



A PUBLICATION OF AEROSPACE ENGINEERING · FALL 2013

Message from the Department Head



One in 25 people in the U.S. who holds a degree in aerospace engineering earned it from Penn State—evidence of our responsibility and impact. The department prepares students for a competitive future, and we are committed to improving their education. We continue to advance aerospace technology and systems, contributing to defense, commercial flight, earth observation, exploration, and energy. And as the aerospace enterprise faces challenging workforce issues, our major contin-

ues to be in high demand. Aviation Week & Space Technology recently ranked Penn State as the #1 university from which the aerospace industry likes to hire engineers!

We are delighted to welcome Jose Palacios (B.S. '03, M.S. '04, Ph.D. '08) to our faculty as an assistant professor. His research interests are in the areas of structural dynamics, aeromechanics, and icing of aircraft, engine, and wind-turbine structures. I'm sure you will hear more about his activities here in the years to come.

A team of our undergraduates took 1st place in the annual student design competition of the American Helicopter Society (AHS)—the eighth year in a row that we have placed in the top two. Our curriculum is distinguished by many opportunities for students to get involved with and lead team-based, hands-on projects and design competitions. Current activities (and advisers) include: American Institute of Aeronautics and Astronautics (AIAA) Design-Build-Fly competition (Maughmer); AHS Design Competition (Bill, Horn, Smith); Association for Unmanned Vehicle Systems International RoboSub Competition (Langelaan, Culver, Horn); LionTech Labs, competing in the NASA University Space Launch Initiative (Wheeler); human-powered aircraft, competing for the Kremer Sporting Prize (Maughmer); Lunar Lions, competing for the Google Lunar X-Prize (Paul, Spencer); CubeSat space missions (Bilen); NASA Simulation Interoperability Standards Organization Simulation Smackdown (Spencer); and the inaugural National Collegiate Wind Competition (Stewart, McLaughlin, Schmitz). And at the 2013 AHS Forum, a team of Penn State graduate students competed in the first electric-powered Vertical Takeoff and Landing (VTOL) Micro Air Vehicle Student Challenge (Smith, Langelaan).

Our faculty members continue to garner well-deserved recognition. This year, Debbie Levin received the Premier Research Award from the Penn State Engineering Alumni Society, and Ed Smith received the President's Award for Student Engagement from Penn State President Rodney Erickson. In addition, Mark Maughmer received the American Society for Engineering Education/AIAA Atwood Award, a national award that recognizes an outstanding aerospace engineering educator.

Other alumni and students received additional awards. Terry Kammash (B.S. '52, M.S. '54), professor emeritus at the University of Michigan, received the Seaborg Medal, one of the American Nuclear Society's highest honors, for research related to space propulsion. Grant Skid-

more (M.S. '13) won the inaugural Pauling-Eisenhuth Award. Nicholas Frey (B.S. '12) received this year's Anthony E. Wolk (B.S. '56) senior thesis award, and Anthony Montalbano (B.S. '13) received the Sigma Gamma Tau Undergraduate Student Award. Nicholas Svrbely (B.S. '13) was the aerospace student marshal for the spring 2013 graduation ceremony, and Emily Wolf (B.S. '13) was the undergraduate student recipient of the 2013 Commission for Women Achieving Women Award. Many graduate students won prestigious external fellowships.

We also had two outstanding McCormick Lecturers this year, Ed White (B.S. '76) Smart Structures Team Lead at Boeing, and Tom Starchville (B.S. '90, M.S. '93, Ph.D. '96) director of the Mission Analysis and Operations Department at The Aerospace Corporation. Barnes McCormick (B.S. '48, M.S. '49, Ph.D. '54) himself recently offered his "Rotary Wing Technology" short course for the forty-sixth year! To close the spring semester, Pierson Holcombe (B.S. '56) former president of Grumman Data Systems, was honored with an Outstanding Engineering Alumnus Award from retiring Dean David Wormley in April.

Through your collective generosity, we awarded more than \$150,000 of college and departmental scholarships to more than 40 students this year. We appreciate your assistance and loyalty to Penn State in making these a reality, and your continued support is more important than ever. We depend on your gifts to purchase materials for projects and to send students to competitions, as well as to support new initiatives that provide the foundation for our future curriculum.

We are pleased to feature David Spencer's research in spacecraft trajectory optimization in this year's research article. I know you will enjoy reading about the many activities and accomplishments of our students, staff, faculty, and alums. We always like to hear from you, and we welcome your feedback. Please send us news at: aerospace@enr.psu.edu.

Best regards,

George A. Lesieutre

George A. Lesieutre

UPCOMING ALUMNI EVENTS

Reception at 52nd AIAA Aerospace Sciences Meeting
January 13, 2014 – National Harbor, MD

*Please visit our website for current information
regarding upcoming events.*

<http://www.aero.psu.edu>

Awards & Recognition

Additions to the Department



Jose L. Palacios joined our faculty as assistant professor of aerospace engineering in August 2013. Palacios received his bachelor's degree in aerospace engineering with a minor in engineering mechanics from Penn State in 2003, followed by a master's in 2004, and his doctorate in May 2008. He was a member of Penn State's national champion gymnastics team in 2000, and captain in his senior year. Palacios has research interests in structural dynamics, aeromechanics, and icing of aircraft, engine, and wind-turbine structures. As a post-doctoral fellow, he designed, constructed, and operated an icing rotor test stand. Initially developed to evaluate ultrasonic ice protection technology for helicopters, Palacios has exploited this unique experimental facility for research in fundamental ice accretion physics, ice-protective coatings, and model validation. Palacios was previously recognized with the Bagnoud Award from the American Helicopter Society for outstanding technical contributions by a member under the age of 35.

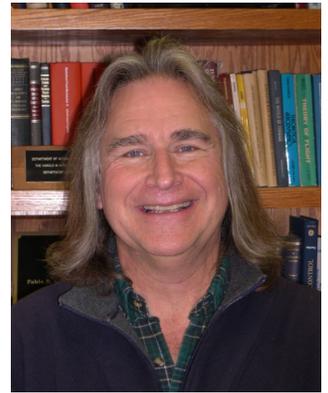


James D. Miller joined the aerospace department as a research assistant in August 2012. Prior to joining the department, he worked for the Penn State Gas Dynamics Lab with Gary Settles, distinguished professor of mechanical engineering, for 23 years. He enjoys fishing, spending time with his family, and the new puppy. Miller is also very active in volunteer organizations.



Two members of our faculty were recognized for twenty-five years of service to the University. **Cengiz Camci**, professor of aerospace engineering, and **Dennis McLaughlin**, professor of aerospace engineering, both were awarded their 25-year chairs by the College of Engineering.

Mark D. Maughmer, professor of aerospace engineering, was selected as the recipient of the 2013 American Society of Engineering Educators (ASEE)/American Institute of Aeronautics and Astronautics (AIAA) John Leland Atwood Award. This award is bestowed annually upon an outstanding aerospace engineering educator in recognition of significant contributions to the profession. The ASEE presentation took place in June at the ASEE meeting in Atlanta, at the Aerospace Division dinner. The AIAA presentation will take place at the Aerospace Sciences Meeting (SciTech 2014) in January 2014.



Faculty Awards



Deborah Levin with College of Engineering Dean David Wormley and her research team at the PSEAS Awards ceremony. (Photo credit: Paul Hazy.)

Deborah A. Levin, professor of aerospace engineering, received the 2013 Premier Research Award of the Penn State Engineering Alumni Society (PSEAS). This award recognizes and rewards an individual whose contributions to scientific knowledge through research are exemplary and internationally acclaimed. Levin was recognized at the annual PSEAS Faculty/Staff Awards Ceremony held in Kunkle Lounge on Apr. 3, 2013.



Edward C. Smith, professor of aerospace engineering, received the 2013 President's Award for Engagement with Students. This award is given to a faculty member who goes above and beyond his or her responsibilities to engage and encourage students in learning. Smith received his award from President Erickson at a luncheon in March.

Editors: Joe Horn, George Lesieutre, Deborah Mayes, and Michelle Barnyak with contributions from the College of Engineering's Public Relations Office

This publication is available in alternative media on request.

Nondiscrimination Statement - The Pennsylvania State University is committed to the policy that all persons shall have equal access to programs, facilities, admission and employment without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. It is the policy of the University to maintain an academic and work environment free of discrimination, including harassment. The Pennsylvania State University prohibits discrimination, harassment against any person because of age, ancestry, color, disability or handicap, genetic information, national origin, race, religious creed, sex, sexual orientation, gender identity or veteran status and retaliation due to the reporting of discrimination or harassment. Discrimination, harassment, or retaliation against faculty, staff or students will not be tolerated at The Pennsylvania State University. Direct all inquiries regarding the nondiscrimination policy to the Affirmative Action Office, The Pennsylvania State University, 328 Boucke Building, University Park, PA 16802-5901, Tel (814) 865-4700/V, (814) 863-0471/TTY. U.E. ENG 14-07 MPC 126672

Awards & Recognition

SCHOLARSHIPS/FELLOWSHIPS 2012-13

Department of Aerospace Engineering

Aero Pioneers Class of 1944 Scholarship
Abdur Akanda, Jacob Johnson, Daniel Parks

Lou Borges Scholarship
Anthony Montalbano, Emily Wolf

GeoEye Scholarship
Davide Conte, Nicholas Ravago

Mary Ilgen Memorial Scholarship
Timothy Weathers

Richard W. Leonhard Scholarship
Robert Arrowood, Ethan Corle, Kevin Dugan, Brian Killeen,
Reed Kopp, Devin O'Connor, Nicholas Ravago, Nicholas Svrbely,
Kurtis Thrush, Gregory Walsh, Gerek Whitman, Shiang-Teng Yeh

James Reynolds Norris Memorial Scholarship
Ryan Royce

David J. Peery Memorial Scholarship
Lovedeep Bhela

Carl A. Shollenberger Memorial Scholarship
Samuel Dubin

Donald G. and Jayne L. Steva Scholarship
Yaowei Li

Anthony E. Wolk Citizenship Award
Anthony Montalbano, Thuan Nguyen

Anthony E. Wolk Senior Thesis Award
Nicholas Frey

College of Engineering

Fred and Kit Bigony Scholarship in Engineering
John Sendek

John J. and Jean M. Brennan Trustee Scholarship
Matthew Glass

College of Engineering Scholarship
Gabriel Rosenwald

Russell and Geraldine Freyermuth Engineering Scholarship
Duy Nguyen

Roy E. Happel Scholarship
Emery Etter

John Pierre Hemler Memorial Scholarship
Brittany Sipple

Huck International Scholarship in Engineering
Duy Nguyen

Elias A. Kazmierski Memorial Scholarship
GerekWhitman

David P. and JoAnne C. Kulig Trustee Scholarship
Charles Zendrosky

James E. and Melinda L. Marley Trustee Scholarship
Alexander Vergara

Edward F. Meinsler Trustee Scholarship
Lovedeep Bhela

William J. Minor Trustee Scholarship
Mitchell Gennocro

Paul Morrow Endowed Scholarship
Logan Sullivan, Gerek Whitman

T. Alan Payne Trustee Scholarship
Jessica Bashioum

Dr. Jeannie McKenzie Pedlow Trustee Scholarship
Nisherag Gandhi

John A. Pursley Trustee Scholarship
Ryan Mattern

John E. and Lynn A. Shavinsky Scholarship
Samuel Dubin

Loren and Bernadine Stolp Family Trustee Scholarship
Ethan Corle, Thuan Nguyen

Trustee Scholarship Fund for Engineering
Brandon Dillinger

Charles Kenneth Turner Memorial Scholarship
John Sendek

Paul E. White '30 and Rachel W. White Trustee Scholarship
Tyler Brantner, Koy Shaffer

Woodle Family Scholarship in Engineering
Alexander Troup

Graduate Scholarships/Fellowships

Aerospace Corporation Graduate Fellowship
Ryan Kelly

AHS Vertical Flight Foundation Scholarship
James Coder, Gurbuz Ozdemir, Jared Soltis

Bell Graduate Fellowship
Michael Spires

DoD SMART Scholarship
Todd Henry, Gabriel Murray, Leighton Myers, Russell Powers

Richard W. Leonhard Graduate Scholarship
Zeljko Raic, Adam Thorsen

Pauling-Eisenhuth Award
Grant Skidmore

LORD Corporation Graduate Fellowship
Raheel Mahmood

National Defense Science and Engineering Graduate Fellowship
James Coder, Nathan Depenbusch

PA Space Grant Consortium Graduate Fellowship
Neal Parsons

University Graduate Fellowship
ZuQun Li

Eric Walker Fellowship (Penn State/Applied Research Laboratory)
Christine Brown, Mark DeAngelo, Lawrence DiGirolamo,
Margalit Goldschmidt, Erika Lieberknecht, Michael Policelli,
David Reich, Brian Shank, Jared Soltis, Michael Wozniak

Research/Department Activities

I
P
A
C

2
0
1
3



IPAC Committee, standing from left: M. Rudy, D. Weir, D. Senft, P. Holcombe; sitting from left: H. Rarick, R. Sedwick, D. Heverly.

The annual meeting of the Industrial and Professional Advisory Council (IPAC) was held Mar. 20-22, 2013. This year's focus was on strategic planning. The IPAC members collected a myriad of information throughout their visit with a full agenda of meetings with faculty, staff, and students. They provided the department with observations about strengths, weaknesses, threats and opportunities, as well as advice on future direction. A summary of their findings follows. Our department is highly-ranked, typically #10-12 by U.S. News for our undergraduate program and #12-16 for our graduate program. Importantly, Aviation Week & Space Technology ranked Penn State the #1 university from which the aerospace industry likes to hire engineers. We are commended for our commitment to hands-on activities and competitions that enhance undergraduate education. The department's centers provide unique research capabilities that attract significant research awards. Our faculty members are consistently recognized for their effective dedication to teaching, research, and service. We should focus future efforts on advancing the graduate program without relinquishing gains on the undergraduate side; this will require faculty growth and related support. IPAC encourages the department and college to build on success and accelerate the renovation and expansion of aerospace engineering buildings, to involve alumni in undergraduate and career counseling, and to enhance the image of the department through service on national committees.

IPAC members participating in 2013 include:

David E. Heverly (B.S. '90, M.S. '91, Ph.D. '02 – ME), principal engineer, Structural Dynamics Group, Bell Helicopter Textron, Inc., Fort Worth, TX

Pierson J. Holcombe (B.S. '56), retired president of Grumman Data Systems Corporation, currently Holcombe Enterprises, Advance, NC

Heather L. Rarick (chair) (B.S. '87), flight director, Mission Control and Mission Operations Manager for Commercial Crew Program, NASA's Johnson Space Center, Houston, TX

Michael D. Rudy (B.S. '70, M.S. '73), vice president/general manager, Teledyne Turbine Engines, Toledo, OH

Raymond Sedwick (B.S. '92), associate professor of aerospace engineering and director of the Space Power and Propulsion Laboratory, University of Maryland, College Park, MD

Donna Cowell Senft (B.S. '83 – E.Sci.), mission lead for the Air Force Research Laboratory (AFRL), Space Vehicles Directorate, Kirtland AFB, NM

Donald S. Weir (B.S. '73, M.S. '75), engineering fellow and technical manager, Acoustics, Honeywell Aerospace, Phoenix, AZ

Unable to attend were **Shelly Corbets** (B.S. '01), aircraft performance and aerodynamics engineer, Lockheed Martin Aeronautics Corporation, Palmdale, CA, **Brian Chappel** (B.S. '83), vice president for F-35 programs, Northrop Grumman Aerospace Systems, El Segundo, CA, and **David V. Pauling** (co-chair) (M.S. '75), retired, Department of Defense Senior Executive Service and former executive director for the Department of Homeland Security's Customs and Border Protection, and currently a consultant at DANANS Institute, Herndon, VA.

Two IPAC members who rotated off this year are **Heather Rarick** and **Brian Chappel**. The department sincerely thanks them for their continued support.

Integrating STEM into the K-12 Classroom with Wind Energy

The Pennsylvania Wind for Schools project, funded by the Department of Energy and coordinated by Penn State, aims to educate students and teachers in wind energy via the installation of small wind turbines at K-12 schools around the state. The program saw its first wind turbine installation during the summer of 2012 in the Northwestern Area School District in Albion, PA, just outside of Erie. A cadre of teachers at the school are using the data from the turbine for in-class activities. Prior to the installation, this team participated in several Wind for Schools activities, including placing first in the high school division of the KidWind Challenge held in the spring of 2012 in State College.

Susan Stewart, research associate in aerospace engineering and leader of our PA Wind for Schools program, recently helped dedicate the program's second wind turbine installation at James Buchanan High School in Mercersburg in early June. The Project Lead the Way

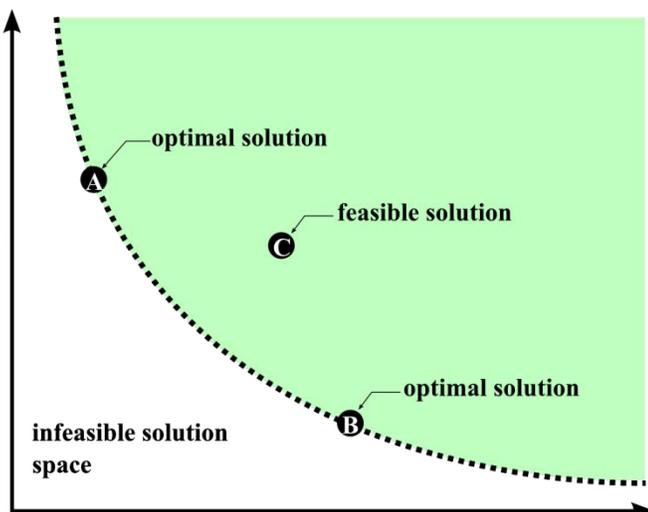
curriculum at the high school—a Science, Technology, Engineering, and Math (STEM) centered curriculum—was instituted four years ago. Several classes use the wind turbine at the high school, including introduction to engineering, principles of engineering, and aerospace engineering.

Mount Nittany Elementary School, located nearby in the State College Area School District, is the third and most recent school to install a turbine. The PA Wind for Schools program has been working with teachers from across the school district over the last two years to provide professional development opportunities and technical assistance for ongoing wind-energy related activities in their classrooms. The Pennsylvania Wind for Schools project team will continue to select new host schools from each year's applicants.

Satellite Trajectories and Darwin's Theory of Evolution

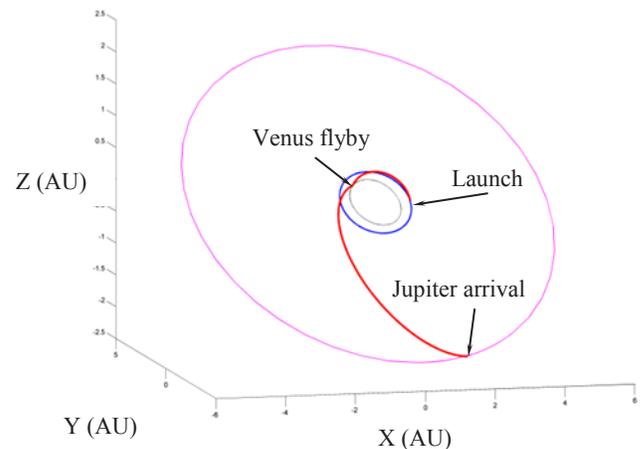
Charles Darwin, the 19th century English naturalist, developed a scientific theory of evolution involving a process of survival of the fittest. While this theory has been applied to biological systems, in recent years, similar principles have been applied to the development of optimal solutions to complex mathematical problems. Over the last decade, **David Spencer**, professor in the Department of Aerospace Engineering and Patrick Reed (formerly a professor in Penn State's Department of Civil Engineering, currently at Cornell University), along with several aerospace engineering graduate students, have been applying Darwin's concepts to the optimization of various spaceflight engineering problems. Genetic Algorithms (GAs), Evolutionary Programming (EP), and Evolutionary Strategies (ES) are examples of some of the different varieties of tools available within the field of Evolutionary Computation. These Evolutionary Algorithms (EAs) have been developed to help find good solutions to complex problems. While computational cost is of growing concern, costs of developing systems are an even greater concern. As budgets continue to shrink, more reliance is made on modeling systems and their behaviors. Complicating matters further, the computational models being used in design tend to increase in complexity over time. This makes it more difficult to understand a model, and complicates the development of engineering intuition about key inputs and analysis models. The use of new optimization methods seeks to bridge this gap, and enable the rapid, systematic identification of key assumptions, inputs, and performance controls.

Evolutionary algorithms have been applied to various multi-objective optimization problems. Multi-objective optimization involves making optimal decisions, often with competing or conflicting objectives. In complex systems, the number of objectives can rapidly grow to the point where there is no single solution that optimizes the system subject to all objectives. A simple two objective tradeoff is shown below. In this figure, there are many optimal solutions (points A and B). All solutions in the shaded area are feasible; while in the unshaded area they are not. The boundary between the feasible and infeasible solutions is known as a Pareto front (named for nineteenth century economist Vilfredo Pareto).



The Pareto front aids designers in understanding tradeoffs by explicitly showing how improved performance in one objective comes at the cost of reduced performance in one or more other objectives. Expanding this front to include several objectives is being applied in many areas, including aerospace design and trajectory optimization.

Traditionally, these types of problems are solved using either math that isn't always valid or trial-and-error, which is very computationally intensive and time consuming. Our first use of EAs was to solve a known optimal orbital transfer problem – the Hohmann transfer, the optimal, coplanar, circle-to-circle orbit transfer. Since the optimal solution was known, this early application of evolutionary algorithms was applied to see if Hohmann's solution could be found. It was, and opened the door to studying more complex spaceflight dynamics problems. Other problems that have been studied include optimal rendezvous, space object collision avoidance, low-thrust trajectory design, interplanetary gravitational assist trajectories, and satellite constellation orbit design. The figure below is an example of the type of interplanetary transfer investigated. A spacecraft is launched from Earth, performs a gravitational assist by Venus, which propels it to Jupiter. When compared to a simple direct flight to Jupiter, this representative trajectory required 18 percent less propellant at the expense of increasing its travel time from 1,081 days to 1,250 days.



In nature, generational continuation is well understood. We can apply this concept to the search for an optimal solution of a mathematical problem that mimics nature. In evolutionary algorithms, there is a parallel between optimality and fitness (which is an optimal solution that is directed by the natural environment). Population members are evaluated and the fittest survive. The next generation (offspring) are given many of the characteristics of the fittest parents (mathematically, this would be possible solutions that have the best traits of both parents). This next generation is subject to random mutations (and we can add some randomness into an optimization problem). That next generation is allowed to become the new population and the process repeats.

New applications of evolutionary algorithms continue to be found and applied to complex trajectory design problems. These can lead to improved solution methods for evaluation of future trajectory design processes which would allow for execution of even more complex space missions.

2013 Outstanding Engineering Alumnus



Pierson Holcombe receiving his plaque from College of Engineering Dean David Wormley.

Pierson J. Holcombe, Jr. (B.S. '56) aerospace consultant and former president of Grumman Data Systems, was honored with an Outstanding Engineering Alumnus Award. This award, established in 1966, is the highest honor bestowed by the College of Engineering and recognizes graduates who have reached exceptional levels of personal achievement. Holcombe has forty years of experience in engineering, business development, and general management roles in the aerospace and defense industry. He started his career as an analyst in the aeroelasticity group at the Glenn L. Martin Co., working on the P-6M Sea Master jet seaplane. He moved on to Fairchild Aviation in the propulsion group working on the Goose, an intercontinental decoy cruise missile. He then spent 18 years with the IBM Federal Systems Division moving from flight test engineer on the XB-70 guidance system to systems engineering on Gemini, Saturn-Apollo, and Space Lab. He later transitioned to vice president, Business Development working on Titan T-II ICBM, Space Shuttle, and classified space programs. Holcombe moved to Norden Systems Division, United Technologies Corporation as vice president and strategic business unit manager for militarized computers and airborne radar. Activities at Norden included low-probability-of-intercept airborne radar systems for the F-117 and B-2 and other classified programs. Next he was recruited to Planning Research Corporation as senior vice president and general manager of the Government Information Systems Division. This division was focused exclusively on compartmented information programs in the intelligence community. Holcombe finished his aerospace career as president, Grumman Data Systems Corporation, a subsidiary of Northrup Grumman Corporation. This subsidiary had more than 200 contracts with a broad segment of the Federal Government. In addition to his bachelor's degree from Penn State, Holcombe did graduate work at Penn State, Syracuse, and the University of California, Los Angeles.

Barnes W. McCormick Honorary Alumni Lectures

Fall 2012



Edward White (C) with George Lesieutre (L) and Barnes McCormick (R) as the fall 2012 Barnes W. McCormick Honorary Alumni Lecturer.

Edward V. White (B.S. '76) visited campus in December to present the fall 2012 Barnes W. McCormick Honorary Alumni Lecture. His seminar titled, "Smart Structures Technology Development at Boeing" was delivered to students and faculty during the aerospace structures class. His lecture discussed the developing technologies of adaptive structures. These include shape change, morphing, and load and vibration/acoustics suppression as well as structural health management and applications of intelligent systems technology. White is an associate technical fellow at Boeing and has 36 years of experience at the Boeing organization in St. Louis, MO, in the areas of structural dynamics and loads. For the last 22 years he has been in smart structures technology development, and team leader since 1994.

Spring 2013



Thomas Starchville, Jr., the spring 2013 Barnes W. McCormick Honorary Alumni Lecturer, pictured with George Lesieutre.

The spring 2013 Barnes W. McCormick Honorary Alumni Lecture was presented by **Thomas F. Starchville, Jr.** (B.S. '90, M.S. '93, Ph.D. '96), director of the Mission Analysis and Operations Department at The Aerospace Corporation. Starchville presented his lecture titled, "Space Debris and Space Operations" to an audience of faculty and students, discussing the history of space debris generation, the growing concern among satellite operators, as well as tracking, modeling and prediction. Starchville is the past chair of the AIAA Astrodynamics Technical Committee and is the chair-elect of the American Astronautical Society's Space Flight Mechanics Technical Committee.

Alumni



Brian Pomeroy (B.S. '06) was in the AIAA Member Spotlight for the month of June 2013. Pomeroy is a combustion analyst at Aerojet where he is responsible for assisting in liquid rocket engine combustion tests and performance analysis.

Johanna Ramos (B.S. '92, M.Eng. '99) was re-elected to the Alumni Council. Ramos served previously on the Volunteer Support and Program Development committees, as chair of the Diversity Committee, and as a member of the Executive Board.

Two aerospace alumni were part of a team that received highest honors from The Aerospace Corporation. **Matthew Ferringer** (B.S. '02, M.S. '05, Ph.D. '09), project leader, Architecture and Design, and **Marc DiPrinzio** (B.S. '92), senior engineering specialist, Mission Analysis and Operations, were honored with the President's Distinguished Achievement Award for their part in the "execution of a revolutionary constellation replenishment technique, allowing for performance recovery and optimization for a critical national system."



Mark Maughmer II (right) pilots an airplane with a student during one of the annual Design/Build/Fly competitions.

Mark Maughmer II (B.S. '04), technical staff assistant V for the Department of Aerospace Engineering and Engineering Mechanics at the University of Texas at Austin, was presented with the Cockrell School of Engineering's Staff Excellence Award on May 14, 2013. The award recognizes non-teaching personnel who have contributed significantly to the effectiveness of the teaching, advising, counseling, and research efforts of the Cockrell School. In 2006, Maughmer was hired to support the undergraduate student Design/Build/Fly project, which is now a highly regarded, nationally recognized team. He continues to work with these students annually as a counselor and mentor and serves as the pilot at international competitions.

Steven Hast (B.S. '75) was recently promoted to director of the Astrodynamics Department of The Aerospace Corporation in El Segundo, CA. Hast manages an engineering team that performs a wide variety of orbit-related analyses, including orbit selection and satellite constellation design, orbit perturbations and lifetime estimation, space debris modeling and collision hazard assessment, optimal on-orbit maneuvers, and relative motion studies.

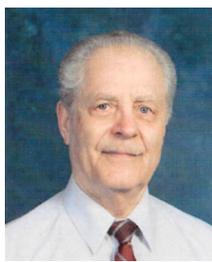
Michael D. Rudy (B.S. '70, M.S. '73) delivered the keynote address at the University of Toledo's spring 2013 graduate commencement. Rudy has 32 years with Teledyne Turbine Engines and has served as vice president and general manager since 2003. He came to Teledyne from Pratt & Whitney Aircraft Commercial Engine Division in East Hartford, CT, where he was involved with large commercial and military engines for more than eight years. Rudy currently serves on the department's IPAC committee and was selected as an Outstanding Engineering Alumnus in the College of Engineering in 2012.

Jason Reed (B.S. '01) has been appointed vice president, Material, Logistics, and Suppliers at Airbus Americas Customer Services, Inc.

Rishi S. Raj (Ph.D. '74), professor of mechanical engineering at The City College of New York (CCNY), authored his fifth book, "Thermo-Fluid Systems Analysis and Design." Raj is currently chair of the Faculty Senate at CCNY.

Brian Chappel (B.S. '83) has been named vice president and program manager of the F-35 Lightning II program at Northrop Grumman Corporation (NGC). He previously held several vice president and executive positions as well as technical program management and systems engineering positions on satellite programs. Prior to joining NGC in 1993, he spent nearly 10 years in the U.S. Air Force.

Terry Kammash (B.S. '52, M.S. '54), professor emeritus of nuclear engineering and radiological sciences at the University of Michigan, received the Seaborg Medal, one of the American Nuclear Society's highest honors. The medal recognizes contributions to the peaceful uses of nuclear technology. Kammash's explorations of fission-fusion hybrid reactors and of magnetic-mirror-machine fusion reactors may one day inform the design of powerful, high-efficiency thrusters for long-haul space flights.



Juan C. Negron (B.S. '00) was selected as the senior engineer for the U.S. Marine Corps AV-8B fleet in charge of the Environmental Control, On-Board Oxygen Generating, Water Injection, and Canopy sub-systems at Naval Air Systems Command based in Cherry Point, NC.

Alina Alexeenko (Ph.D. '03) was promoted to associate professor with tenure at Purdue's School of Aeronautics and Astronautics.

Lawrence Trick (B.S. '82, M.Eng. '94) is the new chief engineer for the Naval Aviation Center for Rotorcraft Advancement (NACRA) at Patuxent River Naval Air Station.

Lawrence Trick (B.S. '82, M.Eng. '94) and **Joe Fraundorfer** (B.S. '82) have been working together since the start of Hurricane Sandy. Fraundorfer was the first Air Force representative at Maryland Emergency Management Agency (MEMA) while Trick was part of the Civil Air Patrol liaison to MEMA. They again worked together at the Federal Emergency Management Agency National Response Coordination Center in Washington, DC. Fraundorfer was the Depart-

ment of Defense liaison and Trick was the Civil Air Patrol liaison.

David Wisler (B.S. '63) was inducted into General Electric (GE) Aviation's Propulsion Hall of Fame in October 2012. The Hall of Fame recognizes individuals who have had a lasting and widespread impact on the aviation industry and on GE's business. There are only about 100 individuals currently elected to this Hall since GE began work on jet propulsion.



Brian King (B.S. '84) was named a senior associate with Gannett Fleming. Based in the firm's corporate headquarters in Harrisburg, PA, King serves as a manager of maintenance facilities in the Transit and Rail Section. With more than 25 years of experience, his responsibilities

include overseeing the planning, design, and construction-phase services of bus and rail maintenance facility projects throughout the U.S. and Canada. He is a registered professional engineer in Pennsylvania.

Thomas Cuff (B.S. '92) accepted a position with Textron Marine and Land Systems as principal mechanical engineer-propulsion systems on the Ship to Shore Connector. The contract is to design the new air cushion craft for the U.S. Navy.

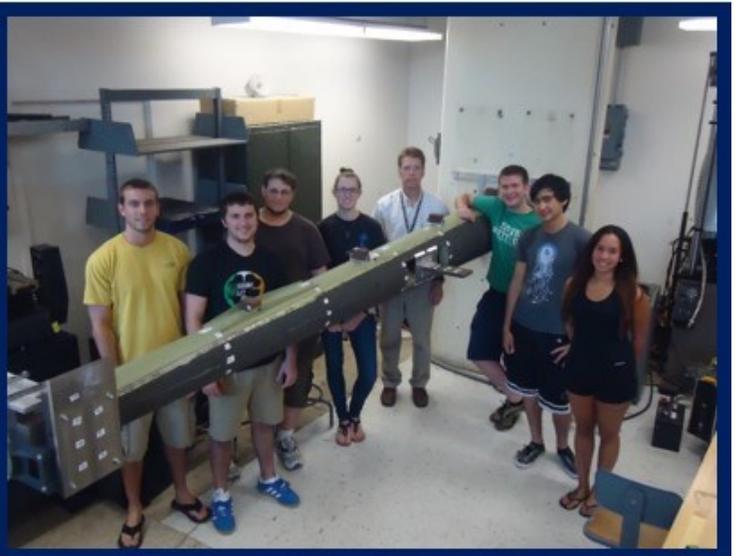
Dan Vergano (B.S. '90) was an invited speaker in the Eberly College of Science in early April. He presented a lecture "Science News in the Digital Age: A Brave New World" as the 2013 A. Dixon and Betty F. Johnson Lecture in Scientific Communication. Vergano is a senior science writer at USA Today.

Razvan Rusovici (M.S. '95), associate professor of aerospace engineering at the Florida Institute of Technology (FIT), represented FIT at the signing of a tripartite partnership between Insitut Teknologi Brunei, Piper Aircraft Inc., and FIT. This agreement will provide for future research collaborations as well as for student and staff exchanges for academic programs.



Peter Phillips (C) receiving his medal and certificate from Robert M. Lightfoot, associate administrator for NASA, and Lori Garver, NASA deputy administrator.

Peter Phillips (B.S. '90) was recently awarded the NASA Distinguished Public Service Medal, the highest honor NASA has for its contract employees. This award was given for work he performed for NASA Goddard Space Flight Center on the Suomi National Polar Partnership mission, which launched successfully in October 2011.



Students experiment with real aerospace hardware in laboratory courses led by **Steve Conlon**, head, Noise Control and Hydroacoustics Division at Penn State's Applied Research Laboratory and assistant professor of aerospace engineering, and **Rick Auhl**, senior research assistant in aerospace engineering.



Nicholas P. Frey (C), **Anthony E. Wolk Senior Thesis Award** winner, with **Tim Wolk** and **Ida Wolk** at the graduation reception in May. Frey was advised by **Robert Melton**, professor of aerospace engineering.



Spring 2013 Graduation Ceremony at the Bryce Jordan Center.



Penn State aerospace alumni with an F-35 Joint Strike Fighter - Flight Testing at Patuxent River, MD (L to R): **Ryan Hook** (B.S. '09, M.S. '11), **TJ Mellinger** (B.S. '10), **Sylvie Garrett** (B.S. '10), **Nick Bartlett** (B.S. '03), and **Nick Hoburn** (B.S. '10).



Capt. **Mike Yukish**, a research associate at Penn State's Applied Research Laboratory and assistant professor of aerospace engineering, accepts command of Naval Reserve Program Executive Offices, Naval Air Station Patuxent River, MD. (U.S. Navy Photo)



Anthony M. Montalbano (L), and **Thuan Nguyen (R)** receiving **Anthony E. Wolk Citizenship Awards** from **Ida Wolk and Tim Wolk** at the graduation reception in May.

RIGHT: Penn Staters at Columbia - **Robert Roedts (M.S. '08)**, **Jim Allen** and **Nick Grasser** (undergraduate student in aerospace engineering).



LEFT: **Jeremy Veltin (Ph.D. '08)** and **Bilim Atli-Veltin (M.S. '07, Ph.D. '09)** with their family in Delft.

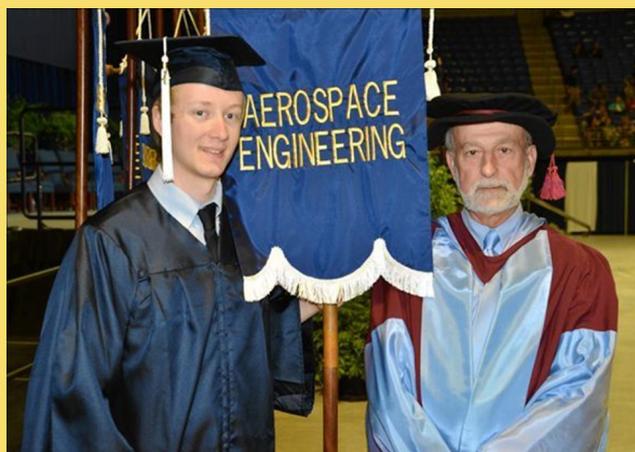


Laura McGill, deputy vice president of engineering for Raytheon Missile Systems, presenting a short course on "Being a Chief Engineer" to aerospace students.

THE GRADUATES

Student Marshal—Spring 2013

Nicholas Svrbely served as the aerospace student marshal for the spring 2013 graduation ceremony. He chose **Philip J. Morris**, Boeing/A.D. Welliver professor of aerospace engineering (his faculty adviser) to be his escort. Student marshals in the College of Engineering are selected for their outstanding academic achievement. Svrbely is the son of Belinda and Edward Svrbely of Hershey, PA, and is a 2009 graduate of Hershey High School. While attending Penn State, he received the Richard W. Leonhard Scholarship, the American Association of Airport Executives Foundation Scholarship, the Henrietta M. Fisher Scholarship, and the Hershey's Chocolate World Scholarship. Svrbely was named to the Dean's List every semester and is a member of the Sigma Gamma Tau, the national aerospace engineering honor society. His extracurricular activities included the American Institute of Aeronautics and Astronautics, the Penn State Aviation Club, and Engineering House. Svrbely completed an internship with the Naval Research Enterprise Internship Program, where he was involved in aircraft performance analysis. Following graduation, he will pursue a career in aircraft flight testing.



SUMMER 2012

Bachelor of Science

Connie Ruiz
Joseph W. Tombasco

Master of Science

Pauline Aufran
Mark P. DeAngelo
Gulkiz Dogan
Maria M. Garzon
Jason M. Halwick
Eric W. Hayden
Jan R. Herzog
Reed H. Johansson
Ryan S. Phillips
Russell W. Powers
John F. Quindlen

Doctor of Philosophy

Moza Maryam Khoshlahjeh
Seung Pil Kim
Chandrashekhar Tiwari

FALL 2012

Bachelor of Science

Arthur Chiu
Nicholas P. Frey
Philip J. Johnston
Brian P. Lani
Amanda M. Mazzenga
Anthony R. Parente
Ishan Y. Patel

Master of Science

Jeswanth Mentey
Kirk P. Miles
Yooku Tachie-Menson
Benjamin M. Wimmer

Anna T. Winslow
Tong Zhu

Master of Engineering

David J. Materkowski

Doctor of Philosophy

Young Tae Ahn
Eui Sung Bae
Zeki O. Gokce
Jeffrey L. Kauffman
Brendon Malovrh
Mihir P. Mistry
Sreenivas Narayanan Nampy
Swati Saxena
Patrick S. Williams

SPRING 2013

Bachelor of Science

Mikhail D. Abaimov
Gianna-Rose Acosta
Abigail Blessing M. Agaran
Robert C. Algazi
Robert H. Arrowood III
Peter M. Blasco[§]
Jose Javier Bustamante
Kevin P. Casey
Daniel P. Chen
Andre V. Coleman, Jr.
Matthew T. Conway
Ethan L. Corle
David R. Cycon
Matthew D. Drury
Dylan I. Dziuba
William I. Dzomba
Tobiasz Fabisiak
Stacie M. Flamos
Rebecca J. Frey
Andrew T. Gerhart

Jannah L. Giffin
Shannon J. Hagarty
Brennan L. Healy
Stefan A. Heren
Kaitlynn N. Hetrick
Connor J. Hoover
Nathan M. Johnson
Eric D. Kachel
Matthew J. Kapusta
Tyler C. Kelley
John T. Knisely
Hsiaoting Ko
Joshua T. Koehler
Daniel S. Kraynik
Thomas A. Letarte
Yaowei Li
John R. Linton, Jr.
Richard J. Mardis[§]
Ryan G. McFalls
Jeffrey M. McShane
Anthony M. Montalbano
John A. Morelli
Andrew D. Newswanger
Duy Nguyen
Thuan M. Nguyen
Sam G. Noerpel
Kimberly A. Novarina
Devin R. O'Connor
Ghanghoon Paik
Mark P. Powell
Stephen C. Prichard[§]
Chengzhi Qi
Nicholas Ravago
Raymond J. Rolston
Jack J. Rowley
Arnab Roy
Ryan S. Royce
Nicholas A. Rudenko
Sean E. Salzman

Koy E. Shaffer
Jaskirat Singh
Swarna Sinha[§]
Brittany A. Sipple
Ryan J. Spangler
Logan T. Sullivan
Niven T. Surenthiran
Nicholas E. Svrbely[#]
Ho Man Jonathan Tang
Michael Tang
Steven J. Tanner
Ethan N. Thompson
Steven T. Toth
James M. Trexler
Joseph M. Tylutki
Alexander F. Vergara
Chelsea K. Walker
Joseph R. Wieser
Emily A. Wolf
Shiang-Ting Yeh[§]
Charles J. Zendrosky

Master of Science

Joshua L. Dowler
Benjamin A. Goldman
Russell D. Moore
Philip L. Myers
Brian S. Shank
Benjamin L. Truskin

Master of Engineering

Penelope A. Campbell

Doctor of Philosophy

David C. Maniaci
Gabriel J. Murray
Thanan Yomchinda

[§]Schreyer Scholar

[#]Aerospace Student Marshal

Student Highlights

Student Awards



Nancy Pauling, Grant Skidmore, and David Pauling at the spring 2013 graduation reception.

The “Pauling-Eisenhuth Award” was endowed last year through the generosity of Nancy and **David Pauling** (M.S. ’75). This award was established to honor and recognize outstanding academic achievement by a master’s degree student whose studies focus on national defense or homeland security. The award is named for the Paulings and **Joseph Eisenhuth** (B.S. ’48, M.S. ’49, Ph.D. ’63), a former faculty member and Nancy Pauling’s step-father, who passed away in 2009. The inaugural recipient of this award was **Grant Skidmore**. Skidmore’s work, which was sponsored by the Office of Naval Research, focuses on experimental investigation of gas cavity pulsation as related to certain undersea naval systems. His adviser was **Rob Kunz**, senior scientist and head, computational mechanics division at ARL, and professor of aerospace engineering. Co-advisers were Jay Lindau, research associate at ARL, and **Tim Brungart** (B.S. ’86), senior research associate at ARL and associate professor of acoustics.



Emily Wolf (B.S. ’13), was the undergraduate student recipient of the 2013 Commission for Women (CFW) Achieving Women Award. Wolf and six others were honored at a University-wide luncheon hosted by the CFW and the vice provost for educational equity. These awards recognize Penn State women who have demonstrated notable leadership and accomplishments in their fields, have championed the University’s diversity efforts, and have engaged in significant public service.

Frank Kody and **Peter Blasco** (B.S. ’13), both graduate students in aerospace engineering, won awards at the 2013 College of Engineering Research Symposium (CERS)—Kody for his poster “Rotor Performance Enhancement Through Evolutionary Strategies and Non-Harmonic Deployment of Active Devices,” and Blasco for his poster “Dynamic Control Feasibility of Maneuvering a Human Powered Aircraft.” The CERS is a student-run event that provides a venue for undergraduate and graduate students to showcase their research. Kody and Blasco are advised by **Sven Schmitz**, assistant professor of aerospace engineering.

Julia Cole (B.S. ’07), doctoral graduate student in aerospace engineering, was selected to attend the Women in Aerospace symposium held in April at the Massachusetts Institute of Technology (MIT). The symposium is a joint venture between the Department of Aeronautics and Astronautics and the Department of Earth, Atmospheric, and Planetary Sciences at MIT. Top doctoral candidates from across the globe attend the event, present their work, and network with professionals from academia, industry, and government. Cole is advised by **Mark Maughmer**, professor of aerospace engineering.

Graduate student **James Coder** (B.S. ’08, M.S. ’10), who is advised by **Mark Maughmer**, professor of aerospace engineering, was awarded second place in the Student Poster Contest at the 11th Symposium on Overset Composite Grids and Solution Technology. The poster titled, “Applications of Overset Grids for Computational Fluid Dynamics Analyses in the Penn State Applied Aerodynamics Research Group” was presented at the symposium in Dayton, OH, in October 2012.

Nathan Depenbusch (B.S. ’09, M.S. ’11), graduate student in aerospace engineering, will be one of the representatives for the College of Engineering as part of the Graduate Student Association Assembly for the 2013-2014 academic year. His adviser is **Jack Langelaan**, associate professor of aerospace engineering.

Bradley Sottile (B.S. ’11, M.S. ’13), graduate student in aerospace engineering, was awarded the Graduate School Teaching Certificate. This certificate is awarded to graduate students who have completed a self-directed program designed to improve their teaching skills. The certificate is available to all graduate students who fulfill the requirements. Sottile is the first aerospace student to receive this award. He is advised by **Robert Melton**, professor of aerospace engineering.

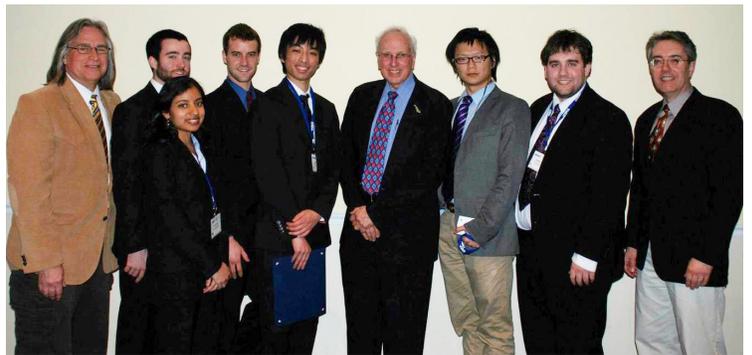
Anthony Montalbano (B.S. ’13) was this year’s recipient of the Sigma Gamma Tau Undergraduate Student Award. He also served as the 2012-2013 Sigma Gamma Tau president. Montalbano’s adviser was **Michael Micci**, professor of aerospace engineering.



Benjamin Pipenberg (holding award) receives award at AIAA student paper competition.

Seventy-nine students from ten east coast universities took part in the AIAA Foundation Region I Student Paper Competition, April 5-6 at the University of Maryland. **Benjamin T. Pipenberg** (B.S. ’11), graduate student in aerospace engineering, took second place for his paper titled, “Design, Fabrication, and Analysis of a 600mg Fixed-Wing Nano Aerial Vehicle.” Pipenberg’s adviser is **Mark Maughmer**, professor of aerospace engineering.

Student Societies



AIAA Student Conference attendees.

American Institute of Aeronautics and Astronautics (AIAA). This year the Penn State chapter of the AIAA organized many special activities in addition to monthly meetings, to get students more involved. For

Student Highlights

instance, AIAA participated in E-week, organized by the Penn State Engineering Ambassadors, hosting a booth to explain to non-engineering majors what aerospace engineering is about. A model jet engine was a popular display. In the beginning of November, a large group of students toured the University Park Airport, learning how a control tower and air traffic control work at a small airport. The students also toured the maintenance hangar and saw Penn State's corporate aircraft. Towards the end of the fall semester, Pratt & Whitney came to describe a case study of an engine design. During the fall, AIAA sold t-shirts to raise funds that support upcoming events.

With the start of the spring semester came more career and professional activities including the planning for the annual AIAA Congressional Visits Day in Washington, D.C. Several engineering-specific career opportunities were available to students throughout the year but especially in the spring.



Richard Mardis, Robert Arrowood, Anthony Montalbano, Eric Cardiff, and Ethan Corle at the SGT Banquet.

Sigma Gamma Tau (SGT). Last year, SGT hosted an Aerospace Networking Reception as part of the Fall Career Days. Four companies participated (United Technologies, Ball Aerospace, GKN Aerostructures, and Capital One), and even more are expected this year. **Eric Cardiff** (B.S. '97, M.S. '99, Ph.D. '02) of the NASA Goddard Space Flight Center headlined the SGT Induction Banquet in the spring. Members of SGT routinely provided tours or aerospace engineering laboratories to potential students, employers, and alumni. In conjunction with AIAA, SGT also established a lecture series in which faculty members discussed their ongoing research while introducing students to the concept of graduate school.

American Helicopter Society (AHS). The Penn State chapter of the American Helicopter Society had an exciting year. Students participated in a range of events including technical talks by rotorcraft experts, trips to an all-helicopter airshow, a trip to Boeing, and a treat day.

The semester kicked off in September with a drop-in treat day in the aerospace engineering office where students were invited to take a break during the school day to enjoy a variety of snacks provided by AHS. An informal information session was hosted in the evening to introduce the club and its officers and to present upcoming events.

In late September, students attended RotorFest 2012, an all-helicopter airshow at Brandywine Airport in West Chester, PA. In addition to the airshow, which consisted of military and civilian rotorcraft, students were able to explore a variety of helicopters on static display and to interact with both military and civilian pilots. Also in late September, Jeffrey Lowinger of Bell Helicopter presented design process for helicopters and the ongoing development of the Bell 525 Relentless. In October, AHS teamed up with AIAA and AeroGSA to inform undergraduate students about graduate study at Penn State. At the final event of the fall semester, Steven Weiner of Sikorsky discussed the development of the X2 demonstrator.

The spring began with a visit from David Heverly of Bell Helicopter, who discussed vibration control and Pylon dynamics, and encouraged students to consider positions with Bell Helicopter. In early April, Boeing held a seminar to help students with job applications and interviewing. In the same week, students took a trip to Boeing in Ridley Park, PA. The tour provided time in the V-22 and CH-47 flight simulators, a close-up of the wind tunnel, and a walk through the CH-47 production line. AHS ended the academic year with a seminar on V-22 nacelle-mounted sails and active flow control, delivered by **Michael Duffy** (B.S. '03) from Boeing.

Student Organizations/Events



Photo credit Jason L. Pereira

J. Cole, J. Bird, N. Depenbusch, and B. Pipenburg at the AHS MAV Student Challenge.

The Gnittany Gnat. A new challenge was incorporated into this year's American Helicopter Society (AHS) Forum, the first electric-powered VTOL Micro Air Vehicle (MAV) Student Challenge. The competition was designed to reward both "form" and "function" of an MAV. With respect to "form," teams with unique, innovative, and robust VTOL MAV air-vehicle design were awarded points. With respect to "function," teams that demonstrated the best flight and autonomy capabilities were recognized. Five teams of student researchers competed for prizes sponsored by Sikorsky. Penn State's Gnittany Gnat team took the prize for the "Best Original Airframe Design and Poster Presentation" and was awarded \$500. Although the team didn't bring home the prize for "function," their MAV had an incredibly low mass of 6 g—about the same weight as a quarter. This was well within the vehicle restriction of 500 g (including batteries). Gnittany Gnat team members were **Julia Cole, John Bird, Nathan Depenbusch, and Benjamin Pipenberg**, all graduate students in aerospace engineering. The team was advised by **Edward Smith**, professor of aerospace engineering and **Jacob Langelaan**, associate professor of aerospace engineering. The competition was overseen by AHS International's Unmanned VTOL Aircraft & Rotorcraft Committee. The MAV Student Challenge is hoped to lead to advances in this area and to increased expertise of students and universities.



The Penn State Gnittany Gnat VTOL MAV.

University Student Launch Initiative (USLI). USLI is an annual event that challenges teams of young engineers and scientists to design and build a high-powered rocket capable of flying to a target altitude of one mile. The rocket must also carry working, retrievable science or engineering payloads. The designs must undergo a preliminary review from NASA along with flight readiness and safety reviews before they can be approved for launch. LionTech Rocket Labs (LTRL) consists of approximately 45 Penn State students, ranging from first year under-

Student Highlights

graduates to masters students. The four main goals of this year's rocket were: Minimization—design a compact rocket that will complete all contest requirements while not using extra components or being larger than necessary. Testing—verify performance through multiple tests of components and duplicate calculations for project data. Simplicity—design a rocket that is both functional and simple, using lessons in structural design learned over the last two years. Payload Improvement—design a sophisticated payload with the ability to collect meaningful scientific data. Thirty-six universities and 21 high schools from across the nation participated in the USLI competition. Six Penn State students comprised the LTRL “Project Maverick” launch team: Heather Dawe, Anthony Maurer, and aerospace undergraduate students, **Thomas Letarte, Vincent San Miguel, Joe Wieser, and Luke Young**. The team traveled to Toney, AL, in April 2013. Despite an unsuccessful launch, the experience was incredibly valuable. LTRL demonstrated that a low-cost device can be made to measure Riemann Curvature parameters with surprisingly good accuracy. Furthermore, the team shrunk 11 complicated circuits to a small single board. The team overcame challenging engineering problems and, in doing so, members became more confident and skilled engineers.



The OSIRIS Lite 2 CubeSat simulator demonstration of the OSIRIS-3U spacecraft bus.

SSPL. This year students and faculty at SSPL submitted a proposal for the OSIRIS-3U program to the NASA CubeSat Launch Initiative and were awarded a launch opportunity in late 2015 or early 2016. In preparation, students held a preliminary design review to show their progress moving from the OSIRIS Lite 2 bus demonstration to a “FlatSat” bench model of the 3U CubeSat. They will continue toward a critical design review for the prototype in late fall 2013. An additional proposal was submitted to the Undergraduate Student Instrument Program, which would provide a team of undergraduate students the chance to design, construct, and fly a small payload aboard a sounding rocket in 2014; this payload would demonstrate the technologies being used on the OSIRIS-3U CubeSat in order to improve the technology readiness level of student-built systems. SSPL also welcomed a new group of students into the Student Training Program this year. A team of Penn State multidisciplinary first-year and sophomore students was formed to learn about building space systems while building a soda can-sized payload to launch on a model rocket and deploy at 2000 feet. The payload was required to report telemetry data including GPS data, atmospheric pressure, acceleration, and roll and pitch throughout the flight. Additionally, the payload had to safely descend to the ground falling between 15 and 30 feet per second, land upright and, if a parachute was used, detach it upon landing. SSPL students also participated in education outreach activities this year. SSPL hosted a take-your-child-to-work-day station, provided tours of the lab to prospective high school students, and staffed a table at the Exploration-U event to promote STEM activities.

Penn State chosen for DOE's inaugural wind competition. Penn State was named as one of only ten universities to compete in the U.S. Department of Energy's (DOE) inaugural Collegiate Wind Competition. Over the next year, student teams will be challenged to design and construct a lightweight, transportable wind turbine that can be used to power small electronic devices. The ten teams will compete head-to-head in spring 2014. **Susan Stewart**, a research associate in aerospace engineering, advises the Penn State team. Each team will design and construct a prototype wind turbine, develop a business plan and engage in a debate contest as part of the overall competition. The students' prototype wind turbines will be tested in a wind tunnel under specific conditions and judged for performance, operational safety, component durability and

system reliability. Each university's business plan will be evaluated with respect to market deployment feasibility, creativity, cost and other criteria. Teams will debate one another on current wind market drivers and issues, and will be evaluated on their understanding of the questions posed, their communication of potential solutions, and their ability to promote constructive dialogue. At the end of the contest, the team with the best overall score will have its wind turbine featured at DOE headquarters near the National Mall in Washington, D.C. The contest is sponsored by the department's Office of Energy Efficiency and Renewable Energy, and its National Renewable Energy Laboratory.



The Flight Vehicle Design and Fabrication (Sailplane) Class. At the end of the last school year, the Flight Vehicle Design and Fabrication course (AERSP 204H and 404H), the “Sailplane Class,” had its annual internal design competition in which Power-Up electric motors were used to power paper airplanes with the goal of maximum endurance. The longest time recorded was over 30 seconds, with one airplane sailing off into the sunset over campus to never be recovered.

The class continues to focus on the Zephyrus, a human-powered airplane intended to compete for the Kremer Sporting Prize administered by the Royal Aeronautical Society. The Zephyrus had an unsuccessful flight test last spring at Mid-State Airport, but damage was minor and better outcomes are expected this semester. Current efforts are directed at completing a new set of wings and tails with improved manufacturing methods and straighter, cleaner trailing edges. Work is also progressing on completing a fiberglass pod and integrating the drive-train system including propellers.



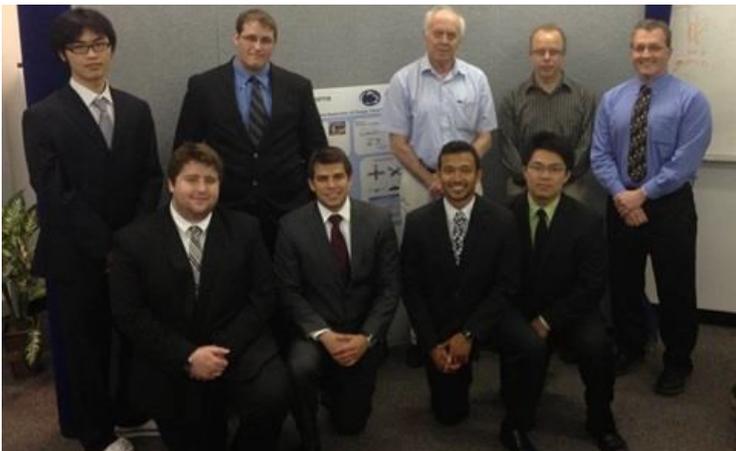
The AIAA Student Design-Build-Fly Competition. The 2013 AIAA/Cessna Aircraft Company/Raytheon Missile Systems Design/Build/Fly Competition Flyoff was held at TIMPA Field in Tucson, AZ, on the weekend of Apr. 19-21, 2013. The competition in its 17th year had 90 entrants. Eighty-one teams submitted written reports, and of those only 60 teams attended the flyoff. The theme this year was the Joint Strike Fighter. There was a short take-off mission with no payload, followed by a stealth mission with only an internal payload, and a third mission with a strike mission consisting of six possible payload configurations with various combinations of internal and external stores. Only 12 teams successfully completed all three missions. Penn State's team finished seventh in the report score and, despite being unable to perform their last flight due to minor damage, their score placed them seventeenth overall. Attending the competition this year were **Kevin Dugan, Alex Troup, Nick Grasser, and Justin Valenti**. **Mark Maughmer**, professor of aerospace engineering advised this year's team.

Student Highlights



Attendees at the RASC-AL Forum.

The spring AERSP 401B Spacecraft Design class attended the National Institute for Aerospace **RASC-AL Forum** (Revolutionary Aerospace Systems Concepts Academic Linkage), where they presented their design for a human mission to Mars. This team was selected by the RASC-AL committee, and included seven students: **Davide Conte** (team leader), **Rochak Dahal**, **Emery Etter**, and **Jon Lyons**, undergraduate students in aerospace, and **Jack Rowley** (B.S. '13), **Michael Tang** (B.S. '13), and **Mike Abaimov** (B.S. '13). The team was advised by **Kaushik Basu**, a graduate student in aerospace engineering. The team presented on day one, with various universities, industry community, and NASA speakers presenting over the three-day forum. The Penn State team also participated in the beach volleyball tournament, making it to the semi-finals, and visited the Kennedy Space Center facility.



Members of the Penn State Tilt-rotor Design Team.

30th Annual American Helicopter Society (AHS) Student Design Competition. A group of Penn State undergraduate students won the undergraduate category of the annual AHS Student Design Competition. The 2013 competition challenged students to design the Heal-Copter, a helicopter aimed at rescuing victims of a natural disaster. The Penn State Tilt-rotor Design Team included aerospace undergraduate students **David Cycon**, **Javier Bustamante**, **Arnab Roy**, **Thuan Nguyen**, **Chengzhi Qi**, and **Trevor Steiner**. The team was advised by aerospace faculty members **Robert Bill**, research associate, **Joseph Horn**, associate professor, and **Edward Smith**, professor. The team developed the Griffin, a medivac aircraft that is capable of performing three individual missions that require: fast deployment and rescue coordination, aid distribution, and evacuation of casualties, respectively. In

order to perform these missions effectively, the aircraft is capable of flying at 6000 m altitude at 240 knots cruise speed, hovering at 2000 m altitude, and climbing at 2000 feet per minute. Implementation of new technologies was one of the team's main thrusts for their next-generation tilt-rotor design, including active flow control devices on the wing to reduce wing download, and composite structure for the wing to reduce thickness and increase whirl-flutter stability. Also, unlike conventional tilt-rotors, Griffin has an outboard section that is independently controlled to reduce drag and wing download, and to improve roll control. These characteristics made it easier and safer for the aircraft to assist in disaster relief rapidly. The "Griffin," a historical symbol of strength and salvation, perfectly represented the team's mission to create the ultimate rescue aircraft. This year the sponsor for the annual competition was Eurocopter, which rotates among Agusta-Westland, Boeing, Bell, Sikorsky, and Eurocopter.

The Chinese Undergraduate Student Association (CUSA). The Chinese Undergraduate Student Association competed in the 2013 Penn State **Rube Goldberg Machine Contest** on Feb. 23, 2013 at The Penn Stater Conference Center Hotel. CUSA's team captain, **Xiaomo Zhang**, an undergraduate student in aerospace engineering, and his team dedicated more than 100 hours to the entire process. All teams were challenged to use innovative ideas, unconventional problem-solving skills and a little humor to design and build a machine that hammered a nail in 20 or more steps. The contest is named after Pulitzer Prize-winning cartoonist, Reuben Lucius Goldberg, who drew cartoons that combined simple machine parts and household items to create contraptions that accomplished simple tasks in a laughable number of excess steps.



Mitchell Gennocro, **Colonel Gary Konnert** (retired)-test pilot, and **Collin Russo** at the "It Flies" Competition.

The Merlin Flight Simulation Group's Annual **Aircraft Design and Handling Competition "It Flies USA"** was held on Apr. 13, 2013, at The University of Dayton. **Mitchell Gennocro** and **Collin Russo**, undergraduate students in aerospace engineering, were one of the nine entrants who participated in the competition with designs ranging from an airship to a Red Bull style racer, an amphibious light sport plane, and a human powered aircraft. The goal of the competition was to design aircraft that fly well. The Competition was judged in two parts: a ten-minute presentation to the judges on the aircraft design; and a "flying" assessment of the design in one of Merlin's simulators, by two test pilots. All entries were "flown" and assessed by experienced test pilots on one of Merlin's Engineering Flight Simulators.

ATTENTION AEROSPACE GRADS!

What are you doing now?

You can send your news by e-mail to aerospace@engr.psu.edu.

We look forward to hearing from you!

Visit us on our website at <http://www.aero.psu.edu>

If you've moved and would like to continue to receive our newsletter, please remember to update your address with the Alumni Association at <http://www.aero.psu.edu/Alumni/addresschange.html> and complete the secure online change form.

Outreach and Other News



Attendees at the 46th Annual Rotary Wing Technology Short Course.

Barnes McCormick, Boeing Professor Emeritus of Aerospace Engineering, organized and offered the **Rotary Wing Technology Short Course** for the 46th consecutive year at Penn State. McCormick's hard work and tireless contribution to the continuing education community was previously recognized with the 2007 UCEA Mid-Atlantic Outstanding Faculty Service Award. "Barney" has announced his intentions to turn the reins over to **Ed Smith**, professor of aerospace engineering, and director, vertical lift research center of excellence, for future offerings.



Undergraduate students—**Kevin Dugan**, **Greg Walsh**, **Emery Etter**, **Emily Wolf** and **Nicholas Rudenko** (far right) participating in THON 2013.

THON 2013

Emily Wolf – dancer for Engineering House
Chris Santo – dancer for Ohana (special interest organization)
Greg Walsh – Moraler – active in Newman's Club THON
Richard Zang – Rules and Regulations committee member
Ryan Burns – Rules and Regulations committee member
David Boal – OPPerations committee member
Peter Blasco – OPPerations committee member
Shannon Hagarty – OPPerations committee member
Shiang-Ting Yeh – participating through Beta Theta Pi
Steve Flinchbaugh – THON chair for Pi Lambda Pi
Damon Raynor – VP of Raw Aesthetic Movement dance group
Nicholas Rudenko – Wondershop Showdown band (saxophone)
Kevin Dugan – Hospitality Committee

Mandy Ott (B.S. '07) was featured in the November issue of ASME magazine for helping her climbing partner, C.J. Howard, design a customized climbing foot. Using an engineering CAD program, they designed an aggressive climbing shoe with a downturned toe (like a banana). The foot was then fabricated using direct metal laser sintering technology, in about 40 hours. Ott had encountered the process while working at a major aerospace company. Howard climbs as many as three times a week, giving him the opportunity to try out his new prosthesis.

Susan Stewart, research associate in aerospace engineering and director of the PA Wind for Schools Program, was one of the judges in the second annual PA KidWind Challenge held on Mar. 23, 2013, at the Londonderry School in Harrisburg. The KidWind Challenge, a competition for middle and high school students in which teams of two to four students apply their knowledge of science, technology, engineering, and mathematics (STEM) to create a wind turbine that produces more power than that of their competitors. There are two divisions, geared and direct drive, with prizes awarded to the first, second, and third place teams in each division. One of the goals of the KidWind Challenge is to interest students in careers in the STEM fields pertaining to renewable energy.



Zachary Olshenske (B.S. '08), played a role in first telerobotic pitch in Major League Baseball (MLB) history. Nick LeGrande, an avid 13-year old baseball player, was diagnosed with a rare blood disease and was no longer able to play the sport he loved. With the help of many, his dream of throwing the first pitch at a MLB game became a reality. Olshenske's role in this project was to design and build the machine and all the mechanics and hardware for the machine that threw out the first pitch. In essence it was an adjustable pneumatic catapult that was actuated by young Nick's motions. The project was made possible by high speed Internet so that everything happened in near real time. Nick was also able to operate a camera on the machine so that he could look around the ballpark and interact with the players.

Seminars and Short Courses

Charles E. Tinney, assistant professor in aerospace engineering and engineering mechanics, The University of Texas at Austin, "Cumulative Nonlinear Distortion of Acoustic Waves Produced by High-Speed Jet Flows" – September 2012

Kevin Rivers, manager, Orion Launch Abort System Office, NASA Langley Research Center, "Development of the Orion Multi-purpose Crew Vehicle Launch Abort System" – January 2013

Laura J. McGill, engineering deputy, Raytheon Company, "Systems Engineering and Being a Chief Engineer" – March 2013

K. Todd Lowe, assistant professor of aerospace engineering, Department of Aerospace and Ocean Engineering, Virginia Tech, "Time Resolved Optical Diagnostics for Supersonic Jet Noise Research" – May 2013

Oguz Uzol (Ph.D. '00), director Middle East Technical University (METU) Center for Wind Energy and associate professor, Department of Aerospace Engineering METU, Ankara, Turkey, "METU Center for Wind Energy: Research Activities and Collaboration Opportunities" – June 2013

Barnes McCormick, Boeing Professor Emeritus, University Park, "46th Rotary Wing Technology Short Course" – August 2013



Contributions

Thank You to All Who Have Contributed to the Department!

The department is grateful to all who have provided financial support of its students and activities. Following is a list of individual donors to the department from July 1, 2012, to June 30, 2013. We apologize if there are any omissions. If you contributed and have not been acknowledged below, please contact us so that we can correct our records. If you are already giving to Penn State, you might consider directing your future gifts to the Department of Aerospace Engineering.

Ronnie E. Allan
 Dominic Amaturio
 Daniel F. Antinone
 James & Joyce Bambrick
 Carl W. Banks
 Stephen C. Bartch
 David & Kathy Baughman
 William & Karen Bechtel, II
 Karl & Jimmie Bergey, Jr.
 Richard & Ida Bobrow
Boeing Company#
 Paul M. Branson
 Michael T. Carozza
 Brian & Marion Chappel+
 Silvio & Dawn Chianese
 Robert & Renee Coleman
 Fredric & Karen Dellinger
 Vincent & Donna DiLoreto
 Michael J. Donoghue
 Mark & Ruth Dreier
 Jess W. Endicter
 Linn C. Flohr
 Joseph & Shannon Gasbarre
GE Foundation##
GeoEye Foundation++
 Nicholas A. Grande
 Ryan F. Hook
 Francis & Brigitte Hurley
 Philip L. Johnson
 Steven & Lisa Johnson

Emil & Maria Kaegi
 Mark J. Keller
 Joseph & Tracey Krug
 Daniel & Elaine Kunec
 Roger E. Lindenmuth
Lockheed Martin#
 Thomas D. Makowski
 Timothy & Mary Makuch
 Michael G. Mancini
 Janis L. Mantini & Theodore R.
 Rutkowski
 Robert J. Mayer
 David & Nancy Maynard
 Barnes & Emily McCormick, Jr.**
 Joseph & Claire Mellish
 Michael L. Merritt
 Miles & Janet Miller
 Brandon P. Montemuro
Mynah Aircraft Structure Co.
 Robert & Julia Nelson**
Northrop Grumman Fdn.#+
OppenheimerFunds#
 Ricky & Charlotte Ort
 Brent & Roberta Paul
 David & Nancy Pauling##
 Brian Pomeroy
 William & Sara Posnett
 Tushar Prabhakar
 Dimitri & Beverly Pucher
 Douglas & Heather Rarick

Carlos & Kristin Rascon
Raytheon Company#
 James M. Rebel
 Alexander M. Ridgeway
 Michael & Karen Rudy
 William J. Schumacher
 Norman & Shirley Schwalm
 Jeffrey T. Semenza
 Robert E. Sheridan, Jr.
 Harold & Lynda Sherrieb**
 Brian & Barbara Shuba**
 Jason & Toni Skank
 Richard & Bonnie Smith
 Michael & Jane Solly
 David & Carol Spencer
 Jonathan C. Stergiou
 George & Louise Sterner
 Keely D. Sullivan
 Robert & Helen Swab

Timothy S. Swan
 Keith A. Tilford
 Lawrence & Amanda Trick
United Technologies Corporation#
 Jeffrey & Valeria Walters
 Michael & Laurie Weigner
 Ida Blackburn Wolk*
 Timothy & Mary Jo Wolk*

***Bold**—Corporate Support
 # Matching gifts
 * Wolk Senior Thesis Award
 + Chappel Scholarship
 ** McCormick Excellence Fund
 ++ GeoEye Foundation
 ## Pauling-Eisenhuth Award*

Your support makes a difference to our department and our students. Please consider a gift “for the future” at www.givenow.psu.edu; select “other” in the Designation of Gift section, and write in “Aerospace Engineering” with any other special designation you may desire. We thank you for your generosity.