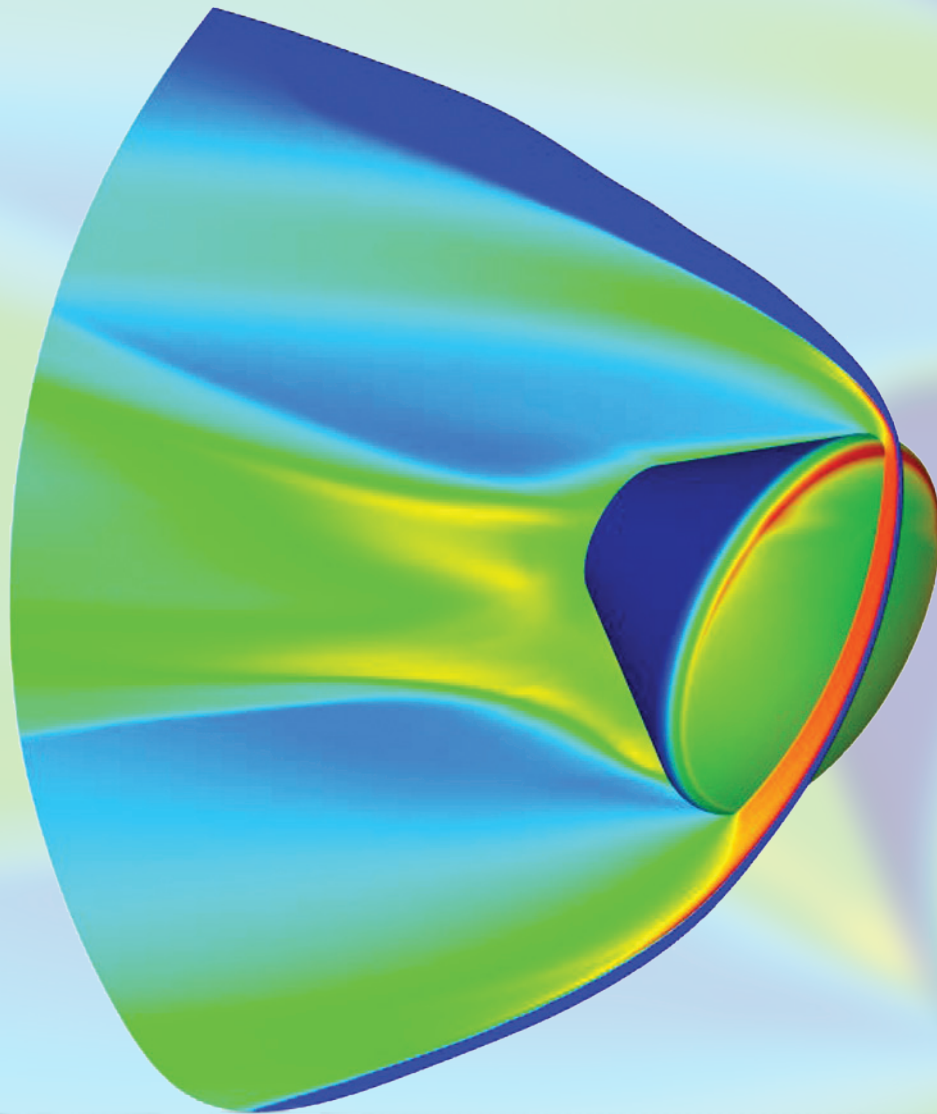


AE Illinois



*Newsletter of the Department of Aerospace Engineering
University of Illinois at Urbana-Champaign*

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Welcome to the 2012 edition of the Alumni Newsletter of Aerospace Engineering at Illinois

We have much to celebrate this academic year, starting with the arrival of two new faculty members. **Dr. Marco Panesi**, who joined the department this past summer, brings a unique expertise in the numerical modeling of complex flows and chemistry associated with hypersonic and reentry vehicles. He comes to us after completing his PhD at the Von Karman Institute in Belgium and a postdoc at ICES in Texas Austin. His research background at the intersection of computational fluid dynamics and computational chemistry will complement the current modeling work of AE faculty like Dan Bodony and Jonathan Freund.

Dr. Grace Gao, who joined our department in October after a PhD and postdoc at Stanford, brings her expertise in the area of Global Navigation Satellite Systems (GNSS), which includes the ubiquitous US GPS, and the European Galileo, Russian Glonass and Chinese Compass systems. Her research addresses the many new challenges and opportunities associated with the GNSS, and she will undoubtedly constitute a great link between AE and all those across the College of Engineering and campus interested in developing new applications of this technology.

I invite you to find out more about Marco and Grace’s background and research activities on pages 4 and 5 of this newsletter.

Also joining AE as Research Professor is **Dr. Thomas Jackson**, who has long been an affiliate of the Center for the Simulation of Advanced Rockets in Computational Science and Engineering at Illinois, and who brings his expertise in the theoretical and numerical modeling of combustion and energetic materials, with emphasis on solid propellants. Tom has been collaborating with various AE faculty and graduate

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students for many years, and we are delighted to see him 'officially join' the department.

I am also pleased to announce that AE will continue to grow this coming year, as we plan to fill *three additional open rank faculty positions* in the areas of

space systems, autonomous aerospace vehicles, and multidisciplinary design optimization. The MDO position is expected to benefit from access to large scale computing. The College has identified the position as a Blue Waters position, giving the selected faculty member substantial allocations on, and expedited access to, the new petascale computer.

With about 400 and 150 students, respectively, the AE undergraduate and graduate programs are very strong. In May we celebrated the first graduating class of the new Aerospace Systems Engineering MS program. Steve D'Urso, who joined our program in the summer of 2011 after a very successful career in industry, heads the program. (see p. 21 and 25 for more details). Students in this year's program are collaborating closely with industrial partners and NASA to select design projects to which they can apply systems engineering concepts.

The newsletter also described the many achievements and awards of AE faculty members, students and alumni, including the first- and second-place award recipients of our capstone design teams in the national AIAA Space Design competition (p. 23), the induction of Pres Henne (BS 69) in the Engineering at Illinois Hall of Fame (p. 30), the promotion of Ioannis Chasiotis and Cedric Langbort to full and associate professors, respectively, (p. 12 and 8), best papers awards received by Prof. Tim Bretl and his student (p. 12) and many others.

On a sadder note, we lost this year an eminent member of the AE faculty, Prof. Emeritus Allen Ormsbee, who passed away this summer. The impact AI has had on the department and on many of our former students over his 44 year career in AE has been tremendous. A memorial in his honor written by Dr. Robert Liebeck is on p. 15.

I invite you to discover the many stories presented in this newsletter, and look forward to your comments. Our contact information can be found on the department's web site at www.ae.illinois.edu, together with the many other stories that could not fit in this newsletter.

Sincerely,

Philippe H. Geubelle
Bliss Professor and Head

Department of Aerospace Engineering

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J. Craig Dutton
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AE Faculty Listed As Excellent

AE faculty recently included on the List of Teachers Rated as Excellent by Their Students have been: Spring 2012, Daniel J. Bodony; Timothy W. Bretl; David L. Carroll; Bruce A. Conway; Steven J. D'Urso; J. Craig Dutton. Fall 2011, Bodony; Conway; D'Urso; Dutton; Philippe H. Geubelle; John Lambros.

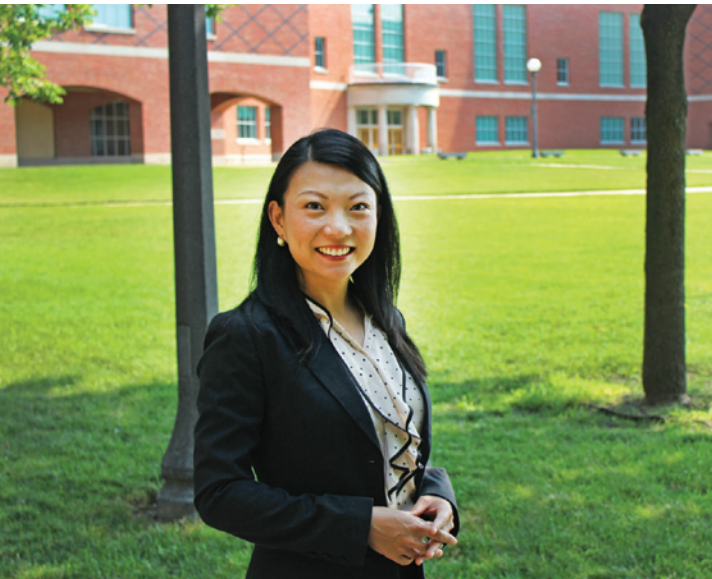
On the cover: Space capsule reentering the atmosphere at high speed (M = 30) (Crew Exploration Vehicle). The color map refers to the temperature. Graphic by Marco Panesi.

Gao Brings GPS Expertise to AE

Grace Xingxin Gao, an expert at decoding the structures of Global Navigation Satellite Systems (GNSS) civil signals, has brought her talents to the AE at Illinois' faculty lineup.

Most recently a Research Associate in the Global Navigation and Satellite Systems Laboratory at Stanford University, Gao has gained a reputation in sorting out and identifying the myriad of signals beaming down on Earth from GNSS systems. These include not only the established GPS system of the United States and GLONASS of Russia, but also newer systems: COMPASS of China and GALILEO of the European Union.

Some of the signals transmitted by these satellite systems are only as powerful as a 50-watt bulb shining from 12,000 miles away. And, just like AM radio stations, their reception becomes more jumbled the more crowded the frequencies get. On the other hand, more satellites and signals from the new systems can bring better accuracy and more redundancy to the GPS system. That's where engineers like Gao come in.



"I work on how the systems can work together. By making the systems more redundant, we can make GPS more robust against errors."

The various countries realize the value of coordinating their work. Gao attended and helped produce a report of a meeting in Shanghai in May 2011, in which scientists from the U.S. and Chinese National Academies of Engineering sought coordination between GPS and COMPASS. Gao feels fortunate to have been included in such important work.

"I think I'm quite lucky in this way," she said. "It is the right time as China is at the developing stage."

Having earned a bachelor's degree in mechanical engineering in 2001 and a master's in electrical engineering in 2003, both from Tsinghua University in China, Gao was introduced to GNSS through her doctoral work in electrical engineering at Stanford, where she earned her PhD in 2008. Her breakthroughs in the field had such impact that she received the Institute of Navigation's (ION) Early Achievement Award for 2008. A year later, she was awarded the William E. Jackson Award by RTCA, the U.S. aviation standards organization. She was also named as one of the 50 GNSS Leaders to Watch by GPS World Magazine. She has won a number of ION GNSS Conference's Best Presentation and Best Student Paper awards. Most recently, she was elected to be an ION council member. She serves a two-year-term as an air representative for ION.

Gao emphasizes that satellite navigation plays pivotal roles in many aspects of our normal, everyday lives:

- Navigation systems are key for synchronization in cell phone use.
- Navigation systems provide precise timing in transactions such as buying and selling stock.
- Phasor measurement units (pmu) employ GPS to synchronize power grid operations.
- Farmers use GPS for precise placement of fertilizers and seeds.
- Continued research into GNSS applications could reduce air traffic delays and fuel consumption. The next generation of ATC is expected to fully depend on GNSS.

Improved satellite navigation can help smooth an aircraft's ascent and descent, reducing the amount of fuel needed.

Gao plans to work with AE Assistant Profs. Soon-Jo Chung and Timothy Bretl in applying GPS navigation to the development of unmanned, autonomous aircraft and formation flying. She also will collaborate with Electrical and Computer Engineering Prof. Jonathan J. Makela, who studies multi-technique remote sensing of the Earth's ionosphere. This spring, Makela and Gao will co-teach a GPS class with applications for remote sensing.

Exploring Physical Modeling: Panesi Takes an Interdisciplinary Approach

With recent advances in computational capabilities and quantum chemistry, a new range of engineering tools is at the disposal of scientists and engineers. Marco Panesi, new assistant professor in AE at Illinois, aims to focus his research efforts in physical modeling within the interdisciplinary fields of quantum chemistry, high performance computing, and computational fluid dynamics.

Panesi uses his improved physical models to study the detailed chemistry that occurs when a spacecraft re-enters an atmosphere such as Earth or Mars. "A shock wave forms around the vehicle upon re-entry," he said. "Earth's atmosphere is comprised mostly of nitrogen and oxygen. When the shock wave develops, chemical reactions occur near the spacecraft. These reactions are critical when determining the heat load to the vehicle surface."

Previous models, mostly phenomenological in nature, have been developed to study these problems. These models were constructed from legacy experiments (performed in the 1950s and 1960s), because computational resources were limited. "Now we have access to better chemical databases formulated *ab initio* from quantum mechanics calculations," he said. "These databases enable researchers to construct improved physical models for use in a variety of engineering applications."

The chemical processes and flow composition of the gas are critical to vehicle design, since the state of the gas defines the overall heat transfer to the surface of the vehicle.

"The composition of the gas has a dramatic effect on the heat flux," Panesi said. "If we have a good estimate of the state of the gas, we hope to improve the predicted surface heating that will aid in design of thermal protection systems, for example."

Panesi plans to take model development a step further, by incorporating uncertainty quantification to improve confidence in his model predictions.

"When you generate a model," Panesi explains, "you introduce mathematical equations that describe the critical phenomena that are important to your design. When generating a model, uncertainty quantification can be used as a powerful tool to determine the confidence in your predictions."

Panesi has worked on these types of problems for the past three years while a research scientist for the DOE-funded Center for Predictive Engineering and Computational Sciences at the University of Texas at Austin.

To solve these problems Panesi has worked closely with chemists and experimentalists at the Electric Arc Shock Tube Facility at NASA Ames Research Center. He envisions reaching out to chemists on the Urbana campus, as well as working with AE Profs. Joanna Austin and Gregory Elliot, both experimentalists specializing in fluid mechanics, compressible flow and combustion.



"When you generate a model, you introduce mathematical equations that describe the critical phenomena that are important to your design. Uncertainty quantification can be used as a powerful tool to determine the confidence in your predictions."

Panesi also will expand his research to parallel fields of combustion, as well as plasma discharges and plasma-assisted combustion.

Panesi earned his PhD in aerospace engineering in 2009 from von Kármán Institute for Fluid Dynamics (VKI) in Belgium, in cooperation with the Università degli Studi in Pisa, Italy. He earned a master's degree in fluid dynamics in 2005 from VKI, and a master's in aerospace engineering from Università di Pisa in 2003.

Panesi is a member of the American Institute of Aeronautics and Astronautics (AIAA) and a member of the European Community on Computational Methods in Applied Sciences. His honors include the David Weaver Best Student Paper in Thermophysics at the 42nd Annual AIAA Conference; the 2011 Award for Fundamentals on Aerothermodynamics at the 7th Annual Symposium on Aerothermodynamics for Space Vehicles; a 2008 CTR Summer Program Fellowship at Stanford University; and NATO Fellowships for his master's and PhD at VKI.

Bat, Bird Flight Inspire Chung, Expert in Control and Robotics



“There’s a lot to learn from bio systems. Bats are so agile and highly maneuverable; they can make rapid 180-degree turns and they can fly indoors without colliding with obstacles.”

based flight, have become the research centerpieces for the AE at Illinois assistant professor. The topics “share a common theme: how to reduce the complexity of complex aerospace systems that might involve networked dynamical systems and distributed measurements by applying nonlinear control theory,” Chung said.

He and his students work on control and robotics for complex aerospace systems, examining nonlinear control, estimation, and synchronization of multi-agent or distributed dynamical systems. Such tools are used to reduce the complexity of networked dynamic systems that span coupled neural oscillators for flapping wing patterns, swarms of spacecraft, and vision-based sensing for autonomous navigation.

Flapping Flight

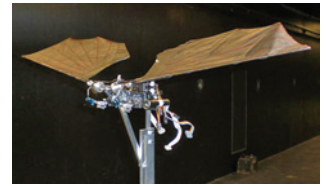
In studying flapping flight, Chung’s group has built a robotic bat that has wings equipped with eight motors to simulate joints found on a bat in nature (the animal’s wings have 24 joints). The timing of movement between one joint and another when a bat’s wings flap can be observed as an oscillatory network phase synchronized pattern. By controlling the phase differences of oscillations, Chung can mimic the movement for the robotic bat without having to monitor all eight of its joint controls.

This research was selected for the Best Paper Award presented during the American Institute of

Soon-Jo Chung looks to nature, watching bats and birds as they manipulate and flap their wings to fly, glide and land, and dreams of aircraft that can mimic those movements.

This bio-inspired flight, along with swarm control and vision-

Aeronautics and Astronautics 2009 Infotech@Aerospace (I@A) Conference, and also recently led to an ARCS Foundation Scholar Award for Chung’s student, Michael Dorothy.



“There’s a lot to learn from bio systems,” Chung said. “Bats can fly with damaged wings. They are so agile and highly maneuverable; they can make rapid 180-degree turns autonomously and they can fly indoors without colliding with obstacles. These qualities are desirable for small robotic aircraft that could be used in surveillance, particularly in urban settings where obstacles hamper movement and satellite control is blocked.”

The Army Research Office (ARO) and Air Force Office of Scientific Research (AFOSR) support this research.

Gliding and Perching

Chung and his students also have gained considerable media attention for a video of a robotic bird they built that can glide and perch on a specific location, which, in the video, is a human hand. The work was made based on multiple journal and book chapter articles, including the AIAA Journal, Bioinspiration and Biomimetics, and AIAA Progress in Astronautics and Aeronautics. The derivation of the perching control and guidance law is in review for the IEEE Transactions on Robotics.

The wings of birds or aircraft with flapping wings are inherently capable of being reoriented, allowing them to be used for control and maneuvers in a gliding phase and eliminating the need for additional traditional actuators. Gliding is an effective way to conserve energy while soaring, descending, and landing.

“The driving philosophy behind the work is that the maneuverability and control efficiency of avian flight can be replicated by applying their actuation and control principles to advanced MAVs (micro aerial vehicles) designed on the size scale of small birds,” explained Aditya Paranjape, a postdoctoral scholar who did his PhD thesis with Chung.

"We choose a perching maneuver to demonstrate the capabilities of our articulated-winged aircraft concept, novel guidance algorithms, and control design. In particular, the ability to perform perched landings on a human hand endows our robot with the ability to operate around humans," Paranjape said.

Chung said his group has equipped their laboratory space with 16 infrared cameras that track the motion and orientation of the robotic bird and use that information in real time to send messages to actuators on the craft to let it know where it is. Currently, Chung and his students are working on a version that can fly autonomously outdoors with the camera system.

Chung's current work is focused on controlling flexible wings of aircraft by using PDE boundary control. This PDE control work is conditionally accepted for publication in the IEEE Transactions on Robotics.

Spacecraft Swarms

Chung's research also covers controlling swarms of small spacecraft. Formation flying is the use of several, small spacecraft for a mission rather than a single, large spacecraft. This method has become popular over the past decade because it is cheaper to launch smaller spacecraft.

Along with Dr. Fred Hadaegh's team at the NASA Jet Propulsion Laboratory (JPL), Chung and Morgan have been studying the use of hundreds to thousands of very small spacecraft, each about the size of an iPhone. By using so many identical spacecraft, the cost of each and the overall cost of the mission decrease. Another advantage of flying so many spacecraft is that the loss of a single spacecraft is much less significant.

But the use of such a large number of craft has inherent challenges: "That's when the game changes," Chung noted.

Since the individual spacecraft are spaced within one meter of each other, collision avoidance becomes an issue. Also, rather than fly in unison in space, the craft without any control tend to spread apart from one another thereby quickly forming a string of pearls, Chung said. To counteract this, the researchers have programmed the crafts so that, while the entire unit rotates around a heavenly body such as Earth,

smaller groups form within the unit to oscillate with one another in a contained elliptical pattern. The oscillation establishes energy matching, reducing fuel consumption and maintaining the overall formation to allow for optimal mission capacity and greater simplicity, Chung said.

"Instead of controlling each craft individually, we can control the phase angle between them. Having control over one phase in the oscillation allows for control over the whole group," he said.

NASA Office of Chief Technologist and NASA JPL support this research.

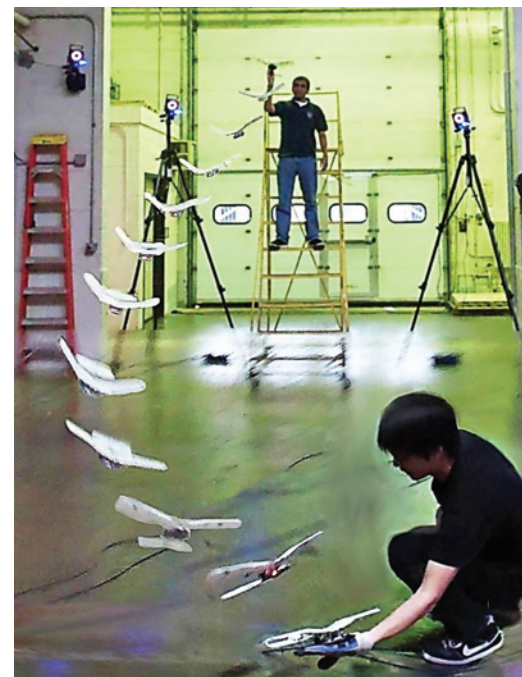
Vision-based Flight

Chung and his students are working with Seth Hutchinson, professor of Electrical and Computer Engineering, on vision-based navigation for small aircraft in times when Global Positioning System (GPS) devices are not operational, such as indoors or in riverine environments with overhanging canopies. Vision cameras are placed upon the craft during flight to create a visual map of the area while localizing its location in real-time without GPS signals.

Chung and Hutchinson are also supervising a group of students who are developing unmanned aerial vehicles whose cameras can track multiple moving objects in the ground. Chung noted, "We have an outstanding group of students from AE, ECE, and CS, who basically developed a fully autonomous UAV with a vision tracking system within a semester."

Compared to his small indoor perching robot, this UAV, with a wing span of 3 meters wide, can fly at an altitude of 1,000 feet for one hour at a single charge, Chung noted.

The Office of Naval Research (ONR) supports this research.



"Instead of controlling each craft individually, we can control the phase angle between them. Having control over one phase in the oscillation allows for control over the whole group."

Langbort Research: High-tech Hide and Seek



Langbort

AE at Illinois Associate Prof. Cedric Langbort's research efforts can be compared to a very high-tech game of hide and seek.

On the one hand, Langbort has earned a National Science Foundation Faculty Early Career Development Program (CAREER) Award for a project that cloaks information as a last line of defense against potential cyber terrorists. On the other hand, as Co-Director for the new Center for People and Infrastructures, Langbort wants to help consumers become aware of the underlying workings of electronic systems used in everyday life.

"In one case, I'm making information visible, and in another, I'm hiding it," he said.

Langbort's CAREER Award for his project, "A Dynamic Game Theoretic Approach to Cyber-security of Controlled Systems," involves manipulating algorithms to control the amount of information accessible to a potential hacker.

"I try to mitigate in the best possible way any attacks on the system. It's a game theory approach in which I look at a number of different scenarios and strategic intent," Langbort said. "Even if (a hacker) modifies the algorithm, the control logic itself should be resilient enough to not go out of balance."

Langbort's theories provide protection when usual security mechanisms fail. It's a defense critical for structures such as power systems that become

vulnerable because of their constant back and forth data transfers from control centers.

The CAREER Award provides Langbort with \$400,000 over five years to pursue his research.

The information that a power system may gain about a consumer in the transfer of data from a meter to a control center may not be transparent to the consumer. That's where Langbort's work for the People and Infrastructures Center comes in.

"More systems are becoming smart, such as smart meters that monitor consumption. In some ways, it's wonderful, but the systems are making assumptions about users. They are making the users behave according to the systems' assumptions."

For example, he said, when an individual decides to google a topic, Google will suggest possible sites to be examined based on trends the system has gathered about the person from past searches.

By doing this, Langbort said, systems "put us in our own little bubble; they limit our choices and potentially isolate us from other points of view."

"We feel that users need to know that this is going on and should have a decision in whether they want it to go on or not," he said.

The Computer Science Department, the Coordinated Science Laboratory and the College of Media provide funding for the center.

Bodony: Linking "Ahhhh" to Aeronautics



Bodony

What does a person's ability to say "Ahhhh" have to do with aeronautics? More than one might think.

"Speaking involves a complex interaction of the flexible vocal folds and the unsteady jet of air they generate when they oscillate. Despite our reliance on oral communication, we still don't know what happens in the voice box to make sound," said AE at Illinois Assistant Prof. Daniel J. Bodony, who studies aeroacoustics. "There are fundamental questions about how the dynamic fluid-structure system works in general and, in particular, how they work together."

Understanding this biological phenomenon also leads to better designs for aircraft, Bodony maintains.

"Gone are the days when high-performance air vehicles are efficiently designed by the aerodynamicists and structural dynamics working separately," Bodony said.

"We can no longer treat aircraft as rigid structures, and we now have to look at both solid and fluid mechanics together," he continued. "The structure heats up, vibrates, and changes the aerodynamics. Both very fast (hypersonic) and very slow (micro UAVs, such as those worked on by AE Assistant Prof. Soon-Jo Chung) are becoming flexible. Predicting the performance of flexible aircraft and, more importantly, developing methods for optimizing and

Self-Healing Electronics Could Work Longer, Reduce Waste

WRITTEN BY LIZ AHLBERG

AE at Illinois Prof. Scott White and his colleagues have developed a self-healing system that restores electrical conductivity to a cracked circuit in less time than it takes to blink. The work made the list of "Science News of the Year" in technology for 2011.

As electronic devices are evolving to perform more sophisticated tasks, manufacturers are packing as much density onto a chip as possible. However, such density compounds reliability problems, such as failure stemming from fluctuating temperature cycles as the device operates or fatigues. A failure at any point in the circuit can shut down the whole device.

Most consumer devices are meant to be replaced with some frequency, adding to electronic waste issues, but in many important applications – such as instruments or vehicles for space or military functions – electrical failures cannot be replaced or repaired.

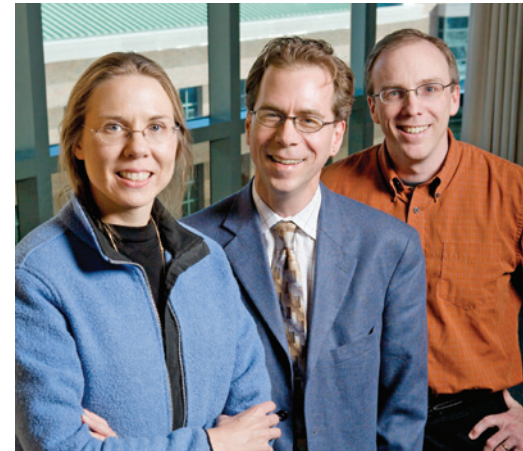
The Illinois team previously developed a system for self-healing polymer materials and decided to adapt their technique for conductive systems. They dispersed tiny microcapsules, as small as 10 microns in diameter, on top of a gold line functioning as a circuit. As a crack propagates, the microcapsules break open and release the liquid metal contained inside. The liquid metal fills in the gap in the circuit, restoring electrical flow.

"What's really cool about this is it's the first example of taking the microcapsule-based healing approach and applying it to a new function," White said. "Everything prior to this has been on structural repair. This is on conductivity restoration. It shows the concept translates to other things as well."

A failure interrupts current for mere microseconds as the liquid metal immediately fills the crack. The researchers demonstrated that 90 percent of their samples healed to 99 percent of original conductivity, even with a small amount of microcapsules.

The self-healing system also has the advantages of being localized and autonomous. Only the microcapsules that a crack intercepts are opened, so repair only takes place at the point of damage. Furthermore, it requires no human intervention or diagnostics, a boon for applications where accessing a break for repair is impossible, such as a battery, or finding the source of a failure is difficult, such as an air- or spacecraft.

Collaborating with White in the group are Nancy R. Sottos, materials science and engineering professor and an AE affiliate, and Jeffrey Moore, chemistry professor.



Sottos, White, Moore

controlling them, including where to place sensors and actuators, is a critical new area in aerospace engineering."

Studying how air interacts with the vocal folds to make sound, and connecting the fundamental ideas to the flight of UAVs and hypersonic vehicles, has led to a Faculty Early Career Development Program (CAREER) Award for Bodony from the National Science Foundation. The award supplies \$400,000 in funding for the project over five years.

Bodony is working to model the vocal folds in 3-dimensions in their proper geometry. His goal is not only to better understand how speech works, but also

to discover ways it can be controlled and optimized to improve current, or enable new, methods of surgical speech recovery.

Bodony's simulation data will be used to provide a missing link between the brain's inputs to the vocal folds and the resulting speech. Colleagues from the Beckman Institute for Advanced Science and Technology work with Bodony.

"No one has tried to look at speech in such a holistic way," Bodony said.

"We can no longer treat aircraft as rigid structures, and we now have to look at both solid and fluid mechanics together."

Voulgaris Heads \$1 Million Surveillance Network Research



Voulgaris

Pearl Harbor may have been more prepared to counter an invasion in the 1940s if surveillance network research AE at Illinois Prof. Petros Voulgaris is now leading had been available.

Voulgaris heads a multi-university group in an approximately \$1 million grant over three years from the Air Force Office of Scientific Research (AFOSR) to determine how sophisticated, unmanned surveillance vehicles can provide navy antiterrorism and force protection measures in harbors. Envisioned is a heterogeneous group of ground, underwater, surface, and aerial unmanned vehicles monitoring the Navy fleet and ports.

The researchers believe that aerial autonomous surveillance of vessel traffic, current and wave patterns, and ocean weather conditions can enhance the military's ability to coordinate autonomous surveillance agents positioned underwater and on the surface.

The proposal presents a complex problem of using a large network of decentralized autonomous agents with various sensing capabilities to work together to provide a massive amount of data. The scientists must also take into consideration uncertainties, including potential sensor and communication link errors.

"We consider multi-autonomous systems tasks with minimal information so that the complexity is reduced and we can deal with the massive amounts of data. The present amount of data is too much to accomplish the coordination task," said Voulgaris, who also has an appointment in the Coordinated Science Laboratory (CSL).



While heading the AFOSR grant, Voulgaris is also working on a three-year, \$950,000 grant from the Qatar National Research Fund to develop methods for safely coordinating networked vehicles.

Safe and reliable multiple vehicle systems can be applied in numerous ways to benefit the oil and gas industry, making this technology important to Qatar's growth in that industry. This technology can be used in patrolling robots that sense dangerous leaks, such as H_2S , coordinated fire extinguishing, coordinated oil spill cleaning and field coordinated surveillance.

The CSL researchers are working on developing algorithms that will guarantee safety in the presence of physical, collision avoidance and information constraints, and they will make the technology robust to communication uncertainty.

Voulgaris said this project is a "collaboration in a field that's new to us and can lead to further collaborations in bigger projects."

Jackson Brings Rocket Knowledge to AE

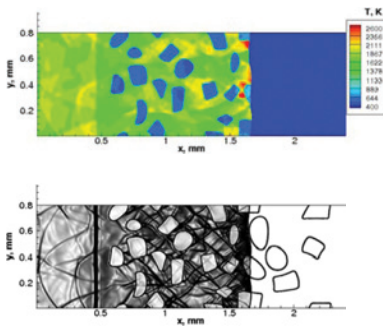
Dr. Thomas L. Jackson's connection within the AE at Illinois became even closer this fall with his new appointment as a Research Professor.

Previously an adjunct professor, Jackson has taught courses within AE for the past five years, and has long collaborated with AE faculty and graduate students on research efforts.

Jackson came to the Urbana campus in January 1988 as the first scientist hired for the Center for Simulation of Advanced Rockets (CSAR). The U.S. Department of Energy funded CSAR to accurately predict through computational simulation the performance, reliability, and safety of solid rocket motors. At that time DOE was considering simulation solutions for nuclear stockpiling, and the complexity of simulating the physics of rockets offered an example.

Jackson was responsible for investigating the propellant's microstructure, examining issues such as burning rate, pressure response, erosive burning and aluminum particulate burning. Throughout CSAR's thirteen years, Jackson and his colleagues developed several very complicated computer codes modeling the rockets' propellant behavior, and have since formed their own company, IllinoisRocstar^{LLC}, located in the University of Illinois Research Park.

IllinoisRocstar has contracts with the University of Illinois, Purdue University and Notre Dame University; grants from government agencies including the Department of Energy (DOE), the National Aeronautics and Space Administration (NASA), Sandia National Laboratories, the Army, the Navy, the Air Force, and the Missile Defense Agency; and work with industries including ATK, a prime supplier of aerospace and defense products.



Temperature (top) and numerical Schlieren (bottom) showing hot spot formation due to shock interaction in a heterogeneous explosive. The formation of hot spots can lead to a transition to detonation.

Starting with a focus on solid rocket propellants, IllinoisRocstar has expanded into energetic materials and other areas, and has five full-time employees, 12 part-time employees, and several faculty consultants.

Understanding the dynamics and coupling between the propellant and what goes on inside a rocket are key to assuring the safety, reliability and performance of the motor.

Solid propellants consist of a combination of fuel and oxidizer. Unlike air-breathing aircraft, which take in oxygen from the atmosphere, rockets must carry their own oxygen supply for burning as there is none in space. Jackson said the two ingredients are combined in what is similar to a mixing bowl, then poured into molds of various shapes and cured to become solid.

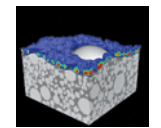
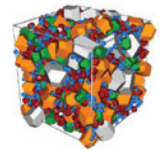
The best way to generate the microstructure of these packs is in a simulation, he said. Rocpack, one of the several specialized codes developed by Jackson for solid propellants, can also be used to simulate packs used for emulsion, rocks, concrete, and explosive studies.

In some current work, Rocpack is used to simulate energetic (explosive) crystals as they grow in size and number, and Jackson and his colleagues observe how they burn at their surface. "In our simulation, we get a reasonably close approximation of the simulated burn to the actual burn – within 10 to 15 percent," he said. "It gives us a lot of confidence that what we're doing is good."

Knowing a propellant's microstructure is helpful in designing the propellant for specific launch missions. For example, he said, aluminum particles may be added to the propellant, since the metal increases the chamber temperature and can produce a larger thrust compared to non-aluminized propellants. Unfortunately the aluminum also produces a visible plume from a rocket nozzle, so aluminum should not be added if stealth is desired.



Thomas Jackson



Top: Typical microstructure generated by Rocpack. Bottom: Numerical simulation of solid propellant combustion.

Faculty Awards and Honors



Solomon

Solomon Inducted into University of Idaho Hall of Fame

Emeritus Prof. and former AE Department Head Wayne Solomon, best known for innovative research efforts in propulsion and high-energy lasers, has been inducted into the Alumni Hall of Fame at the University of Idaho.

Solomon is best known for innovative research efforts in propulsion and high-energy lasers. In the 70's and 80's, he and a team of scientists conducted major research and design programs for chemical lasers and laser radar devices. After a stint in the U.S. Air Force, Solomon joined Bell Aerospace Textron as director of High-Energy Laser Systems and, later, director for Advanced Systems. He joined AE as professor and head from 1988 to 1999. He gained emeritus status in 2002. During Solomon's tenure, AE at Illinois gained national prominence for research on aerodynamics, lasers, structures and space systems.

Since 1998 Solomon has chaired CU Aerospace, LLC, an aerospace research firm in Urbana-Champaign, Illinois. The company works closely with several universities to evolve aerospace research and provides the development expertise to commercialize aerospace innovations in the laser, electric propulsion and micro-satellites areas.



Bretl

Bretl, McCarthy Win Best Manipulation Paper at IEEE Robotics and Automation Conference

AE at Illinois Assistant Prof. Timothy Bretl and his student have won the Best Manipulation Paper Award at the IEEE International Conference on Robotics and Automation. Their paper was chosen out of a record 2,032 submissions.

"Mechanics and Manipulation of Planar Elastic Kinematic Chains," was co-written with Zoe McCarthy, a former undergraduate student of the Electrical and Computer Engineering Department. The paper provides a mathematical model for solving a problem that has mystified researchers for years: How to enable robots to manipulate deformable, or flexible, objects.



Lambros

Lambros Elected SEM Fellow

AE at Illinois Prof. John Lambros has been elected a Fellow of the Society for Experimental Mechanics (SEM).

Lambros was a member of the Society's Executive Board and Executive Board Subcommittee on National Meetings between 2008 and 2010. He has been a member of the Society's Fatigue and Fracture Technical Committee since 1999, and has served as secretary, vice-chair and chair of that committee.

Between 199-2005 he also has served as Associate Technical Editor for *Experimental Mechanics*, SEM's official journal.

On the AE faculty since 2000, Lambros studies the mechanical characterization of material response over multiple length and time scales. Materials of interest range from traditional structural materials, such as metals and polymers, to advanced materials, such as composites, multifunctional materials, functionally graded materials, MicroElectroMechanical Systems, nickel-based superalloys, and more recently micro-structurally tailored granular media for wave mitigation.

Lambros earned a bachelor's degree in aeronautical engineering in 1988 from the Imperial College of Science and Technology, University of London. He earned a master's degree and PhD in aeronautics in 1989 and 1994, respectively, from the California Institute of Technology. Upon earning his PhD Lambros was a postdoctoral research fellow at Caltech for a year, and then took a faculty position at the University of Delaware before coming to Illinois.

Chasiotis: Winner of ASME, SEM Awards

Prof. Ioannis Chasiotis adds to an impressive list of honors achieved in his young career with his selection for the J.R. Hughes Young Investigator Award from the American Society of Mechanical Engineers (ASME) and the A.J. Durelli Award from the Society for Experimental Mechanics (SEM).

Joining AE in 2005, Chasiotis' research interests focus on experimental mechanics at the micron and the nano scales, the mechanical reliability of microelectro



Chasiotis

mechanical systems, (MEMS) and in general thin films and the failure mechanics of heterogeneous materials.

Chasiotis started his career at the University of Virginia, having earned a master's degree and PhD in Aeronautics from the California Institute of Technology in 1998 and 2002, respectively. He earned his first degree in chemical engineering in 1996 from the Aristotle University of Thessaloniki, Greece.

Bodony Chosen for Eminent Engineer Award

The Tau Beta Pi Engineering Honor Society at Illinois has chosen AE Assistant Prof. Daniel J. Bodony for the Eminent Engineer Award.

Bodony has been an AE faculty member since 2006, having earned his bachelor's and master's degrees at Purdue University in 1997 and 1999, respectively, and his PhD from Stanford University in 2004. His research interests are aeroacoustics, compressible turbulence, wave propagation, fluid-structure interaction, aerothermoelasticity, numerical algorithms for massively parallel computing, and computational fluid mechanics.

Austin Elected AIAA Associate Fellow

Associate Prof. Joanna M. Austin and Prof. Jonathan B. Freund have been elected Associate Fellows of the American Institute of Aeronautics and Astronautics (AIAA).

Austin researches fundamental problems in fluid mechanics, particularly in reacting, compressible flows that occur in a broad range of applications: hypervelocity planetary entry, shock-driven bubble collapse, detonation and supersonic combustion, and high speed flow phenomena in geological applications such as explosive volcanic eruptions. Her research is predominantly experimental, combined with analytical modeling.

Austin has been an AE faculty member since 2003, and is an affiliate of Mechanical Science and Engineering (MechSE). She earned bachelor's degrees in mechanical and space engineering, and mathematics from the University of Queensland in 1996, and a master's degree and PhD in aeronautics from the California Institute of Technology in 1998 and 2003, respectively.

Freund concentrates his research on numerical simulation studies of atomic-scale and biological flows, free shear flow turbulence, and jet aeroacoustics. His

group investigates mechanical phenomena in a range of systems. Most of the group's investigations utilize advanced computer simulations tools coupled with detailed analysis. Freund and his colleagues design many of the simulations tools they use.

On faculty in Engineering at Illinois since 2001, Freund has a joint appointment in AE and MechSE. He also is a Computer Science Department affiliate and a part-time faculty member of the Beckman Institute.

Before coming to Illinois, Freund was an assistant professor at the University of California, Los Angeles. He earned three degrees in mechanical engineering from Stanford University: a bachelor's in 1991, a master's in 1992 and a PhD in 1998.

Bragg Appointed to NASA Aeronautics Committee

Michael B. Bragg, AE at Illinois professor and Interim Dean of the College of Engineering at Illinois, has been appointed to the influential Aeronautics Committee of the National Aeronautics and Space Administration (NASA) Advisory Council.

Reporting to the NASA administrator, the committee advises the agency on aeronautics programs and policies, and shapes national research agendas.

Coverstone Elected to Chair National Space Research Group

Prof. Victoria Coverstone has been elected Chair of the Council of Institutions (COI) for the University Space Research Association (USRA).

With 105 member institutions, COI forms the largest and most technically diverse university association serving the space research community. USRA is dedicated to advancing space sciences and exploration through innovative research, technology, and educational programs. USRA provides a collaborative membership organization where universities and other research organizations cooperate effectively with each other, with the United States government, and other entities to develop knowledge associated with space science and technology.

In addition to her faculty position with AE, Coverstone also is Associate Dean for Graduate and Professional Programs for the College of Engineering at Illinois.



Bodony



Austin



Freund



Bragg



Coverstone

AE at Illinois Saddened by Death of Emeritus Prof. Allen Ormsbee



Ormsbee

“He was part of the Aerospace Department for half a century and his many contributions will always be remembered.”

AE Emeritus Prof. Allen Ives Ormsbee, a part of Aerospace Engineering at Illinois since the Department’s very beginnings, passed away July 13, 2012, from complications of pneumonia.

Ormsbee had graduated from AE in 1946, becoming the second person to have earned a bachelor’s degree from the Department. Upon graduating with high honors, he was appointed as an AE instructor and earned his master’s in 1948. He was promoted to Assistant Professor in Aeronautical Engineering in 1949. After that, Ormsbee became a part-time employee of Hughes Aircraft, and a member of the technical staff at Caltech. He was awarded a Howard Hughes Fellowship by the California Institute of Technology in 1952, and was awarded the degree cum laude Dr. of Philosophy in Aeronautics and Mathematics by Caltech.

Ormsbee then returned to the University of Illinois and achieved full professor status in 1957. He retired from AE in 1992, and served as Department Chair for Aerospace Engineering at Embry-Riddle Aeronautical University, Daytona Beach, Florida, from 1995 to 1999. He later made his home in New Bern, North Carolina.

“We all feel a profound loss with Al’s death,” said AE Emeritus Prof. Harry H. Hilton. “He was part of the Aerospace Department for half a century and his many contributions will always be remembered. His devotion to teaching, to higher education through his tireless efforts in ABET, and to his beloved gliders will not be forgotten.”

Ormsbee was an American Institute of Aeronautics and Astronautics (AIAA) Associate Fellow; and a member of the Accreditation Board for Engineering and Technology (ABET). He served as ABET secretary for one year, treasurer for four years, and then chair and past chair of the Engineering Accreditation Commission (EAC). He was appointed as the AIAA representative on ABET and, in 2010, was awarded ABET’s highest honor, the Linton E. Grinter Distinguished Service Award.

Ormsbee was an avid handball player, and loved to fly fish, hike, backpack, travel, and especially fly gliders.

He achieved the Diamond Award in soaring for altitude in March 1973 after gliding outside of Colorado Springs. He had rented a Schweitzer 1-34 metal plane. Ormsbee suited up like a WWII bomber pilot and used an oxygen tank. He released from the tow

plane at 15,500 ft., his flight ranging from 14,200 to 31,000 ft. in altitude, reflecting a gain of 16,800 ft. His airspeed was 75mph as was the wind speed, so since he was flying into the wind, he gained altitude but stood still in relation to the Earth. “It was colder than you wouldn’t know what,” Ormsbee professed of that experience.

In July of 1974 in a Standard Libelle, Ormsbee did the Diamond Distance (500km or more) and a Closed Course Diamond combined, a unique and thrilling challenge. For him, the triangular route for the dual achievement consisted of flying from Champaign’s Willard University of Illinois Airport (CMI) to the Highland, Illinois, gliderport to the Lawrenceville, Illinois, Airport and back to CMI at an average speed of 42.9 mph and a distance of 521km. He was among the first hundred sailplane pilots to achieve all three diamonds.

When not gliding, Ormsbee loved hiking the backcountry trails and fly fishing the streams and lakes of the Sierra Nevada and Rocky Mountain Ranges of the U.S. and Canada with his family and friends. He hiked hundreds of miles, fished dozens of waterways, and swatted thousands of mosquitos in his backcountry explorations. He and his wife, Gerry (the former Geraldine Wilma Bartlett), climbed Mount Whitney when they were in their 20s.

His passion for flying infused his teaching at AE at Illinois. He thrived on teaching and inspiring his students to explore and hone their own gifts of knowledge to bring to the world of aerospace. He was equally inspired by their academic and professional accomplishments.

As his daughters were fond of saying “My dad really is a rocket scientist!”

Ormsbee and his wife enjoyed traveling for work and play to 15 countries including China, Turkey, and Peru. He would often say his greatest achievement was staying alive for over 80 years. Ormsbee’s greatest disappointment was that the sun comes up in the East. His unusual attributes and humor consisted of being left-handed and right-footed. He said he was “grateful for my charming and singular wife and my kids, and for all my friends and colleagues on whom I blame my success or lack thereof.” The three words that he used to sum up his life: “Pretty damn lucky.”

Thoughts on Al

BY R. H. LIEBECK, JULY 20, 2012

My first encounter with Prof. Allen Ormsbee occurred in the fall of 1959 when I entered his classroom at the University of Illinois to learn about compressible fluid dynamics; the course was Aero 216. The text was "Elements of Gasdynamics," by Liepmann and Roshko, and it contained the most terrifying set of homework problems—probably to this day. Al walked in bare-handed (no lecture notes or a copy of the text) and proceeded to fill the blackboards with a derivation of equations, all legible and neatly presented. This process was repeated three times a week (MWF) through the semester. Occasionally, Al would near the end of the lecture and discover that the result did not appear correct. An error! In turn he would carefully review his derivation, identify the error, and correct the result. Clearly, Al was deriving the solution real time, a capability I have not witnessed in my career to date. As U of I undergraduates, I recall that even we appreciated this special expertise.

Moving ahead to 1961, I was about to graduate and in the process of signing up for an interview with the Douglas Aircraft Company in Santa Monica, California. Al observed and said "Don't sign up Bob, I want you to go to graduate school. As a consultant at Douglas, I will get you a summer job." He did, and at the end of the summer I was offered a leave of absence so I could return the following spring. This process prevailed through my completion of a PhD, at which time I became a full-time Douglas engineer. This is my 51st year at Douglas, now called Boeing. And to date, I have never interviewed for a job.

Back to the graduate school days, where Al's guidance, encouragement, and mentorship remain invaluable to this day. At a time when missiles and space were the predominant focus in aerospace, Al suggested a thesis topic in subsonic aerodynamics: airfoil design. This ultimately evolved into the problem of "Optimization of Airfoils for Maximum Lift." We were able to solve the problem and this yielded airfoils whose lift to drag ratios were unmatched. More later.

Applications of this technology include the NASA Helios high altitude airplane, the Boeing Condor and more recently the Boeing Phantom Eye, the Ratsrepus World Championship aerobatic airplane, the keel for the America3 sailboat that won the America's Cup in 1990, race car wings that won the Indianapolis 500 and several Formula 1 races. A glib reference to this could be: "victory on land, sea and in the air." In addition, the airfoil technology has been successfully applied to several airplanes that remain classified.

What may be the most significant contribution of the airfoil work was recently identified by my colleague at MIT, Prof. Earl Murman. In defining the problem for maximum lift from an airfoil, we developed the equivalent of the Carnot cycle for internal combustion engines. This accomplishment was fundamental to my being awarded the 2011 Daniel Guggenheim Medal.

The airfoil problem was borne out of Al's love for aerodynamics, and what could be more aerodynamically pure than a sailplane? Thus he acquired his first high-performance glider in the mid 60s, a Libelle. This launched a hobby that lasted for most of his life. His bride, Gerry, was the captain of the recovery team when Al landed off-base.

Over the years since my graduation, our regular contact became the annual AIAA Aerospace Sciences Meeting in Reno each January. The meeting was held in a large casino hotel, originally called the MGM Grand. I could always locate Al and Gerry, along with their close friend Penn State Prof. Barnes McCormick, at the craps table. Each year, our mutual Christmas cards included the note "See you at Reno."

In 1994, Al led a successful campaign for me to receive the University of Illinois College of Engineering Alumni Award for Distinguished Service. And, in 2011 I was inducted into the Engineering at Illinois Hall of Fame. Al and Gerry were unable to travel to Champaign-Urbana for the induction ceremony. Instead, Al recorded a DVD titled "Tribute to Robert H. Liebeck from Allen Ormsbee." My eyes water when I watch it, and it is now a treasure.

My existence and success as an engineer must be attributed to Prof. Allen Ormsbee. As an undergraduate, it began with his motivation via his impeccable lectures on compressible flow theory. When he asked me to stay on as a graduate student and arranged a summer job at the Douglas Aircraft Company in Santa Monica, CA, I was overwhelmed by the honor. Early graduate school was a struggle, challenged by a request from my first wife for divorce circa two weeks prior to my oral examination. Somehow Al gave me the confidence to proceed, and after a short delay—I passed! In those days, you had one shot at the orals with no opportunity for a makeup. Sincere thanks, Al.

On to the thesis. During the summer of 1966, Al introduced me to the late A.M.O Smith, head of the Aerodynamics Research Group at the Douglas Aircraft Company in Long Beach. We had laid out the theory of airfoil design and analysis, but defining a canonical design problem was elusive. The following summer I was in Long Beach working for AMO. One day he called me into his office and said quite simply, "Why don't you see how much lift you can get from an airfoil?" A proper design problem. The remainder is well-known history to those in the business. Al advised me through the successful completion of the thesis titled "Optimization of Airfoils for Maximum Lift." The work is referenced in aerodynamics textbooks today.

I believe it was Sir Isaac Newton who said, "We stand on the shoulders of giants." I was blessed to have the opportunity to stand on the shoulders of two giants: Allen Ormsbee and A.M.O. Smith. Now I must show that I am worthy of the opportunity.

Geubelle Named Head of AE at Illinois



Geubelle

Philippe H. Geubelle, Bliss Professor in the College of Engineering at Illinois, has been named Head of the Aerospace Engineering Department.

Geubelle has been serving as Interim Department Head since October 2011. He has been a member of the AE at Illinois faculty since 1995. He holds joint appointments in the Mechanical Science and Engineering, and Civil and Environmental Engineering departments, and is affiliated with the Beckman Institute of Advanced Science and Technology, and the National Center for Supercomputing Applications. For the past six years, he has been serving as Director of the Illinois Space Grant Consortium, a NASA-sponsored higher-education program involving a variety of institutions across the State of Illinois. Prior to becoming interim Department Head in October 2011, Geubelle had been AE Associate Department Head, overseeing the graduate programs.

Geubelle has distinguished himself nationally and internationally as an engineer and educator in computational mechanics. His research interests pertain to the theoretical and numerical treatment of complex problems in solid mechanics, and, in particular, of fracture mechanics, multiscale modeling of heterogeneous, granular and layered materials, composite

manufacturing processes and computational design of novel biomimetic materials. Other research activities involve computational aeroelasticity, structural/acoustic fatigue and parallel programming. His current research projects are supported by the Boeing Company, AFOSR, AFRL, ARO, NSF and the Industrial Research Institute.

A (co-)author of about 90 peer-reviewed papers and 40 conference papers, Geubelle received the 2007 Best Paper of the Year Award from the Materials Division of the American Society of Mechanical Engineers (ASME). In 2009, he was elected ASME Fellow. Over his seventeen-year career at the University of Illinois, he has received various departmental and college awards for excellence in research, teaching and advising.

Originally from Belgium, Geubelle earned his bachelor's degree in mechanical engineering in 1988 from the Catholic University of Louvain, and his master's degree and Ph.D. in aeronautics from the California Institute of Technology in 1989 and 1993, respectively. He joined the AE Department in January 1995 after a postdoc at Harvard.

Bragg Appointed Engineering at Illinois Interim Dean



Bragg

AE Prof. Michael B. Bragg has been appointed Interim Dean of the College of Engineering at Illinois.

Bragg began his interim duties Aug. 16, when the Dean Ilesanmi Adesida assumed the role of Vice Chancellor of Academic Affairs and Provost of the Urbana campus.

Bragg is an Illinois alumnus, completing his bachelor's and master's degrees in aerospace engineering at Illinois before earning his doctorate at Ohio State University in 1981.

Bragg returned to the U. of I. in 1990 as a faculty member, focusing his research and teaching on

aerodynamics and flight mechanics. In particular, he is an internationally renowned expert on ice accretion on aircraft and its effect on flight safety. He was named Head of Aerospace Engineering in 1999.

Bragg joined the administration of the College of Engineering in 2006 as the Associate Dean for Research and Administrative Affairs. In 2008, Bragg became Executive Associate Dean of Academic and Faculty Affairs, overseeing all faculty members and academic personnel, managing the budget and resources of the college, and playing an active role in the college's diversity activities and global initiatives.

Cochrane to Lead AE at Illinois Alumni Programs

Illinois alumnus Timothy A. Cochrane has joined AE at Illinois as the new Associate Director for Advancement.

Cochrane, who will be working with AE alumni and friends to advance programs for AE students, research and initiatives, has taken the position previously held by Brett S. Clifton, now the Visiting Director of Media Sales Certificate Program for the College of Media at Illinois.

"As a fellow graduate of our great university, I look forward in discussing the memorable experiences and opportunities that the University of Illinois has provided our AE alumni," Cochrane said. "I'm equally excited to have the opportunity to learn the educational and research objectives of our current students and faculty and look forward in working with our alumni in seeing that these objectives are not only realized but are consistently surpassed."

Cochrane gained 10 years of sales experience working for the Champaign, Illinois, firms of Human

Kinetics Publishing, which provides information and products to promote physical activity and health, and Herff-Jones/Collegiate Apparel, which supplies thousands of colleges, schools and other organizations with caps and gowns, diplomas, rings and other merchandise.

Most recently, Cochrane was an award-winning Regional Sales Manager at Human Kinetics, where he was responsible for cultivating sales in a 9-state territory with over 7,200 individual customers. He also mentored incoming sales associates, and developed the training program and sales manual for all incoming sales professionals.

After earning a two-year degree from Parkland College in Champaign, Illinois, Cochrane earned a bachelor's degree in kinesiology and bioscience from Illinois in 1993. He returned to Parkland to coach track, and served as head track coach and the director of fitness and wellness for seven years.



Cochrane

AE Says 'Happy Retirement!' to Kirts

AE at Illinois wishes hearty congratulations to Undergraduate Student Coordinator Barb Kirts on her retirement from the University of Illinois!

Kirts worked 35 years and 8 months for the university, starting in 1976 in the Admissions and Records Office, then moving to the former Theoretical and Applied Mechanics (TAM) Department in the College of Engineering in 1977, and finally to AE in 2006.

"I started out in (TAM) in the typing pool, typing thesis and papers for grad students and faculty members on manual typewriters," Kirts said. The machines required users to change keys when typing symbols. "We did two or three carbon copies, so when you had to correct something it took a lot."

Kirts worked for 12 department heads throughout her time in the College of Engineering, with duties including serving as department head secretary, carrying out administrative activities such as course scheduling, making appointments and supervising other secretaries, and, finally working with students. Kirts worked with both graduate and undergraduate students in TAM. She served as Undergraduate Student Coordinator in AE, having helped about 1,100 students in her six years in the department.

She was recognized for her good work. In 2000 Kirts was honored with the campus' Robert B. Larsen Human Development Award for her contributions to the enhancement of Students Development. In 2009, she received the Aerospace Engineering Outstanding Staff Award.



Kirts

Alum's Tragedy Leads to Scholarship Legacy



Patnaude

The family of an AE alumnus who tragically drowned last spring has kept his memory alive by establishing a scholarship program that has benefited two current AE undergrads and will continue to benefit students in the future.

Receiving the Philip W. Patnaude Scholarships, at \$2,000 each, were new freshmen Ashley T. Hemmingway and Austin M. Ruf, both 2012 graduates of Downers Grove North High School in the Chicago area. The scholarships will be awarded annually to one male and one female graduate from that high school, based on their academic standings and their plans to attend the University of Illinois. Special emphasis will be given to students who will be entering the College of Engineering and, particularly, Aerospace Engineering.

"A scholarship in Phil's name was one of the perfect ways to carry on his legacy," said his older brother, Art Patnaude. "(Philip) was a proud Illini; proud to be among the caliber of students at the engineering school. He'll be happy that students from his hometown will be given that extra boost to follow a similar path."

Philip Patnaude had graduated from Downers Grove North in 2002, and earned his bachelor's degree in 2006 from Aerospace Engineering. He was very active in the American Institute of Aeronautics and Astronautics student chapter, serving as AIAA president his last year on campus. In 2006, his AIAA team won a third-place award for Engineering Open House. He also earned his pilot's license while in Urbana-Champaign.

Following graduation Patnaude took a position at Sargent & Lundy, a Chicago-based engineering consulting firm, and traveled the world as a mechanical engineer in the company's fossil fuel division. While on campus Patnaude met his fiancée, Selena Nanthavong, BS 06, MS 07, Accountancy. They had made plans to marry on October 6, 2012.

"Phil was the kind of person that became your best friend five minutes after he met you," Nanthavong said. "He was never too busy to be genuinely interested in who you are, where you came from, and where you were going. It was as if you were the only person in the room when you were talking to him and the two of you privy to a secret."

"There were countless times when I'd go visit Phil in the Aerospace lab where he'd be studying," his



Ruf and Hemmingway

fiancée continued. "As I'd walk in, he'd be laughing with another Aerospace person in the lab. And it would turn out not to be a close classmate, but someone he'd just met in the lab ten minutes ago, or someone he was only acquainted with. It didn't matter who it was, he just wanted to share something funny."

Philip Patnaude's body was found March 5 in the waters of Lake Michigan. The 28-year-old had last been seen two days earlier when he was socializing with friends, and had told them he was going to the lakefront.

His mother, Phyllis Patnaude, said the family members' decision to create the scholarships came to them almost immediately as they were planning the funeral. "It's a bittersweet type of thing for us," she said. "We're blessed to have a community that wants to keep Philip's memory alive."

As many as 2,000 people attended the visitation, waiting up to four hours to express condolences to the family.

In addition to presenting the scholarships to Hemmingway and Ruf during the high school's Senior Awards Night last spring, the Patnaudes also gave each of the students a pair of flip-flops, Philip's choice of shoes while he was attending the university. Said the family to Hemmingway and Ruf: "We hope that you can create your own 'life's foot prints' in a way that others can also follow your lead. And all the while you do that, you can be assured that you will have the goodness of Philip and the support of your community alongside of you as you blaze your path to a successful future."



Philip Patnaude's mother, Phyllis, displays the quilt that commemorates her son. One of the patches was made from a T-shirt saying that Philip flew solo while at the University of Illinois.

AE Alumni Board Funds First Endowed AE Fellowship

Full funding was achieved in late 2011 for the Aerospace Engineering Alumni Advisory Board Fellowship, the department's first endowed graduate fellowship. The award has been made to graduate student Ravi Kumar Tumkar Revannasiddaiah.



Revannasiddaiah

"The Department is tremendously grateful for the remarkable dedication and generosity of the Alumni Board," said AE Department Head Philippe Geubelle. "This graduate fellowship, the first one to be fully endowed in the AE Department, will allow us year after year to keep recruiting and supporting top quality graduate students who will make tremendous contributions to the educational and research missions of the Department."

"This generous gift will further strengthen the bond between the AE Department and the members of the Alumni Board," Geubelle continued.

AE alumni board members joined forces starting in the Summer of 2009 to raise the \$150,000 needed to fully fund the fellowship. Lockheed Martin Corporation also donated \$10,000 toward the effort. The board's intent was to aid the Department in recruiting and sponsoring top graduate students to work with faculty in education and research programs. The fellowship initially will yield about \$6,000 annually to be used toward graduate student support.

Revannasiddaiah earned a bachelor's degree in mechanical engineering from the National Institute of Technology in Calicut, India, in 2002; and a master's degree in design engineering from the Indian Institute of Technology in Delhi, India, in 2006. Under the direction of AE Prof. Lawrence A. Bergman and Alexander F. Vakakis, professor of Mechanical Sciences and Engineering, Revannasiddaiah is studying strongly nonlinear dynamics of laminar vortex-induced vibration of a rigid circular cylinder.

AE Students Awarded Rockwell Collins Scholarships

Three AE students received scholarships of \$5,000 each in Academic Year 2011-12, thanks to the philanthropy of Rockwell Collins, Inc.

Scholarship awardees were Spencer Gore of Naperville, Illinois; Brandon Boyce of Crystal Lake, Illinois; and Erin Anderson of Aurora, Illinois.

In addition to the scholarships, Rockwell Collins supports AE students by consistently contributing to the AIAA student chapter.

"The \$1,000 generously provided by Rockwell Collins this year has been used to fund numerous events and opportunities for students to interact with professionals from industry," said AIAA President Ryan Smoot.

AIAA toured GE Aviation facilities in Cincinnati, Ohio, and Rockwell Collins funds helped pay for the students' lodging and travel. The trip helped students gain a perspective on applying their degree in a career after graduation. It also helped lead to more members joining the organization this year.

AIAA has used Rockwell Collins' gift funds to support informational sessions the organization hosts during career fairs, Smoot said. These informational sessions give students a way to hear more about specific companies, and offer a more personal way for students to network while exploring potential job opportunities.

AIAA also has invested contributed funds in a new technical project to design and fly a model aircraft for an Academy of Model Aeronautics competition. Rockwell Collins' support allowed the AIAA student group to purchase a number of tools necessary to complete this project.

"AIAA is greatly appreciative of the support Rockwell Collins provides, and we pledge to use it to improve students' technical abilities and professionalism," Smoot said.



Gore

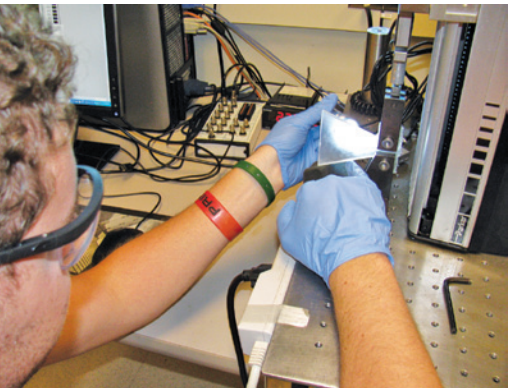


Boyce



Anderson

UROP Provides Undergraduate Research Opportunities in Aerospace



Astronautics took off in aerospace engineering as a result of the space race in the 1950s and 60s. Numerous college graduates entered the field as it grew, where they have been working ever since.

But today, NASA is concerned over the fact that a large percentage of the aerospace workforce will retire in the next number of years. To prepare for this, AE at Illinois implemented the Undergraduate Research Opportunities Program, or UROP, which began its 10th installment at the university in Summer 2012.

“It is very important for undergraduates to have hands-on experiences in engineering because that’s what tends to help firm their commitment to their major and career,” said Diane Jeffers, AE coordinator of external relations and associate director of the Illinois Space Grant Consortium, which helps with the program’s funding.

“It is very important for undergraduates to have hands-on experiences in engineering because that’s what tends to help firm their commitment to their major and career,” said Diane Jeffers, AE coordinator of external relations and associate director of the Illinois Space Grant Consortium, which helps with the program’s funding.

UROP, which started at Illinois in 2004, averages around 15 students a summer depending on funding. The costs are split 50/50 by the NASA grant and the students’ faculty advisers from within the College of Engineering who supervise the students. Faculty advisers helping with the costs, Jeffers said, allows for the grant money to go further and provides an incentive for the faculty advisers to work closely with their students. The advisers cover the gamut in regards to the topics researched, Jeffers said.

Outside of lab time, the program also offers numerous professional development seminars that cover topics such as how to give a technical presentation, how to write a technical paper and research science ethics.

The students receive compensation for their 10 weeks of work. Outside of working around 40 hours a week, the students are also required to give a formal presentation and write a five-page extended abstract.

Students, mainly upperclassmen, from throughout the College of Engineering have participated in the program.

High School, Middle School Students Get Taste of Aerospace During Summer Camps



Seventy-nine high school and middle school students from across the country and internationally got a taste of aerospace engineering in Summer 2012 during camps AE either hosted or helped teach.

For 21 years the Department has presented the Illinois Aerospace Institute, a week-long outreach program that drew 40 high schoolers to campus in July and had a waiting list of another 25 to 30

students. Other than the World Youth in Science and Engineering program, the Institute, open to both boys and girls, is the longest-operating program of its kind in the College of Engineering, according to organizer Diane Jeffers.

Another 20 high school girls participated in aerospace engineering projects through G.A.M.E.S (Girls Adventures in Mathematics, Engineering, and Science), coordinated through the Engineering at Illinois Women in Engineering Program. And 29 fifth through seventh grade girls were introduced to the AE at Illinois department through GIRRRLS Exploring Science and Engineering Summer Camp, sponsored by the Campus Middle School for Girls in Urbana, Illinois.

Instruction offered campers included aeronautics and astronautics, materials and structures, model rocket design, rocket propulsion, mechanics, control and robotics, radio-controlled model flying demonstrations, orbits and missions, and space robot teleoperation.

First Grads Happy with AE's Systems Engineering Degree

The first five students of AE's new Systems Engineering master's degree program have now graduated and so far, so good. All had firm plans upon graduating, and believe the new program helped guide them on their way.

"I would recommend this even if you're not going for a systems engineering certificate," said graduate Phil Hornstein. "It's just knowledge people should have."

The program, one of the first of its kind offered in U.S. universities, provides students with a foundation in the methods and tools involved in defining and managing complex, multidisciplinary aerospace design projects. AE alumnus Steven J. D'Urso, who has over 30 years' experience working for St. Louis aerospace industries The Boeing Company and McDonnell Douglas, directs the program.

Another five students are enrolled in the program for the 2012–13 Academic Year. All of them have chosen to work on systems for Mars exploration, a subject that the National Aeronautics and Space Administration (NASA) posed through AE alumnus Stephen Hoffman.

D'Urso also said that this year's curriculum includes a new elective, Aerospace Flight Vehicle Systems, to examine the systems inside the flight vehicles.

The first Systems Engineering master's degree earners were Hornstein, Bryan Withrow, Richard Strobe, Jonathan Yong and Brendan Lane.

Hornstein, Withrow and Strobe have taken jobs with Boeing. Hornstein, who also earned a bachelor's degree from AE in 2011, is a propulsion engineer in Everett, Washington. Withrow has been hired as a systems engineer in Tukwila, Washington. He earned his bachelor's in aerospace engineering in 2011 from The Ohio State University. Strobe worked in the aerospace industry a year after earning his bachelor's in astrophysics in 2010 from Louisiana State University. "After a year I wanted to be a design engineer," he said. He has gotten his wish, and is with Boeing's Aerospace Exploration Department in Houston.

Yong, who also earned a bachelor's in 2011 from AE, works for a U.S. Department of Defense science organization, conducting research into unmanned aerial vehicles (UAVs). A second lieutenant in the U.S. Marine Corp, Lane had his commission postponed for a year so he could attend grad school.

Through the program, the students produced a set of requirements for a large, complex aerospace system or space exploration system, then wrote systems engineering master plans to carry out the project.

Hornstein, Strobe and Viktoria Shikova, an AE graduate student who was not in the systems engineering program, worked on a space-based project for Mars. Withrow, Yong and Lane worked on a global resupply UAV designed for military purposes to move cargo in and out of areas.

Hornstein suggested a larger class would improve the program's outcome. "It would be more flushed out with a few more people. We had three people per project; I think it would have been better with five to 10."

The program's main objective appears to have been accomplished, however.

"What we got out of the program gave us a new mindset. With the systems engineering way, you step back and look at everything as a whole."



"What we got out of the program gave us a new mindset," Lane said. "With the systems engineering way, you step back and look at everything as a whole."

"I enjoyed the real-life stories and the real-world experiences that aren't usually taught in the classroom," Yong said.

"We gained more practical knowledge about how aerospace engineering works, not just equations on a blackboard. The insight we got from Steve will be really helpful," added Hornstein.

Bodony, Lindsey Honored as Teacher, Staff Member of 2012



Assistant Prof. Daniel Bodony and Administrative Aide Kendra Lindsay are AE at Illinois' Teacher and Staff of the Year for 2012, respectively.

This is the third time in Bodony's young career in AE that the American Institute of Aeronautics and Astronautics student group has recognized him with the teaching award. Joining the AE faculty in October 2006, Bodony was also honored in 2008 and 2010. He is regularly included on the campus-wide List of Teachers Ranked as Excellent and has been honored with the Engineering Council Award for Excellence in Advising.

The Staff of the Year Award is based on overall excellence in service to the students and faculty of the Department. Lindsey, Administrative Aide for AE Department Head Philippe Geubelle, has spent 17 years working for the University of Illinois in secretarial positions for the Department of Classics, the English as an International Language Program, and for AE since 1999.

NASA to Launch Two Small AE Satellites

Two spacecraft developed by AE faculty members are among the 33 small satellites the National Aeronautics and Space Administration (NASA) has selected to fly as auxiliary payloads aboard rockets planned for launching in 2013 and 2014.

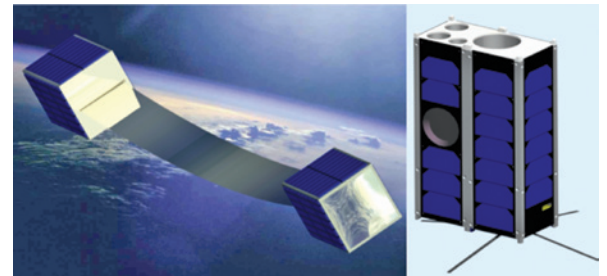
One craft is a solar sail demonstration called "CubeSail," and the other is a remote sensing satellite called "LAICE," according to Prof. Victoria L. Coverstone.

Researchers hope that CubeSail will make significant strides towards technical goals for solar sails that NASA's In-Space Propulsion Roadmap has set to be achieved by the end of this decade.

NASA has long regarded solar sail technology as high payoff, high risk.

The payoff is desirable because solar photons are the primary propellant, resulting in very high payload fractions (~60%), lower spacecraft mass, and lower launch costs than those that chemical or electric systems can provide. Also, solar sails having large sail area allow for significantly larger accelerations compared to equal mass electric propulsion systems, resulting in faster missions.

The impracticality of conducting ground-based life cycle testing of a complete solar sail system in a 1-g field, however, makes the risk factor high. AE's CubeSail demonstration aims to reduce the risks for the "UltraSail" interplanetary and interstellar mission concept, and increase the crafts' technology readiness level.



CubeSail gives graduate and undergraduate students the opportunity to work directly with all aspects of real satellites and operations. Through a Cubesat class that AE and the Electrical and Computer Engineering (ECE) Department jointly teaches, students have helped upgrade the CubeSail hardware, finish the software, and perform space qualification testing. Students will also help provide ground support during and after the launch.

Funds from NASA's Small Business Innovation Research (SBIR) program have supported the building of CubeSail's hardware. CU Aerospace, a local, private business and the prime contractor on the SBIR program, will use internal research and development funds to support launch activities.

Students also have been involved in the LAICE small satellite project, developed through the joint AE-ECE CubeSat class.

The LAICE project, an initiative in upper atmospheric research, has two goals:

- To demonstrate a unique magnetic torquing altitude control system that constrains the satellite in a fixed altitude.
- To demonstrate and acquire in situ measurements of neutral and ion density properties in the altitude region from 150 to 325 kilometers; and to remotely sense wave parameters between 90 and 100 kilometers as the waves move upward from the lower atmosphere into the ionosphere.

The LAICE project hopes to reveal new information about the neutral ion coupling processes in the 150 to 325 kilometer atmospheric region. The phenomenon has led to ionospheric instabilities that disrupt communication and global positioning system (GPS) signals.

AE Teams Take First and Second in Space Design Competition

Aerospace Engineering at Illinois teams took first and second place in the 2011-12 American Institute of Aeronautics and Astronautics Foundation's annual Undergraduate Team Space Design Competition.

The competition required creation of an architecture for a Deep Space Habitation Module that could support a crew of six during a 15-month-long roundtrip mission to a destination within the solar system, for example, the Martian moon, Phobos. Designs needed to focus on the craft's structure and life support systems, allowing the hypothetical crew to make their journey safely in the microgravity space environment. Focuses lay in the areas of micrometeoroid and debris protection, radiation, thermal systems, power systems, extravehicular activities, and life support systems. Solutions for each design had to include protection from radiation in the space environment, limitation of the mass of air and volume of consumable resources, maintenance of crew nutrition levels, crew resupply challenges and the provision of habitable living accommodations.

First place and a \$2,500 prize went to team "Local Space Systems," with Wahab M. Alshahin of Palos Hills, Illinois, as team leader. Second place and a \$1,000 prize went to team "Exodus Space Ventures," with Benjamin M. Parks of Oak Park, Illinois, as team leader. David L. Carroll, AE visiting professor, served as faculty advisor for both projects.

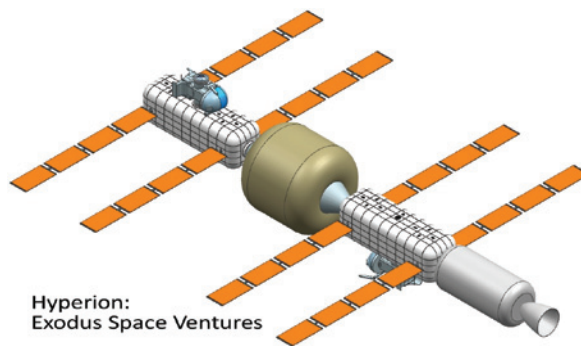
"The AIAA judges commented heavily on our idea to use the Orion Multi-Purpose Crew Vehicles to serve a dual purpose as the mission airlocks, along with being the transport vehicles for the crew from Earth to space," Alshahin said. "They cited this as a solution that they had not seen before, but also one that seemed to meet all the requirements and provide a significant mass/cost savings. That was one example of how the team was able to use a piece of technology that has already been developed and researched in a new and innovative method."

In addition to Alshahin, Local Space Systems team members were Nikhil Agarwal, Eric A. Anden, Jordan B. Holquist, Robert A. Lozar-McDonald, David W. Slaby, Ryan A. Smoot, and Erik A. Lopez.

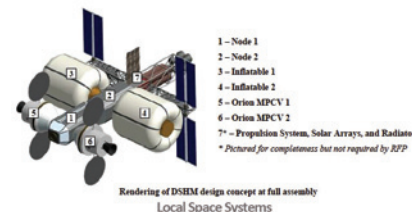
The Exodus Space Ventures team designed the Hyperion spacecraft, composed of three modules and an optional fourth module to be used as a biomass chamber to assist other life support systems. An external propulsion module would control Hyperion's orbital maneuvers.

Parks said the team's plans to cut costs focused on creating a universal design so that multiple modules could be created, reducing the amount of design and specialized manufacturing to be performed. The team stressed that the design's modularity could allow for it to be used on other missions.

In addition to the team leader, members of the Exodus Space Ventures Anil A. Mohammed, Michael J. Mueller, Samantha D. McCue, Kapil Varshney, Tyler C. Buell, Rasheed D. Ibrahim, Zachary J. Lee-Richerson, and Erin E. Ahern.

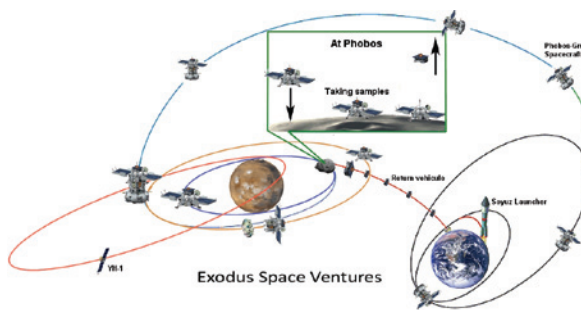
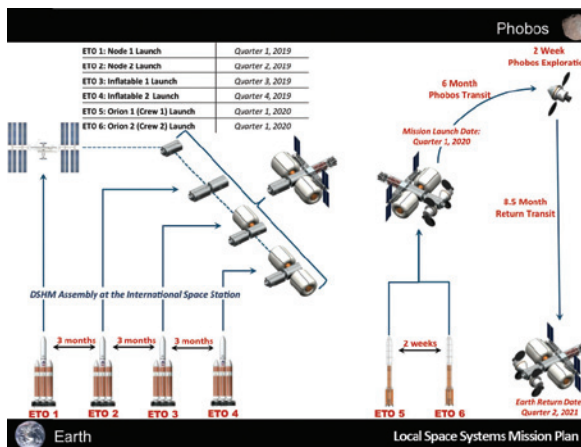


Hyperion:
Exodus Space Ventures



- 1 - Node 1
 - 2 - Node 2
 - 3 - Inflatable 1
 - 4 - Inflatable 2
 - 5 - Orion MPCV 1
 - 6 - Orion MPCV 2
 - 7* - Propulsion System, Solar Arrays, and Radiators
- * Pictured for completeness but not required by RFP

Rendering of DSHM design concept at full assembly
Local Space Systems



Three AE Teams Compete in Regional Rocket Launch

Three AE student teams designed and built rockets then tested them against the best from other colleges and universities in five Midwestern states during the 2012 Space Grant Regional Collegiate Rocket Competition held in late April.

Team Rough Riders, one of the Illinois teams, placed second of the 21 teams participating.

The teams were charged with designing a one-stage, high-powered rocket that could transmit live video from a downward-looking camera to a ground receiver during the rocket's ascent. The rocket needed to clear an altitude of 2,500 feet, and be recovered safely and in flyable condition.

Leading Rough Riders was Akshita Kakarlapudi, and her team members were Kyle Pieper, Elliot Schwartz and Matt Schonert. Their rocket, the RR-217, hit an apogee of 2,811 feet, transmitted approximately 8 seconds of live video, and was retrieved in a flyable condition.

Competition scoring was based on design presentation, design reporting, the flight, the flight performance evaluation and the teams' efforts in educational outreach. The flight competition was judged based on the success of the rockets' flights and the length of good video each team was able to produce during the ascent with an apogee nearest 3,000 feet.

The Wisconsin Space Grant Consortium organized the competition in late April. The launch was held at the Richard Bong State Recreation Area.

Also from Illinois were the Illinois Space Society (ISS) Tech Team, with team leader Jason Allen and members Erik Lopez, Rishi Bajekal and William Bader; and Team 2, with team leader Jason Morich and members Aliya Burkit, Robyn Macdonald, Raghav Kochhar, and Heath Reising.

Kakarlapudi thought the experience was worthwhile. "We enjoyed participating in this competition and learned a lot," she said. "We gained valuable rocketry experience and learned different techniques and tips to improve the rockets performance from other groups that participated."



ISS Hosts Illinois Space Day

About 220 high school and junior high students from the area surrounding Urbana-Champaign attended Illinois Space Day recently on the University of Illinois campus.

Hosted by the Illinois Space Society (ISS) student organization on April 14, Illinois Space Day promotes space exploration, technology, and advancement, and focuses on the importance of space, its effects on day-to-day lives, and all of the achievements possible in space-related fields. ISS hopes to inspire the next generation of astronauts, engineers, physicists, astronomers, scientists, and space enthusiasts.

The guests were guided through exhibits ranging from astronomy to telescopes to liquid nitrogen and space shuttle tiles. Graduate and undergraduate students gave tours of the wind tunnel, Cubesat, and AR.Drone laboratories.

Elizabeth Jordan, a Mechanical Science and Engineering Department alumnus who now works at



the National Aeronautics and Space Administration's Jet Propulsion Laboratory in California, presented a keynote talk on the Mars Science Laboratory.

AE Students Perform NASA Test of iPad Use in Microgravity

Five AE students moved a step closer to the dream of being an astronaut last spring when the National Aeronautics and Space Administration (NASA) chose their team to conduct an experiment in microgravity.

The students worked with NASA mentor Sherri Thaxton on demonstrating and recording human response to using an iPad tablet computer in microgravity. The experiment's results will be useful for astronauts while on the International Space Station and in other microgravity situations. Steve D'Urso, faculty advisor for the AE team's project, said astronauts follow lists of strict procedures in conducting their work. NASA is interested in reducing and replacing the volume of paper used to print out these procedures and keep records by transferring the astronauts' tasks from paper to iPads. Student Dan Regan of Wheaton, Illinois, said Boeing is also interested in the data, as the company considers whether to use iPads (or other tablets) in the cockpit of Boeing's CCDev capsule.

Along with Regan, Jordan Holquist, Erik Lopez, Zak Lee-Richerson, and Samantha McCue; and Samantha McCue of Bartlett, Illinois, were chosen from AE to be one of the eight teams nationwide for NASA's Reduced Gravity Education Flight. The students traveled to Johnson Space Center in Houston to conduct experiments aboard the "Weightless Wonder" (alias the "Vomit Comet"). The aircraft is hollowed and padded so passengers can experience free floating in near zero gravity.

The students divided into two groups of three, with one group including Thaxton. During the 1½ hour flights reaching altitudes of 40,000 feet, the students experienced zero-gravity in 30 parabolas lasting about 20 seconds each. The time to conduct experiments and gather data was limited, so the groups spent a great deal of time strategizing before the actual take-offs.

"They came organized and focused," said D'Urso. "(NASA) organizers said the (Illinois students) stood apart from other teams, and were very professional in that respect."

The students experimented with working on a free-floating iPad, and with one tethered to one of their arms. They worked with the machine's switches, buttons and sliders, with the latter proving to be the most important of the three tests. The students recorded the effects of the microgravity on typing speed and hand-eye coordination.



The flights provided some time for play as well as work: in the last two parabolas the students got to do flips and acrobatics while floating. "We also did one parabola with lunar gravity (microgravity) and one with Mars gravity (strong gravity)" to experience the difference, Lopez said.

In addition to conducting the flight experiments, the Illinois students were treated to tours of Lockheed Martin's Orion Multi-Purpose Crew Vehicle, Boeing's CST-100 Avionics Laboratory and the space center's Neutral Buoyancy Room where astronauts practice physical movements while wearing spacesuits. The tours were made possible in part through connections with AE alumni Lee Archambault, Steve Hoffman, Blaine Brown and Mike Lembeck. Archambault, an astronaut; Hoffman, who works at SAIC; Brown, a program director for Lockheed Martin Corp.; and Lembeck, Chief Executive Officer of Lembeck Engineering, met with the students while they were in Houston.

"They were so quick to go out of their way for us," Regan said of the alumni hosts.

The Illinois Space Grant Consortium and the Illinois Space Society, a student organization, helped sponsor the students' trip to Houston.

The students believe working on the microgravity project will be a bonus to list on their resumes, and was an experience they're unlikely to forget. "I already wanted to be an astronaut in the first place," Holquist said. "This is like crossing one thing off the list of things to do that."

"(NASA) organizers said the (Illinois students) stood apart from other teams, and were very professional in that respect."

AE Honors Outstanding Students



AE Prof. Scott White and David Slaby

AE recognized several of the Department's undergraduate and graduate students this spring with awards for their scholastic achievement and other contributions.

AIAA Scholastic Achievement Award, to the senior graduating in May 2012 with the highest class GPA—**David W. Slaby of Edwardsville, Illinois**, and graduating in December 2012—**William A. Garlisi of O'Fallon, Illinois**, and **Cameron T. Jones of Dixon, Illinois**.



William Garlisi and AE Prof. Scott White



Cameron Jones and AE Prof. Scott White

H.S. Stillwell Memorial Award, to students showing outstanding scholastic achievement and contributions in extracurricular activities—**Eric A. Anden of Hinsdale, Illinois**, and **Ryan A. Smoot of Bloomington, IL**.

The H.S. Stillwell Memorial Award was established in honor of Professor H.S. (Shel) Stillwell. At the age of 27, Professor Stillwell founded the Department of Aeronautical Engineering at the University of Illinois in 1944. He served as department head at Illinois for 32 years. A graduate of the University of Minnesota, he served as Head of the Aeronautical Engineering Department at the University of Kansas prior to coming to Illinois. Professor Stillwell was influential in the design of the first ramjet-powered missile and was highly respected for his contributions to aerospace engineering education.



Eric Anden and AE Prof. Mike Bragg



Ryan Smoot and AE Prof. Mike Bragg

Robert W. McCloy Memorial Award, to a junior or first-semester senior student in recognition of outstanding academic performance—**Jeffrey B. Lawson of Bloomington, Illinois**, and **Paul R. Schlais of Gurnee, Illinois**.

Professor McCloy was the first faculty member hired in the new Dept of Aeronautical Engineering. He was known for his research and teaching in propulsion and for his pioneering work in jet propulsion.



Jeffrey Lawson with AE Prof. Gregory Elliott



Paul Schlais with his advisor, AE Prof. Gregory Elliott

Dale Margerum Memorial Award, to the AE undergraduate who exemplifies outstanding leadership qualities by participation in departmental extracurricular activities—**David J. Hanley of Orland Park, Illinois**, and **Jordan B. Holquist of Springfield, Illinois**.

Dale Margerum was a 1979 graduate who died in an accident the summer after graduation. He was very involved in extracurricular activities.



David Hanley with AE Undergraduate Coordinator Barb Kirts (now retired)



Kaitlin Vahling with donor Rob Chappell

Jo Ann Haynes Platt & Daniel Wall Platt Memorial Award, to the AE sophomore, junior or senior female undergraduate James Scholar and/or Chancellor's Scholar studying aerospace engineering—**Kaitlin R. Vahling of Newton, Illinois**.

H.S. Stillwell Problem-Solving Scholarship, to a junior-level student majoring in aerospace engineering who exhibits exemplary problem-solving skills—**David J. Hanley of Orland Park, Illinois**, and **Akash A. Shah of Mumbai, India**.

This scholarship was set up by a generous alumnus as a tribute to H.S. Stillwell and the role he played as a mentor to students.



David Hanley with AE Prof. Gregory Elliott



Akash Shah with AE Prof. Gregory Elliott

Rockwell-Collins Scholarships, awarded to sophomore or junior-level AE students in recognition of outstanding academic performance—**Erin K. Anderson of Aurora, Illinois**, **Brandon P. Boyce of Crystal Lake, Illinois**, and **A. Spencer Gore of Naperville, Illinois**.

AE Academic Scholarship, a 4-year scholarship awarded to an incoming freshman based on outstanding academic performance—**Jacob R. Dluhy of Riverside, Illinois**.



Brandon Boyce with AE Prof. Gregory Elliott



A. Spencer Gore with AE Prof. Gregory Elliott

Illinois Space Grant Scholarships, awarded by the NASA Illinois Space Grant Consortium to entering and continuing undergraduate students based on academic performance—**Eric A. Anden of Hinsdale, Illinois**, and **Eric A. Lopez of Los Angeles, California**.

continued on next page



Jacob Dluhy with AE Prof. Gregory Elliott



Eric Anden with AE Coordinator of External Relations Diane Jeffers



AE Prof. Bruce Conway and his advisee, Jacob Englander



Andrew Swantek with AE Department Head Philippe Geubelle



Takashi Tanaka with his advisor, AE Associate Prof. Cedric Langbort



Ravi Kumar Tumkur with AE Prof. Larry Bergman

Richard R. Sladek Scholarships, awarded to Aerospace Engineering students based on financial need—**Michael A. Passaro of Elk Grove Village, Illinois; Kelaine P. Patterson of Sugar Grove, Illinois; Brandon M. Vlach of Chicago, Illinois; and Shannon M. Weber of Westmont, Illinois.**

Roger A. Strehlow Memorial Award, to a graduate student in recognition of outstanding research accomplishment—**Jacob Englander of Basking Ridge, New Jersey.**

The award is presented annually to honor Professor Strehlow, who joined the aero faculty in 1961. His background was in chemistry, and he was an acknowledged expert in the field of detonations and explosions. He also made significant contributions toward the understanding of the structure, stability, and extinction of laminar premixed flames. He was an early advocate of microgravity combustion research and successfully characterized the extinction and flammability states of flames under microgravity conditions. Professor Strehlow was the first AIAA Fellow in the Department of Aerospace Engineering.

Faculty Outstanding Graduate Award, in recognition of outstanding contributions to the Department's teaching and/or research missions—**Andrew B. Swantek of Norwood Park Township, Illinois.**

Kenneth Lee Herrick Memorial Award, presented annually to a graduate student in recognition of outstanding research and academic performance—**Takashi Tanaka of Kiryu, Japan.**

AE Alumni Advisory Board Fellowship, presented annually to a graduate student in recognition of outstanding research, academic performance, and research accomplishments—**Ravi Kumar R. Tumkur of Tamkur, India.**

AE students also recently have garnered awards from several other organizations.

Bronze Tablet Awards, recognizing high academic achievement and awarded to the top 3 percent of undergraduate students across the U of I campus. The names of this select group of students are inscribed on bronze tablets displayed on the first floor of the Main Library.



AE Student Groups Win EOH Awards

An exhibit featuring four large rockets, and unmanned aerial vehicle (UAV), and an experiment showing zero gravity's effects on an iPad won a first place in the March 2012 Engineering Open House (EOH).

A flight simulator exhibit took second place, and an orbital simulator and robotics exhibit took third places. Winning organizations were the Illinois Space Society (ISS), the American Institute of Aeronautics and Astronautics (AIAA), and the Illinois Robotics in Space (IRIS)

December 2011

- Erik P. Babcock of Palatine, Illinois
- Ryan J. Merriman of Park Forest, Illinois
- Ziyi Wang of Nanjing, China

May 2012

- Prateek Arora of Sainik Farms, New Delhi
- David W. Slaby of Edwardsville, Illinois
- Ryan A. Smoot of Bloomington, Illinois

Knight of St. Patrick, awarded by the student-administered Engineering Council in recognition of student leadership and contributions to the College of Engineering—**Eric A. Anden of Hinsdale, Illinois.**

Anne Elizabeth Suratt Memorial Scholarship, honoring Suratt who was a student at the University of Illinois from 1994 to 1997. Suratt died in a tragic airplane crash in May 1997 at Willard airport, where she was training to acquire flight instrument ratings. She was scheduled to leave the following week to work at the NASA Goddard Space Flight Research facility in Maryland. Suratt was involved in campus programs to promote space studies, especially remote sensing of the environment. She gave numerous talks to elementary and secondary schools, as well as on campus, to promote awareness of remote sensing and how useful the technologies were to studying environmental problems. The scholarship fund was created by Suratt's parents, relatives and friends to fund annual scholarships designated for a junior, senior or fifth year undergraduate interested in space studies and/or earth sciences, and whose major field of study includes at least one of these areas—**Nikhil Agarwal of Gilberts, Illinois.**

University Achievement Scholarship—**Peter J. Grega of Ramsey, Minnesota**

Engineering Excellence Scholarship—**David R. Brandyberry of Mahomet, Illinois, and Jacob R. Dluhy of Riverside, Illinois**

Engineering Freshman Scholarship—**Gil Shohet of Acton, Massachusetts**

Tau Beta Pi Scholarship—**Brandon P. Boyce of Crystal Lake, Illinois**

Illinois Engineering Enhanced Scholarship—**A. Spencer Gore of Naperville, Illinois, and Jessica T. Lauzon of Sandwich, Illinois**

Edith and Harry Darby Leadership Scholarship—**Akash A. Shah of Mumbai, India**

Vincent E. O'Brien Iroquois County Scholarship—**Sarah J. Cash of Danforth, Illinois**

International Titanium Association Scholarship—**Robert C. Reid of Lees Summit, Missouri**

William L. and Elizabeth A. Ackerman Scholarship provided through a gift to the College of Engineering in honor of William Ackerman, a 1934 graduate in Mechanical Engineering—**Daniel E. Niemeyer of Columbia, Illinois**

Calvin Barnes Niccolls Memorial Scholarship to honor the memory of Calvin Niccolls, a student in the College of Engineering from 1895-1897—**Heath H. Reising of Edwardsville, Illinois**

Engineering Diversity Program Scholarship—**Gary R. Weber, Jr. of Crystal Lake, Illinois**

Fred Eggers Engineering Scholarship provided through a gift to the College of Engineering in honor of Fred Eggers, a 1939 graduate in Mechanical Engineering—**Wilbur E. Shirley of Gaithersburg, Maryland, and Gil Shohet of Acton, Massachusetts**

AE Boeing Scholarships—

- Erin E. Ahern of Hinsdale, Illinois
- David R. Brandyberry of Mahomet, Illinois
- Rosemary F. Chapple of Fults, Illinois
- Jessica T. Lauzon of Sandwich, Illinois
- Kevin M. Reyes of Chicago, Illinois
- Gil Shohet of Acton, Massachusetts

AE Boeing Scholarship from Undergraduate Research Opportunities Program—

- Abigail E. Atkinson of Joliet, Illinois
- Ryan J. Merriman of Park Forest, Illinois
- Richard J. Orozco of Calumet City, Illinois
- Daniel J. Park of Roscoe, Illinois
- Heath H. Reising of Edwardsville, Illinois
- Jennifer A. Roderick of Taylor Ridge, Illinois

College of Engineering Boeing Scholarships—**Erin E. Ahern of Hinsdale, Illinois, and Jessica T. Lauzon of Sandwich, Illinois.**

Mavis Future Faculty Fellows (MF3) developed in the College of Engineering to provide the opportunity for those doctoral students interested in engineering teaching as a profession to gain experience in the focus areas of research, teaching and mentoring. Each award will be \$5,000 with an additional \$1,000 available to support travel—**Abhishek Gupta of Patna, India, and Phillip Ansell of York, Pennsylvania.**

National Science Foundation Graduate Fellowship—**Anthony M. Coppola of Sussex, New Jersey, and Joseph Kim of Glenview, Illinois.**

NASA Space Technology Research Fellowship—**Mallory C. Casperson of Champaign, Illinois.**

Best Student Paper Award at Electrical and Electronics Engineering (IEEE) Conference—**Takashi Tanaka of Kiryu, Japan.**

ARCS Foundation Scholar Award—**Michael R. Dorothy of Creston, Iowa**

Illinois Team Improves in Lunabotics Competition; Places Third

The Illinois Robotics in Space (IRIS) team, including several AE students, placed third of 57 teams competing in the Systems Engineering paper category of the National Aeronautics and Space Administration (NASA) Third Annual Lunabotics Mining Competition.

The competition, held May 21-26 at NASA's Kennedy Space Center in Cape Canaveral, Florida, involved building a teleoperated or autonomous lunar excavating robot to collect and deposit regolith simulant, a terrestrial substance synthesized to approximate lunar surface material. The robot's goal was to navigate an obstacle course of craters and rocks, both when the robot was empty and when carrying cargo.

The Illinois group continues to improve: last year's team placed 19th out of 36 teams overall.

"This was our second year at the competition, and the first year that our robot both passed inspections and managed to move via remote control on the lunar regolith simulant," said IRIS President Jordan Holquist of the recent competition. "While we were unable to excavate any regolith, we are very proud of the rest of our accomplishments with this entire project."

The systems engineering project required the management of schedules, deliverables, interfaces, resource budgets, multiple engineering disciplines, and much more. Each major functional area of the robotic system was split into different subsystems, which various students led.

IRIS is a multidisciplinary, fully student-led and managed team that has worked on this project as an extracurricular activity. AE Assistant Profs. Soon-Jo Chung and Timothy W. Bretl co-advised the Illinois team. The team is greatly appreciative of the sponsorship and support they received from Caterpillar, Illinois Space Grant Consortium, the Student Organization Resource Fund, the University of Illinois Aerospace Engineering Department, and the College of Engineering Design Council.



Henne Inducted into Engineering College Hall of Fame

Preston A. (Pres) Henne, BS 69, has been inducted into the College of Engineering at Illinois Hall of Fame.

Recognized as a global leader in new aircraft development programs introducing advanced technology in aerodynamics, acoustics, avionics, and systems, Henne is Senior Vice President for Programs, Engineering & Test at Gulfstream Aerospace Corp.

A member of the National Academy of Engineering and recognized previously with the College's 2005 Alumni Award for Distinguished Service, Henne treated Aerospace Engineering students and faculty with a talk entitled, "Business Aircraft - A New World," when he traveled to the Urbana campus in September for the Hall of Fame ceremonies.

Henne began his aerospace career in 1969 at McDonnell Douglas, where he managed several advanced programs in aerodynamics and acoustics for both military and commercial aircraft. Known for his work in advanced aerodynamic technology, he was responsible for the aerodynamic design of the wing on the C-17. Considered the most versatile aircraft in airlift history, the design was recognized with the 1994 Collier Trophy for aeronautical achievement. Henne later served as chief design engineer for the MD-80 aircraft. In 1991, he became Vice President and General Manager of the MD-90 program at McDonnell Douglas' Long Beach Douglas Aircraft facility, where he oversaw the aircraft's complete development and certification process.

Joining Gulfstream in 1994, Henne is credited with the design, development, test, and certification of the Gulfstream V aircraft, which was awarded the 1997 Collier Trophy. Henne became a Vice President of General Dynamics in July 1999 when the company acquired Gulfstream. As Senior Vice President of Programs, Engineering and Test, he is responsible for Gulfstream's product program management, engineering, and light operations. His organization led the development of the Gulfstream 550—which was recognized with the Collier Trophy in 2003—and the Gulfstream 450. His organization is leading the development of the new large-cabin, mid-range G280 and the new ultra-large-cabin, ultra-long-range G650.

Henne earned a master's degree in engineering from California State University at Long Beach. He is a Fellow of the American Institute for Aeronautics and Astronautics (AIAA) and a Fellow of the Royal Aeronautical Society. He was elected to the National Academy in 2003.

Other awards include the AIAA Engineer of the Year Award in 1996 and the AIAA Hap Arnold Award in 2001. He received the 2010 Living Legends of Aviation, Industry Leader of the Year Award, and the 2011 AIAA Aerodynamics Award for his technical contributions in applied and computational aerodynamics.

In his presentation this fall to about 90 AE students and faculty, Henne maintained that today's business aircraft is a time-producing machine.

He showed the audience Gulfstream's perspective of the evolution of business aircraft, and the challenges the industry faces in the future. While the purpose of commercial aircraft is to produce revenue for airlines, the purpose of business aircraft is to save time for the companies and individuals who can afford a price tag that can reach up to \$50 million per craft.

To further reduce travel time, Gulfstream is working to develop supersonic technology that decreases sonic boom impact. Currently, "We're forbidden from flying (supersonic civil aircraft) overland because of the noise," Henne said. "Until we can prove that we can fly an airplane that is quiet, there's a prohibition against it." Several AE faculty members are conducting research into the issue in cooperation with Gulfstream.

Henne told of innovations available now that greatly improve safety and comfort features for Gulfstream customers. Among them are Enhanced Vision Systems (EVS) including infrared cameras to help pilots see during low visibility and night conditions, and Synthetic Vision Primary Flight Displays (SV-PFD) that access database renderings to synthetically create clear scenes of fixed landmarks and terrain as the aircraft approaches them. The aircraft are equipped with Broadband Multilink so that riders' Internet access is as seamless on the plane as it is in their offices.

While the contributions of business aircraft to worldwide carbon emissions are small in comparison to other transportation modes, Henne said Gulfstream continually strives to reduce fuel consumption and its environmental footprint. "It's the right thing to do from a natural design process," he said. Henne noted that Gulfstream was the first company to fly a business aircraft using biofuel across the Atlantic.

Producing about 50 of its flagship model a year, Gulfstream has about 600 of this model GV/G550 in service currently, with several award-winning designs.



Henne

AE Alumnus' Creation Flies Like a Plane; Drives Like a Car



“Not bad for an airplane; a bit pricey for a car.”

“To design a brand new vehicle is every aerospace engineer’s dream,” says AE alumnus Sam Schweighart. So he and his colleagues designed one that could both fly like a plane and drive like a car.

Coming off a successful debut at the New York International Auto Show early in April, the Transition Roadable Aircraft is in the testing stage right now, and Schweighart and his partners at Terrafugia, Inc., have received deposits for over 100 aircraft. The first models will fly/roll out sometime next year, at a cost of about \$280,000 each.

“Not bad for an airplane; a bit pricey for a car,” Schweighart observed.

The versatile crafts provide the best of both worlds. Like any small plane, they can fly at altitudes of 10,000 to 12,000 feet, traveling around 100 miles an hour. On ground, they are 100 percent street legal, able to travel the road at normal highway speeds. A push of a button inside the 2-person cockpit folds the Transition’s wings so it can fit in a standard garage, or spreads them to prepare for take-off.

Wings folded, the unusual vehicle draws a crowd when developers test drive it on the streets of Boston. Onlookers react positively, Schweighart said. “Most people are curious to see what it is.”

Potential customers must have at least a sports pilot’s license (minimum 20 hours of flight instruction) to operate the Transition aircraft. Take-offs and landings require runways, so regional or small airports suffice.

Schweighart, who earned his BS from AE at Illinois in 1999, joined with fellow grad students at Massachusetts Institute of Technology to found Terrafugia, Inc. “One of my co-founders came to me when we were in grad school, and we joked a bit about building a flying car, but we realized there actually was potential there.” When the idea placed second in an MIT business school entrepreneurial competition, the creators knew their project had wings.

Although he has been enjoying the business end of the small company, Schweighart’s main focus has been in designing and testing, particularly in regard to the vehicle’s wings and electronics. Challenges arise in meeting both Federal Aviation Administration and highway requirements. For example, Terrafugia received an exemption to use lightweight material for the craft’s windshield, rather than the heavier glass used in most cars. Designers maintained the heavier glass could shatter if a bird hit the windshield while the craft were in flight. The Transition is about the same size as a standard SUV, but weighs less than 1,000 pounds.

Although other companies are pursuing design of flying road vehicles, “we’re the farthest along on getting it sold,” Schweighart said. Terrafugia, based in Woburn, Massachusetts, is Latin for “escape the earth.”

Schweighart returned to the Urbana campus April 26 to present for AE students a seminar on his company’s product. He was also presented the 2011 Outstanding Recent Alumnus Award during AE’s Awards Banquet that evening.

Schweighart grew up in Paxton, Illinois, about 30 miles from the university, and credits AE Profs. Bruce Conway and Victoria Coverstone and Emeritus Prof. John Prussing with helping to shape his engineering interests.

His family living in Paxton and Champaign were at first skeptical about his startup company, but now are supportive. “They thought, ‘Ten years in college and you decide to start a plane company?’ But I think they’re on board now.”

Butler Garner's College Alumni Award



The College of Engineering at Illinois has recognized AE alumnus P. Barry Butler with the 2012 Alumni Award for Distinguished Service.

Butler, BS 79 AE, MS 81 AE, PhD 84 *Mechanical Engineering*, is Executive Vice President and Provost of the University of Iowa in Iowa City. He has been cited for his outstanding leadership in the development of future engineers.

After earning his PhD, Butler began his academic career in the Department of Mechanical Engineering at the University of Iowa, where he served as associate professor, professor, and department chair. In 1997, he was named an Associate Dean and, later, Dean of Academic Programs for the College of Engineering at Iowa. He began his current position in 2011.

Butler's leadership has been instrumental in the creation of two highly successful, multi-college research centers and in the establishment of combined BS/MS programs. He also serves as the campus coordinator of the Iowa Space Grant Consortium. With this experience and a \$3 million grant from the Iowa Office of Energy Independence, he established a statewide consortium to enhance Iowa's wind energy competitiveness.

Throughout his 27-year academic and administrative career, Butler has focused on the preparation of future engineers.

Butler was honored in 2005 with the Aerospace Engineering Distinguished Alumnus Award from Illinois.

Butler's research focus is in the area of non-ideal reactive fluid flow modeling, and he has published 59 archived journal articles and select conference proceedings. His consulting work is highly valued by numerous professional entities.

AE Alum Farquhar Elected to National Academy

A 40-year veteran of deep space missions, AE Alumnus Robert W. Farquhar has been elected to the 2012 class of the National Academy of Engineering.

Now an executive for space exploration at KinetX Inc. in Tempe, Arizona, Farquhar has been recognized for deep space missions to asteroids and comets, and for leading the NEAR (Near Earth Asteroid Rendezvous) mission to Eros.

The NEAR Shoemaker craft, launched in 1996, was the first space probe to orbit and perform an in-depth investigation of an asteroid and then safely land on it. The Eros landing occurred February 12, 2001. Farquhar directed the NEAR mission, designed to answer many fundamental questions about the nature and origin of asteroids.

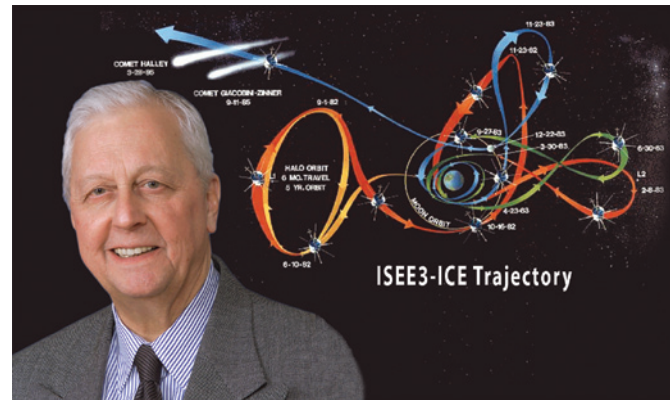
Also among Farquhar's career highlights has been the ISEE-3/ICE (International Sun-Earth Explorer/International Cometary Explorer) mission. As the mission's flight director, Farquhar led the crew that flew the spacecraft through the tail of the P/Giacobini-Zinner comet in September 1985. This was the first successful mission to a comet.

Farquhar's knowledge of halo orbits, a term that he had coined in his 1969 dissertation at Stanford University, was critical in calculating the trajectory for the successful ISEE-3/ICE mission.

That mission was carried out as part of Farquhar's assignments for the NASA/Goddard Space Flight Center in Greenbelt, Maryland. Also while working at Goddard, Farquhar was program manager in the Halley's Comet Mission.

The NEAR mission was accomplished during Farquhar's tenure from 1990 to 2007 with the Applied Physics Laboratory at Johns Hopkins University in Laurel, Maryland. Also while there, he directed the CONTOUR (Comet Nucleus Tour) Mission; the MESSENGER (Mercury Surface, Space Environment, Geochemistry, and Ranging) Mission to the planet, Mercury; and the New Horizons Mission to the planet, Pluto, and its moon, Charon.

Among his awards and honors, Farquhar is a Fellow of the American Institute of Aeronautics and Astronautics, and received AE's 1980 Distinguished Alumnus Award. NASA has honored him several times.



AE Alumni Award Winners



Khodadoust



Fisher



Horie



Schweighart

Abdollah Khodadoust and **Jeffrey W. Fisher** are winners of the AE at Illinois 2012 Distinguished Alumnus Awards, and **Kazuhiro Horie** and **Samuel A. Schweighart** are winners of the 2012 Outstanding Recent Alumnus Awards.

The alumni were recognized during the AE Awards Banquet April 26.

Khodadoust, PhD 93, has filled various leadership positions at the Boeing Company for over 10 years, and currently is Aerodynamics Group Leader in Boeing's Research & Technology Division (BR&T), in Huntington Beach, California. He leads a team of 50 scientists and engineers in Boeing's Research & Technology organization, with a strong focus on aerodynamic improvements and breakthroughs for concepts ranging from subsonic fixed wing and rotary wing, to hypersonic flight regimes.

Khodadoust is also the Boeing Program Manager for SMAAART—Structures, Materials, Aerodynamics, Aerothermodynamics and Acoustics Research and Technology—for aerospace applications. In that capacity he is responsible for oversight of R&D in the SMAAART flight technologies, with emphasis in developing foundational technologies, as well as assessment of advanced systems that emerge for combination of such technologies on aerospace platforms. This 5-year NASA program is a key vehicle for technology development and maturation with NASA in areas of Fundamental Aeronautics, Integrated Systems, Air Traffic Management, Aviation Safety and Space Exploration technologies.

Khodadoust is the Business Leader for Boeing's Flight Sciences Technologies Contractual activities with entities outside of the Boeing Company. He is responsible for development of relationships with external customers such as the Department of Defense (DOD), the National Aeronautics and Space Administration (NASA), and academia.

Khodadoust had earned a bachelor's and a master's degree in aeronautical and astronautical engineering from The Ohio State University in 1984 and 1987, respectively.

A Lockheed Martin Fellow, Fisher, BS 83, is technical leader for the company's world-class spacecraft pointing control organization in Sunnyvale, California. He is Principal Investigator for IRAD efforts in vibration control, active sensing, and advanced CMG steering laws, and manages the subcontractor development of Firecracker CMG & GeoEye-2 Momentum Control Assembly.

Past responsibilities for Lockheed included work in the Scan Drive Subsystem, Advanced Technology Microwave Sounder; the Space-Based Infrared System; the IRIDIUM Bus and MILSTAR satellite programs; and training and university relations positions.

In addition to his work for Lockheed, Fisher also serves as a private engineering consultant on motion control and robotic systems, primarily for semiconductor manufacturing and biotech firms.

Fisher earned a master's and a PhD in aeronautics and astronautics from Stanford University in 1984 and 1992, respectively.

Horie, MS 98, PhD 02, has worked the past 13 years for the Japanese Ministry of Defense's Technical Research & Development Institute.

He began his career there in 1999 as a senior research scientist in the Flight Mechanics and Flight Control section, and soon was put on the XF-2 fighter project, the first fighter that Japan and the United States developed together. He also worked as a senior research scientist in the Aircraft Systems Research Section.

In 2002 Horie became the Director of the Research & Development Planning Division of the Bureau of Finance and Equipment, where he was responsible for research and development policy and program monitoring of aircraft, submarine, tank, missile defense and other programs. In 2005, Horie was made Deputy Project Manager for the Air Systems Development Department's P-X & C-X Development Office, making him "chief-of-staff" for developing Japanese maritime patrol aircraft and cargo aircraft. The office's mission was to develop two large military aircraft simultaneously.

In 2009 Horie became Chief of the 1st Element (Aircraft) Programs Management Division, in charge of budgeting, supervising and evaluation for all programs for military aircraft research and development. Finally, in 2010, Horie was made Chief of the Air Systems Research Section, responsible for aircraft system and performance, and evaluation of developed aircraft systems.

Schweighart, BS 99, is Vice-President and Co-Founder of Terrafugia, a company in Woburn, Massachusetts, that makes the Transition Roadable Aircraft, a vehicle that both flies like a plane and drives like a car. (*Learn more about Schweighart and Terrafugia on page 31*).

Greetings from the AE Alumni Advisory Board

The Aerospace Engineering Alumni Advisory Board helps provide advice and support for the Department. Through the annual campus meeting, AE “meet and greet” events at conferences, and outreach to fellow alumni, the Board engages with faculty, staff and students to enhance the reputation of Aerospace Engineering at Illinois. As in past years, our annual October board meeting on campus afforded us the opportunity to stay involved with the Aerospace Engineering Department and discuss new ideas for the future. We had 22 Board members in attendance this year, which is the highest we’ve ever had at the annual meeting.

Department Head Philippe Geubelle gave an update on the status of the AE Department and College of Engineering as a whole. He reported that the Department enrolled 96 new freshman undergraduates and 33 new graduate students, with a total of 354 undergraduate and 133 graduate students now enrolled in the Department. The AE Department continues its high *US New and World Report* national rankings (ranked 8th and 7th respectively for undergraduate and graduate programs) and our alumni, faculty and students continue to win prestigious awards.

New faculty members Marco Panesi and Grace Gao introduced themselves to the Board and provided short presentations on their research objectives. Student leaders from the Illinois student branch of AIAA, Illinois Space Society (ISS) and the Graduate Student Advisory Committee gave presentations updating the Board on their most recent student activities and projects. New AE Department Associate Advancement Director Coordinator Tim Cochrane gave an update on the contributions of Alumni.

This year, we continued a strategic objective of the Board to increase its participation with students, faculty and staff to further support the Department. Board members were active in presenting at AE Courses on campus and finding new ways to interact with students and faculty.

This year we welcomed four new members to the Board: John Soldner, Vice President Program Execution SAIC; Rick Mange, F-35 PNR Program Manager, Lockheed Martin; Terry Jagers, Director of Air Force Study Board & Intelligence Community Standing Committee at the National Academy of Sciences; and Dave Sliwa, Insitu, Inc., Director of Business

Development. They provided fresh ideas and enthusiasm to the Board and we’re expecting to add a few additional members in the coming years.

During the year, the AE Department reached out to alumni across the country hosting receptions at conferences and sponsoring other social gathering events. Faculty and staff met with alumni at a reception at the AIAA ASM conference in Nashville in January, and a College of Engineering event in Seal Beach CA. Prof. Geubelle and Tim Cochrane met with Alumni around the country in several meetings. I encourage alumni to watch for these opportunities to meet and talk with the department head, faculty, and staff when they occur.

Of special note, I am delighted to report Alumni support to the department has increased significantly over the past two years. In January, the AE Alumni Advisory Board Fellowship Challenge met its pledge goal of \$150,000. The AE department for the first time in its history awarded a graduate fellowship this year, totaling \$6,000 to a deserving student. Even in lean economic times, the Department has been a constant in educating exceptional students in Aerospace Engineering who move on to contribute to our industry or in academic education and research. Please consider making a financial commitment to help your Department. Contact the Department advancement officer, Timothy Cochrane for more information.

Finally, it has been an honor to serve as the President of your Alumni Board these past two years. Mark Crowley of SolFocus was elected as President at the October meeting after serving as Vice President the past two years. Mark has been an active supporter of the Department spearheading efforts for the new Systems Engineering program and the Board Fellowship Challenge. I know Mark will continue to solicit your ideas and how your Board can better serve our excellent Department, continue to enhance its exceptional reputation, and provide opportunities for you to participate and interact with Department faculty and students.

Best Regards

Michael Miller, '76
AE Alumni Advisory Board President
mmiller@comspacedev.com

Stay tuned for the AE at Illinois reception to be held during the 51st American Institute of Aeronautics and Astronautics meeting January 7–10 at the Gaylord Texan Hotel and Conference Center in the Dallas/Fort Worth area!

Class Notes

Jeffrey P. Dunning, BS 95, MS 00, is of counsel in the Intellectual Property & Technology Department at Greenberg Traurig^{LLP}, a Chicago law firm. He focuses his practice on the prosecution and litigation of patent, trademark, unfair competition, domain name and copyright matters. His experience includes patent and trademark analyses, as well as licensing. He earned his J.D. from the Washington University in St. Louis School of Law.

Eric Trant, BS 00, is a Senior Systems Engineer at Orbital Sciences Corp. in Chandler, Arizona.

Lynn E. (Craig) McGrew, BS 00, at the NASA Johnson Space Center in Houston, Texas, and **Evgeniy Sklyanskiy**, BS 01, MS 04, at the Jet Propulsion Laboratory in Pasadena, California, were among the many engineers and scientists who helped in the mission of the land rover, Curiosity, executing a near-perfect landing on Mars on August 6.

Craig was an Entry Guidance engineer on the Entry Descent and Landing (EDL) team. She worked on simulating, optimizing, and testing the reference trajectory that the on-board flight software would use to control its path through the Martian atmosphere. Using lift, drag and altitude rate, the spacecraft was able to more precisely hone its flight and thus achieve the most accurate Mars landing to date.

Craig has been stationed at Johnson Space Center as part of the Flight Dynamics branch since 2008, and also worked trajectory and mission design for the Mars Exploration Rovers and Mars Phoenix lander missions from 2002 through 2008.

Sklyanskiy was part of the Surface Guidance Navigation and Control (GN&C) team, whose main objective was to test the Gyrocompass (IMU) and the GN&C logic/software functionality of the two pairs of Navigation cameras mounted on the rover mast. The team also was responsible for the High Gain Antenna (HGA) GN&C algorithms antenna located on the main deck of the rover."

The system Sklyanskiy and engineers at JPL developed is the most complex GN&C has ever built. The onboard computer located on Curiosity was responsible for the trajectory correction maneuvers during the Earth-Mars cruise phase, entry, descent and landing (EDL) and rover surface operation phase.

Paul Martin, BS 06, and **Jim Liao**, BS 00, played parts in the historic sea trials testing of the F-35B Joint Strike Fighter onboard the USS WASP (LHD-1) in October. The testing, taking place off the coasts of Maryland and Virginia, marked the first time the aircraft had operated from a ship.

As an Air Traffic Control and Landing Systems Engineer Martin has spent over five years working in ship suitability, and has been working on the Joint Strike Fighter program the past 2½ years. Currently working for Naval Air Systems Command, Martin's role was to interact with the ship's personnel,

plan the flight test periods, and ensure the ship was able to provide the desired wind conditions for test points.

Liao is a Flying Qualities/Air Data engineer working for Lockheed Martin Aeronautics. He has been working the past six years on the Joint Strike Fighter program, in both design and flight test roles. At sea, Liao's job was to monitor the aircraft's air data system and flying qualities during the high-risk test points.

Both alums work for the Integrated Task Force at NAS Patuxent River, Maryland.

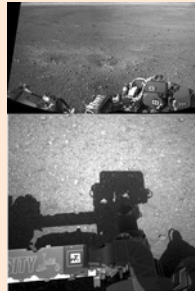
Sylvee Walenczewski, BS 08, is Chair of the American Institute of Aeronautics and Astronautics (AIAA) San Francisco Section and a member the AIAA Western Regional Advisory Committee.

Christopher S. Martin, MS 07, PhD 11, and Mauro Pontani have contributed chapters to AE Prof. Bruce Conway's book, *Spacecraft Trajectory Optimization*. Also contributing a chapter and software results were AE Emeritus Prof. John Prussing and his student, Suzannah Sandrik, MS 02, PhD 06.

Wallace H. Hanlon, 81, BS 58, of Huntington Beach, California, died May 26, 2012. After earning his degree, Hanlon worked for the Convair Division of General Dynamics in San Diego, California; ITT in Fort Wayne, Indiana; and then McDonnell Douglas in Huntington Beach. For McDonnell Douglas, Hanlon worked on Manned Orbiting Laboratory and, later, the SkyLab project with several astronauts. He designed the film vault aboard SkyLab. Hanlon owned Spring Crest Custom Drapery franchises in Orange County, and later worked as a part-time sales executive with Perfectex in Huntington Beach.

Lawrence L. Galigher, 75, BS 59, of Tullahoma, Tennessee, died June 25, 2012. Galigher had retired in 1995 from Arnold Engineering and Development Center where he worked for ARO, Inc., Calspan Corporation and Micro Craft in several engineering and management position with the propulsion wind tunnel facility over a span of 35 years. Galigher had earned a master's degree from the University of Tennessee.

Scott A. Chizzo, 53, BS 81, died September 18, 2012. Chizzo was president and chief executive officer of his company, Maxiom Consulting Group of Waltham, Massachusetts. Chizzo earned a master's in business administration from the University of California-Los Angeles School of Business Management, worked in Northrop design teams, and worked in several consulting firms including Deloitte and Touché. He was an avid golfer and won billiard competitions of the USA Pool League. Chizzo was an experienced astronomy buff and helped with educational events for children and wrote guides for new telescope users.



Sklyanskiy



Martin and Liao

Thanks to Our Donors

The alumni and friends listed here contributed to Aerospace Engineering during Fiscal Year 10 (between July 1, 2011 and June 30, 2012). Thank you for your gifts! (All degrees are in AE unless otherwise indicated.)

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Why I Give

I have a lot of pride and personally feel honored having received both my Bachelor's and Master's degrees in Aerospace Engineering at the University of Illinois. The excellent classroom education, the mentoring from several professors who went above and beyond their duties with both patience and caring, and the undergraduate and graduate research and teaching opportunities not only prepared me from a technical perspective, but also developed the foundational leadership skills and confidence to enable me to succeed in my career. Donating to the Aerospace Department to help continue the tradition of excellence I witnessed as a student is a way for me, each year, to say "Thank You" for all of the benefits I received. Go Illini!! —*James J. Guglielmo, BS 92, MS 96*

My wife and I started our undergraduate educations at Illinois and that set the stage for our future careers. It was an easy decision to give back to the institution that means so much to us. We've been giving on and off for many years, increasing the amount as we could afford to give more. I've also assisted with the AE Alumni Advisory Board's efforts in raising the money to fully endow a graduate student fellowship, which will be a huge benefit to the Department and future graduate students.

As an alum from the Department of Aerospace Engineering, I personally give back to help the AE Department maintain and improve its level of educational standing. In today's budget environment, the department can use as much help as possible and I hope that other alums see the urgency of how important individual and corporate donations are to the department and the University of Illinois as a whole.

I hope that our loyal and dedicated AE alumni base will realize the importance of giving back and will provide gifts of any level, as every contribution both large and small helps. Together we can make a difference and continue to honor the Department that provided us so many memories and prepared us for the world outside of the Urbana/Champaign campus. —*Mark A. Crowley, BS 83*

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In addition to the individual alumni and friends who contribute to AE, we are pleased to recognize the corporations and organizations that give to our research and ongoing programs. This support enables us to maintain our standing among the top undergraduate and graduate aerospace engineering programs in the nation.

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