

## Boeing Recognizes AE Graduate Student in International Competition

Busch said the engineering team hopes to be able to move to that next phase—testing their theories using human racers, on the track—this fall. Such tests might include measuring the total power needed to propel a chair around a track.

According to the students' Web site, challenges of such future testing would be difficulties related to controlling external variables such as wind, and obtaining reliable measures of required power.

Besides Busch, other members of the engineering research team have included Jeremy Alonso, Jeff Burgess, Maulik Choksi, Austin Ellis, Wes Hammes, Bryan Lin, Krunall Patel and Chris Richgruber. The scale-model wheelchairs are based on a computer model from wheelchair manufacturer Invacare Top End and are constructed from rapid prototyping material in the engineering college's Ford Lab in the Mechanical Engineering Laboratory. Wind-tunnel time was donated by the Aerospace Engineering Department.



L. Brian Stauffer

**Greg Busch said the engineering team hopes to be able to test their theories using human racers on the track this fall. Such tests might include measuring the total power needed to propel a chair around a track.**

AE graduate student Manu Sharma has been honored in the Boeing 2008 Student of the Year Awards.

According to the company, this year's competition attracted a record number of qualified entries from around the world, including Australia, India, Singapore, South Africa and the United Kingdom, as well as the United States.

Boeing's sponsorship is one of its many efforts aimed at encouraging students to pursue careers in aerospace-related engineering fields. The worldwide competition, now in its third year, is open to any full- or part-time engineering student pursuing a recognized degree. The winning student's work must be judged as likely to impact the future of aerospace engineering in areas such as new or enhanced capabilities, systems, processes or tools; new levels of performance; and improved life cycle costs.

Sharma received an honorable mention for his project involving the experimental investigation of compressible hypersonic flow using the recently constructed Hypervelocity Expansion Tube (HET) facility. He reports that he was heavily involved in the installation of the tube itself, the test section, data acquisition system, vacuum pump, gas lines and pressure instrumentation.

"I was responsible for the design of a novel primary diaphragm cutting mechanism and the test section sting and model mounts. Specifically, the long-term goal of my Ph.D. is to examine the high-temperature effects that are a defining hallmark of hypersonic flow. Thermochemical processes such as dissociation and vibrational excitation can have a substantial impact upon hypersonic aerodynamics. Towards investigating these high-temperature effects, we have selected a Mach reflection as a canonical flow-field and have used schlieren visualization, pitot pressure and wavespeed measurements and imaging spectroscopy to characterize the flowfield," Sharma said.



# Flying the Crowded Skies

## AE Grad Student Wins NASA Scholarship to Improve Air Transportation

BY DOUG PETERSON

Our current air transportation system has reached its capacity, says Heather Arneson, a graduate student working under Cedric Langbort, a professor of aerospace engineering and the Coordinated Sciences Laboratory. Every day, roughly 50,000 flights must be managed by the U.S. system, Arneson explains, but that number is projected to increase to anywhere from 100,000 to 150,000 flights per day by the year 2025.

### Something has to give

To solve the problem, the United States is actively developing the next-generation air transportation system, and Arneson is in the thick of the action. To work on the issue, she has received a highly-competitive NASA Aeronautics Scholarship, awarded to only five graduate students nationwide each year.

The NASA scholarship will fund two years of research—and a third, if needed. It also provides Arneson with two summer internships at top NASA research centers.

According to Arneson, there are two levels

of research on the new air transportation system. The individual aircraft level focuses on using new technology for automatic collision detection and avoidance. Arneson is working at the flow control level, managing the flow of large *groups* of airplanes through specific air spaces. In particular, she is looking at ways to more efficiently reroute airplane traffic around regions when they become congested due to factors such as weather.

The current air transportation system relies on humans to monitor sections of air space. When the weather is bad, certain flights must be grounded until the weather clears, causing massive backups, she says. The next-generation system would be more dynamic, keeping the aircraft flowing as the flights are rerouted.

Arneson hails from Barrington, Rhode Island, and came to the Department of Aerospace Engineering at the University of Illinois at Urbana-Champaign in 2005 after working on NASA's Mars Exploration Rover Mission for three years. One of her professors at Cornell University, where she received her bachelor's degree, was the lead researcher in developing panoramic cameras for the Mars rovers.

Arneson helped to calibrate the panoramic cameras, which are mounted on the rovers to take photographs of the Martian landscape. Once the first rover reached Mars in January of 2004, she then worked on the scientific team that took images of the Red Planet.

"Some of the most exciting moments were when the rovers would reach a crater," she says. "Arriving at craters was really exciting because they could potentially reveal a lot about how the Martian surface was formed. It took us months to get to certain craters, but the long treks were well worth it."

Today, Arneson's research is a little bit closer to Earth—but equally exciting, she says.

As part of her master's work at Illinois, she developed two algorithms that could be applied to an existing Eulerian flow model for air traffic management; but her focus was on air traffic between just a single take-off airport and single landing airport. Her PhD research will build on her master's work, dealing with increasingly more complex network scenarios. She and Langbort will concentrate on distributed control algorithms to solve problems with air traffic delays, primarily those caused by weather.

"With weather conditions causing approximately 65 percent of the delays in the national airspace system in recent years," she says, "adaptability to changing weather conditions will be an integral part of any new air transportation system."



Heather Arneson with Diane Jeffers, AE Coordinator of External Relations, at the department's Awards Banquet.

## AE Teams Win Firsts at EOH

The American Institute of Aeronautics and Astronautics and the Illini Space Jet (ISJ) student organizations captured First Place awards in projects demonstrated during the University of Illinois 2008 Engineering Open House in March.

AIAA students won first under the category "EOH Theme-Sparking Curiosity" for their Wind Tunnel Demonstration exhibit. The students demonstrated in a wind tunnel how wings work and what causes them to fail. They showed how wings are designed and tested, and tested the lift, drag and other aerodynamic properties of a wing, sphere and golf ball.

ISJ students won first for Best Underclass Class Project for their Jet Powered Airplane and Rocket Launch exhibit. They displayed a turbine-powered 10-foot, 1/10 scale airplane, built to demonstrate the possibility of rocket launch from a moving aircraft. They also ran drag races every 30 minutes between two 6-foot rockets fired between the two bridges over the Bone Yard Creek north of Engineering Hall.

### **Members of the AIAA team were:**

Sarah Fullmer  
Dennis Bosco  
William Wheeler  
Jacob Shulkin  
Jake Turelli  
Sara Streeb  
Gregory Sabina  
Steven Moran  
Brian Lester  
Ryan Palmer  
Tyler Gillen  
Joseph Bottalla  
Joel Houston  
James Osiol  
Jared Daum  
David West  
Jiang John Yu

### **Members of the ISJ team were:**

Christopher Richgruber-Team Leader  
Virag Shah  
Scott Allen  
Ryne Beeson  
Elizabeth Bozek  
Dain Christensen  
Aaron D'Souza  
Jonathan Huffman  
Patrick Looby  
Steven Moran  
Matthew O'Brien  
Corey Osland  
Christopher Re  
Gregory Sabina  
Richard Scheweighart  
Dustin Williams  
Matthew Starr  
Yin-Ping Su  
Bryant Whitesel  
Jay Patel  
Namho Kim  
Wayne Neumaier  
Jeewan Ghuman  
Jiang John Yu

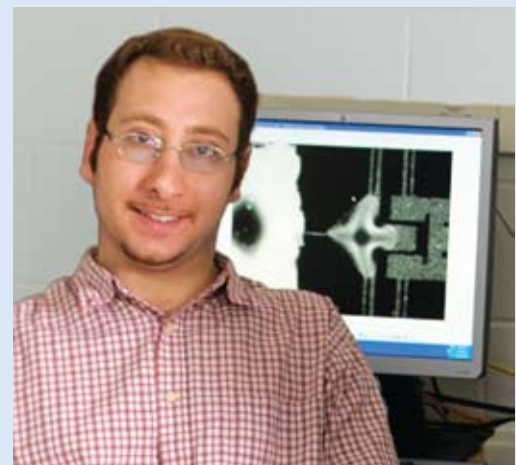
## AE PhD Takes First for Second Year in Sandia Lab Contest

Doctoral student Mohammad Naraghi has taken first place for two consecutive years at Sandia National Laboratory's University Alliance competition.

Most recently, Naraghi took first at Sandia's fourth annual competition for student micro-electromechanical systems designs. His design fit the category calling for a micro design to reliably inspect nanoscale phenomena. The Illinois device featured a mechanical testing platform specifically designed to perform creep/stress relaxation tests on soft polymeric and biological nanostructures. The device incorporated a piezoresistive loadcell with a novel on-chip actuator capable of generating large deformations on the sample. AE Associate Prof. Ioannis Chasiotis advises Naraghi.

The University Alliance competition gives universities around the country an opportunity to test their skills in developing all the intricate details of design, analysis, and fabrication of complex MEMS devices, says Mark Platzbecker, technical team lead in Sandia's MEMS Core Technologies Department.

Naraghi's work was supported in part by the National Science Foundation (NSF) under NSF-NIRT grant DMI-0532320.





Michael Duffy and John Prussing



Ryan McDonald and Ioannis Chasiotis



Gregory Sabina and Eric Loth



Jeremy Alonso and Larry Bergman



Wilbur Chang and Craig Dutton



Craig Dutton and Michael Day



Krishna Jonnalagadda and Ioannis Chasiotis



Matthew Cruce and Diane Jeffers

About two dozen of Aerospace Engineering's top students were recognized in April during the department's Awards Banquet.

- The **AIAA Scholastic Achievement Award**, given each year to the senior graduating in May with the highest class grade point average, was awarded to **Michael J. Duffy of Bloomington, Illinois**. Duffy was recognized this spring as a **Bronze Tablet** member, one of a select group of undergraduate students whose names are inscribed on bronze tablets displayed on the first floor of the University of Illinois Main Library. Only the top 3 percent of undergraduate students across campus receive this highly coveted award, which recognizes continuous high academic achievement. Duffy also was awarded an **Illinois Space Grant Scholarship** from the NASA Illinois Space Grant Consortium, based on his academic performance.

- The **H.S. Stillwell Memorial Awards** are presented annually on the basis of outstanding scholastic achievement and extracurricular activities. The 2008 winners were **Ryan P. McDonald of Holland, Michigan**, and **Gregory W. Sabina of Brookfield, Wisconsin**. McDonald also received the **Chancellor's Award** for Academic Excellence this past spring. The award recognizes the student athlete with the highest GPA on the University of Illinois football team. McDonald's position is offensive lineman. He was awarded second-team, All-Big Ten honors for his excellent work on the team last fall.

- **H.S. Stillwell Problem Solving Scholarship** recipients are junior-level students majoring in aerospace engineering who exhibit exemplary problem-solving skills. The 2008 winner was **Jeremy R. Alonso of Freeport, Illinois**. Alonso also was awarded an **Illinois Space Grant Scholarship** from the NASA Illinois Space Grant Consortium, based on his academic performance.

- The **Robert W. McCloy Memorial Award** is presented annually to a junior or first semester senior student in recognition of outstanding academic performance. The 2008 winners were **Wilbur Chang of Chicago** and **Michael T. Day of Homer Glen, Illinois**.

- The **Roger A. Strehlow Memorial Award** is presented annually to a graduate student in recognition of outstanding research accomplishment. The 2008 winner was **Krishna N. Jonnalagadda of India**.

- The **Dale Margerum Memorial Award** is presented annually to the AE undergraduate who exemplifies outstanding leadership qualities by participation in departmental extracurricular activities. The 2008 winner was **Matthew J. Cruce of Pekin, Illinois**.

- The **Faculty Outstanding Graduate Student Award** is presented in recognition of outstanding contributions to the teaching and/or research missions of the department. The 2008 winner was **Mohan G. Kulkarni of Pune, Maharashtra, India**. Kulkarni also was a winner of the College of Engineering **Mavis Memorial Fund Scholarship Award**. The Mavis Scholarship program, designated for students working on their doctorate in the College of Engineering, was made possible by a generous bequest of Frederic T. and Edith F. Mavis. Dr. Mavis received his B.S., M.S., and Ph.D. degrees in civil engineering from the University of Illinois. He was a professor of civil engineering at several universities and was dean of engineering at the University of Maryland. Recipients are chosen based on their academic performance, research accomplishments, and demonstrated interest in engineering education.

- **Illinois Space Grant Fellowships** are awarded to entering and continuing graduate students by the NASA Illinois Space Grant Consortium and are based on academic and research performance. In AY 07-08, fellowships were awarded to **Heather M. Arneson, Greg T. Busch, Miles J. Johnson, Andrzej Pukniel, and Robert E. Thomas II**.

- **Illinois Space Grant Scholarships** are awarded to entering and continuing undergraduate students by the NASA Illinois Space Grant Consortium and are based on academic performance. **Brandon E. Copp, Michael B. Dunkel, Thomas G. Herges, Albert Y. Lee, and Jacob P. Niehus** were among the AY07-08 scholarship recipients.

- The **Department University Fellowship Kenneth Lee Herrick Fellowships** are awarded to graduate students based on academic and research performance. Among the AY07-08 winners were **Jerome Barral and Felix D. Pflaum**.

- **Stephen M. Moran** earned **First Place in the Undergraduate Poster Competition** of the Great Midwest Regional Space Grant Conference.



Mohan Kulkarni and Philippe Geubelle



Heather Arneson and Diane Jeffers



Miles Johnson and Diane Jeffers



Andrzej Pukniel and Diane Jeffers



Brandon Copp and Diane Jeffers



Michael Dunkel and Diane Jeffers



Thomas Herges and Diane Jeffers



Felix D. Pflaum and Philippe Geubelle