AEROCONTACT
AEROSPACE ENGINEERING AT MARYLAND

The Power of Partnership

ALUMNUS KERRY WISNOSKY CREATES NEW PATHS FOR AEROSPACE ENGINEERING STUDENTS

Interim Chair's Message

I'm so pleased and honored to be writing you in this time of transition at the department. Norman Wereley, Minta Martin professor, stepped down this summer after having served the department for over nine years as our chair. Aerospace engineering at UMD achieved new heights under his leadership, and we are profoundly grateful to Norm for his tireless dedication to our program and our students. We wish him all the best as he returns full-time to research and teaching. Part of his legacy is the growth of our department. Our freshman class is our largest ever! With 128 students having declared aerospace engineering as their major, we have the second largest freshman class in the college!!

Our other big transition is our return to the classroom! We are teaching all our fall semester classes in-person, with masks worn by students, staff, and faculty; and, truly, we couldn't be more excited!

Many variables come together to produce a successful academic program, including faculty, resources, partnerships with industry, location, and the ability to recruit high-caliber students. To these I would add another variable: support from active alumni with a commitment to further strengthening the department where they earned their degrees. In this issue of *AeroContact*, we highlight the contributions of one such alum, Kerry Wisnosky. When it comes to giving back, few have done so as extensively and impactfully as Kerry. As you'll learn from our cover story, there is hardly any aspect of our program that Kerry has not touched. His example bears powerful testimony to the crucial roles played by dedicated Terps who go on to support the university as they progress in their careers.

Also in this issue, we will bring you up to speed on innovative research being spearheaded by our faculty. In a collaboration supported by ARPA-E, Christopher Cadou and Maryland Energy Innovation Institute director Eric Wachsman are working to design greener, more fuel-efficient aircraft engines, to be used on narrow-bodied planes such as the Boeing 737. Christine Hartzell's research interests, meanwhile, are focused beyond the highest earthly altitudes: NASA tapped her as mission scientist for its SIMPLEx Janus Mission, which will investigate the binary asteroids 1996 FG3 and 1991 VH.

We also highlight new work from Stuart Laurence, who has devised a more accurate approach to measuring the properties of free-floating objects in hypersonic wind tunnels. Finally, we report on the progress of an ambitious new endeavor spearheaded by the UMD Unmanned Aircraft Systems (UAS) Test Site—the creation of a UAS routing network in the Chesapeake Bay. Though still in its infancy, such a network could help pave the way towards a safely integrated airspace.

We hope you'll enjoy this snapshot of the current activities at our department. Like all of you, we continue to navigate the "new normal" created by COVID-19—a "normal" which is something of a moving target. Amid these uncertainties, the work continues.

With best regards,

Alison B. Flatau
INTERIM CHAIR
DEPARTMENT OF AEROSPACE ENGINEERING

TABLE OF CONTENTS

AEROCONTACT
AEROSPACE ENGINEERING AT MARYLAND

PUBLISHER
Department of Aerospace Engineering
A. James Clark School of Engineering
Alison B. Flatau, INTERIM CHAIR

EDITORIAL & DESIGN STAFF
Robert Herschbach, EDITOR AND WRITER
Laura Figlewski, ART DIRECTOR
Jennifer Figgins Rooks, WRITER
Rebecca Copeland, CONTRIBUTING WRITER

COVER PHOTO
Mohamed Nassif

AeroContact is published annually for alumni and friends of the Department of Aerospace Engineering at the A. James Clark School of Engineering, University of Maryland.

Please send letters to the editor and alumni notes to aero-comms@umd.edu.

Call him an opportunity maker.

For much of the past decade, engineer-turned-entrepreneur Kerry Wisnosky ('86) has been providing expertise, mentorship, and financial support to a growing array of programs at the University of Maryland's aerospace engineering department. He's sponsored high-altitude balloon launches. He's collaborated with aerospace engineering faculty on cutting-edge unmanned systems research. He's backed student groups such as Women in Aeronautics and Astronautics. And these are only some of the ways in which Wisnosky has helped strengthen the department.

His purpose? Creating opportunities. That includes opportunities for innovation, opportunities to strengthen the department, and opportunities for students.

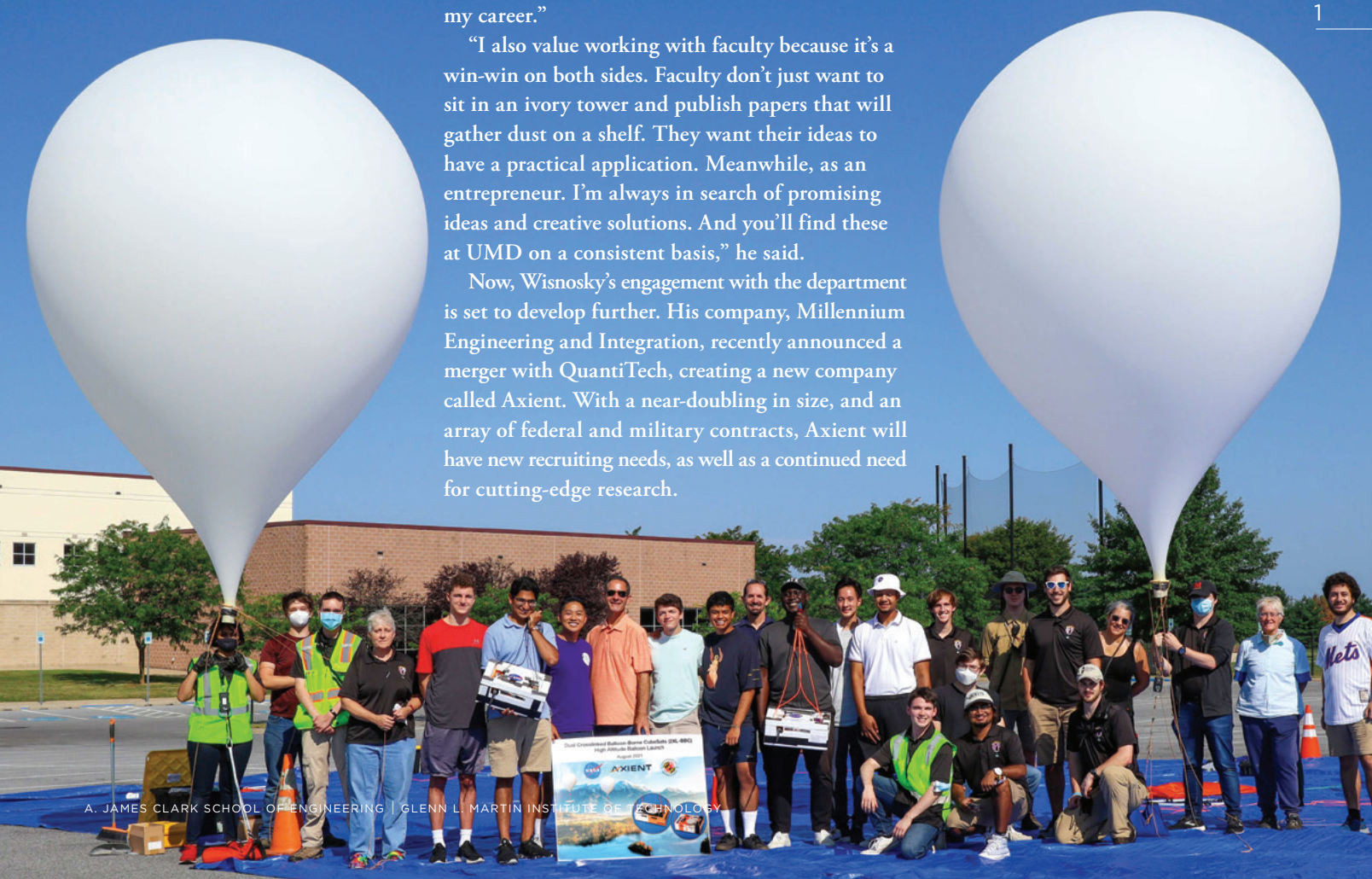
The Power of Partnership

ALUMNUS KERRY WISNOSKY CREATES NEW PATHS FOR AEROSPACE ENGINEERING STUDENTS

"I'm very focused on providing experiences for students that they otherwise wouldn't be able to get outside the classroom," Wisnosky said. "Following my pedigree back to when I was a student at Maryland, I know how much of a difference practical experience made as I began my career."

"I also value working with faculty because it's a win-win on both sides. Faculty don't just want to sit in an ivory tower and publish papers that will gather dust on a shelf. They want their ideas to have a practical application. Meanwhile, as an entrepreneur. I'm always in search of promising ideas and creative solutions. And you'll find these at UMD on a consistent basis," he said.

Now, Wisnosky's engagement with the department is set to develop further. His company, Millennium Engineering and Integration, recently announced a merger with QuantiTech, creating a new company called Axient. With a near-doubling in size, and an array of federal and military contracts, Axient will have new recruiting needs, as well as a continued need for cutting-edge research.



NEXT-GENERATION CUBESATS

Undergraduate students don't often get to play a critical role in the development and testing of transformative technologies. Through a collaboration between Wisnosky's firm (formerly Millennium, now Axient), the UMD Balloon Payload Program, and NASA, students are doing exactly that.

Also known as UMD Nearspace, the program was established in 2003 with a mission that is primarily educational. Students design experiments that are then flown at extremely high altitudes—so high that photos sent back from the attached cameras look like they were taken in space. The Maryland Space Grant Consortium, a Congressionally-funded umbrella organization bringing together universities and other institutions from across the state, helps support the program's launches and other activities.

"When we began, our main purpose was to engage our students, particularly freshmen and sophomores, with hands-on aerospace engineering projects," said Mary Bowden, the program's director. "During their first two years, students take a lot of foundational courses, such as physics, and may not feel as connected as they'd like to the aerospace engineering field. We set up UMD Nearspace so these students could have a more aerospace-centered experience—and to a large extent, that's still our main objective."

That said, the Nearspace team also conducts launches on behalf of UMD research units, such as the High-Speed Aerodynamics and Propulsion Laboratory—as well as private aerospace companies, such as Axient.

Indeed, Wisnosky and Axient have been partnering with UMD to test a concept that could potentially transform satellite operations. Simply put, the company is engineering intelligent CubeSats that can communicate directly with each other while in space, as opposed to running all communications through ground control.

It's an ambitious plan that requires plenty of testing—and conducting the tests in space would be prohibitively expensive. High-altitude balloon launches, by contrast, cost a fraction of the amount of an actual space launch, and come close enough to orbital altitude to deliver useful results. Not only that, but payloads are retrievable: once it has reached maximum altitude, the balloon bursts, and parachutes open to guide the payload earthwards, with the team continuing to track it during its descent.

Explains Wisnosky: "During the summer of 2021, we built two functional CubeSats and tethered one each to the high-altitude balloons at UMD. We designed a gimbal system to provide pointing control of the cameras throughout flight. The satellites successfully communicated with each other and sent imaging data to each other and back to the ground."

"Having demonstrated that ability— a first in a university lab environment, we are now evaluating this technology for incorporation into sounding rockets and potentially onto on-orbit operations."

The partnership brings mutual gain to Axient and to UMD students: while Axient benefits from the testing opportunities, students also gain hands-on experience working with high-value payloads, while also forging connections that can help launch their careers post-graduation. "It's been tremendously beneficial," Bowden said.

COLLISION AVOIDANCE SYSTEMS FOR UAS

Through the Maryland Industrial Partnership (MIPS) program, designed to foster collaboration between area industries and academic researchers, Wisnosky's company has teamed up with UMD aerospace engineering assistant professor Huan "Mumu" Xu to help equip drones to respond more effectively to unexpected events, such as equipment malfunctions or imminent collisions.

Drones perform beautifully when everything goes to plan. But that very often isn't the case. If they are ever to share the skies with manned aircraft, or operate with full autonomy, unmanned aircraft must have the ability to recognize anomalies and take appropriate action.

"There are millions of combinations

UMD Nearspace Surpasses 100th Launch Mark

It would be a special milestone under any circumstances, but doubly so following an extended hiatus due to the COVID-19 pandemic. UMD's balloon payload program has now officially conducted more than 100 high-altitude launches since the program's inception in 2003. After a lull of more than a year, the team has now returned to its regular pace of near-monthly launches. "It really feels like we're back in business," UMD Nearspace Director and Principal Investigator Mary Bowden said.

In addition to his activities as a business executive and philanthropist,

Kerry Wisnosky is also a highly accomplished engineer, with experience in systems engineering, hardware integration, flight testing, mission operations, missile development, and infrared sensors. He is the author of ten technical papers, which he has presented at national and international conferences and seminars. Recognizing the full scope of his achievement, the UMD aerospace engineering department will induct Wisnosky as a member of its Academy of Distinguished Alumni (ADA) this spring. As an ADA member, he joins a select group of individuals that includes aviation pioneer Glenn Martin, NASA administrator Michael D. Griffin, and astronaut Jeanette Epps.

of things that can go wrong," said Xu. "Right now, most drones have a fairly rudimentary set of behaviors in response to an anomaly: 'this isn't working, so I'm going to land now.' Or 'something unusual happened, so let's return home.' We need to be able to go beyond that and enable drones to recognize what the problem is and take appropriate action."

Xu and her team of graduate students, including post-doc student Lina Castano, have designed a software system—known as the Automated Intelligent Flight Monitoring System (AIFMS)—that can be integrated into an unmanned aircraft, providing it with collision avoidance and anomaly detection capabilities. Wisnosky and Millennium provided research and development funding, and then shepherded the transition from research lab to in-the-air implementation—in the process, bringing Castano on board as project lead.

In late 2020, the U.S. Army put the AIFMS through a series of rigorous tests. It passed with flying colors.

SUPPORTING DIVERSITY, EQUITY, AND INCLUSION

Creating opportunity also means, for Wisnosky, helping to foster a more welcoming environment within aerospace engineering for female students and for students from underrepresented backgrounds. While many view such efforts as a moral imperative, Wisnosky points out that it also makes solid business sense.

Synergy flourishes when a team is diverse, Wisnosky believes. Team members bring a variety of perspectives to the table, and the result can be a healthy "creative disruption" that fosters innovation and counters a well-known problem in many organizations: the tendency to get stuck in old habits, doing things as they have always been done.

"I've seen the huge benefit of diversity, and this has been a driving motivation in my company over the last several years," Wisnosky said. "You get value-added perspectives, and it yields a real payoff. Better products and solutions come about as a result."

Wisnosky and his company have provided support for UMD's Women in Aeronautics and Astronautics (WIAA)—a precursor to the American Institute of Aeronautics and Astronautics' Women of Aeronautics and Astronautics (WoAA)—which works to provide leadership opportunities, professional and technical development, and networking avenues for female students. WIAA celebrated its fifth anniversary last year.

Now Wisnosky and his wife, Robin, have ramped up their commitment to positive change by establishing the Kerry and Robin Wisnosky Fund for Diversity, Equity, and Inclusion Initiatives in Aerospace Engineering. Backed by a major gift from the Wisnoskys, the fund will support a variety of programs and activities.

"The aerospace engineering field is changing, and we want to encourage that change," Wisnosky said. "Let's diversify, let's be inclusive, let's enable people from many different backgrounds to help us grow our aerospace program."

BREADTH OF ENGAGEMENT

Wisnosky's involvement with UMD Nearspace, his research partnership with Dr. Xu and her team, and his establishment of the DEI Fund are signature examples of his impact on aerospace engineering at UMD, but they do not tell the whole story. In fact, Wisnosky has been involved in many other ways, from serving on the department's Board of Visitors—as well as that of the A. James Clark School of Engineering—to collaborating with faculty on grant proposals.

It's this depth and scope that make Wisnosky's involvement with the aerospace engineering department especially impactful, says Minta Martin Professor of Aerospace Engineering Norman Wereley, who served as departmental chair from 2012 until 2021.

"He's done pretty much everything that an alumnus can do to support the department," Wereley said. "He's mentored students, he's funded research programs on the campus, he's participated in writing federal contracts, he's set up fellowships and scholarships at the university, both as a personal donor and as a corporate donor, and he has supported diversity, equity, and inclusion. Whatever you can imagine in terms of alumni engagement, Kerry's done it. I see him as the epitome of what a truly engaged alumnus can be."

"Kerry has demonstrated how many ways there are for an alumnus to be actively involved with our program and students," Wereley said. "If more alumni were to emulate him, we'd have the kind of strong alumni base that we need to achieve even greater things."

Kerry Wisnosky and his wife, Robin, have endowed multiple scholarships

for UMD aerospace engineering students. Among them is the Norman M. Wereley Scholarship in Aerospace Engineering, established in October 2020. This merit-based scholarship, intended for undergraduate students, is backed by a generous gift from the Wisnosky family.

"Robin and I both felt that Professor Wereley should be recognized for all he has done to grow the aerospace engineering program at Maryland," Wisnosky said. "His approach has always been to focus on quality, and then quantity will naturally come. That means quality faculty, quality facilities, quality coursework and programs, and quality commitment to students. UMD Aerospace has always been a great department, but competition is fierce, and Professor Wereley's efforts have put the department at a level that is right there with the top aerospace departments in our country."

WERELEY STEPS DOWN AS CHAIR

Norman Wereley retired as aerospace engineering chair this summer, with the department having achieved major milestones under his leadership.

PHOTO: ALAN P. SANTOS

From left: Dr. Norman Wereley (left). University of Maryland Medical Center transplant surgeon Dr. Joseph Scalea, UMD R. Adams Cowley Shock Trauma Center Physician-in-Chief Thomas Scalea, and UMD UAS Test Site Director Matt Scassero.

Historic firsts and robust growth: these have been hallmarks of UMD aerospace engineering with Norman Wereley at the helm. After an impactful nine years heading up the department, Wereley stepped down last summer to return full-time to his regular research and teaching duties.

Wereley, a Minta Martin Professor and director of the Composites Research Laboratory (CORE), presided over significant increases in student enrollment and research expenditures during his time as chair. The scope of expertise in the department expanded as well, with Wereley hiring new faculty in the areas of space science, autonomous flight vehicles, helicopter aeromechanics, and mechatronics, as well as experimental and computational fluid dynamics for hypersonic flight. He also established the Distinguished Professorship in Rotorcraft.

Wereley made support for students a priority, with several undergraduate and graduate scholarships launched under his leadership. In 2020, Millennium Engineering and Innovation principal owner Kerry Wisnosky and his wife Robin established the Norman M. Wereley Endowed Scholarship in Aerospace Engineering Education to provide merit-based support for undergraduates.

Wereley's tenure as chair also saw history-making achievements—perhaps most notably, the first-ever transport by drone of a live organ for transplant. The successful mission, carried out by the University of Maryland Unmanned Aircraft Systems (UAS) Test Site in collaboration with the University of Maryland Medical Center (UMMC), got its start when UMMC transplant surgeon Joseph Scalea contacted Wereley to discuss the feasibility of such an idea.

Wereley took up the challenge with enthusiasm, marshalling departmental resources and helping to develop the concept and methodology that provided the basis for the flight.

"Nothing like this had ever been done before, and my guess is that many a department chair would have greeted it with a flat-out no—too risky, even crazy," said Matt Scassero, director of the UMD UAS Test Site. "But Norm's reaction was just the opposite. From an engineering perspective, he understood that it was doable. And he saw the immense value of being the first to accomplish such a mission."

"It's that kind of bold thinking that characterizes a world-class engineering program," Scassero said. In 2020, the Helicopter Association International honored the endeavor with a Golden Hour Award—the second time, following the Gamera human-powered helicopter in 2012, that the department has received this distinction.

UAS Test Site 2014 launch event

Wereley helped drive other technological feats as well: he played a key role in the program to design, develop, and flight test the first magnetorheological seat suspension system in a helicopter, the SH-60 Seahawk.

UMD President Darryll Pines, a longtime colleague of Wereley's, lauded his accomplishments as chair.

"Norm has led the UMD Department of Aerospace Engineering during a historic time, one that has seen an increased focus on emerging technologies such as robotics and unmanned aircraft," Pines said. "He initiated one of UMD's proudest engineering feats: the first-ever delivery by drone of a live organ for transplant. As chair, Norm worked tirelessly to support student competitions and activities, and he has been a strong advocate for diversifying the program and fostering greater inclusion through his support for Women in Aeronautics and Astronautics (WIAA) and diversity initiatives within the department."

"Thank you, Norm, for your service as chair. I wish you all the best."

FLATAU NAMED INTERIM CHAIR

Professor Alison B. Flatau, a member of the UMD aerospace engineering faculty since 2002, has been appointed interim chair of the department as a search begins for a permanent successor to Professor Norman Wereley. An expert on smart materials and structures, with a particular interest in magnetostrictive actuator and sensor technologies, Flatau has also held key leadership roles, including as a National Science Foundation program director and as associate dean of research at UMD's A. James Clark School of Engineering.

A fellow of the American Society of Mechanical Engineering (ASME) and the American Institute of Aeronautics and Astronautics (AIAA), Flatau is the recipient of numerous awards, including a Smart Structures and Materials Lifetime Achievement Award from SPIE and an Aerospace Educator Award from Women in Aerospace.

UMD RESEARCHERS DESIGN GREENER AIRCRAFT ENGINE

ARPA-E-SPONSORED PROJECT AIMS AT BREAKTHROUGHS IN EFFICIENCY

Worldwide aviation is growing at a fast pace, with many more planes in the sky expected over the coming decades. And that means an increased need to rein in emissions.

But how? The gas turbines used in today's aircraft are already highly efficient, with little room for further optimization, so any solution will have to leverage newer technologies, such as electric propulsion and fuel cells.

Led by UMD professors Christopher Cadou (AE) and Eric Wachsman (MSE), a multi-institutional team has its sights set on a breakthrough. With funding from the Advanced Research Projects Agency–Energy (ARPA-E) and support from Raytheon and other industry partners, the team is developing a hybrid gas turbine/fuel cell system that can be used to power large aircraft (like the Boeing 737) that are responsible for more than 85% of aviation emissions globally.

"Our approach is to marry a gas turbine with a new, ultra-high performance fuel cell to create a synergistic system whose overall performance is better than either component by itself," Cadou said. "It's a practical way to realize the improvements in overall efficiency (and thus reduced emissions) offered by electric propulsion without waiting for the needed improvements in hydrogen or battery technology. Just as importantly, it's a fuel-flexible solution that can be used with today's fossil fuels as well as tomorrow's carbon-neutral fuels."

OPTIMIZING EFFICIENCY, REDUCING POLLUTION

Gas turbines work by burning fuel with air to heat up pressurized gases, which are then expanded through a nozzle to produce thrust. Relatively few components are required and thus power/weight and power/size are very large. Fuel cells similarly oxidize fuel but do it electrochemically, directly producing the electricity that drives electric motors to produce thrust. The fuel cell system has lower power/weight and power/size because it requires more components to work. However, because of the direct electrochemical conversion of fuel to electricity, it is more efficient than a gas turbine.

"We have developed record high power density fuel cells that puts them closer to turbines, but with greater fuel efficiency for electric power production. This is a great opportunity to integrate the two technologies to achieve a hybrid solution that further advances the electrification of flight," said Wachsman.

"In an aircraft, it's all about weight and size," Cadou said. "The bigger you are, the more drag you incur and the more fuel you need to burn to overcome it. That's one of the reasons we're not going to see a purely battery or fuel cell-powered vehicle at the scale of a 737. But if we put a fuel cell together with a gas turbine and electric propulsors, we get a workable compromise. The system becomes a little larger and heavier, but it gets a lot more efficient. This means that the aircraft doesn't have to carry as much fuel and emits fewer pollutants per cargo mile."

The combination also makes sense from an operational perspective. Pilots sometimes need to adjust power quickly, for example by switching to takeoff/go around power. But fuel cells don't easily respond to sudden changes, so a pilot confronted with a rapid-response situation might not be able to adjust the power in time. Adding the gas turbine provides the needed flexibility. On the other hand, during normal cruise conditions, power settings change very little, and the steady-state behavior of a fuel cell provides greater fuel efficiency.

By combining the two, pilots get the best of both worlds, Cadou said. "When you're climbing and need a lot of power, the turbine will be making more power and the fuel cell will be making less. If you need to floor it or pull back quickly, the turbine can do it. When you're in cruise, the turbine will be making less power and the fuel cell will be making more power. You're able to better manage energy."

CROSS-DISCIPLINARY COLLABORATION

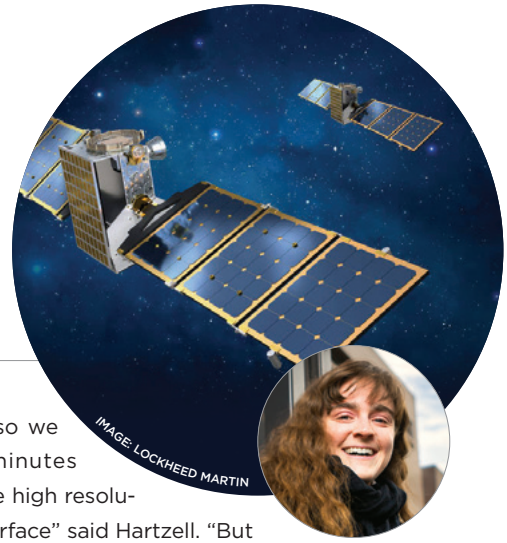
The system being developed incorporates new fuel cell technology from Wachsman's group that achieves unprecedented levels of power/size and durability. It also incorporates regenerative use of electrical energy—that is, energy given up by the aircraft as it descends can be stored for use later instead of being dissipated into the air. The principle is familiar to anyone who has driven a Tesla: when braking, kinetic energy is fed back into the electric motor, conserving energy.

The four-year project, which also involves a research team from the Colorado School of Mines, will take place in two phases. During the initial two years, the team will design the system, model its performance characteristics, and show that it will meet the target performance specifications; in the subsequent, second phase, an actual prototype will be built and tested in a simulated flight cycle, taking advantage of the state-of-the-art

facilities and resources available at UMD. Cadou's focus will be on systems modelling, pressurized fuel cell testing and, later, manufacturing the full system; Wachsman, who directs UMD's Maryland Energy Innovation Institute, will develop the fuel cell, working together with associate research professor Yi-Lin Huang and the students in the Wachsman group. The fuel cell group at the Colorado School of Mines will develop fuel cell reformer materials and architectures that will maximize the system's power/weight and overall reliability.

In keeping with ARPA-E's push for industry-transforming research, the team's goal is to develop a commercially viable technology that could find its way to market within the decade. Given the urgency of the need for reduced emissions, Cadou anticipates that the UMD-led research may one day be considered a milestone.

"My metric for success is to be able to walk into the Smithsonian Air and Space Museum in 25 or 30 years and see a hybrid turbine/fuel cell on display as an example of state-of-the-art aircraft engine technology," Cadou said.



Hartzell Mission Scientist for NASA SIMPLEx Janus Mission

MISSION WILL SEND TWIN SMALL SATELLITES ON A DEEP SPACE JOURNEY TO STUDY TWO BINARY ASTEROIDS.

Launching in 2022, the NASA SIMPLEx Janus Mission is a mission of twos. Named for the two-faced Roman god of beginnings and passages, the mission is sending a pair of craft deep into space to investigate a pair of binary asteroids—1996 FG3 and 1991 VH. A binary asteroid system contains a primary asteroid and its moon, called the secondary asteroid.

Joining the Janus Mission as mission scientist is Associate Professor Christine Hartzell, whose previous NASA work includes the recent OSIRIS-REx mission to study asteroid 101955 Bennu.

"My responsibility is to ensure that the spacecraft take the measurements that we need them to take to achieve the science objectives," explained Hartzell. "I also need both to understand the science and to pay close attention to the engineering decisions to make sure they match our requirements."

After riding along with the launch of NASA's Psyche mission in 2022, the Janus twin crafts will first complete an orbit around the Sun, before heading back toward Earth for a gravity assisted slingshot far into space for their four-year journey to the asteroids.

Each pair of asteroids presents different orbital patterns, and the goal is for the suite of cameras onboard Janus' small satellites (SmallSats) to carefully track these dynamics to build an accurate model of the two different binary asteroid systems. The images will also be used to study the geologic features on the surface of these binary asteroids. They only have a short window of time to do it.

"It's just a flyby, so we only have a few minutes when we can capture high resolution images of the surface" said Hartzell. "But we'll have a cruise period before then where we'll have opportunities to calibrate and test the instruments to make sure the cameras are working the way they are supposed to be working when they arrive."

This mission is the first of its kind from NASA's Planetary Science Division to utilize craft this small—about the size of a suitcase—for scientific exploration. The advantages of these smaller craft is that they are less expensive to build and can be launched as a secondary payload. The downside is that they take a long time to transmit data back to Earth.

"We're going to take something like 300 images, but since we can't send them all back at once, we need to be able to make decisions about which images to send back first," explained Hartzell. "What I have been doing for the mission is taking the images we have of Bennu, compressing them, and seeing what they look like compressed to determine if we have enough information from the compressed images to make decisions about which images to downlink first."

Beyond the mission objectives set by NASA, Hartzell is also hoping to get some insights for her own area of research, which focuses on the surface environments and characteristics of celestial bodies, and in particular regolith—the loose, dusty material covering rocky planets and asteroids.

"I am really interested in seeing what the surfaces of these asteroids look like since we haven't seen any binary asteroids like this," said Hartzell. "I'm obviously interested in dust, so do they have any small particles on them? The other cool thing would be to see the surface of the primary asteroids to see if there is any evidence of formation of the secondary."

TOWARDS A SAFELY SHARED AIRSPACE

Matt Scassero, director of the UMD UAS Test Site, is pictured with a custom-built vehicle that conducted the first-ever drone delivery of a live organ for transplant in April 2019.

It's an idea that people have been discussing for years: create a corridor in the Chesapeake Bay area in which unmanned aircraft could conduct operations, sharing airspace with their manned counterparts.

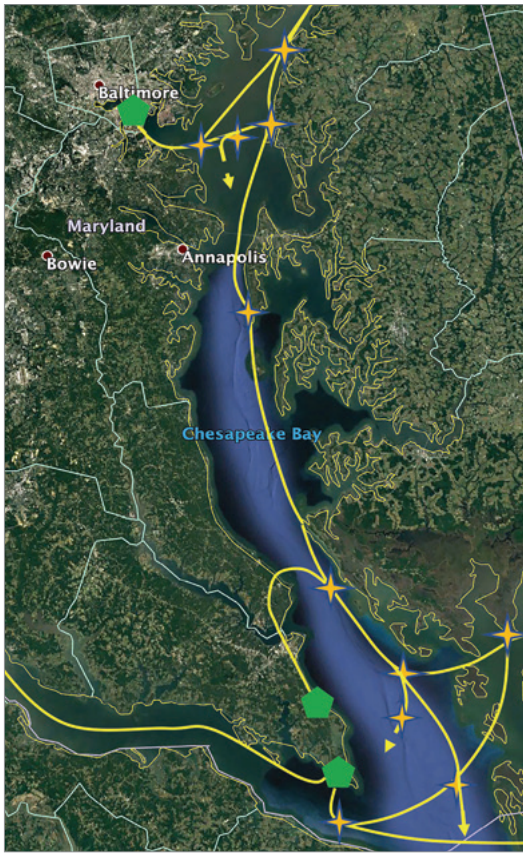
During 2020, even as the COVID-19 pandemic kept its hangars shut, the UMD UAS Test Site took a significant first step towards turning this bold concept into reality, commissioning a feasibility study that examines whether a proposed Chesapeake Bay UAS Route Network is a viable endeavor.

The study, completed in January 2021, was carried out by the Padina Group, a consulting firm that specializes in aerospace and aviation, with the participation of key industry and government stakeholders, including the Federal Aviation Administration's (FAA) UAS Integration Office.

It represents the first major effort to map out details of the proposed network, which would be designed to enable unmanned aircraft to be flown safely within airspace that also includes conventional, piloted aircraft.

UAS utilizing the network would be able to fly beyond visual line of sight (BVLOS) and over populated areas. Currently, most UAS operations are constrained by BVLOS requirements and restrictions on flying over people.

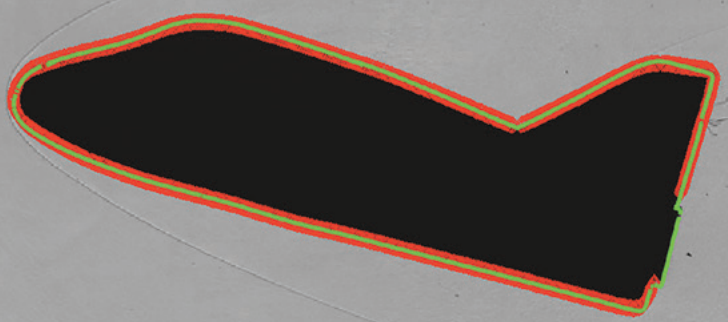
"There is a widespread consensus that integrating UAS into non-segregated airspace is critical to realizing the vast potential of unmanned systems," said UMD UAS Test Site Director Matt Scassero. "But it has to be done safely and systematically, with a well-conceived framework and operational best practices. The Chesapeake Bay UAS Route Network will provide an appropriate means to move forward."



A feasibility study for the proposed Chesapeake UAS Route Net

Hypersonic Wind Tunnel Research: Ray Tracing Inspires a New Approach

STUART LAURENCE TESTS AN IMPROVED METHOD FOR MEASURING THE AERODYNAMICS OF FREE-FLYING OBJECTS.



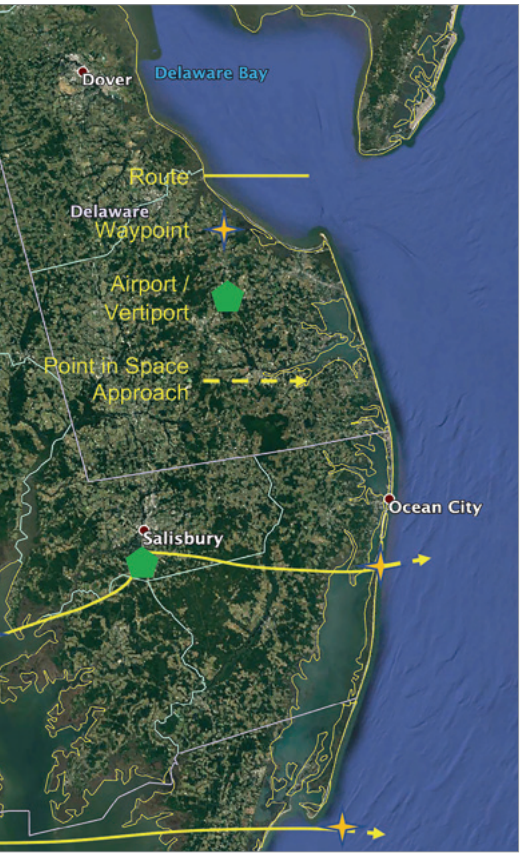
Forces and moments are fundamental quantities in physics, but in some circumstances—as in the case of models in hypersonic wind tunnels—they can be difficult to measure accurately. Taking a cue from the world of gaming, Associate Professor Stuart Laurence has devised a means to obtain more precise results in such facilities.

Laurence recently received a Defense

Advanced Research Projects Agency (DARPA) Young Faculty Award (YFA) that will provide $500,000 to support further development of this new approach.

"We let models fly freely in the wind tunnel, with multiple cameras tracking them and creating silhouette images,"

A FEASIBILITY STUDY COMMISSIONED BY THE UMD UNMANNED AIRCRAFT SYSTEMS (UAS) TEST SITE EXAMINED THE VIABILITY OF ESTABLISHING A UAS ROUTE NETWORK IN THE CHESAPEAKE BAY REGION.



:work was completed in January 2021.

To iron out the specifics, the Padina Group analyzed the geospatial operating environment, identified the advanced UAS capabilities needed for safe and efficient operation, and assessed the level of support for such an initiative as well as the potential economic benefits. Public policy challenges were also discussed. The feasibility study laid out a blueprint for phased implementation of the proposed network.

"The Chesapeake UAS Route Network initiative has strong, enthusiastic support from Operational Users and Network Implementation Service Support Suppliers. This, coupled with having already defined operational missions for the UAS route network, clearly demonstrates a high credibility of achieving the Chesapeake UAS Route Network goal and objectives," the report concluded.

The UAS Test Site could conduct advanced UAS operations on the Chesapeake UAS Route Network and in so doing play a key role in supporting and shaping FAA regulations and policies, as well a serving as a model for the future, the report suggested.

According to John Walker, senior partner with The Padina Group, the Chesapeake Bay region is poised to take on a historic role.

"Technology advancements within the aerospace industry have generated a 'Kitty Hawk' moment that is revolutionizing global air transportation," Walker said. "The innovative use of drones for commercial purposes is recognized as an early enabler of this new aircraft technology."

"The Chesapeake Bay is close to the site where the Wright Brothers successfully took flight in December 1903," he noted. "Now, the Bay region is poised for the development of new technology and services that will benefit millions. This emerging air transportation technology will bring important public benefits and connect with other transportation systems throughout the region."

Laurence explained. "After the experiment, we run computer simulations to reproduce the recorded images based on estimates of the model position and orientation. By comparing the images to the simulations, we can determine how close the estimate is. We then iterate the process until we have a very accurate approximation to the model translation and rotation throughout the experiment."

Traditionally, researchers have measured the motion of free-flying bodies in wind tunnels by tracking individual markers on the body surface. Although forces and moments can be estimated indirectly through this means, the process is cumbersome and not very precise, Laurence said.

Indeed, he said, the approach he is using yields levels of accuracy that are at least two orders of magnitude higher.

Laurence credits the initial breakthrough to a former student, William Starshak, who began exploring whether techniques used by video game developers could be used to track free flying objects.

Of particular interest: ray tracing, in which game developers track the behavior of light rays as they interact with an object, and are thus able to better recreate what the eye would see in a non-virtual environment.

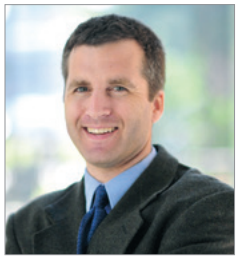
Now Laurence and his team have been able to extend the principle and devise a method that can be used for any number of scenarios involving one or multiple objects within a flow—for example, meteor fragmentation or the breakup of a satellite.

"In any situation where you have an object of a known geometry moving freely, you could potentially use this approach to reconstruct the motion of that object," Laurence said.

The DARPA Young Faculty Award supports rising stars in junior research positions, providing generous funding and engaging selectees with the DARPA program development process. The long-term goal is to "develop the next generation of academic scientists, engineers, and mathematicians who will focus a significant portion of their careers on Department of Defense and National Security issues," according to the agency's website.

PALEY IS LEAD RESEARCHER IN MULTI-INSTITUTIONAL DRIVE TO ACCELERATE AI, AUTONOMY IN COMPLEX ENVIRONMENTS

New ARL-UMBC-UMD partnership aims to kickstart major advances in AI and autonomy.



Derek Paley, Willis H. Young Jr. Professor of Aerospace Engineering Education and Director of the Maryland Robotics Center, is the lead researcher on a major new cooperative agreement with the University of Maryland Baltimore County (UMBC) and the Army Research Laboratory (ARL).

The five-year agreement, worth up to $68 million, brings together a large, diverse collaborative of researchers—leveraging the University System of Maryland's national leadership in engineering, robotics, computer science, operations research, modeling and simulation, and cybersecurity—to drive transformational advances in artificial intelligence (AI) and autonomy. A key objective is to accelerate the development and deployment of safe, effective, and resilient capabilities and technologies, from wearable devices to unmanned aircraft, that work intelligently and in cooperation with each other and with human actors across multiple environments.

"This is a big partnership with an ambitious vision: We want to change the world by quickly getting AI and autonomy into the hands of the people who need it," Paley said. "No matter how autonomous we think a system is, a human operator will interface with it at some level. The goal is to migrate the dangerous, dirty, and dull work to the autonomous platform."

UMD is also represented on the project by Dinesh Manocha, Distinguished University Professor and Paul Chrisman Iribe Professor (Departments of Electrical & Computer Engineering and Computer Science and Institute for Advanced Computer Studies); and Jeffrey Herrmann, Professor (Department of Mechanical Engineering and Institute for Systems Research).

They are joined by Univeristy of Maryland Baltimore County (UMBC) faculty members Aryya Gangopadhyay, Professor and Chair (Department of Information Systems); and Nirmalya Roy, Associate Professor (Department of Information Systems).

The AIFMS software guides an unmanned aircraft safely away from a potential mid-air collision during a technology assessment.

Castano, Xu Recognized by AIAA for Work on UAS Collision Avoidance

UMD aerospace engineering Assistant Professor Huan "Mumu" Xu and Affiliate Assistant Research Scientist Lina M. Castano have received awards from the American Institute of Aeronautics and Astronautics (AIAA) for their work on a collision avoidance and hazard mitigation system, known as the Autonomous Intelligent Flight Management System (AIFMS), for unmanned aircraft.

Xu won the AIAA National Capitol Section's Engineer of the Year Award, while Castano won the Hal Andrews Young Engineer/Scientist award.

Xu has led development of the AIFMS through a partnership with Millennium Engineering and Integration Company, LLC (now Axient), under the auspices of the

Aerospace Engineering Welcomes New Faculty Member Dr. Christoph Brehm

The Department of Aerospace Engineering welcomes a new assistant professor to the faculty, Dr. Christoph Brehm. Brehm joins the UMD community after four years as an assistant professor at the University of Kentucky.

Brehm will be supporting the department's increased investment in hypersonics research, which is also a current U.S. national priority for research and development. He will also apply his expertise in fluid dynamics and multi-physics modeling and simulations to the Alfred Gessow Rotorcraft Center, and he is currently supervising nine Ph.D. students and two post-docs.

Before joining academia, Brehm worked as a senior research scientist for the Science Technology Corporation at the Advanced Supercomputing Division at the NASA Ames Research Center from 2012 to 2016.

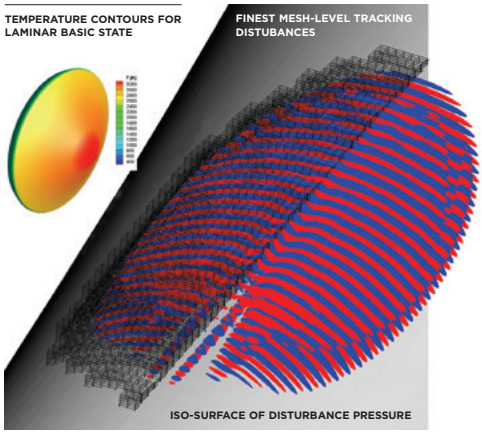
He was one of the main developers of the Launch Ascent and Vehicle Aerodynamics (LAVA) solver framework, and he has employed LAVA to study a wide range of unsteady fluid dynamics problems such as rocket launch environment flows, aeroacoustics noise prediction of a contra-rotating open rotor, jet impingement noise, and more.

His current research focuses on developing fundamental numerical methods to apply to large-scale flow problems—including multi-physics effects—as well as the extraction and understanding of the relevant physics. His most recent research efforts focused on simulating and analyzing transitional and turbulent flows in low and high-speed regimes for fundamental studies in laminar-turbulent transition, turbulence, relaminarization, aeroacoustics, fluid-structure interaction and fluid-ablation interaction.

Brehm has authored over 60 archival peer-reviewed journal and conference publications, and has received multiple awards for his work, including a 2019 Office of Naval Research Young Investigator Award.

His research is supported by the National Science Foundation (NSF), NASA, Office of Naval Research (ONR), Air Force Office of Scientific Research (AFOSR), Hypersonic Vehicle Simulation Institute (HVSI), and industry partners in close collaboration with several U.S. and international research institutions.

He is a member of the NATO Task Force on hypersonic turbulence, several American Institute of Aeronautics and Astronautics (AIAA) working groups, and is the co-organizer of the Large-Eddy Simulation (LES) AIAA Workshop 2022 as well as the co-chair of the 2022 International Conference on Computational Fluid Dynamics (ICCFD).



Simulations of laminar-turbulent transition process

Maryland Industrial Partnerships (MIPS) program. MIPS provides grants that help companies utilize university research in support of their research and development goals.

Castano, who earned her doctorate in aerospace engineering from UMD in 2015 and went on to run the UAS program at Millennium, has led the practical implementation of the system, including flight demonstrations designed to assess its capabilities.

In December 2020, the U.S. Army tested the system at its base in Ft. Leonard, Missouri, with successful results.

Two unmanned aircraft were flown into the path of an AIFMS-equipped drone, which detected the collision risk and veered away to avoid it. The exercise was repeated from multiple angles, with the system proving to be reliable each time.

FACULTY PROMOTIONS

The department of aerospace engineering congratulates **DAVID AKIN** and **ANYA JONES** on their promotions from associate professor to professor, and **STUART LAURENCE** on his promotion from assistant to associate professor.

COMPLETING A DOCTORATE–ABOARD AN AIRCRAFT CARRIER

THE LOGISTICS WEREN'T ALWAYS EASY, BUT NAVY COMMANDER DONALD "BUCKET" COSTELLO NOT ONLY FINISHED HIS DISSERTATION, HE EARNED AN ETTER AWARD FROM THE U.S. NAVY FOR HIS GROUNDBREAKING RESEARCH.

Commander Donald "Bucket" Costello does not recommend working on an engineering doctorate via night school while on active duty.

A career naval aviator, engineering test pilot, and permanent military professor at the U.S. Naval Academy, Costello spent two of his five years during his doctoral work stationed on an aircraft carrier. With many hours a day on the bridge during its around-the-world deployment, he also endeavored to make progress on his dissertation. Besides the grueling schedule, there were other barriers, including spotty internet and the challenge of syncing schedules with those back in the U.S.

"At one point we were in the Red Sea and I had to set an alarm for the middle of the night so I could make a scheduled meeting with my advisor at UMD. Unfortunately, I was unable to get a phone line off the ship so we had to reschedule via email for the following week," he recalls.

All these hurdles aside, Costello persisted and was able to finish his research—a groundbreaking study on the certification process for autonomous aircraft within the United States Navy. His work, which dovetails with that of the Naval Air Warfare Center, Aircraft Division's center for autonomy, could go a long way towards enabling broader use of autonomy within naval aviation, with such vehicles taking on many tasks—such as delivering supplies or even transporting soldiers—that currently require a human in the decision loop for aircraft.

"Our approach was to define the requirements—that is, the aircraft needs to do X, Y, and Z—and identify the series of decisions that the aircraft must make: whether it should proceed with the landing, for example," Costello said. "We matched the requirements to the aircraft specifications and showed that algorithms could be developed that allow the aircraft to make the needed decisions and complete the mission."

An effective certification process, he said, must be able to account for gaps in situational awareness, even as engineers work to mitigate them. In his research, Costello drilled down to focus on unprepared landing field missions carried out by the rotorcraft community, as there have been mishaps in civilian and military aviation during this phase of flight over the last decade.

"Situational awareness is a critical concept in aviation," Costello said. "That means being able to sense the environment accurately, understand what's happening around you and predict what's going to happen in the future. If a vehicle's situational awareness depends on a set of sensors, then as long as the sensors are providing 100% valid information, the vehicle is probably going to make a good decision. In the real world, though, the input data will probably not be 100%, and the resulting decision by an autonomous system may not be a sound aeronautical decision."

Having successfully defended his dissertation in October 2020, Costello plans to continue his research. Meanwhile, his dissertation work has earned him a Dr. Delores Etter Top Scientists and Engineers of the Year Award from the U.S. Navy. Etter awards are given annually in recognition of outstanding achievements.

Shikha Redhal: Igniting the Spark for Aerospace Engineering

BY JENNIFER FIGGINS ROOKS

Growing up in Haryana, India, Ph.D. student Shikha Redhal's spark to pursue engineering grew out of a unique combination of her parents' encouragement, select television programming, and a local home-state hero.

"My mother encouraged us to watch National Geographic and Discovery," said Redhal. Through shows like Megafactories and Air Crash Investigation, Redhal became fascinated not only by how things were made, but also by how to make things better.

In addition, Redhal's father, a retired Junior Commissioned Officer from the Indian Army, told her stories about astronauts Sunita Williams and Kalpana Chawla, both of whom were women of Indian descent. Chawla, moreover, hailed from Redhal's home state, and graduated from Redhal's eventual undergraduate alma mater, Punjab Engineering College.

Her final decision to choose aerospace engineering as a career came during an internship with Air India. "There were workshops where they tested different airplane components, and it was great to be able to get hands-on experience and understand how they were made," explained Redhal. "That experience is also what got me really interested in all aspects of propulsion from the chemistry to designing the components."

Coming to the U.S. for her graduate degree because of the greater number of aerospace industry opportunities, she joined Professor Kenneth Yu in the Advanced Propulsion Research Lab where she is now exploring injection dynamics and mixing in model rotating detonation engines (RDE).

"There is a great deal of interest in rotating detonation engines right now," Redhal said. Advantages of this kind of engine include higher thermal efficiency and a simpler design with no moving parts, making it easier to design and scale for different applications, she said.

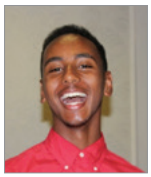
Not only is Redhal testing these engines, but she built the current model research framework they are using in the lab.

"Most of this research has not been done before, so you don't have the answers," Redhal said. "I love problem-solving and learning what results I will get from different experiments. And I get to tell people that I detonate things! That's fun."

Through that framework, Redhal is studying the fundamental nature of RDE propulsion concepts and the effects of dynamic interactions between propellant injection and the detonation wave inside RDE combustors. "This work could eventually lead to the development of practical RDEs," she said.

Outside of the lab, Redhal is active in a number of campus organizations. She served as a board member for two years in Women in Aeronautics and Astronautics (WIAA), and is now involved in the national organization Women of Aeronautics and Astronautics (WoAA). She is currently president of the department's Graduate Student Advisory Committee and works in these roles to help ensure that other current and aspiring aerospace engineers have mentors and role models to help them achieve their goals.

"There were not a lot of mentors when I was in undergraduate, and WIAA is a good opportunity for me to both learn, and help someone else and give back what I have learned, especially as one of only a few women in experimental propulsion systems," Redhal said. "I want to help others build trust and confidence that they can do this, because, if you love it, you should pursue it! Have faith in yourself and don't give up!"



BURRIS, DANIEL, MCLEAN AWARDED PATTI GRACE SCHOLARSHIPS

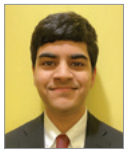
Three UMD aerospace engineering students—Alexis Burris, Elias Hailu Daniel, and Kirk "KJ" McLean—are among the awardees of the inaugural Patti Grace Smith Fellowship, established in 2020 to help foster diversity in the U.S. aerospace industry.

They are among 43 highly accomplished undergraduates nationwide who were selected for the fellowship, which includes cash grants, mentorship opportunities, and paying internships in the space industry. Announcement of the awardees came after a rigorous, three-round selection process, with each candidate reviewed by a panel of industry professionals, rising star early career employees, and corporate employers.

"The Patti Grace Smith Fellowship exists to serve extraordinarily talented students who possess everything that is needed to thrive in aerospace, but who come from a community where talent has long been overlooked by our industry," said Col. B. Alvin Drew, Jr., (USAF, Ret.), a two-time Space Shuttle astronaut and a co-founder of the fellowship. "[The students] inspire us with their drive, their intellect, their work ethic, and their deep commitment to advancing the state of the aerospace industry."

ADITHYA ARUN RECEIVES 2021 DINAH BERMAN MEMORIAL AWARD

Rising senior **ADITHYA ARUN** is the recipient



of the 2021 Dinah Berman Memorial Award, which recognizes students who have demonstrated both academic excellence with leadership or service to the Clark School.

Arun, who is studying both aerospace engineering and computer science, is a member of the Aerospace Engineering Honors program and was in the First- Year Innovation & Research Experience (FIRE) Autonomous Unmanned Systems Stream in past semesters. He is also a research assistant in the Space Systems Lab and the Space Power and Propulsion Lab.

As a co-founder of SEDS@UMD, he led the creation of UMD's first student-designed CubeSat with a research payload.

GUL RECEIVES VFS BEST PAPER AWARD

Graduate Research Assistant **SEYHAN GUL** received the Best Paper award in the

Dynamics session of the Vertical Flight Society's 77th Annual Forum that was held on May 10-14, 2021. His work showed that a full-scale hingeless hub tiltrotor can in fact achieve 400 knots flutter-free flight with thin wings and swept-tip blades.

BILER AWARDED WYLIE FELLOWSHIP

Ph.D. student **HULYA BILER** is among 14 students selected to receive Ann G. Wylie Dissertation Fellowships by the UMD Graduate School. The fellowships provide support to excellent UMD doctoral

candidates who are in the latter stages of writing their dissertations.

Biler's research focus is on improving the understanding of fundamental flow physics behind the unsteady force production during transverse gust encounters and to develop a physics-based low-order aerodynamic model that is capable of quickly predicting unsteady loads. Her advisor is Anya Jones.

JACEK GARBULINSKI AWARDED 2021 ALEX BROWN SCHOLARSHIP

The Department of Aerospace Engineering named Ph.D. student **JACEK GARBULINSKI** the 2021 Alexander Brown Scholarship and Leadership Award recipient. Garbulinski is working with Professor Norman Wereley

in the Composites Research Laboratory, where his research focuses on control and structural properties of continuum soft robots that utilize pneumatic artificial muscles. Some of that work, "Characterization and Analysis of Extensile Fluidic Artificial Muscles," was recently published in *Actuators*.

AEROSPACE ENGINEERING STUDENTS RECEIVE VFS SCHOLARSHIPS

Six UMD of Aerospace Engineering graduate students have won 2021 Vertical Flight Foundation Scholarships from the Vertical Flight Society (VFS). VFS awarded 27 total scholarships this year in recognition of the world's most talented engineering students interested in vertical flight.

The UMD awardees are **CHENG CHI** (advisor: Anubhav Datta), **RAVI LUMBA** (advisor: Anibhav Datta), **NICHOLAS REHM** (advisor: Inderjit Chopra), **PETER RYSECK** (advisors: Inderjit Chopra, Derrick Yeo), **JAMES SUTHERLAND** (advisor: Anubhav Datta), and **FREDERICK TSAI** (advisor: Anubhav Datta).

DEPARTMENTAL AWARD WINNERS

Gessow Academic Achievement Awards: **IAN DOWN** and **NILOY GUPTA**

Robert M. Rivello Scholarship Awards: **RAHUL JAIN**, **EVAN RUDERMAN**, **LOGAN SWAISGOOD**, and **CATHERINE YATES**

Joseph Guthrie Memorial Scholarships: **THOMAS BONE**, **EZRA BREGIN**, and **ALEXANDER COCHRAN**

The American Institute of Aeronautics and Astronautics Outstanding Achievement Award: **RACHEL CUEVA**

Chair's Award: **RACHEL CUEVA**, **RACHEL HARVEY**, and **JOSHUA MARTIN**

Women in Aeronautics and Astronautics Award: **RACHEL HARVEY**

ALEXIS (SOUMIYA) D. WILLIAMS: MOTIVATED BY RESEARCH

BY JENNIFER FIGGINS ROOKS

Ask Alexis (Soumiya) D. Williams how she first became interested in engineering, and she'll mention the TV show Star Trek.

"The engineers were always my favorite characters," she explains. "I wanted to be just like Geordie LaForge." Fascinated by building things, Williams would spend long hours during high school working with Arduinos and building robots in her school's engineering lab.

Today, she is an aerospace senior at UMD and 2021 Anderson Scholar. She chose Maryland because of its programs, and also because its labs offered the hands-on experience she was looking for. In fact, it wasn't long into her freshman year before Williams joined Professor Alison Flatau's Magnetorestrictive Materials Lab, working on a non-contact magnetoelastic torque sensor.

"It was great not only working on the prototype sensor and learning how it worked, but taking what I learned to figure out how to make it even better," said Williams. She credits that first-year experience with helping her learn the foundations of data collection, analysis, and research writing.

That love of research would continue to be a driving force for Williams, and one which sustained her during setbacks: a medical condition that necessitated taking a semester off during her freshman year, followed by a research project—involving the design of a 3D-printable sensor using a polylactic acid (PLA) iron-composite material—that didn't go as planned. "I thought the material would be conductive, and that I could figure out the change in strain of the material based on its change in conductivity, but it turned out not to be conductive at all," explained Williams. "But even when things don't work out the way you expect, you can still get useful data."

Through support from the department's Aerospace Engineering Research Opportunity Scholars (AEROS) Program, Williams has continued her work in this area. "My research did show that the material was in fact magnetic, but I want to switch from PLA materials which are more rigid to a thermoplastic polyurethane (TPU) which is more flexible, so I should be able to better see a response to the magnet."

Outside of the lab, Williams is active in student organizations serving as both a member of Women in Engineering's (WIE) Student Advisory Board and as president of UMD's chapter of Out in Science, Technology, Engineering, and Mathematics (oSTEM). Through oSTEM, Williams helps organize social and professional activities for the group, working hard to ensure that LGTBQ+ students find a place of community and support on campus. "I enjoy working with oSTEM, because I know it impacts so many people positively," she said.

Looking ahead, Williams plans to pursue a graduate degree and would ultimately like to direct her own lab pursuing and guiding research. "I always want to be in the lab myself, because I really do love the work, working with the materials, and gathering data."

Digging Into Competition

Engineering a tunnel-boring machine (TBM) presents formidable challenges, particularly when the goal is to improve on existing designs, but a team of intrepid UMD students proved up to the task.

In September, following months of rigorous preparation, the UMD Loop team traveled to Las Vegas to compete in The Boring Company's Not-A-Boring competition. Once there, they worked long days and late nights to get their TBM, comprising more than 4,000 parts and weighing several tons in total, into final shape before competition day.

UMD was one of only 12 teams—from an international pool of nearly 400 applicants—to be selected for the competition. Not only that, but they were among just four teams that passed all safety checks and received the OK to dig—although integration issues on competition day ultimately prevented them from doing so.

Even so, UMD Loop garnered an award for Best Team Safety and an invitation to participate in next year's meet."There were a lot of great takeaways, and we're all proud of what we were able to accomplish," said team leader Shane Bonkowski.

The UMD Loop team was among 12 international teams selected to compete at the Not-a-Boring Competition in Las Vegas.

Jeanette Epps Tapped for Boeing Starliner Spaceflight

NASA astronaut and alumna Jeanette J. Epps (Ph.D. '00) has been assigned to the Boeing Starliner-1 mission, the first operational crewed flight of the Boeing CST-100 Starliner spacecraft. Epps will join NASA astronauts Sunita Williams and Josh Cassada for a six-month expedition to the International Space Station (ISS), with the launch planned for 2022. In doing so, Epps will make history as the first Black woman astronaut on an ISS crew.

While on board the ISS, Epps will be responsible for supporting both research activities during the mission and onboard maintenance for the nearly twenty-year-old station. In addition, crew members serve as experiments themselves, with data regularly collected on them to provide insights into the effects of space on the human body.

Since earning her doctorate, Epps has returned to the UMD campus as a guest speaker on multiple occasions. In 2012, she was inducted into the aerospace engineering department's Academy of Distinguished Alumni, which recognizes alumni who have made notable contributions to the field of aerospace engineering and/or achieved other significant accomplishments. The following year, she delivered the Clark School's Winter Commencement address.

JONES ELECTED TO NATIONAL ACADEMY OF ENGINEERING (NAE)

Engineer, flight technology expert, Air Force veteran, and business executive Christopher T. Jones (Ph.D. '97) has received one of the most prestigious professional distinctions available to engineers—membership in the National Academy of Engineers (NAE). In electing him to its Class of 2021, the NAE cited Jones's "leadership of defense logistics, sustainment, training, and system readiness in support of U.S. national security."

While at UMD, Jones was advised by Professor Roberto Celi, an expert in helicopter dynamics and control and optimization methods. Jones continues to be an active supporter of both school activities and students, contributing his time and resources to further opportunities and programs, especially for underrepresented students of color. He was inducted into the Department of Aerospace Engineering's Academy of Distinguished Alumni in 2016 and serves on the Clark School's Board of Visitors.

Jones is one of two A. James Clark School alumni selected to the NAE this year; the other is Rajiv Laroia, who earned his master's and doctoral degrees in electrical engineering from UMD.

CUEVA, GUPTA, LIDARD AMONG AVIATION WEEK NETWORK'S 20 TWENTIES

Three aerospace engineering alumni are among this year's Aviation Week Networks 20 Twenties awardees. Established by the Aviation Week Network in 2013, the 20 Twenties program recognizes talented individuals who are on course to change the face of the aerospace and defense industry.

Rachel Cueva ('21) is an incoming Aerospace Engineering Sciences doctoral student at the University of Colorado Boulder, where she will be joining the Orbital Research Cluster for Celestial Applications (ORCCA) lab within the Astrodynamics & Satellite Navigation Systems focus area. Niloy Gupta ('21) will be pursuing his Ph.D. in hypersonic aerodynamics this fall at the University of Michigan after graduating this spring with bachelor's degrees in both aerospace engineering and mathematics. Justin Lidard ('20) is currently pursuing his aerospace engineering studies as a Ph.D. student at Princeton University.

Ramasany Wins Alfred Gessow Award

Department of Aerospace Engineering alumnus Dr. Manikandan Ramasamy (Ph.D. '04) received the Vertical Flight Society's (VFS) prestigious Alfred Gessow Award for the best technical paper at this year's 77th Annual Forum and Technology Display.

Ramasamy's paper "Does Scatter Matter? Improved Understanding of UH-60A Wind Tunnel Rotor Measurements Using Data-Driven Clustering and CREATE™-AV Helios," addressed the creation of a data-driven clustering algorithm based on proper orthogonal decomposition was applied to assess the scatter found in the UH-60A wind tunnel airloads measurements, and was written with colleagues Rohit Jain of the U.S. Army Combat Capability Development Command (DEVCOM), Aviation & Missile Center (AvMC) and Mr. Thomas R. Norman, NASA Ames Research Center.

AEROSPACE ENGINEERING BOARD OF VISITORS

Mr. Kenneth Baird
Dr. Supriya Banerjee
Dr. Peter Chen
Mr. Steven Donaldson
Mr. Marcio Duffles
Dr. Matthew Hutchison
Mr. Daniel Newman
Mr. Thomas Ng
Mrs. Tanya Pemberton
Dr. Michael Ryschkewitsch
Mr. Daniel Scott
Dr. Allan Sherman
Mrs. Mary Snitch
Mr. Chris Van Buiten

DORIAN DEMAIO: A LIFETIME OF AEROSPACE ENGINEERING AND EXPLORATION

COMING OF AGE DURING NASA'S SPACE RACE TO THE MOON, NEW JERSEY NATIVE AND AEROSPACE ENGINEERING ALUMNUS DORIAN DEMAIO ('68) GREW UP FASCINATED BY ANYTHING THAT FLEW.

After his father's career moved their family to the Wheaton/Rockville, Md. area, and DeMaio learned about the aerospace programs at Maryland, "there was absolutely no question about what I was going to pursue," he said, adding that "the pace of aerospace engineering at the time was amazing."

His education at Maryland would be heavily informed by the design courses taught by author and professor Dr. Gerald Corning. "His design classes were very interactive and iterative, and the coursework I found most useful, because it involved looking at systems of systems, complex interfaces, and the architecture of a problem, from both top down and bottom up."

DeMaio would go on to apply that knowledge in later careers in space surveillance programs and a then new technology now known commonly as GPS (Global Positioning System).

Before that later work, DeMaio would complete two master's degrees in aeronautics and astronautics at MIT ('71), and serve four years in the U.S. Air Force at the Air Force Space Division in Los Angeles. His work on the evaluation of technologies for advanced space and strategic programs would earn him a U.S. Patent and the Air Force Commendation Medal.

That work would pay forward into his career at the Science Applications International Corporation (SAIC), where he would work 28 years in numerous technical, project management, and operations positions in support of space and defense programs.

As one of the engineers at the forefront of the creation of the GPS infrastructure we now have today, DeMaio played key roles in supporting the U.S. Air Force. An early study of his pointed to shortcomings in the initial satellite orbits and led to a radically different GPS constellation now employed today. Later, the Air Force turned to him for an independent and comprehensive evaluation of GPS, resulting in the Air Force's commitment to fully develop and deploy GPS.

"I've always tried to look at problems in a different way, from a different perspective leading to improved designs," said DeMaio. Out of that mindset, another success in DeMaio's career was designing new, cost-effective upgrades to space-based missile warning systems, pioneering the widespread use of low-cost sensors deployed on numerous space platforms.

SAIC afforded him an opportunity to found a new research and engineering organization, which grew tenfold at four nationwide offices. "Sustaining our growth and meeting numerous and diverse customers' needs while maintaining profitability was most challenging and rewarding," he added.

After retiring as Group President from SAIC, DeMaio continued to pursue his aerospace engineering enthusiasm from a different angle—the cockpit of his Cirrus SR-22.

Since earning his civilian pilot's license, DeMaio has used flying as a hobby to decompress and explore. In retirement, he's taken to the sky to explore the western United States, tracing paths of historical significance like the Oregon Trail, the Lewis and Clark Expedition, and other events and places that pique his interest.

DEMAIO SCHOLARSHIP IN AEROSPACE ENGINEERING

To recognize the many benefits DeMaio acknowledges from his Maryland education—and the inspiring instructors whose focus on academic studies, experiment, and design projects provided an excellent foundation for his future work—he established the DeMaio Scholarship in Aerospace Engineering.

"Maintaining our leadership in aerospace and space technology is important to me and I hope there are many future ambitious engineering projects to inspire later generations." said DeMaio, who wants to motivate UMD students to become global leaders in the field. "I also wanted to find a way to honor all of the professors who were very impactful on me while I was at school."

INTERESTED IN MAKING A GIFT?

Visit aero.umd.edu/give or contact Almarie Wood at aiwood@umd.edu

A. James Clark
School of Engineering

Department of Aerospace Engineering
3179 Glenn L. Martin Hall
4298 Campus Drive
University of Maryland
College Park, MD 20742

DELIVERING WINNING DESIGNS

UMD TEAMS SWEEP 2021 VFS STUDENT DESIGN COMPETITION

University of Maryland aerospace engineering students once again took top spots for both the graduate and undergraduate categories in the Vertical Flight Society's (VFS) Student Design Competition.

This year's challenge—"2025 Unmanned Vertical Lift for Medical Equipment Distribution"—required students to design an unmanned vertical lift concept for medical and emergency supply distribution that could deliver, at high speed, up to 50 kg (110 lb) payloads to end-user customer sites up to a 50 km (31 mile) radius, and to logistics centers up to 200 km (124 miles) away.

This year marks the fourth sweep for UMD teams at this competition and the 20th win in the graduate category.

Learn more at go.umd.edu/2021-VFS

GET SOCIAL!

aero.umd.edu
@UMDAero
youtube.com/UMDAerospace
facebook.com/umdaero
@UMDAerospace