AME Highlights

Department of Aerospace and Mechanical Engineering

UNIVERSITY OF NOTRE DAME

Academic Year 07- 08

White Field High Speed Turbomachinery Laboratory

Compression system for the turbine research facility (looking South).

The White Field Research Facility is now home to a new high speed turbomachinery laboratory. The research conducted in this laboratory is focused on new technologies that will improve gas-turbine engines for the production of electricity and for propulsion applications. Two of the most important requirements for engine design are fuel efficiency and safety. Unfortunately, these requirements often lead to conflicts for design engineers. For example, designing a part to be stronger may lead to increased safety, but will also increase the weight of the engine which can reduce efficiency. Two important components of an engine are the compressor (which pushes the air through the machine), and the turbine (which drives the compressor and/or provides the output power for electricity). The ND turbomachinery laboratory has developed two unique facilities for studying both of these engine components. The Transonic Axial Compressor (TAC) facility has been in operation for over two years, and research in this facility is currently sponsored by General Electric Aviation. The high-speed turbomachinery lab was constructed with sponsorship from the Air Force Office of Scientific Research, and will be commissioned in fall 2008. The new laboratory is a participant in the Center for Flow Physics and Control (FlowPAC) and thus one of the main motivations for the construction of these facilities is the use of active flow control. Specifically, the research is based on the premise that sensors and actuators can be designed and integrated into the engine components that will allow the engine to operate with both increased fuel efficiency and increased safety margins. Several patents have been applied for based on recent research results. Tests using a real engine are currently being planned for 2009. Professor Scott C. Morris, an associate professor at Notre Dame in Aerospace & Mechanical Engineering since 2002, runs the turbomachinery lab. His research expertise is in both acoustics and turbomachinery.

Above: White Field Research Laboratory

Pictured left: The Turbine Facility, looking North

Letter from the Chairman

Dear AME Alum,

The 2007-08 academic year was exciting and rewarding. Undergraduate enrollment in AME continues to be the largest in the College of Engineering and our research and graduate programs continue their strong growth. This past year the College welcomed the arrival of a new Dean, Dr. Peter Kilpatrick, who was formerly the Chair of the Chemical and Biomolecular Engineering Department at North Carolina State University. AME and the University also welcomed Dr. Robert Bernhard, University Vice President for Research and Professor of Aerospace and Mechanical Engineering. Bob joined us from Purdue University where he was the Associate Vice President for Research and a professor in the ME Department. As Notre Dame pursues its goal of becoming the premier Catholic research university, we will need to continue the development of our people, facilities and programs and Drs. Kilpatrick and Bernhard are dedicated to assisting the faculty and students in achieving that goal.

As described in this issue of Highlights, the new White Field experimental facility was completed during the past year and construction began on the new Stinson-Remick Engineering Building on the DeBartolo Quad. Both locations will complement our current facilities and allow for continued enhancement of our educational and research programs. Though new buildings may be the most apparent changes, our faculty and programs continue to evolve to keep up with the ever-changing demands of the engineering profession and society. We continue our strong engagement with the University's Center for Flow Physics and Control and more students were added to the new Ph.D. program in bioengineering. New initiatives range from efforts related to the nano-scale modeling of materials to the development of autonomous, "football playing" robots!

My letter in this year's AME Highlights will be my last as Chair. I will be on sabbatical leave next year hopefully gaining some new insights and valuable experience that I can bring back to the classroom. I have enjoyed my time as Chair and during that time have had the support of a dedicated and hardworking faculty and staff. Dr. John Renaud will assume the role of Chair in August 2008 and John will bring new energy, ideas and initiatives to AME.

Please keep us posted on your activities and don't hesitate to stop by the Department during your next visit to campus. Thank you for your ongoing interest in and support of the AME Department and the University. May Our Lady, patroness of Notre Dame, watch over you.

Sincerely,
Stephen Batill, Professor and Chair

A snapshot of AME:

- *97 B.S. Degrees were awarded in Jan./May 2008 - 24 AE and 73 ME.*
- *On graduation day, 94% of the 2008 B.S. graduates had definite career plans in either industry (70%), post-graduate education (12%) or military/public service (12%).*
- *22 AME graduates from the Class of 2008 accepted positions within General Electric.*
- *A 2008 AE grad will be teaching in an orphanage in Honduras and a 2008 ME grad - high school physics in Chicago.*
- *Anticipated undergraduate enrollment, Fall 2008 (sophomores through seniors) – 88 aerospace engineers and 236 mechanical engineers.*
- *107 graduate students with 14 M.S. and 13 Ph.D. degrees granted in 2007-08.*
- *10 AME faculty members are Fellows in AIAA, ASME or AAAS.*
- *Faculty, students and facilities located in 4 buildings: Fitzpatrick/ Cushing Hall, Hessert Laboratory for Aerospace Research, Multidisciplinary Research Building and the White Field Laboratory.*
- *$13.9M in research proposals submitted and $5.5M in research awards received during the 07-08 academic year.*

"Tony Robo" from Spring 08 ME Senior Design Team "Hewlett Packers" (C. Feely, B. Nelessen, J. Rees, J. Rowland, & P. Tennant).

Industry supporters

AME receives financial support annually from both individual and corporate donors. These funds are used to assist in the mission of the Department in many important ways. The University is well-known for the generous support of its alumni, but it is particularly helpful when organizations, with the encouragement of our alums, contribute either by participation in events such as Industry Day, by supporting intern programs or through grants or gifts. This year we wish to recognize those organizations that have provided direct support to AME: Chrysler, Honeywell Inc., Innovative Scientific Solutions, Inc., Spectral Energies LLC, Boeing, Orbital Research Inc., Procter & Gamble, Zimmer, Rohm & Hass Co., Bell Helicopter and Shell International.

Alumni Recognition and News

Col. Michael T. Good (BSAE '84, MSAE '86) has been assigned as a Mission Specialist to Space Shuttle STS-125 mission to repair the Hubble Space Telescope scheduled for launch in Oct. 2008. Godspeed Mike!

Dr. Kevin A. Ford (Col., USAF, Ret., BS '82) was recently named to pilot space shuttle Atlantis on the STS-128 mission. The flight, targeted for launch on July 20, 2009, will carry science and storage racks to the International Space Station.

Notre Dame's Physics Department's extended Research Community (NDeRC) program hosted a lecture in the Fall 2007 featuring Mark Klem (BSAE '82, MSME '84). Mark is currently at the NASA Glen Research Center and serves as the Program Manager of the Propulsion and Cryogenics Advanced Development Program.

At the 2008 AIAA Aerospace Sciences Meeting, Dr. Andrew Arena (PhD '92) currently Professor of Mechanical and Aerospace Engineering at Oklahoma State University received the 2008 AIAA Faculty Advisor Award and Joshua Johnson (BSAE '05) received the Willy Z. Sadeh Graduate Student Award in Space Engineering and Space Science. Joshua is currently a graduate student at the University of Maryland, College Park.

Notre Dame held its first University-wide Undergraduate Scholars Conference this past spring. The Keynote Address at the Conference was presented by Dr. Dava Newman (BSAE '86) who is currently the Margaret MacVicar Faculty Chair and Professor of Aeronautics and Astronautics and Engineering Systems at MIT. Dava has also been named one of the Best Inventors of 2007 for her BioSuit™ system by Time Magazine, and the BioSuit™ system was exhibited in the Metropolitan Museum of Art's Super Heroes show (May-Sept. 2008).

©Photo courtesy of Donna Coveney, Massachusetts Institute of Technology

Dr. Dava Newman, modeling her much lighter BioSuit ™, alongside a photo of the 40-year standard flight suit.

The successful landing of NASA's Phoenix Mars Lander on May 25, 2008 marked the culmination of 5 years of effort by Dr. Matthew Robinson (BSME '96, PhD '01). Matt is the Robotic Arm Flight Software Lead for the Phoenix Mission.

After completing post-doc appointments at Johns Hopkins and the University of Pennsylvania, Dr. Nathan Sniadecki (BSME '00) has joined the faculty of Mechanical Engineering Department at the University of Washington in Seattle.

In November 2007, a reception was held at the White House for 20 scientists selected from across the country as recipients of 2006 Presidential Early Career Awards for Scientists and Engineers (PECASE). Dr. James Schmiedeler (BSME '96) was recognized at that ceremony for his work bridging neuroscience with mechanical engineering in the domain of rehabilitation engineering. Jim's current faculty appointment is at The Ohio State University but he will be joining Notre Dame's AME Department in October 2008 as an Associate Professor.

Dr. William Hart (BSME '02) completed his PhD at Stanford last year and is currently working at Loral Space and Communications in California and Lt. Jeffrey Newcamp (BSAE '04) has been selected for Air Force Test Pilot School at Edwards AFB as a Flight Test Engineer and Jeff will begin training later this year.

Illustrating the breadth of contributions from AME grads: Ana Villamil Kelly (BSME '82) after working as a NASA project engineer and as an Associate Director at the US Conference of Catholic Bishops now heads a web site dedicated to providing resources to lay Catholics, www.ActiveParishoner.com. David Williams (MSME '94, PhD '96, MBA '01) recently left a position at Berkshire-Hathaway and now is working with an IT start-up in the Huntsville area that is supporting the NASA Constellation program and he is now an Operations Manager for the Ares program. Combining his MBA with his PhD has given David the chance to balance his interests in both management and technical development and operations – along with his family and parish life. David is also working with David Tarkowski (BSAE '68, MSAE '70) and Joe Szedula (BSAE '80, MSAE '82) in the Huntsville ND Alumni Club.

Finally, a few alums responded to the 2007 Highlights "Do Your Recognize These Engineers" feature. John Patrick Doyle (BSAE '82) who began his career at McDonnell Douglas, which is where the picture was taken during a 1981 field trip, worked on a number of aircraft development programs at the Phantom Works and is now with Ford. Patrick Logan (BSAE '82) also began his career at McDAC and is now with K Ridley Technology in Eugene, Oregon where his engineering is more down-to-earth but equally interesting. Mark Lilly (BSAE '82) noted that seven years later he was actually working on the same ramp that the picture was taken and is now in Starkville, Mississippi. Chris Spitzer (BSAE '82) currently with Northrop Grumman Space Technology and is Spacecraft Manager for the James Webb Space Telescope was surprised that the Highlights had tracked him down.

Take a moment to send the editor a quick note and Highlights can update you on more of your classmates and their activities.

Cathy Pieronek

AME Alumna Receives National Adviser Award

Catherine F. Pieronek (BSAE `84) is Notre Dame's College of Engineering Director of Academic Affairs and Director of the Women's Engineering Program. Cathy joined College of Engineering Dean's Office in 2002 and has had a significant influence on a number of key programs, most notable of which is her development of the Women's Engineering Program. Building upon her academic background in engineering and law (MSAE `87, UCLA and J.D. `95, Notre Dame) in addition to industry experience with TRW, Cathy has developed a nationally recognized program that has contributed in critical and substantial ways to the College of Engineering at Notre Dame. Her initiatives have resulted in a 25% increased retention rate of female engineering students, exceeding the retention rate of their male peers. Female egineering student attendance at Notre Dame is also up 20%. The ND Society of Women Engineers (SWE) Section was recognized in 2003 as the campus "Club of the Year", in 2005 for "Program of the Year" and awarded the SWE Outstanding Collegiate Section in 2006 and 2007. Cathy was presented with the first-ever Outstanding Faculty Adviser Award from the Society of Women Engineers National Office in Fall 2007. Cathy's career is another outstanding example of the opportunities available to our AME graduates to make a difference in other's lives and contribute to society.

Student Recognition and Awards

Gianluca Puliti, conducting research in the area of transport properties of nanofluid under the direction of Dr. Samuel Paolucci, received an AIAA Foundation Open Topic Graduate Award to assist in supporting his graduate studies. He will receive this prestigious national award at the 2009 Aerospace Sciences Meeting in Orlando, Fl.

Dr. Gabriel Converse (PhD `08) received the 2008 Eli J. and Helen Shaheen Award which recognizes the top graduating doctoral degree recipients in humanities, social sciences, science and engineering. Dr. Converse's advisor was Dr. Ryan Roeder. This is the second consecutive year an AME graduate has received this award.

A number of AME undergraduate students participated in the 2008 AIAA Region 3 Student Conference. John Cooney (BSAE `08) placed first in the Paper/Presentation Category and was invited to present his paper at the 2009 AIAA Aerospace Sciences Meeting. Alyssa Teves (BSAE `08) and Kristy Schlueter (BSAE `08) placed first in the Presentation Only category and Sarah Lane (AE `09) placed second in the Presentation Only category. Each of these student projects was mentored by Prof. Robert Nelson (BSAE `64, MSAE `66).

Dr. Robert Nelson with 2008 AIAA award recipients John Cooney, Alyssa Teves and Kristy Schlueter.

The National Science Foundation's Graduate Research Fellowship Program awards prestigious multi-year fellowships to outstanding students across the country. NSF Fellows are expected to become knowledge experts who can contribute significantly to research, teaching, and innovations in science and engineering. Thomas Economon (BSAE `08) received an NSF fellowship in Spring 08 and will begin graduate studies at Stanford in the fall.

Each spring, Sigma Gamma Tau, the National Aerospace Honor Society recognizes eight outstanding Aerospace Engineering seniors in the United States, based upon their academics, service, and extracurricular accomplishments. This year Erin Mullholland (BSAE `08) received the 2008 Great Lakes Regional Award. Erin and Patrick Noble (BSME `08) also received the University's Steiner Award which recognizes top graduates in the College of Engineering.

College of Engineering Honor Award recipient, William Oberkampf and wife Sandi

College of Engineering Honor Award:

Each year, departments within the College of Engineering nominate distinguished alums or other "friends of the University" for this unique distinction. In the past 34 years the AME Department has honored 34 individuals out of approximately 6000 AME alums. The 2008 College of Engineering Honor Award was presented to "Double-Domer" Dr. William Oberkampf (B.S. in AE, 1966 and 1970 Ph.D.). His professional career started with an academic appointment at the University of Texas, Austin, as a tenured associate professor. In 1979 Bill joined Sandia National Laboratory, where he retired in 2007 as Distinguished Member of the technical staff. His work focused in the area of computational fluid mechanics and he became a national leader in the area of computational simulation software verification and validation. V&V, as it called, is a key part in the process of development of software for predicting behaviors of complex engineering systems. Dr. Oberkampf and his group at Sandia pioneered these efforts and help set many industry standards. Bill received a number of noteworthy professional recognitions including election to the rank of Fellow in the American Institute of Aeronautics and Astronautics. He also participated with the Shuttle Columbia Accident investigation team, and his career illustrates how dedication to an important problem can influence one's profession. Bill and his wife Sandi, pictured left, visited campus this past spring to receive the award.

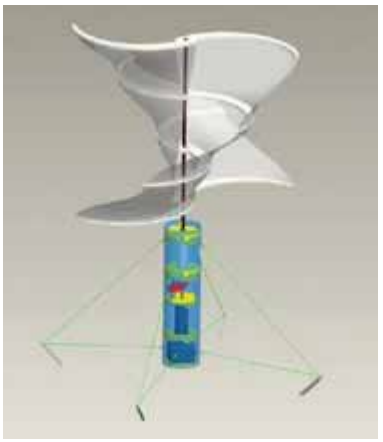
FACULTY NEWS

Dr. Bill Goodwine (BSME `88) was this year's true "triple-crown" winner. Bill received the University's Rev. Edmund Joyce, C.S.C. Award for Excellence in Undergraduate Teaching, the College of Engineering's 2008 BP Foundation Outstanding Teacher of the Year Award and the AME Department's Ruth and Joel Spira Faculty Teaching Award – a truly unique accomplishment.

The North American Manufacturing Research Institution of the Society of Manufacturing Engineers presented a 2007 NAMRI/SME Outstanding Paper Award to Prof. Steven R. Schmid and Dr. Paul Nebosky (BSME `01, PhD `06) for their paper entitled "Formability of Porous Tantalum Sheet Metal."

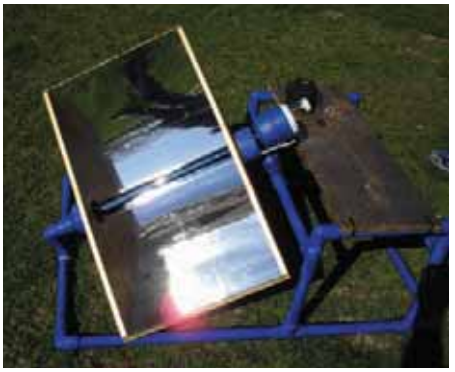
Two new Assistant Professors will be joining the AME department in August 2008. Dr. Philippe Sucosky, who received his Ph.D. in Mechanical Engineering from Georgia Tech in 2005 and then completed a post-doctoral appointment in the Biomedical Engineering Dept. (also at Georgia Tech), will complement our programs in both fluid mechanics and bioengineering. Philippe's research focus is in the area of cardiovascular mechano-biology. Dr. David B. Go (BSME `01) recently completed his Ph.D. at Purdue after spending 3-years at GE Aviation. David will be teaching courses in measurements and data analysis and his research interests are in the area of small-scale transport with particular emphasis on miniature mass spectrometry systems.

ME Senior Design Projects Spring 2008



Above Left & Right: CAD and completed vertical-axis wind turbine, "Revolutionary Technologies" Team (N. Arch, N. Fraser, R. Huth, P. Noble, & M. Toomey).

Pictured Right: Compact Solar Energy System, Team "Solar Power Rangers" (P. Hicks, K. Kastenholz, D. Lipp, P. Nistler, & R. Paietta).



40 years of AME leadership: Judy Kenna with current and past departmental chairs (left to right): John Renaud (2008-), Kwang-Tzu Yang (1969-78), Albin Szewczyk (1978-87), Bob Nelson (1996-2002), Thomas Mueller (1987-96), and Stephen Batill (2002-08).

Judith Kenna Retires

At the end of June 2008, Judy Kenna, AME Department Administrator, retired after 28 years of service to the University and AME. As everyone understands, the success of any organization depends upon the professional dedication of support staff and AME is no exception. The generation of students, faculty and alums who interacted with Judy through the years surely appreciated her efforts on their behalf and her dedication to the Department. Shortly before her retirement, Judy was one of just three staff members from across the University to receive a Presidential Achievement Award. These new awards are in recognition of "break-through initiatives, extraordinary innovations and significant contributions to the University's long-term success." Judy was honored for her "business acumen" and her role as a "University-wide resource who assists in the improvement of accounting and personnel practices across divisions and departments." Judy would be the first to stress that this recognition was made possible by all the staff in AME who've worked with her throughout her career and who contribute daily to the success of the Department.

UNIVERSITY OF NOTRE DAME

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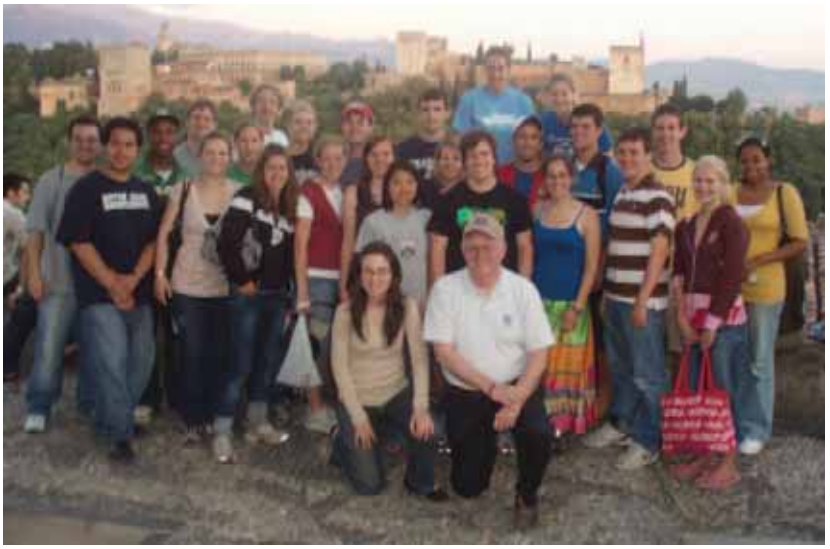
Summer 2008: Spain Program

The College of Engineering started a new summer program in 2008, once again with leadership and encouragement from AME. Twenty-five engineering undergraduate students from all majors traveled to Alcoy, a city of 80,000 people near the Costa Blanca in Spain.

This new program grew out of a research relationship between Drs. Steven Schmid and Mihir Sen in AME and the Universitat Politècnica de València in Alcoy (UPVA). There has been considerable demand for a foreign study opportunity in a Spanish-speaking country and this sunny location became a natural venue, with all necessary facilities and housing already in place. The students departed for Spain on May 11, and returned on June 21.

Dr. Robert Nelson served as the ND faculty representative in Alcoy and taught a course on Ethical Issues in Engineering. Prof. Elena Perez of the UPVA also taught the Introduction to Probability and Statistics class. In addition to the accelerated coursework schedule, the students visited the Higuereula Wind Farm, the Ford facility at Almussafes, and the Playmobil toy factory.



Professors Elena Perez (UPVA), Robert Nelson and twenty-five Notre Dame Spain Program participants visit Alhambra Palace in Granada, Spain.

In addition to the technical excursions, students enjoyed an extended weekend in Granada, where they toured the famous Alhambra, and then continued to Toledo. They also were able to enjoy an excursion to Valencia, and had numerous opportunities to take short trips on weekends. Feedback from the students was very positive, and the level of interest in the program within the College is strong enough to support future summer sessions in Alcoy.