Fall 2013

AEROCONTACT

AEROSPACE ENGINEERING
A. JAMES CLARK SCHOOL *of* ENGINEERING
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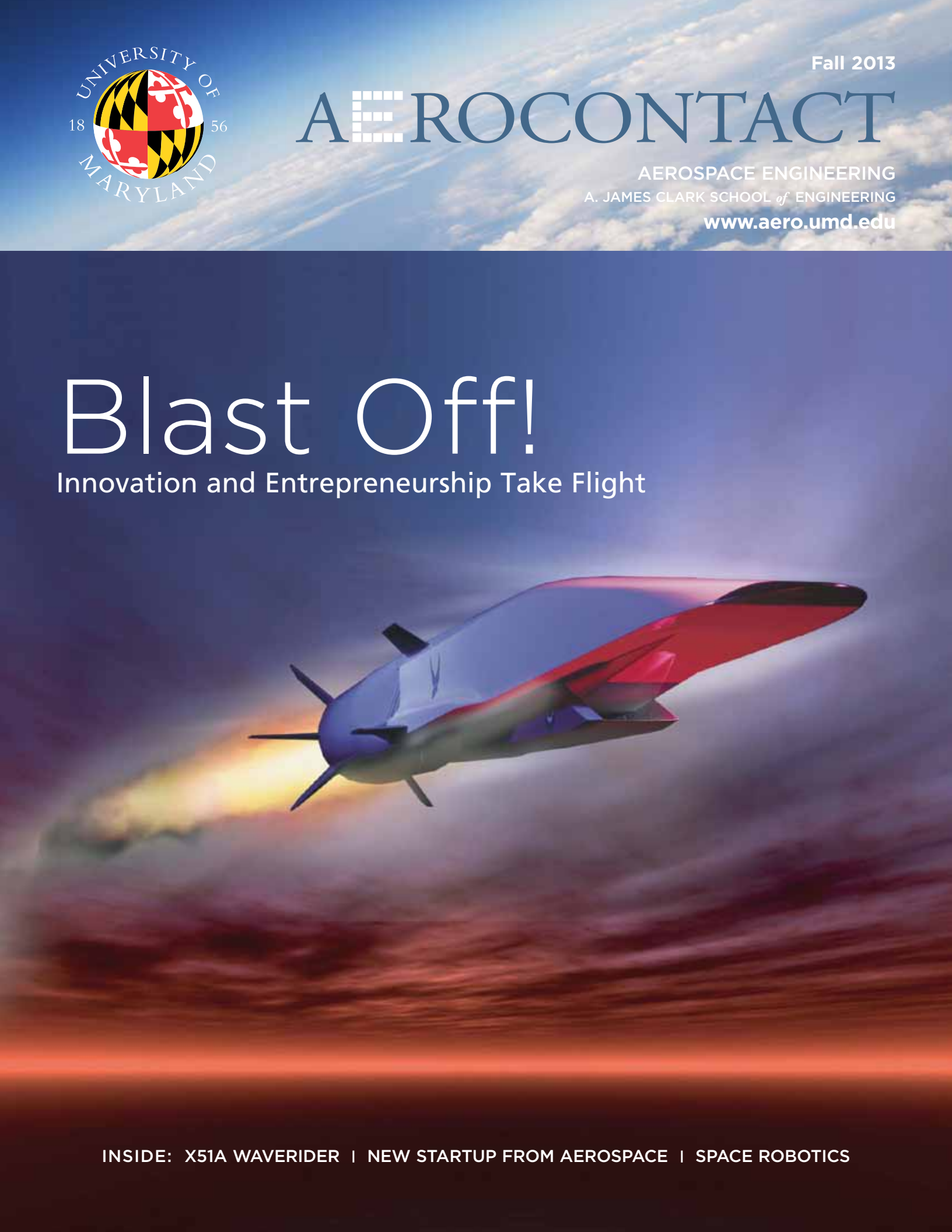
Blast Off!

Innovation and Entrepreneurship Take Flight



INSIDE: X51A WAVERIDER | NEW STARTUP FROM AEROSPACE | SPACE ROBOTICS

Chairman's Corner

NORMAN WERELEY

Academic research at the University of Maryland (UMD) is fast-paced, innovative, and focuses on new and original ideas and challenges. However, the expected role of a university laboratory, which has been historically viewed as solely a creator of new knowledge or methodologies, is now encompassing technology demonstration, technology transfer and technology commercialization.

This issue of *AeroContact* focuses on some of the outstanding examples of how our faculty, students and alumni have catalyzed and realized milestones in innovation and entrepreneurship. Although the archival journal paper still remains the focus of faculty productivity, shepherding new technology into demonstrations and commercial products is becoming a key feature of an academic researcher's portfolio.

The Boeing X-51A Waverider flight test demonstrates how government, industry and academia can work together to achieve truly amazing results. The best part of the X-51A story is how UMD faculty and alumni played key leadership roles in this successful flight test. Tauros Engineering is a faculty start-up led by Professor Alison Flatau, and it is a direct descendant of research funding from the Office of Naval Research. Tauros Engineering seeks to commercialize GalFeNOL whisker sensors that can be used to improve the detection of scouring in bridge columns built under flowing water. This issue of *AeroContact* highlights the key role academic research can play in innovation and entrepreneurship and how these activities can benefit and better society.

The Department. of Aerospace Engineering continues to grow and prosper, and I am pleased to welcome two new professors to our ranks this fall.

Dr. Elaine Oran joined the Department of Aerospace Engineering as a Glenn L. Martin Institute Professor of Engineering. Dr. Oran worked at the U.S. Naval Research Laboratory for over three decades, culminating in her leadership role as Senior Scientist for Reactive Flow Physics. Dr. Oran is an Honorary Fellow of AIAA and a member of the National Academy of Engineering. Dr. Oran's research focuses on chemically reactive flows, turbulence, shocks and shock interactions, rarefied gases, and microfluidics, with applications to combustion, propulsion, and astrophysical explosions. Dr. Oran holds a Ph.D. in Engineering and Applied Science from Yale University.

Dr. Stuart Laurence joined the department as an Assistant Professor. Since 2009, Dr. Laurence has worked at the German Aerospace Center in Goettingen's Institute of Aerodynamics and Flow Technology. His research focuses on hypersonic aerodynamics and aerothermodynamics, supersonic combustion and propulsion, boundary-layer transition, naturally occurring hypersonic flows, and experimental techniques. Dr. Laurence holds a Ph.D. (2006) in Aeronautics from CalTech and a B.S. (2001) in Applied Mathematics, Physics, and Philosophy from the University of Auckland in New Zealand

Please welcome Drs. Oran and Laurence to the Aerospace Engineering family, and watch for new faculty profiles in our next issue of *AeroContact*.

Please enjoy 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
Department of Aerospace Engineering
wereley@umd.edu

Congratulations to our 2013 Graduates!

Visitors on a tour of the Glenn L. Martin Wind Tunnel view the tunnel's propeller.

A NEWSLETTER FOR ALUMNI AND FRIENDS OF THE DEPARTMENT OF AEROSPACE ENGINEERING AT THE A. JAMES CLARK SCHOOL OF ENGINEERING, UNIVERSITY OF MARYLAND, COLLEGE PARK

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

Your alumni news and comments are welcome. Please send them to:
Tom Hurst
Department of Aerospace Engineering
3181 Martin Hall
College Park, MD, 20742
thurst@umd.edu
Visit our web site at:
www.aero.umd.edu

Chair: Norman Wereley
Editor: Nancy Grund
Graphic Designer: Jason Quick

FALL 2013
ON THE COVER
The X-51A Waverider

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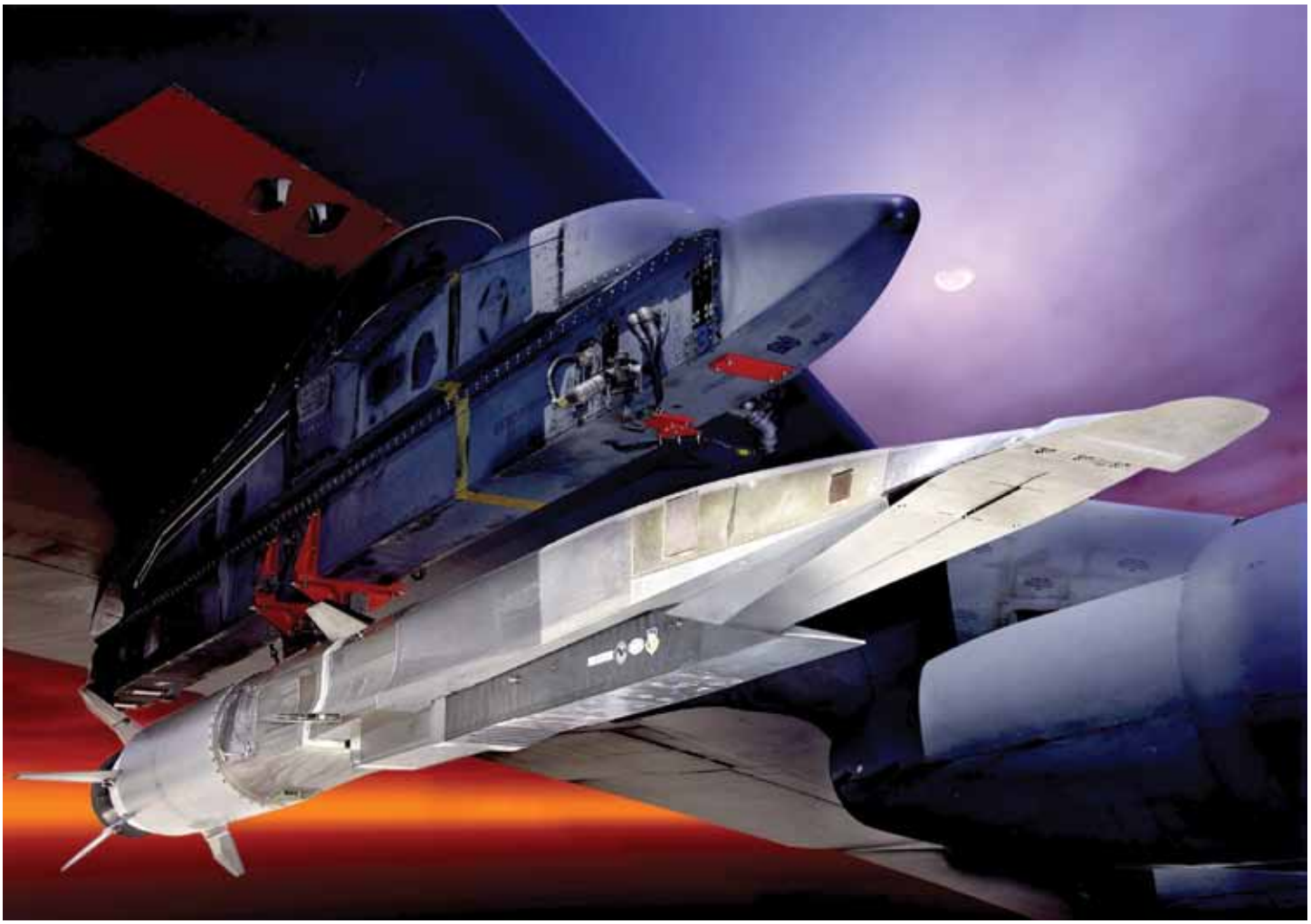


X-51A Waverider Achieves Hypersonic Breakthrough

On May 1, 2013, the final flight of the X-51A Waverider test program achieved a breakthrough by achieving sustained, hypersonic flight using air-breathing, high-speed scramjet propulsion. The fourth and final test vehicle launched during the program reached a speed of Mach 5.1, traveling more than 230 nautical miles in just over six minutes.

University of Maryland Department of Aerospace Engineering Professor Mark J. Lewis and Charles Brink, B.S. '84, and Kevin G. Bowcutt B.S. '82; M.S., '84; Ph.D. '86, have been principal contributors in the X-51A's 10-year program.

Lewis, who also directs the Institute for Defense Analysis' (IDA) Science and Technology Policy Institute, has been a key leader on the program, serving as the chief scientist of the U.S. Air Force (USAF) for the X-51A program from 2004 until 2008.

During that time, Lewis expanded research support and focused efforts on high-speed flight, sustainment, launch vehicle technologies and operational space. His four-year tenure with the USAF makes him the longest-serving chief scientist in its history.

Brink and Bowcutt, both Department of Aerospace Engineering Academy of Distinguished Alumni inductees, have been involved with the X-51A project since its inception.

Brink serves as the X-51A's program manager for the Air Force Research Laboratory Aerospace Systems Directorate. He has been leading the $300 million effort through Preliminary and Critical Design Reviews and has coordinated the efforts of the Boeing/Pratt & Whitney Rocketdyne X-51 Consortium with the Air Force Flight Test Center, Naval Air Warfare Center and NASA for all test flights.

In the May 3, 2013, issue of *Air Force Print News Today*, Brink stated the project, "was a full mission success" and that the "X-51A Waverider will serve as a bedrock for future hypersonic research and ultimately the practical application of hypersonic flight."

Bowcutt, a Boeing Senior Technical Fellow and chief scientist of hypersonics for The Boeing Company, has served as a primary designer for the X-51A program. He is a recognized expert in hypersonic aerodynamics, propulsion integration, and vehicle design and optimization.

Due to challenges of heat and pressure at Mach 5, conventional turbine engines are impractical at hypersonic speeds. The X-51A uses a supersonic combustion ramjet, or scramjet, engine that is unique in its use of hydrocarbon fuel. Using no moving parts, the Waverider injects hydrocarbon fuel into the combustion chamber where it mixes with oxygen pulled from the atmosphere to create combustion, not unlike trying to light a match in a hurricane. The X-51A was dubbed Waverider because it was designed to ride its own shockwave.

The X-51A program started in 2004 as a collaborative effort of the Air Force Research Laboratory and the Defense Advanced Research Projects Agency (DARPA) with industry partners. The Boeing Company and Pratt & Whitney Rocketdyne. The program set out to prove the viability of air-breathing, high-speed scramjet propulsion for hypersonic flight and provides foundational knowledge that could be used for advancing technologies for future access to space and long-range weapons.

Above: X-51A's fourth flight on the wing of the B-52. Below: Launch sequence of the X-51A; release from B-52, boost, separation and scramjet ignition.

While the program does not currently have a successor, in a statement made on May 3, 2013, in an American Institute of Aeronautics and Astronautics press release, Lewis said, "The X-51 program has advanced our knowledge and understanding of nearly every aspect of high-Mach vehicles, from fundamental understanding of materials, aerodynamics and combustion, to the practical aspects of vehicle design, and has been a marvel of interagency-industry cooperation. Hopefully our nation will have the wisdom to build on this aviation milestone and continue the quest for operational hypersonic flight."

Tauros Engineering Team Creates Revolutionary Bridge Scour Technology

Innovative Design Sparks Major Commercial Potential

University of Maryland's Tauros Engineering was formed in early 2013 to commercialize bridge scour sensing technology developed by University of Maryland Associate Dean of Research and Aerospace Engineering Professor Alison Flatau in partnership with Michigan Technological University Professor Andrew Swartz.

Scour is the erosion of earth, rocks and sediment, typically due to swiftly moving water, around the structure of a bridge that compromises its integrity. With 57 percent of bridge failures attributed to hydraulic forces, scour is a leading cause of failure. The poor state of U.S. infrastructure has received national attention, and since 25 percent of bridges in this country are either structurally deficient or functionally obsolete, the need to monitor for potentially damaging conditions is critical. Most of the 610,000 bridges in the U.S. are at risk of scour, and 23,000 bridges are currently listed as "scour critical." This means that in any given year, scour will occur and repairs will need to be made. In some cases, bridges will need to be completely replaced.

Detecting scour is one of the most challenging bridge monitoring tasks since the environment underneath a bridge is often difficult to access and assess. Many bridges require constant and extremely costly repairs because scour is often not detected early enough. Tauros Engineering's technology is a sensor designed specifically for early detection of the onset of scour. Very few monitoring options are currently available and Tauros' scour sensing technology presents a one-of-a-kind solution that provides robust, accurate and continuous 24/7 monitoring.

This new sensor technology relies on biologically inspired magnetostrictive 'whisker' sensors that are attached to a post and can detect changing flows. When the post is buried in the soil under a target bridge, the whiskers can detect when water flows past them and scour may be occurring. The scour detection sensors then trigger an alert to bridge owners that makes them aware of the potential hazard.

Since bridge scour is a major issue affecting most U.S. bridges, this sensing technology has tremendous commercial potential. The primary markets for this technology include state departments of transportation that oversee bridge infrastructure.

This year, Tauros Engineering will be implementing a prototype at four sites in Maryland. Two sites in Michigan are slated for next year, and Iowa's Department of Transportation has also expressed an interest in implementing a prototype. In addition to identifying business opportunities, Tauros Engineering is also developing installation protocols and evaluating the operational practicalities of commercializing the technology.

The Tauros Team assists UMD graduate students in testing a bridge near Annapolis, MD. Pictured in foreground (left to right): Tyler Flatau (B.S., '15), Adrian Ross (Harvard M.B.A, '14) Pictured in background (left to right): Aerospace Engineering Graduate Student Steven Day (in water); visiting scholar Koji Vanage and graduate student Vera Klimchenko, B.S. '13, aersopace engineering.

The Tauros team includes:

- Alison Flatau, CTO and University of Maryland Associate Dean of Research and Aerospace Engineering Professor
- Adrian Ross, CEO and MBA candidate at Harvard Business School
- Tyler Flatau, VP of Operations and University of Maryland undergraduate student

Tauros Engineering Team Gains Recognition

Alison Flatau

Tauros Engineering was selected as a winner in Harvard Business School's 17th Annual New Venture Competition (NVC). The Tauros team includes Alison Flatau, professor of aerospace engineering and associate dean for research at the Clark School; Tyler Flatau, B.S. '15, Letters and Sciences; and Harvard Business School M.B.A. candidate Adrian Ross.

The NVC recognizes innovations for business and society and awards top finalists in two tracks: business and social enterprise. Tauros won not only the $50,000 first prize in the student business track, but also received the $2,000 crowd favorite award.

Co-funded by the Maryland Industrial Partnership (MIPS) program, Tauros focuses on developing better technology for the detection and monitoring of bridge scour caused by hydraulic forces, erosion and deposition processes. The team already has identified customer demand for their product.

Winners were announced April 30 at the Grand Finale that took place in Harvard Business School's Burden Auditorium, which was attended by judges, investors, entrepreneurs and prominent alumni. For more information, visit: www.hbs.edu/entrepreneurship/new-venture-competition/overview.html.

Other awards and recognition include:

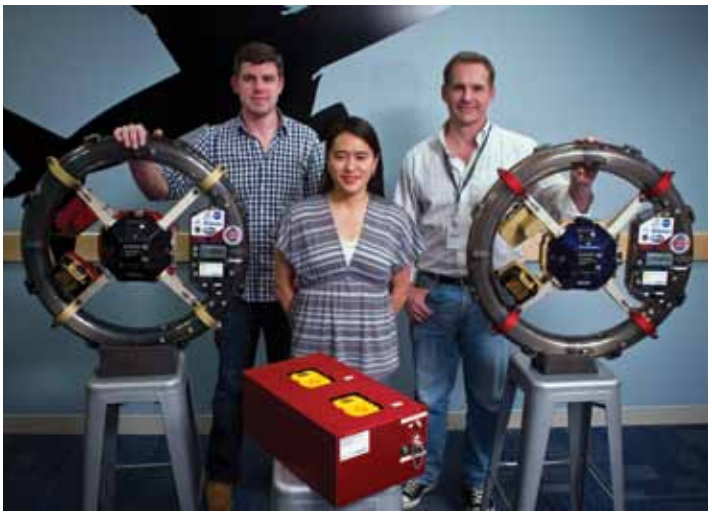
- Finalist in the MassChallenge program and participating in the accelerator
- Finalist in the UM business model challenge
- Partnering with UM on MIPS, MII, and NSF I-Corps awards

Sedwick Leads Flight Experiment to International Space Station

Since spring 2011, the Space Power and Propulsion Lab (SPPL), under the direction of Professor Raymond Sedwick, has been leading the development of a flight experiment that was launched to the International Space Station (ISS) in late summer 2013. The flight program, known as "RINGS: The Resonant Inductive Near-field Generation System," is a joint DARPA/NASA (Defense Advanced Research Projects Agency/National Aeronautics and Space Administration) -funded program to demonstrate and mature two technologies that could help future space missions employ formations of multiple spacecraft. The RINGS project is a collaborative effort between the university, Aurora Flight Sciences (AFS), and the Massachusetts Institute of Technology (MIT).

Electromagnetic formation flight (EMFF) is a propellantless propulsion technology that uses locally generated magnetic fields to generate forces and torques between vehicles. When coupled with reaction wheels or control moment gyros, EMFF can offer full controllability of the relative degrees of freedom within a spacecraft cluster without expending any propellant. Removing reliance on propellant as a life-limiting resource would allow operation for a much longer period of time and could potentially increase the science return of the project.

The second technology demonstrated is a form of wireless power transfer referred to as resonant inductive coupling (RIC). This approach, first demonstrated by Nikola Tesla at the turn of the 20th century, is a non-radiative and largely non-directional power transfer approach that could power a fleet of small spacecraft using power transferred from one or more larger "powersats." This technology is also being developed for use in recharging personal electronics. One of the goals of the RINGS program is to demonstrate that RIC and EMFF can be employed using a single, compact hardware set.



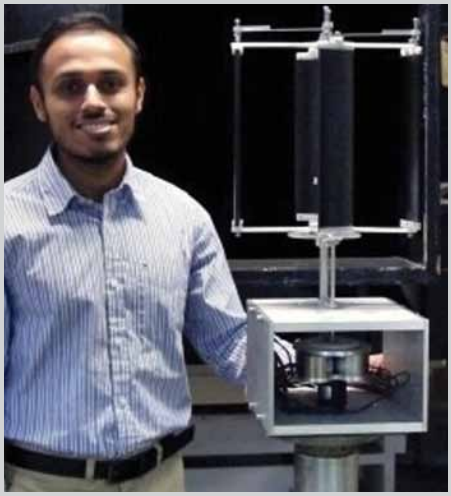
The RINGS flight hardware is pictured during final checkout at AFS with Professor Raymond Sedwick (right) and Graduate Researchers Dustin Alinger (left) and Allison Porter (center). Each flight unit is mounted to a SPHERES vehicle that is located at the center of the assembly. The dual battery charger is shown in the foreground. A duplicate set of RINGS/SPHERES hardware is undergoing microgravity testing through NASA's Reduced Gravity Aircraft program.

RINGS will be flown internally onboard the ISS as a payload on the SPHERES formation flight facility. SPHERES was jointly developed by MIT and AFS as a platform to mature formation flight technologies in a representative micro-gravity environment while offering hands-on accessibility available within a laboratory. For more information on SPPL ongoing projects, visit www.sppl.umd.edu.

Moble Benedict Wins *Innovate the Future* Challenge

Aerospace Engineering Assistant Research Scientist Moble Benedict captured the grand prize in the Lockheed Martin 2012 Innovate the Future Challenge for his novel wind turbine idea. Benedict's winning entry, "Revolutionary Vertical Axis Micro Wind Turbine with Dynamic Blade Pitching for Urban Environments," details an efficient small-scale (diameter and height of two meters and one- to two-kilowatt range), stand-alone, compact, variable-pitch, vertical axis cycloidal wind turbine design. Key advantages that Benedict demonstrated include an ability to self start at speeds as low as 3.3 miles per hour (1.5 meters per second), an ability to capture energy regardless of fluctuations in wind direction, and high efficiency even at low tip speed (ratio of tip speed to wind speed).

The wind turbine design is the result of eight years of intensive research in cycloidal-rotor design, development and testing led by Benedict in the Alfred Gessow Rotorcraft Center. His extensive research program of wind tunnel testing and simulations via computational fluid dynamics clearly shows the potential of this cycloidal wind turbine to maximize energy capture at low-wind speeds. The concept could be applied to small rooftop farms of micro wind turbines that provide efficient wind power generation in urban environments, where energy needs are very high and wind conditions are extremely unpredictable.



Moble Benedict is pictured with his clean-energy wind turbine.

The Innovate the Future Challenge, held by Lockheed Martin as part of its centennial celebration, encourages and nurtures innovative global technologies that can lead to a secure future for the planet. Ray Johnson, chief technology officer for Lockheed Martin, noted, "ideas may help solve important global challenges, encourage the next generation of researchers and make our communities better places to live and work."

Benedict received a $25,000 cash prize, as well as technology incubation services provided by the Maryland Technology Enterprise Institute (Mtech). His entry was one of 15 finalists selected from more than 500 entries submitted to Lockheed Martin. Finalists presented their concepts to an executive review board, which selected the winner based on potential impact of the innovation, its creativity and the quality of the presentation.

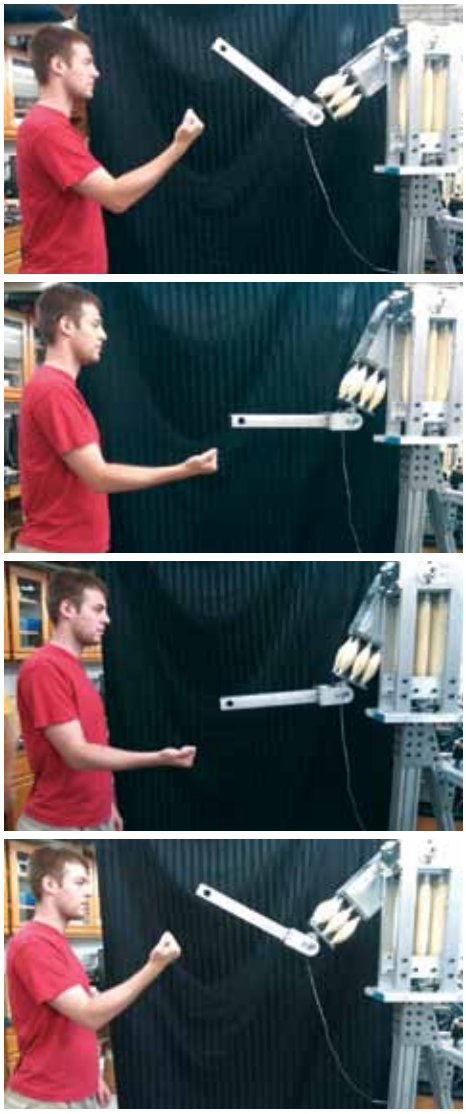
Research Team Designs Bio-Inspired Robots with Soft Artificial Muscles

Department of Aerospace Engineering researchers are investigating innovative ways to make robots safe around humans using biologically-inspired muscle technology. They are using pneumatic artificial muscle (PAM) actuators to produce smooth, naturally compliant motions that mimic human muscle movement.

The university's PAM Robotics team includes aerospace engineering students Ryan Robinson, Robert Vocke III, Thomas Pillsbury and faculty advisor, Department Chair Norman Wereley. Their robotic manipulators will push the limits of muscle output with new patented muscle technology, an innovative mechanical design and specialized control strategies. The program is sponsored by the U.S. Army Telemedicine and Advanced Technology Reasearch Center (TATRC) through Phase I and II Small Business Innovation Research (SBIR) grants, which were awarded to UMD in collaboration with Techno-Sciences, Inc. The group's research is intended to produce robotic manipulators strong enough to lift and carry a human while remaining as light, portable and efficient as possible. Such systems are envisioned for casualty extraction on battlefields or patient lifting in hospitals.

A PAM-based arm that can lift hundreds of pounds smoothly, accurately and consistently had not been previously attempted. Several obstacles reported in literature had to be overcome, including poor PAM durability, relatively low force output and the inherent nonlinearities present in every aspect of the system: pneumatic valves, PAMs and arm linkages.

Robinson demonstrates how the control system uses video imaging to enable the robotic manipulator to mimic the arm pose of the human operator. This approach can be used to remotely operate the robot while it is in a hazardous environment.



After several generations of design and experimental testing, PAMs designed by the team produced five to 10,000 pounds of initial force per pound of actuator weight while using pressures that are nearly 10 times lower than hydraulics. Experimental fatigue testing past 200 million cycles has demonstrated the durability and reliability of these muscles.

The team employed genetic algorithms to design muscle group and joint combinations that produced the highest possible torque over the entire range of motion. This optimization procedure was incredibly effective: The latest robotic arm can perform shoulder raises with 225 pounds attached to its hand.

These manipulators have also demonstrated smooth, quick, accurate motion, even when moving multiple joints simultaneously. The best results were achieved using a combination of fuzzy logic and model-based control. The arms can perform many impressive feats, including drawing shapes.

Future work will focus on modeling and advanced algorithms to provide greater control and combine an arm with a visual system to demonstrate hand-eye coordination. The team is also working on miniature PAM actuators for a robotic hand.

Robinson Wins Student Hardware Competition

Ryan Robinson

Ryan Robinson captured first place in the Society of Satellite Professionals International (SSPI) 2013 Mid-Atlantic Regional Chapter Student Competition for his work on employing PAMs in space systems. He was also the winner of the Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS) Best Student Hardware Competition, which included a live demonstration of a robotic arm at the 2012 ASME SMASIS Conference in Atlanta, Georgia. Robinson is an L-3 Graduate Fellow, and his faculty advisor is Department Chair Norman Wereley. His research goal is to design PAM-based manipulators for a battlefield casualty extraction robot.

The UMD Smart Structures Lab researches robotic manipulation with pneumatic artificial muscles (PAM), extremely lightweight actuators that provide high power-to-weight ratios, but are naturally compliant. This combination enables robots that can perform heavy-lifting operations more safely around humans.

Scholarships and Awards

Singh Wins Wylie Dissertation Fellowship

Harinder Singh

Ph.D. Student Harinder Singh is a 2013-2014 recipient of the Ann G. Wylie Dissertation Fellowship, a one-semester award to support outstanding doctoral students who are in the final stages of writing their dissertations. The fellowships include a $10,000 stipend, tuition remission and an $800 contribution to health insurance.

Singh's research focuses on the theoretical and experimental analysis of an adaptive crash protection seat suspension for helicopters. He is working on a project supported by the U.S. Naval Air Warfare Center at Patuxent River, Md. The goal of the research is to minimize the potential for injury, a key issue in designing helicopter seat suspension. Hard or crash landings can cause intense helicopter ground impacts that transmit lumbar loads to the seated occupants and can cause spinal and pelvic injuries. New designs must maintain a high level of protection for both male and female pilots in different crash- or hard-landing conditions.

Singh, a native of Mohali, Punjab, India, began his studies at the Clark School in fall 2008. He earned his M.S. in aerospace engineering in 2011 and has continued to work closely with his advisor Department Chair Norman Wereley.

David Mayo Wins L-3 Fellowship

David Mayo

Ph.D. student David Mayo has been selected to receive an L-3 Graduate Fellowship for the 2012-2013 academic year. David is working under Professor Inderjit Chopra to complete research on the aerodynamics of bio-inspired flight. The goal of his research is to carry out systematic parametric studies to come up with an optimized geometry and kinematics for efficient hover and forward flight performance of flapping-wing MAVs.

Knittel and DeVries Join 2013 Future Faculty Inductees

Jeremy Knittel and Levi DeVries were selected for the 2013 Future Faculty Fellows Program in the A. James Clark School of Engineering. The program, which includes a travel stipend for faculty to present their research at professional conferences, is designed to:

- Increase the number of highly qualified teachers the Clark School produces for the world's engineering schools.
- Prepare selected Clark School doctoral students to achieve career-long success in the academic world as teachers and researchers.
- Facilitate placement of selected students in leading institutions where their impact can be greatest and where they can continue to partner with the Clark School.

Knittel's research focuses on hypersonics under the direction of Professor Mark Lewis and Professor Kenneth Yu. His research, funded by a NASA Space Technology Research Fellowship, is in the area of vehicle and trajectory design for aero-assisted spacecraft missions.

DeVries is currently in the fourth year of his Ph.D. program and has worked with Professor Derek Paley in the Clark School's Collective Dynamics and Control Lab since beginning his studies at UMD in 2009. His research interests are in collective dynamics, nonlinear control, nonlinear estimation and adaptive sampling.

Benjamin Berry Awarded Sikorsky Aircraft Fellowship

Benjamin Berry

Benjamin Berry, B.S. '04, aerospace engineering, received a 2012-2013 Sikorsky Aircraft Fellowship. Berry, who completed his M.S. in aerospace engineering at Georgia Tech in 2006, worked at Groen Brothers Aviation in Salt Lake City on the DARPA Heliplane program. He returned to the Clark School in 2008 to pursue his Ph.D. and is currently conducting research related to slow-rotor, high-advance ratio aeromechanics. Berry is a member of the record-setting Team Gamera, the American Institute of Aeronautics and Astronautics, American Helicopter Society, the SAMPE and Engineers without Borders.

DeLaHunt Wins WAI's Delta Air Lines Engineering Scholarship

Sylvie DeLaHunt

Sylvie DeLaHunt, B.S. '14, aerospace engineering is the Women in Aviation International (WAI) 2013 recipient of the $5,000 Delta Air Lines Engineering Scholarship. The award includes a trip to the 24th Annual International Women in Aviation Conference. DeLaHunt was selected for the award based on excellent academic, cocurricular and personal achievements.

Schlueter Receives NDSEG Fellowship

Kristy Schlueter

Aerospace Engineering Graduate Student Kristy Schlueter has been awarded a prestigious National Defense Science and Engineering Graduate (NDSEG) Fellowship to support three years of master's and doctoral research. M.S. Student Gino Perotta received an honorable mention. The highly competitive fellowship provides full tuition, all mandatory fees, a monthly stipend and up to $1,000 a year in medical insurance. Recipients can use the funding from the fellowship to attend any U.S. institution that offers the supported disciplines.

After graduating in 2008 from the University of Notre Dame with a B.S. degree in aerospace engineering, Schlueter worked for The Boeing Company as a structural engineer for two years. At Boeing, she redesigned the structural components of the Chinook helicopter for international and domestic governmental customers. She used both numerical simulations and experiments to investigate the effect of wall boundaries on the flow field of rotating wings in research with Professor Anya Jones. Schlueter spent part of summer 2012 performing flapping wing experiments in a water tunnel at the U.S. Air Force Research Laboratory at Wright-Patterson Air Force Base near Dayton, Ohio.

Continued on next page

From left: Liz Miles, Johnathan Pino, Daniel Sullivan, Teddy Levine, Sarvesh Sethi, Michael Hamilton, Kip Hart, Matthew Marcus. Not pictured: Sylvie DeLaHunt.

Celebrating Honors and Awards Winners

The 2013 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 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:

- **LAURA "LIZ" MILES** (Elaine Gessow Award)
- **JOHNATHAN PINO** (Alfred Gessow Award)

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:

- **DANIEL SULLIVAN** (Rivello Scholarship)
- **EDWARD "TEDDY" LEVINE** (Guthrie Scholarship)
- **SARVESH SETHI** (Guthrie Scholarship)

THE AMERICAN INSTITUTE OF 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:

- **MICHAEL HAMILTON**

THE SIGMA GAMMA TAU (SGT) OUTSTANDING ACHIEVEMENT AWARDS are presented to those students who made the most outstanding contributions through scholarship and service to the student chapter and the department:

- **KENNETH HART**
- **MATTHEW MARCUS**

THE A. JAMES CLARK SCHOOL OF ENGINEERING INTERNATIONAL STUDENT AWARD is presented to a student who through leadership or service has promoted the international engineering experience on behalf of the Clark School and has demonstrated significant involvement in international engineering initiatives:

- **SYLVIE DELAHUNT**

Jarred Young Awarded Sloan Foundation Scholarship

Jarred Young

Jarred Young, B.S. '09, aerospace engineering and a current master's and Ph.D student, has been awarded an Alfred P. Sloan Foundation Scholarship, which is managed by the National Action Council for Minority Engineers (NACME) to support underrepresented early Ph.D. students in engineering, natural science and mathematics.

Young is currently working with Professor Raymond Sedwick in the Space Power and Propulsion Lab. His research interests include space propulsion systems, electrostatic thruster technology and plasma-material interactions. Young is currently working on a research project in the area of plasma-material interactions titled, "High Energy Plume Impingement on Spacecraft Systems." The research involves using a specially-designed miniature ion engine that will create an ion plume that could be found in a formation flight environment. A variety of specimens will be immersed in this plume to study the possible damage on typical spacecraft material and components, such as kapton or solar cell cover glass.

Young also has worked on the Lunar Reconnaissance Orbiter (LRO) and Soil Moisture Active Passive (SMAP) projects as part of an internship with NASA Goddard Space Flight Center. As a NASA intern, he also worked on research on pilot reactions to different weather conditions using a low-fidelity flight simulator and eye-tracking system.

The Sloan Foundation Scholarship was established in 1995 and, has provided support to more than 900 minority Ph.D. students. UMD is one of 36 higher education institutions currently offering Sloan-sponsored scholarships.

Devries Receives Link Foundation Fellowship

Levi DeVries

Levi Devries has been awarded a Link Foundation Ocean Engineering and Instrumentation Fellowship for the 2013–2014 academic year. His research involves integrating bio-inspired sensing modalities on unmanned underwater vehicles. His work is

based on the incredible sensing system of fish—called the lateral line—that allows them to sense local pressure gradients and flow velocity. Recent developments in materials science have produced sensors with the ability to emulate this sensing strategy. His research will assimilate these bio-inspired sensing modalities onto unmanned underwater vehicles to improve their guidance and navigation capabilities. Specifically, Devries will apply tools from nonlinear estimation and control to enable a vehicle to navigate the underwater environment while estimating the position and size of obstacles in its vicinity.

Devries completed his undergraduate studies at Concordia College in Minnesota in 2009, graduating with a double major in physics and mathematics.

Undergraduate Students Excel at AIAA YPSE Conference

In November 2012, the AIAA Region I Young Professionals Conference was held at the Applied Physics Lab at Johns Hopkins University. Eight of the 17 graduate students who presented and nine of the 25 undergraduates who presented were from UMD. Five awards were given in both the undergraduate and graduate areas, and UMD students captured six of the ten awards.

Aerospace engineering students in the undergraduate category took first and third place:

- **FIRST PLACE: CODY KARCHER**, Design and Manufacture of the Cockpit and Transmission for a Human-Powered Helicopter
- **THIRD PLACE: JOSE MONDRAGON**, The Implementation of Vortex Generators for Ground Vehicles

In the graduate student category, awards were presented to:

- **SECOND PLACE: JONATHAN GEERTS**, Effects of Mean and Fluctuating Pressure Gradients on Boundary Layer Turbulence
- **HONORABLE MENTION: JUSTIN BRANNAN**, Satellite Servicing: Modeling Flexible Satellite Dynamics
- **HONORABLE MENTION: ELENA SHRESTHA**, Design and Control of a Cycloidal-Rotor Aircraft

Undergrads Sweep 2013 AIAA Region I Student Conference

Undergraduates swept the technical paper category at the AIAA Region I Student Conference held at the Clark School of Engineering in early April. More than 55 graduate and undergraduate students from

Continued on next page

The Department of Aerospace Engineering Debuts the AEROS Program

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 summer 2013, the department honored seven scholars, four of whom were financially supported by sponsors. 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.

- **COLIN ADAMSON** was named the Alfred and Elaine Gessow Scholar. He worked with Inderjit Chopra evaluating the scalability of motor-actuated trailing edge flap systems.
- **JEREMY GARBER** was named a Sikorsky Scholar. He worked with Inderjit Chopra on the development of a vertical axis micro wind turbine.
- **ADAM KNOTT** was named an AERO Scholar. He worked with Christopher Cadou researching small gas turbine performance characterization and scaling.
- **EDWARD "TEDDY" LEVINE** was named a Sikorsky Scholar. He worked with Christopher Cadou on the development and application of an LED-based focused Schlieren system to supersonic shear layer growth rate measurements.
- **MICHAEL MADDEN** was named an AERO Scholar. He worked with Anya Jones on a fluid dynamics/sediment transport project to examine how different types of sediment behave in the wake of a turbine.
- **OLIVER ORTIZ** was named an AERO Scholar. He worked with Raymond Sedwick on a pneumatic walking rover.
- **RICHARD YOUNG** was named the John D. Anderson Scholar. He worked with Department Chair and Minta Martin Professor Norman Wereley researching the fabrication of artificial muscles for robotics.

The department would like to expand the AEROS program and offer more funding opportunities for motivated and innovative undergraduate students to engage in research at the university. If you are interested in donating to the AEROS program, please see the back page of the newsletter for details.


Colin Adamson


Jeremy Garber


Adam Knott


Teddy Levine


Michael Madden


Oliver Ortiz


Richard Young

UMD and other institutions, including Cornell University, Pennsylvania State University, Old Dominion University, Rutgers University, Daniel Webster College and University of Virginia, presented their research at the conference.

More than 27 undergraduate and graduate aerospace engineering students presented their research to a panel of judges from industry who selected the top three papers in three categories: Graduate, Undergraduate, and Team. The following UMD students received top honors:

Technical Paper – Graduate

FIRST PLACE: GANESH RAGHUNATH
Wireless Magneto-Elastic Torque Sensor System

Technical Paper – Undergraduate

FIRST PLACE: SCOTT WINGATE
Graphene-Silicon Composite Lithium Ion Batteries for Micro Air Vehicles

SECOND PLACE: JOSEPH TORE MULLINS
Design and Development of a Flying Cyclocopter

THIRD PLACE: JOSE MONDRAGON
Drag Reduction for Ground Vehicles Upon Vortex Generators Implementation

For a full list of winning entries, please visit the conference website at https://region-1ma.aiaastudentconference.org/

Knittel and Malhan Win Aerospace Graduate Research Awards


Jeremy Knittel


Ria Malhan

Ria Malhan, Ph.D. '13, and current M.S. student Jeremy Knittel, M.S., are winners of the Department's 2013 Graduate Research Competition.

Malhan completed her B.E. in aeronautical engineering from Punjab Engineering College in Chandigarh, India, in 2007. She joined the university as a graduate student with adviser Inderjit Chopra. After finishing her M.S. in 2009, she continued as a doctoral student and worked on bio-inspired flapping wings. Her research involved experiments and CFD-CSD analysis to understand the aerodynamics of flapping wings that could be applied to micro air vehicles (MAVs.) Malhan received the Kalpana Chawla Award in 2012 and the Amelia Earhart Fellowship in 2010 and 2011. She graduated in May 2013.

In her presentation, "Investigation of Aeroelasticity of Flexible Flapping Wings for MAV Applications," a coupled CFD-CSD solver was used to simulate the aerodynamics of a flexible flapping wing MAV. The CFD solver is a compressible RANS (Reynolds Averaged Navier Stokes) solver. A Multibody dynamics solver, MBDyn, was used as the structural solver with nonlinear shell elements, making it possible to analyze low-aspect ratio wings with large deformations. The solvers were then coupled using Python and validated against prior experiments and analysis on flexible wings. Malhan performed systematic experiments in house on rigid as well as flexible flapping wings to fill this void and generate required aerodynamic force data and structural properties for the flexible wings and validate the solver. The comprehensive CFD-CSD coupled analysis may serve as a design tool for deciding configurations and wing kinematics for next generation MAVs.

Jeremy Knittel received his undergraduate degree from the University of California, Los Angeles, majoring in aerospace engineering and minoring in political science. He worked at the NASA Dryden Flight Research Center for two years following graduation, where he was responsible for simulation software development and operation for four different projects: Ikhana (a General Atomics Predator); F-16 Automatic Collision Avoidance Technology; Constellation Astronaut Training Facility; and Hypersonic Test Vehicle 2 (HTV2). He then began postgraduate education at Maryland, focusing on hypersonics under the direction of Mark Lewis and Kenneth Yu. His research, funded by a NASA Space Technology Research Fellowship, is in the area of vehicle and trajectory design for aero-assisted spacecraft missions.

Marcus, Sherman, Sloane Awarded NSF Fellowships


Stephen Sherman

Matthew Marcus BS '13, Stephen Sherman, B.S. '11, and Joshua Sloane, B.S. '13, have been awarded NSF Graduate Research Fellowships. The NSF Graduate Research Fellowship Program (GRFP) recognizes and supports outstanding graduate students in NSF-supported science, technology, engineering, and mathematics disciplines who are pursuing research-based master's and doctoral degrees at accredited United States institutions.


Matthew Marcus

Fellows benefit from a three-year annual stipend of $30,000 along with a cost of education allowance for tuition and fees in the amount of $10,500, opportunities for international research and professional development and the freedom to conduct their own research at any accredited U.S. institution of graduate education they choose.


Joshua Sloane

Matthew Marcus, is a member of the Aerospace Engineering honors program. Marcus is currently conducting research pertaining to wireless power transfer using superconducting resonantly coupled coils and plans to continue this research for his master's thesis. In addition, Marcus works part time at the NASA Goddard Space Flight Center with the Satellite Servicing Capabilities Office.

Stephen Sherman works under Department Chair Norman Wereley at the University of Maryland Smart Structures lab. He has conducted research on simulations of magneto-rheological fluids, publishing two papers in IEEE Transaction on Magnetics. He also has received a University of Maryland Minta Martin Fellowship to continue his research.

Joshua Sloane is in Aerospace Engineering Honors and University Honors and is a Gemstone student in the astronautics track. From 2010 to 2011, he was president of the Society of Inquiry, a student group that promotes science and critical thinking to the University of Maryland community. Sloane works with Professor Raymond Sedwick researching multi-grid inertial electrostatic confinement fusion on the Space Power and Propulsion Labs, where he will continue working during graduate school.

Undergraduate Jose Mondragon Achieves Clark School Success

Jose Mondragon will continue his education working in the Clark School's Morpheus Laboratory.

Innovation is about finding a way to improve lives. Often we look for external ways to be innovative, but one student found inspiration from within.

Jose Mondragon, B.S. '13, aerospace engineering, moved to the United States from El Salvador nine years ago. For nearly a decade, Mondragon worked diligently to learn the English language and pursue higher education at a community college before joining the Clark School. "I followed my dream, and it is about to come true," says Mondragon about his greatest accomplishments. "I am about to graduate with my B.S. in aerospace engineering. To achieve this goal, I had to learn to speak English and stay focused on my education. In the process, I developed a strong network of friends and mentors, and I gained a lot of experience in concept applications and real problem-solving in the lab."

> "Life equals risk. If you never fail, you have never lived. Life presents a series of challenges, and we should embrace these challenges and never be afraid of failure."

Mondragon has not just improved his academic and English skills, he has mastered them as evidenced by his award-winning research presentations: third place victories at both the 2012 AIAA Young Professionals Conference and the 2013 AIAA Region I Student Conference. As an undergraduate, he has worked diligently under the mentorship of Professor Alison Flatau researching drag reduction for ground vehicles upon vortex generator implementation. He plans to continue his research efforts as a graduate student with Professor James Hubbard in the Morpheus Laboratory on morphing wing unmanned air vehicles.

He attributes much of his success to his support network. "Throughout my career, I have received support from my family, friends, classmates and faculty advisors," he explains. "They all believed in me and gave me advice. However, the person who has given me the greatest amount of support is my wife. I would not be standing here if not for her." Mondragon hopes to repay members of his support system by making significant contributions to society through his work in engineering and helping other people succeed in the same way his support network assisted him.

Mondragon offers the following advice for students: "Life equals risk. If you never fail, you have never lived. Life presents a series of challenges, and we should embrace these challenges and never be afraid of failure." He looks forward to following his own advice as he takes on new challenges and pushes himself to excel academically, personally and professionally.

Michael Brazelton: The Road from POW to Graduate Degree

Michael Brazelton

Michael Brazelton wanted to earn his graduate degree in aerospace engineering since receiving his B. S. in aeronautical and astronautical engineering from Northrop University in 1963. In spring 2012, at the age of 70, his dream was realized when he earned an M.S. in aerospace engineering from the Clark School. The 49-year journey, from 1963 to 2012, redefines the meaning of non-traditional student.

While at Northrop University, Brazelton corresponded with X-15 Test Pilot Scott Crossfield about how he could become a test pilot. Crossfield's advice: Get an advanced engineering degree. Eager to fly, Brazelton decided to delay graduate school and join the U.S. Air Force (USAF). He completed undergraduate pilot training (UPT) and was able to win one of the few assignments to operational training in the Republic F-105 Thunderchief, a Mach 2+ fighter-bomber.

The year was 1965, and the Vietnam War was just turning into an air strike. Brazelton, seeing an opportunity to gain flight experience, volunteered for duty in Southeast Asia. His plan was to return to the United States as an F-105 instructor pilot and build even more time in the air until he had the minimum 1,500 hours necessary to apply for test pilot school. After flying more than 100 combat missions he was well on his way. "I could conceivably have been the youngest Air Force test pilot in history," said Brazelton. "Also, all of the astronauts at that time had combat experience from World War II and Korea."

Things changed on August 7, 1966, when Brazelton's plane was shot down, and he was captured by the North Vietnamese. "The experience that I and my compatriots went through was, without a doubt, a filthy, frustrating, boring, monotonous, heart-breaking, uncomfortable and often painful existence." Brazelton fought the boredom of solitary confinement by thinking about math problems, physics, financial formulas and similar brain teasers. "It was frustrating to reach the limits of my math ability without a textbook to refer to," recalls Brazelton. "I was occasionally placed with another prisoner who had an engineering background, and we would compare notes and trade expertise." During those years, Brazelton worked with graduates from Purdue, Massachusetts Institute of Technology, Stanford and other renowned universities. Together, they relearned basic calculus, astrophysics and trigonometry--all without paper or pencil.

When Brazelton was repatriated at the age of 31, he was one of the most decorated pilots of the Vietnam War. Unfortunately, he did not have his M.S. in engineering or the flying hours to qualify for test pilot school. He continued his career as a fighter pilot and received flying assignments to several very elite fighter squadrons, including the original USAF "Aggressor," whose mission was to emulate Soviet fighter tactics and doctrine.

Brazelton became a world class expert on aerial combat (dogfighting), was a fighter instructor pilot in the Northrop F-5 Freedom Fighter and taught classes in the F-5 Fighter Weapons School, including energy maneuverability and fighter maneuverability comparison. Between flying assignments and staff jobs, he attended several staff colleges, but no higher education institutions had the science focus that he was seeking. After retiring from the Air Force in 1987, Brazelton was hired two years later, at the age of 47, by American Airlines. Over a 12-year career, Brazelton flew four different airliners: The 727, the 757, the 767 and the MD-11. He retired from American Airlines as a captain in 2002.

"When I retired for the second time, I was a widower with three young daughters. As a single parent, my time was taken up with raising my girls. As the last daughter at home became more self-sufficient, I had more time to pursue interests I had put off for many years."

> "I am starting to look at teaching at the senior high school level, especially science magnet schools."

Michael Brazelton flew more than 100 combat missions in Vietnam.

Brazelton then decided to return to school for a graduate degree in aerospace engineering, citing his deep interest in astronautics. "I think I was reasonably well accepted by my classmates. Most of them knew I was a serious student and normally received A's in most of my classes," says Brazelton. "I was not rejected because I was older than the other students and, in most cases, older than the professors as well. I particularly enjoyed the course projects and group work designing a space vehicle, rover or habitat of some sort."

His hard work paid off. "He generally achieved the top grade in my graduate classes and invariably did a completely professional and comprehensive job on term projects," says Professor Dave Akin. "He is insightful, inquisitive and is always looking beyond the immediate context and lecture examples to other applications."

Brazelton now is hoping to teach high school. "I am starting to look at teaching at the senior high school level, especially science magnet schools," he says. "I feel I could easily teach aeronautics, orbital mechanics, rocketry and astronomy at that level."

Wereley Honored With SPIE Lifetime Achievement Award

Norman Wereley

Department of Aerospace Engineering Chair and Minta Martin Professor Norman Wereley received the 2013 Smart Structures and Materials Lifetime Achievement Award from SPIE, the international society for optics and photonics. The award recognizes outstanding accomplishments in the careers of scientists and engineers in the field of smart structures and materials.

Yu Receives AIAA Sustained Service Award

Ken Yu

Professor Ken Yu has been honored by the American Institute of Aeronautics and Astronautics (AIAA) with the AIAA Sustained Service Award for sustained service and leadership to the AIAA Propellants and Combustion Technical Committee, to many AIAA conferences and to AIAA publications as an author and associate editor of the (AIAA) *Journal of Propulsion and Power*. The award was presented at the 49th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit in San Jose, California, in July.

Mark Lewis Selected for AIAA Dryden Lectureship in Research

Mark Lewis

Professor Mark Lewis has been selected as the recipient of the 2014 AIAA Dryden Distinguished Lectureship in Research. During his 25 years as a university faculty member Lewis has conducted basic and applied research in, and taught many aspects of, hypersonic aerodynamics, advanced propulsion, and space vehicle design and optimization. He is a world-renowned researcher in the field of hypersonic vehicles and hypersonic aerodynamics and is widely acknowledged as the research leader in hypersonic inlet flows. Lewis, currently on leave from UMD, is serving as director of the Science and Technology Policy Institute at the Institute for Defense Analysis in Washington, D. C.

The Dryden Lectureship in Research, one of the premier "distinguished lectureship" research awards, emphasizes the importance of basic research to advancement in aeronautics and astronautics and is a salute to research scientists and engineers. Lewis's lecture is tentatively titled "Taking the Hype Out of Hypersonics: Research Contributions to Operational High-Speed-Systems." He will receive an engraved medal, certificate of citation and a rosette pin symbolizing technical excellence following his lecture on Monday, January 13, 2014, at 5:30 p.m. in conjunction with the AIAA Science and Technology Forum and Exposition (SciTech 2014) at the Gaylord National Hotel and Convention Center at National Harbor, Maryland.

Na, Choi and Hu Promoted to Associate Research Scientists

From left, Suok-Min Na, Young-Tai Choi and Wei Hu

Three research scientists in the department have been promoted. Suok-Min Na has served as assistant research scientist in the Department of Aerospace Engineering for nine years. Na received his B.S., and M.S. degrees in metallurgical engineering from Sungkyunkwan University in Korea, in 1993 and 1996, respectively. After earning his Ph.D in 2003 from Sungkyunkwan University, he continued his research at the Nano Device Research Center at Korea Institute of Science & Technology (KIST). In January 2004, Na joined the department. His ability and skill with smart materials and devices has played an important role in the investigation of novel transducer materials, including magnetostrictive iron-based alloys for adaptive and structural systems, such as a SONAR transducer and a non-contact torque sensor and flow sensor with the goal of making cost-effective new alloys.

Young-Tai Choi has served in the department as assistant research scientist for 14 years. He received his B.S., M.S. and Ph.D. degrees in mechanical engineering from Inha University in Korea in 1992, 1994 and 1999, respectively. He joined the Smart Structures Laboratory in the university's Alfred Gessow Rotorcraft Center in 1999. He has conducted research on the design, testing and control of passive, semi-active and active systems and structures with key components of smart materials, such as magnetorheological fluids and piezoelectric materials.

Wei Hu holds a B.S. degree in aircraft design and M.S. degree in vibration, shock and noise from Nanjing University of Aeronautics and Astronautics. He previously was in the civil aviation industry for four years and obtained an FAA-issued airframe/powerplant (A&P) license. Hu completed his Ph.D. in aerospace engineering at the Clark School in 2005. His research interests are in dynamics and control of smart structures, with an emphasis on active damping control and mine blast protection. His current research includes development of adaptive crashworthy seat suspension systems and shock absorbers. He has served as an assistant research scientist in the department since 2008.

Staff News

Debora Chandler Retires

Debora Chandler

The Department of Aerospace Engineering would like to congratulate Debora Chandler on her retirement from the department and the University of Maryland. A staff member of the university community since 1991, Debora began working at the Department of Aerospace Engineering in 1999. She served as the coordinator for payroll and business services, and her vision, commitment and enthusiasm made her a tremendous employee and asset to the department. Her retirement plans include spending time with her three children: Danielle, Rashard and Gregory; and her grandchildren: Rakira, Antonio and Gabrielle. The Department of Aerospace Engineering team wishes to thank Debora for her outstanding contributions to the department and wish her a happy and healthy retirement.

Hocking's Research Experience Leads to Career Success

Graduate Student Wins Master's Division at AIAA International Student Conference

Erica Hocking

Erica Hocking, M.S. '12, won the Master's Division of the Student Paper Competition at the 2013 AIAA International Student Conference, representing AAIA Region 1. Graduate students, who were winners of one of seven AIAA regional student conferences including Europe, presented their award-winning papers and presentations in January 2013. Hocking's presentation was titled "Fabrication and Characterization of Small-Scale Pneumatic Artificial Muscles (PAM) for a Bio-Inspired Robotic Hand." The AIAA International Student Conference was held concurrently with the 51st AIAA Aerospace Sciences Meeting in Grapevine, Texas.

Hocking, who discussed the honor following graduation, is currently working in the Sea-Based Aviation and Aeromechanics branch at the Naval Surface Warfare Center, Carderock Division. "I utilize data recorded from a variety of Navy helicopters to detect, classify and analyze events that occur during flight," she explains. "The results of my analyses can be leveraged for safety, maintenance and operational considerations, as well as used as a debriefing/instructional tool for pilots."

Q What role did your faculty mentor play in your research?

A Dr. Wereley was an excellent advisor. He never attempted to micromanage my research, but he always made himself available for discussions whenever I needed guidance with my work. Between Dr. Wereley and the rest of the Smart Structures Laboratory at UMD, there was a wealth of experience with PAM fabrication and testing that was extremely valuable for me as I embarked on the design and characterization of the miniature PAMs in my research.

Q Can you elaborate about the research process and why this research interested you?

A My research on small-scale PAMs consisted of fabrication, experimental characterization and analysis. First, I developed a repeatable manufacturing process for constructing miniature PAMs using only commercially available materials, allowing for the production of a low-cost miniature actuator that performed consistently well. Next, I performed testing on these small-scale PAMs to demonstrate the quasi-static behavior of the PAM when actuated using compressed air, which highlighted the nonlinear nature of the actuator. Finally, I proposed a series of model refinements to use with a previously derived force balance analysis to address the nonlinearities discovered during testing. With the inclusion of these refinements, the PAM force model I proposed demonstrated excellent agreement with experimental results.

This research interested me because it allowed me to tackle a few different aspects of PAM research—building, testing and modeling—rather than just focusing on one area alone. A lengthy part of my research, for example, was figuring out how to scale down existing PAM technology to build reliable miniature PAMs using only commercially available materials. To achieve that goal, I worked with my hands and various machining tools to build an assortment of prototypes, and that kind of work was a lot of fun for me. When it came time for testing, I enjoyed the fact that I was testing a specimen that I had actually built rather than just characterizing a product that someone else had made. Finally, when I moved on to refining the analytical models used to predict PAM behavior, the knowledge I had of the materials and processes used to create the small-scale PAMs proved valuable in determining and addressing the shortcomings of existing modeling techniques.

Q How did your work at Maryland prepare you for your current career?

A Although I don't currently do any work with PAMs, the techniques I learned for approaching and solving problems in my research have transitioned well into my current career. For example, as a researcher, I got into the habit of being methodical in my work and taking notes on everything I did. As it turns out, continuing those habits at my current job has allowed me to come up to speed very quickly on my projects, and my methods have already contributed to the standardization and improved efficiency of key tasks.

As far as courses go, the knowledge I gained in helicopter classes at UMD was extremely useful in my current work. A good understanding of helicopter aerodynamics and dynamics has been vital in my productivity and success in analyzing Integrated Mechanical Diagnostics System (IMDS) data for Military Flight Operations Quality Assurance (MFOQA) on multiple U. S. Navy helicopter platforms.

Aero Alumni Make *Aviation Week's* "40 Under Forty" List

Keith Allen

Kevin Schoonover

Two aerospace alumni are included in the 2013 *Aviation Week & Space Technology* "40 Under Forty" list of "rising stars in the global aerospace and defense industry." Keith Allen, B.S. '07, 27, is a senior navigation and controls engineer for Rockwell Collins. A redundancy expert, he is cited for inventions and innovations for UAV and other systems. Kevin Schoonover, B.S. '06, 28, is director of strategy and business development for missile defense at Alliant Techsystems, where he is responsible for the dramatic growth of that business line. He also volunteers for several organizations, including the Clark School's Alumni Chapter Board.

Shane Jacobs Assists with 24-Mile Jump from Space

Shane Jacobs

Aero alumnus Shane Jacobs, Ph.D. '09, helped design the space suit used by Felix Baumgartner, who jumped from 24 miles above the earth in a record-breaking sky dive that broke the speed of sound. The suit, made by the David Clark Company, protected Baumgartner from the dangers of high altitude and provided him with the oxygen needed. Jacobs is soft-goods design director at David Clark. To view a news interview with Jacobs, visit www.cbc.ca/player/News/ID/22290649598/

Ashish Bagai Inducted into Clark School Innovation Hall of Fame

Ashish Bagai

The innovator behind the rotor blade technology used on the fastest helicopter ever produced was the 2012 inductee into the Clark School's Innovation Hall of Fame. Ashish Bagai, Ph.D. '95, is an aerodynamicist and was principal engineer at Sikorsky Aircraft Corp. in 2010 when a team of Sikorsky engineers built the Sikorsky X2 Technology Demonstrator™ (X2). The helicopter can fly 100 miles per hour faster than current production models, with increased maneuverability, endurance and high-altitude performance. Bagai was responsible for the aerodynamic design of the aircraft's main rotor blades, a key element in its success.

The Clark School's Innovation Hall of Fame recognizes innovation at the concept, design or working level of engineering and its benefits to society. Clark School alumni, students, and faculty, as well as other individuals with a strong connection to the Clark School, are eligible for selection.

Vanhoy Honored as Second Civilian Director of USAF Test Pilot School

The Society of Flight Test Engineers honored United States Air Force Test Pilot School Technical Director David L. Vanhoy, M.S. '88 with the 2012 Kelly Johnson Award for excellence and outstanding achievement in flight test engineering. The annual award recognizes individuals for their substantial contributions to flight test and to society.

Vanhoy played a critical role in developing the NF-16D Variable Stability In-Flight Simulator Test Aircraft (VISTA) and was selected as the X-35 Flight Test Team Lead for the Air Force Flight Test Center. He then became the flight chief of the 773rd Flight Test Squadron at Edwards Airforce Base, only the second civilian technical director of the school.

Gandhi Named Redfern Professor of Engineering at Rensselaer

Farhan Gandhi

Farhan Gandhi, M.S. '92, Ph.D. '95, recently joined the faculty of Rensselaer Polytechnic Institute as the Rosalind and John J. Redfern Jr. '33 Professor of Engineering and a tenured full professor in its Department of Mechanical, Aerospace and Nuclear Engineering. During his studies at the Clark School, he worked at the Alfred Gessow Rotorcraft Center under the advisement of Professor Inderjit Chopra.

NASA Astronaut Jeanette Epps Shares Key Skills Acquired at UMD

Jeanette Epps

NASA Astronaut and Department of Aerospace Engineering Distinguished Alumna Jeanette Epps, M.S. '94, Ph.D. '00, returned to the Clark School in fall 2012 to describe her journey "From a Terrapin to the Astronaut Corps." Her presentation to aerospace faculty, staff and students cataloged her transition from a doctoral student in aerospace engineering to her current role as a NASA astronaut.

Edward Smith Receives Penn State President's Award for Engagement With Students

Edward Smith

Edward Smith, M.S. '90, Ph.D. '92, and professor of aerospace engineering in the College of Engineering at the Pennsylvania State University, has received the 2013 President's Award for Engagement With Students. The award recognizes faculty members who go beyond their responsibilities to engage and encourage students in learning. Recipients have made themselves available to interact with students outside class, link students to opportunities, and help them build confidence as learners and potential contributors to society.

NASA Connections From Coast to Coast

NASA's Jet Propulsion Laboratory (JPL) is making progress in strengthening its relationship with the Department of Aerospace Engineering. JPL recognizes that UMD offers one of the top aerospace engineering programs in the world, and the outstanding engineers and research emanating from the Clark School are of great interest to JPL.

In February 2013, JPL welcomed Department Chair Norman Wereley, Professor Dave Akin, and Professor Raymond Sedwick for a special visit to its aesthetic campus in Pasadena, California. The Clark School team toured several key JPL facilities, including the All-Terrain Hex-Limbed Extra-Terrestrial Explorer (ATHLETE) Human-Robot Systems Lab, the Mars Science Lab (MSL) Rover Testbed, the Mars Yard and the Electric Propulsion Lab. At each stop, the professors met with top JPL research engineers who were eager to demonstrate their work and discuss collaboration possibilities.

Wereley and Akin gave a well-attended presentation that detailed various elements of the Clark School's aerospace engineering research and its impressive facilities. Many JPL employees in attendance were Akin's former students, who took advantage of the opportunity to catch up with him after the presentation.

JPL has long been recognized as the world leader in robotic space exploration—from the very first U.S. satellite, Explorer I in 1958 to the recent Curiosity landing on Mars. As JPL moves forward and continues to push the boundaries of exploration, it recognizes the need for bright, young minds that come from the Clark School's Department of Aerospace Engineering. JPL recently hired several Terps for both full-time and summer internships, and this trend is sure to continue. With Maryland entering the Big 10 Conference, the UMD football team may not be the only group of students with a chance to make it to Pasadena. Aerospace engineering students may not be far behind.

Top photo from left: Profs. Raymond Sedwick, Norman Wereley and Dave Akin in front of JPL's ATHLETE, a six-legged, wheeled mobile platform for surface exploration. Bottom: Daniel Limonadi, Phase Lead for NASA's Mars Science Laboratory Surface Sampling and Science, describes the rover's instrumentation to visiting UMD faculty.

UMD Morpheus Lab Establishes the Alexander Brown Center for Adaptive Aerospace Vehicle Technology at the National Institute of Aerospace

The University of Maryland Morpheus Laboratory has announced the establishment of the Alexander Brown Center for Adaptive Aerospace Vehicle Technology at the National Institute of Aerospace (NIA) in Hampton, Virginia. The center is located in the new NIA Research and Innovation Laboratories building at 1100 Exploration Way across the street from NIA's headquarters building. The 14-laboratory, 60,000-square-foot building houses research and development facilities, including a wind tunnel, an unmanned aerial vehicles structures lab (Morpheus Lab) and a boron nitride nanotube development lab, among others. The new facility also hosts the Peninsula Technology Incubator (PTI), a subsidiary of NIA, which encourages entrepreneurship.

The center and the Morpheus Lab's research support have come from grants from the Defense Advanced Research Projects Agency's Defense Sciences Office (DSO), Tactical Technology Office (TTO), Air Force Office of Scientific Research (AFOSR). National Science Foundation (NSF) and the Minta Martin Foundation. Recently, an AFOSR grant was renewed to continue the innovative work in the passive morphing of small unmanned air vehicles (SUAVs). Existing facilities include a two-by-six foot wind tunnel, and an anechoic chamber—all of which are available for manned air vehicles (MAVs) and small vertical take-off and landing (VTOL) studies. "We have a significant number of flight-ready, small-scale (10-foot wing span or less) fixed, rotary and flapping-wing research vehicles," says center founder and Director James E. Hubbard, Jr. Other existing equipment includes a six-degree of freedom (DOF) load cell and test stand capable of evaluating the performance of small-scale, flapping wing and rotary vehicles, and a full machine shop, including a numerically controlled milling machine for making small parts. The center recently enhanced its experimental research capabilities with a Fortus 3D printer capable of printing parts up to two feet in span. This high-resolution, rapid prototyping machine is used for fabricating small airfoils and other custom interface parts. A small-scale, low Reynolds number water tunnel with a three-axis force balance system is used to conduct systematic low Reynolds number aerodynamic tests.

Morpheus Lab graduate student researcher Cornelia Altenbuchner

The Morpheus Lab, located within the center, keeps a substantial inventory of smart and active materials to develop biomimetic devices that enable the realization of micro air vehicle (MAV) flight geometries inspired by nature. A virtual reality flight simulator is used to train students in the use and flight of its fleet of radio frequency (RF)-controlled aircraft. A local RF-aircraft airport in Newport News is available for non-research practice flights and keeps students well-grounded in the realities of flight-based research. Finally, several multi-processor, high-speed computers support modeling and simulation research.

Hubbard, who pledged $25,000 to create the Alex Brown Memorial Graduate Scholarships, reports that the pledge has been fulfilled with the support of the Brown family and friends. He hopes to award the first graduate scholarship in 2013-2014.

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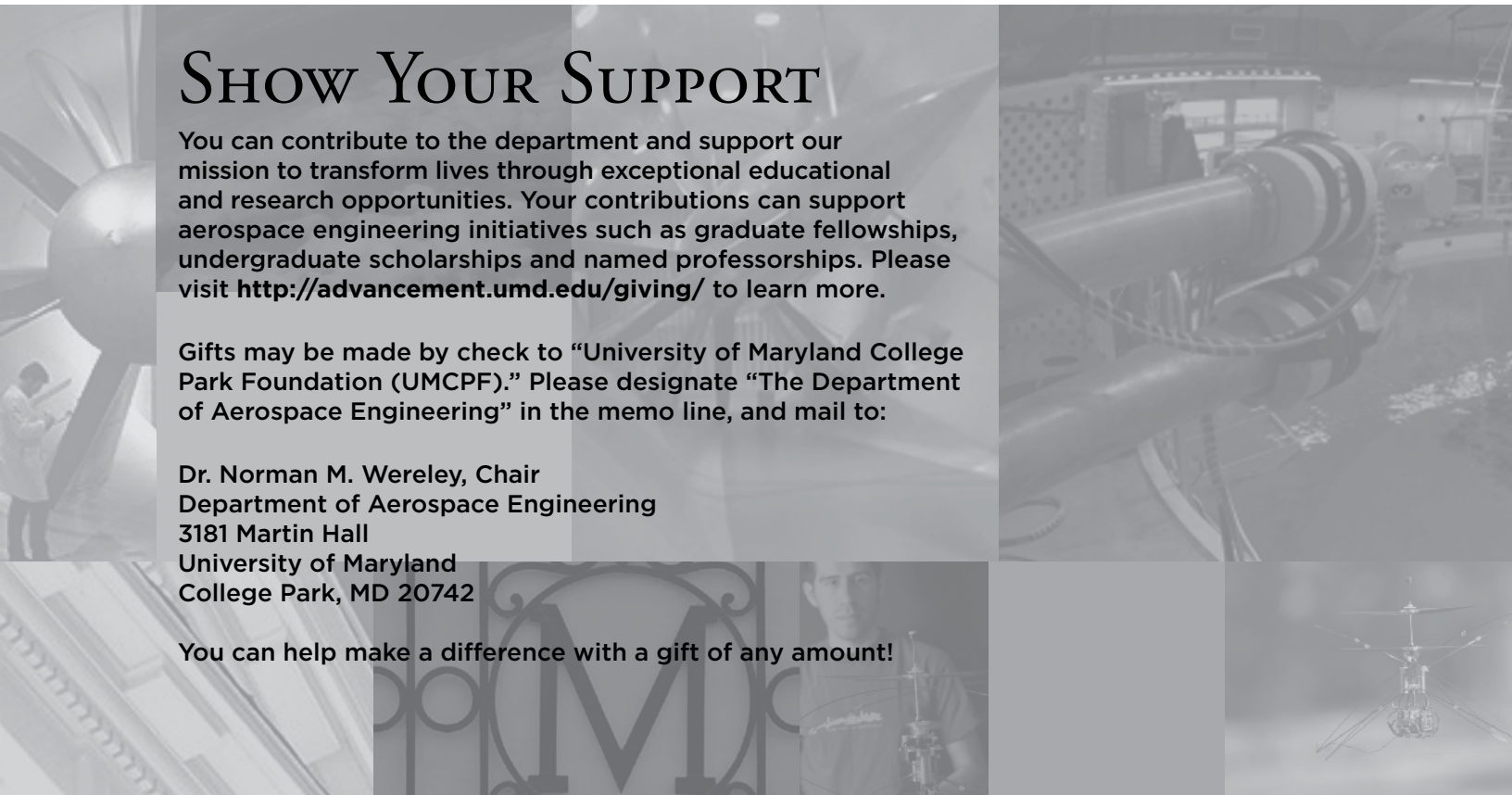

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Gifts may be made by check to "University of Maryland College Park Foundation (UMCPF)." Please designate "The Department of Aerospace Engineering" in the memo line, and mail to:

Dr. Norman M. Wereley, Chair
Department of Aerospace Engineering
3181 Martin Hall
University of Maryland
College Park, MD 20742

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