC-AL) into Aerospace Engineering’s capstone senior design course.

“Competitions are a good motivational tool to get students excited,” explains Akin. He says students who may not piece together material in the classroom, can suddenly see where things apply when they are faced with solving a specific competition problem. Akin goes on to add, “The students also need to work collaboratively and creatively, because the competition problems aren’t linear, and there is no one single approach to solving them.”

He finds that competitions help give students a sense of what it’s like to solve engineering problems in the real world. “I am very grateful when I talk to alumni, and they say that the senior design course is really what their job is like, and that they learned so much [from the course] that helped them in their career.”

Beyond the classroom and competitions, Akin has developed some level of notoriety through a list he’s compiled over the years, ‘Akin’s Laws of Spacecraft Design.’ Google ‘Akin’s Laws’ and pages of search results show that his list has proliferated, showing up on university websites, engineering forums, and blogs.

The list, which begins with ‘Engineering is done with numbers. Analysis without numbers is only an opinion,’ currently stands at 41 bite-size bits of engineering wisdom. According to Akin, the laws came about from what he gleaned over time, learned from others, or as he puts it, “screwing up myself.” A framed copy even hangs in the NASA Mission Management Room at NASA Johnson Space Center.

In any conversation with Akin, it is clear that he has a passion and enthusiasm for his work. “This,” he says, referring to the labs he’s built at Maryland, “is the closest I can get to being an astronaut without living in Houston. Every morning I walk in, I can think, ‘Wow, I work here, and we built this.’”

More Akin’s Laws at: go.umd.edu/akins-laws

AEROCONTACT • FALL 2015

AKIN’S LAW 3. DESIGN IS AN ITERATIVE PROCESS. THE NECESSARY NUMBER OF ITERATIONS IS ONE MORE THAN THE NUMBER YOU HAVE CURRENTLY DONE. THIS IS TRUE AT ANY POINT IN TIME. 12. THERE IS NEVER A SINGLE RIGHT SOLUTION. THERE ARE ALWAYS MULTIPLE WRONG ONES. THOUGH.



The American Institute of Aeronautics and Astronautics National Capital Section Recognized Three Faculty for Their Outstanding Work

Wereley Awarded the 2015 AIAA NCS Marvin C. Demler Award



DR. NORMAN WERELEY AND AIAA NCS CHAIR DR. SUPRIYA BANERJEE

The American Institute of Aeronautics and Astronautics (AIAA) National Capital Section (NCS) awarded Department Chair and Minta Martin Professor of Aerospace Engineering Norman Wereley the 2015 Marvin C. Demler Award in recognition of his outstanding support and many contributions to NCS.

Among his many contributions to the section, Wereley leads the NCS Honors and Awards Program, supports fellow engineers through promotion for AIAA awards and fellowships and engages his

students directly with the organization, many of whom are now active members of the NCS Council.

In addition to supporting NCS activities, Wereley is actively involved in promoting both NCS and STEM initiatives through outreach activities such as Discover Engineering Day and serving as a liaison with the University of Maryland AIAA Student Chapter.

Wereley, along with AIAA NCS Chair Dr. Supriya Banerjee, was also instrumental in starting a new technical seminar series hosted at the University of Maryland—the AIAA National Capital Section Seminars on Emerging Aerospace Technologies. The series provides opportunities for networking between professional and student members of AIAA, highlights emerging and exciting aerospace technologies, engages both speakers from across government, academia and industry and AIAA members, both active and retired, in the local area.

In addition, AIAA NCS selected Wereley for their opening presentations on Emerging Aerospace Technologies at AIAA's inaugural Science and Technology Forum and Exposition (SciTech) in 2014.

Paley Named AIAA NCS Engineer of the Year



Associate Professor Derek Paley was selected as AIAA NCS 2015 Engineer of the Year. Paley was honored “for pioneering research that

applies methods from engineering and biology to study collective behavior in robotic and natural systems, and for dedication to teaching and mentoring students.”

Jones Named AIAA NCS Hal Andrew Young Engineer of the Year



The AIAA NCS named Assistant Professor Anya Jones the 2015 Hal Andrews Young Engineer/Scientist of the Year. The NCS chose Jones

for her outstanding contributions to the science and engineering of biologically inspired flapping wing micro air vehicles and for her dedication to educating the next generation of aerodynamicists.

Three Faculty Receive 2015 DURIP Awards

Three faculty received over \$1.2 million in combined funding through the Office of Naval Research's (ONR) Defense University Research Instrumentation Program (DURIP). DURIP supports university research infrastructure essential to high-quality relevant research, providing funding for research instrumentation that is necessary to carry out cutting-edge research.

Assistant Professor Stuart Laurence was awarded for “*Preheated piston-driven Ludwig tube for the realistic simulation of hypersonic flows.*”

Samuel P. Langley Distinguished Professor James Hubbard was awarded for “*Quantification and analysis of small unmanned autonomous vehicles AFOSR.*”

Associate Professor Kenneth Yu was awarded for “*Ultra high-speed optical diagnostics.*”

New ONR grant for bio-inspired underwater sensing and control

Associate Professor Derek Paley is the principal investigator for a three-year, \$700K Office of Naval Research grant, “Bio-inspired Underwater Sensing and Control with Mechanosensitive Hairs.”

Co-PIs on the grant are alumnus Xiaobo Tan, (Electrical Engineering, Ph.D. 2002), an associate professor at Michigan State University; and Matt McHenry, an associate professor at the University of California, Irvine.

The researchers will develop an underwater robotic perception and control system based on the lateral line and vestibular systems in fish that will support a closed-loop control system using bio-inspired, multi-modal sensing. Emerging tools such as functional imaging (a technique used in parallel with optogenetics) will be used to help resolve the role of multi-modal sensing in behavior. Tools from comparative physiology, material science, and dynamical control systems will be applied to solve the problem of closed-loop sensing and robotic control with artificial lateral line and vestibular organs.



Fourney Receives SEM 2016 C.E. (Chuck) Taylor Award

Keystone Professor and Associate Dean of Engineering William Fourney recently received the Society for Experimental Mechanics (SEM) 2016 C.E. (Chuck) Taylor Award. The award, established in 2000 and given no more than once every two years, recognizes both technical excellence and good citizenship within the field.

He was cited for his lifelong contributions both in dynamic response of structures and materials, and to the improvement of engineering education. The award includes a plaque and a donation to the SEM Education Foundation in his name.

Fourney holds a joint appointment in both Aerospace and Mechanical Engineering at Maryland. He teaches within the Keystone Program, where some of the university's most renowned faculty teach fundamental engineering courses to support the educational experience and enhance student retention. Prior to his current roles, Fourney served as the Chair of Aerospace Engineering.



Lee Receives ICCES 2015 Lifetime Achievement Medals

The International Conference on Computational and Experimental Engineering and Sciences (ICCES) honored Professor Sung Lee with a Lifetime Achievement Medal.

The ICCES Lifetime Achievement Medal is awarded to individuals for sustained and significant contributions in the form of research, teaching, and service to the community, in any area relevant to the ICCES series

of conferences.

Lee, a former student of Professor Theodore Pian at MIT, has made important contributions to computational analyses of shell structures for aerospace and naval applications. ICCES recognized Lee for his highly influential and creative contributions to computational structural mechanics.



Hubbard Named ASME Fellow

Samuel P. Langley Distinguished Professor James E. Hubbard, Jr. has been named an American Society of Mechanical Engineers (ASME) Fellow.

Hubbard is the Director of both the University of Maryland's Morpheus Laboratory and the National Institute of Aerospace's Alex Brown Center for Adaptive Aerospace Research.



Jones Named AIAA Associate Fellow

The American Institute of Aeronautics and Astronautics (AIAA) named Assistant Professor Anya Jones an Associate Fellow.

Jones was recognized for her contributions to aerodynamic research and for her STEM and outreach activities. She has been very active in outreach, and serves on the board of ReSET, a non-profit volunteer organization that partners scientists and engineers with elementary school teachers to improve science motivation and literacy. At Maryland, she runs the Jones Laboratory, an experimental aerodynamics laboratory that explores unsteady, separated and three-dimensional flows on flapping wings, rotorcraft and wind/water turbines.



Department Celebrates Sarni's Years of Service

Earlier this year, the department celebrated the retirement and years of service of Coordinator Rebecca (Becky) Sarni. Sarni started her career at Maryland in 1978. During that time she spent four years working in the Clark School Dean's Office before coming to the Department of

Aerospace Engineering in 1991.

Her favorite part of those years on campus? "I really liked working with the students. Seeing all the new generations come through. It keeps you feeling young," said Sarni.

Despite retiring, Sarni continues to work part-time in the department, but she enjoys having more free time to travel—she spent the summer exploring Great Britain and Ireland—and spend with her grandchildren and family.





Department Welcomes Olivier Bauchau as the First Igor Sikorsky Distinguished Professor in Rotorcraft

The department welcomes Dr. Olivier Bauchau as the first Igor Sikorsky Distinguished Professor in Rotorcraft. Bauchau brings thirty-plus years of experience in the rotorcraft field to the university, and he is a widely recognized scholar

in aeromechanics of rotorcraft, multibody and structural dynamics, composite structures, and wind turbine systems.

Supported through an endowment from Sikorsky and United Technologies, the Igor Sikorsky Distinguished Professorship in Rotorcraft serves to support enhanced research specialization in areas related to rotorcraft.

Bauchau's work on comprehensive aeromechanics analysis of rotorcraft, modeling of flexible multibody systems involving composite structures, and modeling of rotor lag dampers are pioneering efforts in the rotary-wing field. At Maryland he aims to harness research being done in computational fluid dynamics, aerodynamics, and rotorcraft to contribute to his computational modeling work in both rotorcraft and the wind energy industry.

He brings strong industry and government relationships. He is the architect behind the comprehensive multibody dynamics code, DYMORE, which is widely adopted by companies like Sikorsky and Bell Helicopter, government laboratories such as NASA Ames Research Center and academic institutions. The code is used to model all aspects of helicopter design such as dynamics, aerodynamics, controls, and composite materials.

"It's very exciting to be here," Bauchau said. "Maryland has always had a strong program in rotorcraft, and this

professorship sends a very clear signal that Maryland continues to grow and strengthen that area of research."

Bauchau completed his Ph.D. (1981) in Aeronautics & Astronautics from MIT in the area of Structural Dynamics. In 1983, he joined Rensselaer Polytechnic Institute as an Assistant Professor in the Department of Mechanical Engineering, Aeronautical Engineering, and Mechanics, and later became Associate Professor with Tenure. In 1995, Bauchau moved to Georgia Tech as a Professor in Aerospace Engineering until 2010, when he joined the University of Michigan-Shanghai Jiao Tong University Joint Institute (Shanghai, China) as a Professor. He joined Hong Kong University of Science and Technology in 2014 as Professor in Mechanical and Aerospace Engineering.

He is a Fellow of the American Society of Mechanical Engineers (ASME), and he has authored two textbooks and published 88 archival journal papers and 175 conference proceedings papers. In 2012, he received the Textbook Excellence Award from the Text and Academic Authors Association. Recognized as an outstanding teacher, Georgia Tech twice awarded him their "Thanks for Being a Great Teacher" Award, and during his academic career, he has advised 22 students who completed their Ph.D. dissertations.

Most recently, ASME recognized his numerous contributions to the field by awarding him the 2016 ASME d'Alembert Award. The award, established in 2005, recognizes his lifelong contributions to the field of multibody system dynamics.

The Igor Sikorsky Distinguished Professorship in Rotorcraft is one of many efforts in the long-term relationship between United Technologies, Sikorsky and the Clark School of Engineering to expand Maryland's rotorcraft curriculum, research programs and intellectual capital while being a continuous source for the world's best rotorcraft engineers.



Baeder Promoted to Professor

Associate Professor James Baeder was promoted to the rank of Professor. Baeder has been a long time contributor, scholar and leader in the department's Alfred Gessow Rotorcraft Center, with research interests in the areas of computational aerodynamics and aeroacoustics with specific interest in coupling computational

fluid dynamics to comprehensive rotor analysis. Baeder is currently leading the department's foray into wind energy research as thrust leader for wind energy in the University of Maryland Energy Research Center. He is also the faculty advisor to the Wind TERPines student team working on the U.S. Department of Energy's Global Wind Challenge.



Xu Becomes Tenure-Track Assistant Professor

Huan (Mumu) Xu became a tenure-track assistant professor. She joined UMD in 2013 as a research assistant professor, jointly appointed in the Institute for Systems Research and Aerospace Engineering. Xu's research interests lie in control and dynamical systems and formal methods

with applications in autonomy, cyberphysical systems, and unmanned aerial vehicles (UAVs). She focuses on autonomy, and specifically in writing software that can correctly, and in a certifiable way, ensure that the entire system works properly. This year, Xu also began mentoring Maryland's new Student Unmanned Aerial Systems (SUAS) Competition team, Maryland UAS.

John D. Anderson

ENGINEER, HISTORIAN, PHILANTHROPIST

It's a typical day at the Smithsonian Air and Space Museum in Washington D.C. Tourists flock through the exhibits, snapping photos, pointing and chatting as they move from one display to the next. For Professor Emeritus John D. Anderson, it's just another day at the office since he retired from the University of Maryland in 1999. Anderson currently serves as the Smithsonian's Curator of Aerodynamics, and it is evident after a short conversation with him that he is passionate about both engineering and its history, and he enthusiastically shares that passion with others.

In the museum's Boeing Milestones of Flight Hall, sun streams through the lobby's tall glass windows, illuminating one of the most recent additions to the museum's collection. A piece that Anderson worked hard to put into the Smithsonian's collection. What looks like the nosecone and prop from a large plane, is in fact, a fan hub from the National Advisory Committee for Aeronautics (NACA) Full Scale Wind Tunnel (pictured at right) that was at the NACA Langley Memorial Aeronautical Laboratory in Hampton, Va. Its presence at the museum is just another effort by Anderson to preserve our rich aviation history, but history with an engineering twist. Anderson explains that the historical value in the fan hanging above us, and the tunnel it resided in at Langley, was that they helped shape more than 60 years of aircraft design. From 1931, until the 30- by 60-foot tunnel closed in 1995, almost every form of aircraft was tested there.

Anderson's enthusiasm for both aerospace engineering, and its history, is infectious, and it is easy to understand why he was, and still is, such a popular professor at Maryland. Strolling through the Smithsonian's 'How Things Fly' exhibit—an exhibit Anderson helped develop—he demonstrates one of the many interactive displays, a movable wing that gives children a hands-on experience to learn about aerodynamics. Yet another testament of Anderson's passion for educating the next generations, it is a first-hand example of his own teaching philosophy: you have to convey information, knowledge, and enthusiasm.



Anderson's love affair with airplanes began when he was a child. As many did, he spent hours building Cleveland Model Airplane Kits in his youth, but unlike most, those models instilled in him a fascination for engineering that sticks with him to this day. "I really loved airplanes, and in particular, how they looked, the aesthetic appreciation of them," Anderson reflected. "And from building those models, I wanted to learn more about them, how they looked, how they fly."

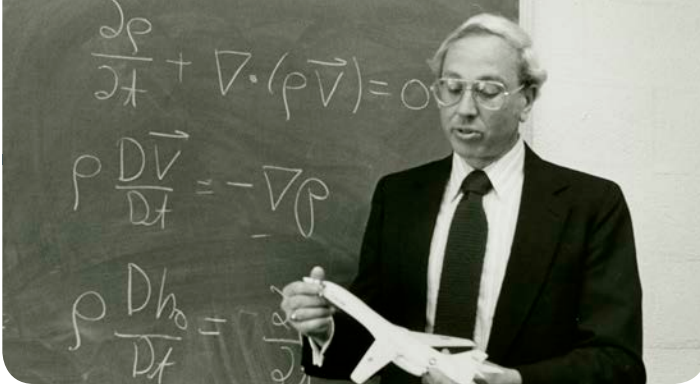
Anderson went on to receive a B.S. with high honors in Aeronautical Engineering from the University of Florida. From there, he became a lieutenant and Task Scientist at the Aerospace Research Laboratory, Wright-Patterson Air Force Base in Dayton, Ohio, before going on to complete his Ph.D. in Aeronautical and Astronautical Engineering at Ohio State. At Ohio State, he studied under Professor Rudolph Edse, a mentor Anderson credits with teaching him so much about how to clearly explain things, and according to Anderson, the person who formulated him in the way he thinks scientifically.

In 1966, he became Chief of the Hypersonics Group at the U.S. Naval Ordnance Laboratory (NOL) in White Oak, Md. During his time at NOL, Anderson collaborated with the University of Maryland on several projects and began teaching evening courses on campus. In 1973 he became chair of the Department of Aerospace Engineering, despite having no former experience serving as a full time professor.

However, the early seventies were a challenging time for the aerospace industry. The Apollo Program was coming to an end, and many aerospace programs were being drastically cut. Focus



DR. ANDERSON STANDS IN FRONT OF AN X-15 AT THE SMITHSONIAN NATIONAL AIR AND SPACE MUSEUM, WASHINGTON, D.C. ANDERSON CO-WROTE A HISTORY OF THE X-15 FOR THE MUSEUM.



“Being a professor, first and foremost, was what it was all about,” said Anderson.

on research was growing within the department, but according to Anderson, he didn't favor research at the expense of teaching, but instead, he did put a premium on research by doing good research and still teaching. At a time when most faculty taught one course a semester, Anderson regularly taught two during his time as chair.

Leaving the Smithsonian exhibition hall for a visit to the museum's offices, we pass through a corridor with floor to ceiling display cases housing scores of model airplanes. Some are remnant wind tunnel test models, while others are the very types of models Anderson assembled as a kid. He can probably tell you the history of most of them, model or aircraft.

While Anderson's first passion was aerospace engineering, a path according to him, was his only choice in engineering. “If I couldn't become an aeronautical engineer, I wouldn't have been an engineer at all,” his second is the history of aerospace engineering. Anderson wrote *Introduction to Flight*, the leading introductory textbook on aeronautical and aerospace engineering, and he blends history and biography narratives along with engineering concepts. First published in 1978, the book is now in its 8th edition. In addition to *Flight*, Anderson has published 10 other books covering topics in aerospace engineering and its history. Most recently, he co-wrote *X-15: The World's Fastest Rocket Plane and the Pilots Who Ushered in the Space Age* for the Smithsonian, published by Zenith Press.

Anderson's books have received praise and recognition—such as the American Institute of Aeronautics and Astronautics' Pen-dray Aerospace Literature Award—for their clarity and readability. Perhaps then it should come as only a little surprising that Anderson graduated high school with honors not in math and science, but in English and writing.

Leaving the hall of models, we arrive at the Smithsonian's National Air and Space Museum Library. It was here that Anderson started his forty-plus year relationship with the Smithsonian while doing extensive research for *Introduction to Flight*. It's an unassuming space, but for Anderson, who has spent many hours here combing through the museum's historical archives piecing together engineering histories, it is a treasure trove of information—and no little nostalgia. Plucking a book off the shelf, Anderson flipped it open and held it out, showing yellowed pages of black and white model plane illustrations. “I subscribed to this magazine as a kid,” said Anderson with a smile. “Where else can I find all the issues of *Air Trails*? Here, of course!” In 1986 Anderson occupied the Charles Lindbergh Chair at the National Air and Space Museum of the Smithsonian Institution, and he continued working with the museum one day each week as their Special Assistant for Aerodynamics, doing research and writing on the history of aerodynamics.

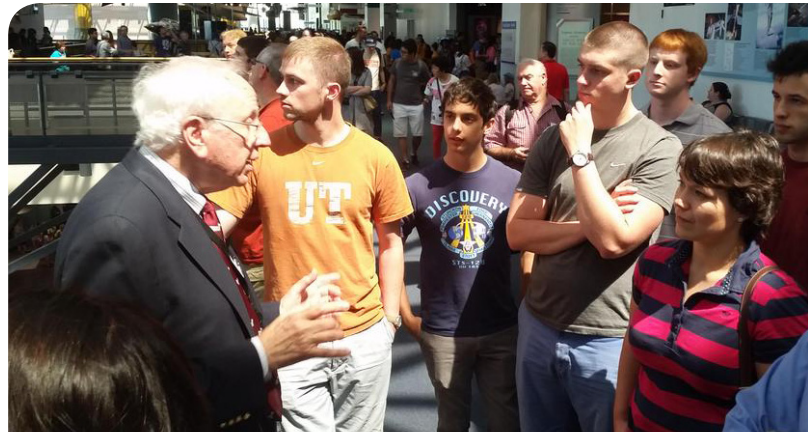
Anderson is both an incredible historian and engineer. An

engineer who has published over 120 papers in his field, whose work is recognized worldwide, and for which he has been made a Member of the National Academy of Engineering, an Honorary Fellow of the American Institute of Aeronautics and Astronautics, and a Fellow of the Royal Aeronautical Society.

But it is his legacy of education and inspiration that we celebrate here at Maryland. Over the years here, Anderson has shaped, mentored, and inspired generations of engineers. Today, we continue to promote Anderson's tireless passion and enthusiasm for aerospace engineering through the John Anderson Research Scholarship in Aerospace Engineering, a cause supported, in part, by regular gifts from Anderson and his wife Sarah-Allen.

Created to empower engineering students in pursuing research opportunities, exchanging knowledge, and cultivating a passion for the field, the Anderson Scholarship is legacy driven by people and their passion for the field.

DR. ANDERSON EXPLAINS HISTORY OF AIRFOIL DESIGN TO UMD STUDENTS VISITING THE SMITHSONIAN.



THE JOHN ANDERSON RESEARCH SCHOLARSHIP FUND

The John Anderson Research Scholarship supports and encourages motivated, innovative, and bright students to pursue research. To continue promoting student success and on-campus research opportunities, the department seeks to expand its support of the best and brightest students through opportunities such as the Anderson Research Scholarship. Established in July 2000 by friends and colleagues of Dr. Anderson to honor his many years of service to the department, the Anderson Research Scholarship encourages students in aerospace related fields to engage in research, exchange knowledge, and generate interest in the field.

HOW YOU CAN GIVE

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Alumnus Michael Griffin Inducted into UMD's Alumni Association Hall of Fame



ALUMNI MICHAEL D. GRIFFIN (PH.D. '77) WITH DAUGHTER KATIE (LEFT) AND WIFE REBECCA (RIGHT).

The University of Maryland Alumni Association in June inducted alumni Michael D. Griffin (Ph.D. '77) into its Hall of Fame. These individuals exemplify the Terp spirit—creativity, generosity, innovation, courage and perseverance—and Hall of Fame induction is the highest honor granted by the association, awarded to preeminent alumni inventors, entrepreneurs, artists, scientists, political and business leaders, and athletes who have brought pride to the university.

"All have led extraordinary lives," association Executive Director Amy Eichhorst said, "and their accomplishments have created waves of inspiration that continue to ripple through our lives today." University President Wallace Loh added the honorees not only support and show loyalty to UMD, but "help lift the next generation and make possible all these opportunities at the university."

After earning his doctorate at Maryland, Griffin went on to rise in the ranks of government, industry, and academia. He was the Space Department head at

the Johns Hopkins University's Applied Physics Laboratory, served as president of In-0-Tel Inc. and held several top positions at Orbital Sciences Corporation before being appointed administrator of NASA in 2005.

He also held other leadership roles within NASA, including chief engineer, and had been deputy for technology in the U.S. Defense Department's Strategic Defense Initiative Organization.

Griffin is a member of the National Academy of Engineering and has received numerous awards, including the Department of Defense Distinguished Public Service Medal and the 2007 President's Distinguished Alumnus Award at the University of Maryland. In addition, Griffin became a commercial pilot and a multi-engine and instrument-rated flight instructor.

"It was clear from the start that Mike was going to be an exceptional, accomplished person," said Griffin's Ph.D. advisor, Professor Emeritus Dr. John Anderson. "He had a way of propelling his goals forward."

Alumni Receives 2015 ASME Gustus L. Larson Memorial Award

Alumni Nikhil A. Koratkar (Ph.D., '00) was awarded the American Society of Mechanical Engineers (ASME) 2015 Gustus L. Larson Memorial Award. The Gustus L. Larson Memorial Award recognizes an engineering graduate who has demonstrated outstanding achievement in mechanical engineering within ten to twenty years following graduation. Koratkar is the John A. Clark and Edward T. Crossan Chair Professor in Engineering at Rensselaer Polytechnic Institute (RPI).



ALUMNI NOTES

Alumnus **PETER CHEN** (B.S. '90, M.S. '93, Ph.D. '96), **GREGORY HIEMENZ** (M.S. '00, Ph.D. '07) and **MICHAEL DEITCHMAN** (B.S. '73) became AIAA Associate Fellows.

HARRY BERMAN (B.S. '80, M.S. '82) named Director of the Aerospace Projects Office for the Defense Advanced Research Projects Agency (DARPA).



The University of Maryland Terp Magazine profiled astronaut and alumna **JEANETTE EPPS** (M.S. '94, Ph.D. '00), pictured above. Read the full article at go.umd.edu/epps-fall2015ae

ALUMNI NOTES

The Indian Institute of Science Bangalore appointed alumni **RANJAN GANGULI** (M.S. '91, Ph.D. '94) Satish Dhawan Chair Professor in their Department of Aerospace Engineering.

Alumna **DIANA TRUJILLO** (B.S. '07) featured in the *Latin Times* for her role in NASA's Mars Curiosity Rover Functions. go.umd.edu/trujillo-fall2015ae

Alumna **SANDRA UGRINA** (Ph.D. '07) appointed to the Senior Executive Service with duties in the Office of the Director, Operational Test and



Evaluation, within the Office of the Secretary of Defense. As the Deputy Director for Live Fire Test and Evaluation. She oversees survivability and lethality testing and evaluation of major Department of Defense systems and munition programs, required before full-rate production.

*Have alumni notes you'd like to share? Send them to **REBECCA KIER**, Associate Director of Development rkier@umd.edu.*

Join Your Fellow Aerospace Engineering Alumni on LinkedIn

The Department of Aerospace Engineering has an alumni group on LinkedIn to help our graduates keep in touch and network with each other. To join, simply search "University of Maryland Department of Aerospace Engineering" and click "Join."



The Clark School Celebrates our Golden Terps During Spring Commencement

Golden Terp Engineers are Clark School alumni who are celebrating their 50th, 55th, 60th, 65th, 70th, or 75th reunions. During the spring commencement ceremony for the year, Golden Terps wearing their gold medallions and gold robes lead the procession and are introduced by name to the Clark School family. This year, five aerospace and aeronautical engineering alumnus joined us for the event.



MR. JAMES A. COSTRELL (left)
B.S. '65, Aerospace Engineering
M.B.A. '70, Finance



MR. RICHARD L. DAVIS
B.S. '55, Aeronautical Engineering



MR. JOEL GLAZER
B.S. '65, Aerospace Engineering



DR. J. KENT HASPERT (left)
B.S. '65, Aeronautical Engineering
M.S. '67, Aerospace Engineering
Ph.D. '70, Electrical Engineering



DR. NORRIS J. KRONE
B.S. '55, Aeronautical Engineering
Ph.D. '74, Aerospace Engineering



2015 GOLDEN TERPS



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SHARE YOUR STORY



ALUMNUS KEVIN SCHOONOVER (B.S. '06) SERVES AS A COMPETITION MANAGER DURING THE CLARK SCHOOL'S ANNUAL ALUMNI CUP COMPETITION.



ALUMNA JEANETTE EPPS (M.S. '94, PH.D. '00) SPEAKS TO STUDENTS IN THE DEPARTMENT'S ENAE 100 CLASS ABOUT HER EXPERIENCES AS AN ASTRONAUT AND ENGINEER.

Find out more about how you can get involved with, and support the Department of Aerospace Engineering at Maryland, contact Rebecca Kier, Associate Director of Development, at 301-405-0318 or rkier@umd.edu.

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