The Department of Aerospace Engineering at the University of Michigan has a longstanding tradition of teaching and research excellence. Collectively, we enjoy synergistic activities and leadership positions in key areas related to computational aero-sciences (including fluid and solid mechanics, dynamics, space physics, and software and control systems), unmanned air vehicles (from micro to very large, fast and high altitude flyers), and spacecraft (especially in NASA’s Moon-Mars exploration endeavors, and electric propulsion). In addition, our efforts on sensors, micro and nano-scale materials, flow diagnostics, and health monitoring are highly visible in the professional community. In this issue, we highlight selected ongoing research endeavors with strong collaborative contents—in particular, funded research projects between multiple faculty members and institutions, some of them with substantial industry support.

New faculty members have arrived in each of the last several years. Last issue we introduced Ella Atkins and Anouck Girard. Two additional faculty members, Matthias Ihme and Veera Sundararaghavan, joined the Department in 2007 and are introduced in this issue. In addition, we are pleased to recognize Charla Wise, The Boeing Corporation, as an adjunct faculty member. These new colleagues have broadened and deepened our capabilities in meeting the Department’s educational and research missions. We trust that you will see that the Department is energetic, vibrant, and in a very healthy state.
HIGHLIGHTS OF MULTIDISCIPLINARY AND INDUSTRY-SPONSORED RESEARCH

Michigan/AFRL/Boeing Collaborative Center in Aeronautical Sciences (MAB-CCAS)

The Air Force Research Laboratory (AFRL), Boeing and our Aerospace Engineering Department have teamed to establish the Michigan/AFRL/Boeing Collaborative Center in Aeronautical Sciences. Established in April 2006 with five-year funding, the MAB-CCAS has the mission of developing, sustaining, and improving our existing, internationally recognized research and education in computational aeronautical sciences through strategic, robust interaction between faculty, students, AFRL, and Boeing researchers.

The MAB-CCAS involves UM Aerospace Engineering professors Iain Boyd, Carlos Cesnik, Werner Dahm, Peretz Friedmann, Ken Powell, Phil Roe, Wei Shyy, and Bram van Leer, as well as three faculty colleagues from Michigan State University. The current research emphasis includes issues motivated by high-speed flight vehicles and micro-air vehicles, with specific tasks investigating numerical techniques for high-speed flows and shocks, shock/boundary-layer interaction, high-speed plasma flow and aerothermodynamics, flapping wing aerodynamics, fluid-structure interactions, and use of dielectric barrier actuators in low-speed flows.

Michigan/AFRL Collaborative Center in Control Science (MACCCS)

Professors Anouck Girard, Carlos Cesnik and Jim Driscoll, along with a faculty colleague from MIT, are leading the efforts of the newly established Michigan/AFRL Collaborative Center in Control Science (MACCCS). The Center has been established with four-year funding in two main areas of concentration: Collaborative Control of Unmanned Vehicles and Air-Breathing Hypersonic Vehicles.

The Collaborative Control of Unmanned Vehicles concentration addresses the problem of coordinating the motion of a large number of heterogeneous mobile agents to provide persistent, real-time, human-driven tactical services to field operators. Mobile agents generally include autonomous or semi-autonomous fixed- and rotary-wing aircraft, ground vehicles, and human-controlled units, operating over a geographically extended region of interest. Services of interest may include urban intelligence, surveillance and reconnaissance, cooperative attack, cooperative sensing, and communication relays.

The Air-Breathing Hypersonic Vehicles concentration is motivated by the fact that designing effective controllers for air-breathing hypersonic vehicles requires reliable characterization of these vehicles’ unique dynamics. These dynamics come from strong interactions between aerodynamics, elastic airframe and control effector deformations, heat transfer, and the propulsion system (itself tightly integrated into the lifting body). These Control-oriented models can be used in a 6 degree-of-freedom flight dynamics simulation to evaluate the dynamic controllability of the vehicle.

Air Force Office of Scientific Research (AFOSR) Multidisciplinary University Research Initiative (MURI)

Started in August 2007, this five-year project funded by the AFOSR is a multi-university team involving Professors Luis Bernal, Carlos Cesnik, Peretz Friedmann and Wei Shyy. Faculty colleagues from the University of Florida and University of Maryland are also partners. The research theme involves the investigation of biologically-inspired, anisotropic flexible wings for optimal flapping flight. Research investigations will utilize the insight gained from biological flight, while focusing on the hovering and forward flight modes of micro air vehicles (MAVs), and will emphasize the intrinsically unsteady environment due to wind gust and flapping motion. The targeted parameters overlap those of bumblebees, hawkmoths, and hummingbirds. Study of these “natural flyers” will provide biological guidance for the research. Anisotropic structures are typically observed in “natural flyer” wings, and will be of central interest in the investigation; passive shape control for lift enhancement is of particular interest.

The Constellation University Institutes Project (CUIP)

CUIP is a consortium of approximately 20 universities in the U.S. working through a cooperative agreement with NASA to focus on addressing key technical challenges of the NASA Constellation Program. There are over 50 baseline research task plans within the CUIP, of which the University of Michigan has the largest share, leading about 25% of the tasks. Professors Iain Boyd, Carlos Cesnik, Werner Dahm, Jim Driscoll, Wei Shyy, Veera Sundararagavan, and Tony Waas are actively participating in this large scale project. The primary technical areas of CUIP are: thrust chamber assemblies, propellant storage and delivery, reentry aerothermodynamics, structures and materials for extreme environments, solid propellant engines, and systems engineering and integration. NASA centers heavily involved in Constellation application of these technical areas are engaged in extensive technical collaboration with the university researchers through research tasks. Projects associated with the Constellation Program include the Crew Launch Vehicle Project, the Crew Exploration Vehicle Project, and the Lunar Lander Project.

Flying Fish Project

The DARPA-funded Flying Fish Project’s objective is to create an ocean environmental monitoring buoy that can persistently and efficiently maintain a watch-circle by means of flight. The project is a joint effort involving Professors Ella Atkins, Luis Bernal, Pete Washabaugh, and colleagues from Electrical Engineering and Computer Science.
and Naval Architecture and Marine Engineering. The team’s concept is an electric powered vehicle based on a robotic pelican that drifts on the sea surface and then flies to a new location. The team has recently returned from open ocean sea trials off the coast of Monterey Bay, California.

The goal for the sea trials was to demonstrate the first fully autonomous take off, climb, cruise, descent and landing of a vehicle that is small with respect to the ocean surface wave environment. In the two days at sea, the U-M team executed 22 autonomous flights.

**Defense University Research Instrumentation Program (DURIP) Grant Awards**

Prof. Carlos Cesnik received a Defense University Research Instrumentation Program (DURIP) Grant Award from the Air Force Office of Scientific Research for “Structural Damage Assessment for Current and Future Air Force Fleets”. The award supports current work on developing an advanced damage detection scheme for structural health monitoring systems. It is based on guided-wave testing methods that can interrogate the structure on demand and evaluate its state. These techniques characterize high-frequency waves generated from piezoelectric transducers, their propagation in the structure, and their reflection, using high-frequency Scanning Laser Doppler Vibrometer. Pictured above is Aero Ph.D. student, Ken Salas, who is working in this area.

Prof. Alec Gallimore also received a DURIP award for “Development of a Cavity Ring-Down Spectroscopy Diagnostic for Hall-effect Thruster Erosion Product Density.” Cavity ring-down spectroscopy is an ultra-sensitive laser absorption technique that can measure trace species in the gas phase. Professor Gallimore and his collaborator from Colorado State University will employ this diagnostic technique to measure the real-time discharge channel erosion rate of Hall-effect thrusters. This work will not only shorten the duration of wear tests needed for thruster life certification (a process that can cost millions of dollars for each new thruster), but will provide great insight on the life-limiting mechanisms of these thrusters.

**General Electric Aircraft Engines University Strategic Alliance Program (GE-USA)**

Professor Jim Driscoll is leading a five-year project funded by GE Aircraft Engines to run experiments to better understand and improve a new device that will be implemented on the Boeing 787 Dreamliner. This is part of GE’s long term strategic alliance program involving multiple tasks with substantial resources and commitments. The GE device, called the TAPS fuel injector, incorporates the revolutionary new concept of lean premixed vaporized combustion. It promises to significantly reduce the emissions of nitric oxide and carbon monoxide from the new GEnx engines. Unique facilities at Michigan provide images of the fuel-air mixing process, the flame stabilization physics, and some causes of combustor noise. The data from the Michigan experiment can offer guidance to improve current GE computational and design tools.

**Computational Aerodynamics of Hypersonic Son Flight Vehicle**

Professor Iain Boyd is involved in the development of computer models for prediction of the aerodynamics and heating of hypersonic vehicles. His work in this field is funded by NASA and the Air Force Office of Scientific Research. The work funded by NASA focuses on capsule entry into Earth and Mars, and involves modeling of complex physical processes including nonequilibrium gas dynamics, chemistry, radiation, and ablation. The work is funded by the U.S. Air Force and investigates the use of plasma for aerodynamic control and mitigation of communication blackouts. The figure above depicts a computation of the flow around the Apollo Command Module. It shows color contours of Mach number. The black lines depict the way that the computational work is distributed across the many processors used in the calculation.

**Radio Frequency Plasma for Hydrogen Production**

Efficient production of hydrogen from a renewable source without CO₂ emission is a main challenge to using hydrogen as a renewable energy carrier to replace fossil fuels. Professor Alec Gallimore is investigating a novel renewable method of hydrogen production by using a radio-frequency plasma source to dissociate water molecules without emitting CO₂. The efficiency of this approach may be higher than its main competitor, electrolysis.

**Multiscale Methods for Fracture Behavior of Advanced Composite Airframe Panels**

Damage growth modeling is important for assessing structural integrity and damage tolerance of advanced composite materials used for airframe structures. Utilizing an experimentally validated variational multiscale method which continuously calculates the direction of damage growth as a function of the local macroscopic stress state, advanced composite laminated panels are being assessed regarding fracture behavior. This research, sponsored by The Boeing Corporation, is led by Professor Tony Waas, with faculty colleagues in the Department of Mechanical Engineering as well as colleagues from Northwestern University.
**UM/GM Collaborative Research Laboratory (CRL) for Smart Materials and Structures**

General Motors Corporation and the University of Michigan College of Engineering established a Collaborative Research Laboratory (CRL) for Smart Materials and Structures in May 2006. The thrust areas of this five-year, nearly $3 million effort include Smart Material Maturity, Smart Device Technology Innovation, and Mechatronic System Design Methodology. Prof. Diann Brei of Mechanical Engineering is the PI. Prof. John Shaw of Aero and GM researcher Dr. Nilesh Mankame are currently studying fundamental material behavior aspects of shape memory alloys, shape memory polymers and related structures, like SMA cables, whose thermally-active and adaptive properties can be used for novel device applications. Smart materials and structures lend themselves well to numerous automotive and aerospace applications including smart pumps and fuel injectors, smart latches and locks, and smart air flow control devices for enhancing aerodynamic performance. Significant potential benefits can be realized including reduction in vehicle mass, added design flexibility and reduction in component size and cost. GM is involved on a nearly daily basis with the basic research process at U-M, and the goal is to bring new technologies to a higher level of prototyping than typically done by a university to ease the path to commercialization. Image shown is a Shape Memory Alloy Cable element.

**Department of Energy Center for Radiative Shock Hydrodynamics (CRASH)**

Professors Ken Powell, Bram van Leer, and Phil Roe, along with the department’s newest faculty member, Chris Fidkowski (who will join the department this summer), teamed up with Michigan faculty from Space Physics, Computer Science, Nuclear Engineering, and Mathematics, along with faculty from Texas A&M University, to win one of the nation’s five Department of Energy Centers in Predictive Science. Predictive science is the study of the behavior of complex systems, especially systems for which full-scale experiments or prototypes are impossible. The focus of the Michigan Center is the study of radiative shocks, which occur, for example, in supernovae. These shocks are strong enough that the hot post-shock flow emits radiation, which in turn affects the structure of the exploding material, making the system challenging to simulate accurately with computers. This topic builds on the plasma-modeling expertise at Michigan in the Center for Space Environment Modeling (a joint Space Physics/Aero/Computer Science research center) and the radiation-modeling expertise in the Nuclear Engineering departments at Michigan and Texas A&M. The Center will include experiments at large laser facilities, computational simulations on massively parallel systems, and a doctoral program in predictive science. The Center will work to quantify uncertainty in simulation results, and to understand the sources of those uncertainties, using that information to make better predictions.

**AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS (AIAA)**

The American Institute of Aeronautics and Astronautics is a national society for professionals and students in the field of aerospace engineering. The U-M chapter is a student-run organization that seeks to educate and excite students about aerospace technologies and science, and promote fellowship among students interested in these topics. As part of this goal, the chapter hosts recruiting and information sessions with many aerospace companies such as: Edwards Air Force Base, GE Aviation, GMV Space Systems, Lockheed-Martin, NASA Ames, and Orbital Sciences Corporation.

AIAA has organized the annual Aerofest, a gathering of aerospace-related student organizations to inspire and attract new members. In 2007, twelve student groups participated. Here’s a brief summary of the organizations:

- **The Michigan Mars Rover Design Projects** goal is to design, build, and test prototypes of a pressurized rover for human missions to Mars. The new Experimental Aircraft Club designs and constructs aircraft to gain valuable hands-on experience and professional business skills to build a foundation for future aviation. The Aerospace Engineering Modeling Club is a group of model airplane building, training, and flying enthusiasts. M-Fly designs, builds, and flies remote controlled aircraft—entering competitions, such as Aerodesign sponsored by SAE and Lockheed-Martin. The U-M Jet Engine Team designs, tests, and modifies applications of small jet engines. The Student Space Systems Fabrication Lab (S3FL) serves to create wiser and better qualified engineers in the nation’s future space workforce—their projects have flown on high-altitude balloons, NASA’s comet comet, and the space shuttle Endeavor! **Human-Powered Helicopter** is vyng to win the $20,000 prize in the Sikorsky Human-Powered Helicopter Competition. **SolarBubbles builds and tests solar-powered, unmanned aerial vehicles (UAVs).** Their goal is to fly a UAV for more than 36 hours continuously. The **Solar Car Team** has won the North American Solar Challenge four times and placed third at the World Solar Challenge three times, besting some of the largest corporations in the world. The Michigan Aeronautical Science Association (MASA) designs, tests, and fly high-powered rockets. MASA has been funded by the Michigan Space Grant Consortium and has completed several hybrid rockets capable of reaching an altitude of 60,000-70,000 feet. Last year, MASA had three rockets fly at Midwest Power, a large regional amateur rocketry launch. **Sigma Gamma Tau** is the National Aerospace Honor Society, and conducts many workshops and EnginInfo Sessions.

AIAA also sponsors field trips to industry sites, museums, and other locations, hosts student mixers, and supports charitable events that facilitate education outside the classroom. For more information, please visit [http://www.engin.umich.edu/soc/aiaa/](http://www.engin.umich.edu/soc/aiaa/) or email aiaa-officers@umich.edu.
AERONewsW08

STUDENT SPACE SYSTEMS
FABRICATIONS LABORATORY (S3FL):
NANOPARTICLE FIELD EXTRACTION THRUSTER (NANOFET)

The nanoBLUE team from the Student Space Systems
Fabrications Laboratory (S3FL) proposed, designed, and
flew an experiment on NASA’s C-9 microgravity aircraft
during the 2006-2007 school year. The nanoBLUE team
was composed of 12 undergraduate students: Vanessa
Bentley, Theresa Biehle, Prateek Choudhary, Tyler Ford,
Horim Han, Patrick Martinchek, Colleen Monahan, Steven Morris, Joseph Munsiki, Shashir Reddy, Xiaoyu Shi, and Rebecca Wind. with graduate student advisor, Thomas Liu. Members of the team went to the Johnson Space Center for a week during May 2007
to tour the facility and prepare the experiment for flight,
in support of an ongoing research project known as the
Nanoparticle Field Extraction Thruster (nanoFET). Five of
those six undergraduates were selected to fly in NASA’s C-9
microgravity aircraft to conduct the experiment. NanoFET
is led by Professors Alec Gallimore (AE) and Brian
Gilchrist (EECS); its concept is an electric propulsion sys-
tem that uses electric fields to charge and accelerate parti-
cles to generate thrust. The purpose of the nanoBLUE team
was to determine the feasibility of the nanoFET concept in
a microgravity environment. The team was successful in collect-
ing preliminary data last summer and will fly a follow-up
experiment this summer. The experience engaged students in
a beginning-to-end look at the workings of a real-world project
and provided them with a systems engineering perspective.
If you are interested in learning more about this ongoing proj-
et, please contact Theresa Biehle at biehlet@umich.edu.

AIAA/SGT STUDENT SUPPORT
MAKE-A-WISH FOUNDATION

Five-year-old Hunter was diagnosed with a rare form of can-
cer called Burkitt lymphoma. He also has a dream of entering
the Guinness Book of World Records record for receiving the
most paper airplanes. Under the leadership of the AIAA and
SGT student organizations, Aero students, faculty, and staff
made about 2,500 airplanes to support the endeavor. Many
thanks to all who participated!
You can read more about Hunter’s story at:
www.caringbridge.org/
visit/hunterwinship.

STUDENT NEWS AWARDS AND ACHIEVEMENTS

Nalin Chaturvedi (PhD AE 2007), received the 2007
CoE Ivor K. McElvor Award for his contributions to
applied mechanics as a doctoral researcher. James Cho,
(BS AE), received a scholarship from the American
Helicopter Society. Jeremy Hollandier, (BS AE) the
2007 CoE Distinguished Academic Achievement Award-
Undergraduate. Thomas Liu, (MS AE), the 2007 CoE
Distinguished Academic Achievement Award Graduate;
Cody Martin, (BS AE) received the 2007 CoE Charles F.
Bart Jr. Class Prize. Cody was also the drum major for the
UM marching band in fall 2007. Amor Menezes
(Ph, D. Candidate, Aero), with U-M Aerospace faculty
Prof. Pierre Kabamba received the “Best Paper in Session”
award at the 2007 American Control Conference (New
York, July 2007) for their paper, “A Combined Seed-
Identification and Generation Analysis Algorithm for Self-
Reproducing Systems.”

Matthew H. McKeown (BS AE), was the recipient
of an Astronaut Scholarship Foundation Award. Matthew
was honored at a recognition luncheon and open forum
on October 19, 2007. The event was sponsored by the
Department, in conjunction with the U-M Provost’s
office and the Astronaut Scholarship Foundation. The
University was honored with the visit of Astronaut Alfred
M. Worden (Foundation Spokesperson and our alumnus)
who spoke to students about the Foundation and his
career experiences.

SIGMA GAMMA TAU (SGT) AT U-M

SGT is the National Aerospace Honor Society. Its mission is
to offer appropriate recognition to persons of superior schol-
arship, outstanding character, and personal achievement in
the field of Aeronautical Engineering.
Academically, the society helps assist students in the
Department of Aerospace Engineering by providing informa-
tive sessions and company presentations and workshops,
most recently a presentation by Michigan Aerospace and
Aernnova (a Spanish aerospace company newly established
in Ann Arbor). These presentations help students learn
about career choices as well as assist in finding possible
internship opportunities. The society also provided a series
of Matlab workshops for the entire College. In order to give
back to the community, SGT members organized a variety
of service events including a trip to help at the Hands-on
Museum in Ann Arbor, baking holiday cookies for the
Ronald McDonald House, cleaning Nichols Arboretum,
assisting seniors with fall chores, and organized a College-
wide food drive during Thanksgiving in 2007. You can
learn more about SGT by contacting them at: SGT-
Chairs@umich.edu or visiting their website www.umsgt.org.
Bram van Leer was appointed as the Arthur B. Modine Professor of Aerospace Engineering effective September 1, 2007. Prof. van Leer’s teaching and research interests are in the field of Gas Dynamics, specifically, computational fluid dynamics—his latest research more accurately computes diffusion processes such as heat transfer, matches the Modine appointment very well. The chair was held previously by the late Prof. Gerard M. Faeth. This endowed chair is funded by the Modine Manufacturing Company, a worldwide leader in thermal management for over 90 years. Modine was founded in 1916 when Arthur B. Modine patented a radiator for tractors. Today, the company designs and manufactures heat transfer products for a wide range of applications and markets. As a good “corporate citizen,” the company supports a range of charitable, educational and other programs. In recognition of this appointment and his accomplishments, Professor van Leer gave a public lecture, “Forty Years in CFD”, at the College of Engineering on February 4, 2008.

Matthias Ihme (Assistant Professor, mihme@umich.edu) joined the faculty in January, 2008. He received his Ph.D. in Mechanical Engineering (2007), from Stanford University, and a M.Sc. in Computational Engineering (2002) from University Erlangen, Germany. Professor Ihme’s research and teaching interests include: fluid mechanics, turbulence, turbulent combustion, aeroacoustics and combustion noise, large-eddy simulation, optimization techniques, and numerical methods.

Veera Sundararaghavan (Assistant Professor, veerar@umich.edu) joined the faculty in September 2007 after receiving his Ph.D. and M.S. (2007 and 2006 respectively) from Cornell University’s Sibley School of Mechanical and Aerospace Engineering. His interests are in the areas of computational mechanics and multi-scale materials modeling as applied to the design of aerospace materials with optimized property distributions and computation of property degradation in high temperature environments. The research focus is on modeling mechanical properties such as strength and failure at different length scales using atomistic-to-continuum techniques. He has made basic contributions towards the development of multi-scale property optimization techniques including: multi-scale sensitivity analysis, adaptive reduced-order optimization, and methods for constructing low-dimensional property-microstructure design spaces.

Charla K. Wise (Adjunct Professor, charla.k.wise@lmco.com) and Corporate Vice President, Technology, Environment, Safety, and Health, Lockheed Martin Corporation. Charla K. Wise is a senior executive who has served in the capacity of Vice President with Lockheed Martin for over 10 years—with more than 25 years in the aerospace and manufacturing industry. As Vice President of Technology—Environment, Safety and Health (ESH) she works across the corporation to integrate the ESH requirements into product development and design, with the goal of reducing hazardous materials from products and processes. She partners with engineering and the Chief Technology Office, as well as business units. She also serves as Program Manager for the Corporate LM21 Executive Steering Committee, chartered to enable and implement flawless execution throughout LMIC.

Werner J.A. Dahm is currently serving a four-year term as a member of the Air Force Scientific Advisory Board (SAB). The SAB is the principal technical advisory body for the Secretary of the Air Force and the Air Force Chief of Staff. Established by General “Hap” Arnold during World War I, SAB members are chosen from leading engineers and scientists in government, industry, and academia, with approval from the White House Liaison Office. They serve as a major force in determining U.S. Air Force research and development policy.

Jim Driscoll with Jeffrey A. Sutton (Asst. Professor, Ohio State University) received the Combustion Institute Distinguished Paper Award at the 31st Combustion Symposium, for their paper “Imaging of local flame extinction due to the interaction of scalar dissipation layers and the stoichiometric contour in turbulent non-premixed flames.”

Harris McClamroch, with Tony Bloch and Nalin Chaturvedi, received a Best Interactive Session Award at the IEEE Conference on Decision and Control in San Diego, December, 2006, for their paper “Global Stabilization of a Fully Actuated System on a Riemannian Manifold including Control Saturation Effects.” Dr. Nalin Chaturvedi received his Ph.D. in Aerospace Engineering in 2007, and is currently a Research Engineer at Robert Bosch LLC, and Prof. Tony Bloch is Chair of the U-M Mathematics Department.

Nguyen X. Vinh (professor emeritus) was the recipient of the American Astronautical Society’s 2006 Dirk Brouwer Award. The award was presented on January 29, 2007 at the 2007 Space Flight Mechanics meeting held in Sedona, Arizona. Prof. Vinh gave a keynote lecture entitled “Unified Theory for Optimal Thrust and Aerodynamic Control In Hypersonic Flight,” which summarized some of his contributions to the field of space flight. The Dirk Brouwer Award was established in 1972 to honor his significant technical contributions to space flight mechanics and astrodynamics, and to recognize his outstanding role in celestial mechanics and widespread influence on workers in these fields.

Tony Waas was named technical chair of the 49th AIAA/ASME/ASCE/ASC Structures, Structural Dynamics and Materials Conference and Carlos Cesnik, general chair of the 16th AIAA/ASME/AHS Adaptive Structures Conference. Both will happen in Schaumburg, IL, from April 7 to 10, 2008. Prof. Waas was also recently elected a Fellow of the American Academy of Mechanics.

Pete Washabaugh was named as an Arthur F. Thurnau Professor of the College of Engineering and received the 2007 ColE Outstanding Student Group Advisor Award for his involvement with the Student Space System Fabrication Lab (S3FL). Pete was also appointed as Director of the Wilson Student Team Project Center, with goals to improve its core mission of supporting student teams and to expand the availability of its resources.

Wei Shyy, with Drs. Yongsheng Lian, Jian Tang, Dragos Viiertu (all with Aero) and Prof. Hao Liu (Chiba University) have written a book, entitled Aerodynamics of Low Reynolds Number Flies (Cambridge University Press, November 2007).

Margaret Wooldridge, (AE/ME) received the 2007 J. Cordell Breed Award for Women Leaders from the Society of Automotive Engineers. She was also recently elected a Fellow of the American Society of Mechanical Engineers (ASME).

FACULTY NEWS
Ms. Albrecht (BSEAE 1972) has made significant contributions to a commanding list of aeronautics organizations, and we are pleased to recognize her for these accomplishments. Following her studies at Michigan, Ms. Albrecht’s contributions to NASA focused on stress fatigue in the shuttle program, and she was actively involved in determining the fatigue properties of the spacecraft’s composite materials. After joining the Martin Marietta Corporation, Ms. Albrecht continued her work in stress analysis, later moving up and taking on additional responsibilities in research and development, robotics, underwater systems, and aircraft products. When Martin Marietta merged with Lockheed, she assumed several key leadership positions in the P-22 program. She was also named manager of the Lean Engineering and Structured Design areas. Ms. Albrecht currently serves as the Engineering Site Director for Lockheed Martin in Marietta, Georgia, where she is responsible for overseeing the technical integrity requirements of the firm’s aircraft programs. Throughout the year, Ms. Albrecht is invited to give presentations about engineering, mentoring, and goal setting encouraging students to consider science, engineering, and technology as a career. She recently spoke to the Girl Scouts, Sally Ride Club, Aviation Camp, Boy Scout Engineering Explorer Academy Awards Dinner, DeVry University, SPSU, Georgia Tech, Auburn University, Georgia Engineering Foundation Awards Dinner, DeVry University, SPSU, Georgia Tech, Auburn University, Georgia Engineering Foundation Awards Dinner, DeVry University, and DeVry University (2007).

ALUMNUS HONORED WITH 2007 MERIT AWARD KAREN ALBRECHT

The Airbus 380 is the largest passenger jet in the world and if you had the opportunity to peek inside the flight deck you might just find U-M alum Terry Lutz (BSEAE 1970). Terry is an experimental test pilot for Airbus and resides in France. He has most recently been involved in studying the wake of the A380, both with Lidar sensing, and through actual wake encounters by flying a smaller airplane through the A380 wake at various distances. Other testing has included takeoff testing at weights as high as 1,267,000 lbs, and stall testing to study lift coefficients with different configurations of leading edge flaps. In March 2007 he was the first pilot to land an A380 in the U.S., at John F. Kennedy Airport in New York.

Terry has had a remarkable career that includes being an Air Force Test Pilot and Flight Instructor at Edwards AFB. While at Wright-Patterson AFB he was involved in test management for high angle of attack testing during F-16 full-scale development, and he tested an energy maneuverability head-up display in the “LAMARS”, a Large Amplitude Multi-mode Aerospace Research Simulator. He worked as a research pilot for Calspans Corporation (Buffalo, NY), flying a variable stability Lear 24, Lockheed NT-33A, and C-131 “Total In-flight Simulator”, or TIFS. TIFS is an airplane designed with dual cockpits and additional flight control surfaces to allow true 6-degree of freedom simulation and evaluate advanced flight control systems as if they were being flown in the actual host airplane. He then joined Northwest Airlines for a career that spanned 17 years.

If you happen to see Terry you should insist on seeing his video of the flight controls of the A380 in action: each wing has three ailerons that actuate as necessary to provide the roll rate commanded by the pilot, and at the same time limiting the wing’s vertical and twist loading, very reminiscent of the flexing of the trailing feathers on a bird’s wing. Terry can be contacted at: terry.lutz@attglobal.net.

ALUMNUS TERRY LUTZ AND AIRBUS TEST PILOT

PROFESSOR THOMAS ZURBUCHEN (A05/AE) NAMED DIRECTOR OF CENTER FOR ENTREPRENEURIAL PROGRAMS

Young inventors can help stoke the state’s economy and the new Center for Entrepreneurial Programs will help make that happen. Thomas Zurbuchen, a professor in the Department of Atmospheric, Oceanic and Space Sciences and Aerospace Engineering, will direct the new Center. The Center will focus on: i) advising the new entrepreneur-focused CoE student group MPowered. The group has hundreds of members already, ii) connecting College of Engineering alumni who work in the start-up community with current students, iii) providing grants for students to pursue their own ideas for companies and products, iv) simplifying and clarifying student intellectual property transfer processes, and v) developing an entrepreneur certificate program so engineering students can take courses in innovation and business from U-M professors or members of the broader entrepreneurial community. The Center is supported by an anonymous gift of nearly $1 million.

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2007 GRADUATES

Doctorate Recipients

Master’s Recipients
Aakansha Aggarwal
Yeon Sik Baik
Nagaraj Kashyap K. Ibanavar
Alicia Lynn Bidwell
Nicholas Jesse Bisek
Weisheng Chen
Derek Jonas Covey
Anand Mukund Dhariya
Norbal H. El Halwagy
Jeremy Lee Hanke
Jeremy Byron Radford Hare
Christian Heinrich
Jennifer Suzanne Hudson
Adam G. Irvine
Virhal Fulchandbhai
Jariruwa
Ryan Edward Kelly
Hu Loc Khieu
Min Kwan Kim
Tadashi Kito
Justin Leander Russell
Langlois
Matthew Miles Leach
Dongyoung Lee
Yang Li
Stephens Andrew Lockwood
Heike H. Lohse-Busch
Martin A. Luser
Pierre Antoine Manec
Petro Alexis Michailidis
Zachary William Nagel
Li-Huan Peng
Saravankanthan Rajendran
Mark David Rundle
Bohit Shastrey
Steve Daniel Sandval
Sandre Simon
Mark Alan Thomas, Jr.
Florent Francois Till
Matthew Steven Van Kirk
Brennen Michael Willhoebe
Shing Yik Yim

Undergraduate Recipients
Luqman Adris
Daniel R. Austin
Michael A. Bakaun
Krzysztof L. Bishop
Nathan P. Blinkilde
Geoffrey Braun
Adam T. Brinckerhoff
Christopher L. Brown
David L. Burns
Stephen B. Cardani
Andrew Chang
Ingrid M. Chiles
James Chulhuyun Cho
Christopher W. Damitz
Erik E. Domendera
Trisha L. Donajkowski
Matthew J. Egan
Michael P. Eisenberg
Neal T. Foley
Jonathan H. Fortin
Benjamin J. Friedland
Carlin C. Garcia
Corinne E. Gatto
Bryan I. Goldstein
Brian M. Green
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APOPHIS MISSION DESIGN COMPETITION


Apophis is a 300-meter diameter asteroid that, in 2029, will make a spectacularly close passage by Earth. When it passes through a small area, called the keyhole, in 2029, it could return in 2036 to slam into Earth.

The Planetary Society’s competition involved designing a mission to rendezvous with and “tag” a near-Earth asteroid such as Apophis, to determine ahead of time whether it could return in 2036 to slam into Earth. The competition was conducted in cooperation with the European Space Agency (ESA), NASA, the Association of Space Explorers (ASE), the American Institute of Aeronautics and Astronautics (AIAA), and the Universities Space Research Association (USRA).
MEMORIAM

Lawrence Lee Rauch

With great sadness we report the passing of Professor Lawrence Lee Rauch, a faculty member of the University for twenty-seven years, on December 18, 2007. Professor Rauch was born in 1919 in Los Angeles. He earned the Ph.D. in Mathematics at Princeton University in 1949, and became a faculty member in the Department of Aeronautical Engineering at the University of Michigan in the same year.

Professor Rauch was best known for his major contributions as a pioneer in the area of radio telemetry. He participated in the design of the world’s first electronically switched time-division multiplex system, a technique now commonplace in cellular transmission systems. He co-authored (with M.H. Nichols) Radio Telemetry (1954, McGraw-Hill), which was the first of its kind. Within the University, Professor Rauch provided leadership in a number of vital positions, serving as chairman in each of the following programs: Nuclear Engineering Program (1950-1952), Management Science Program (1958-1959), and Computer, Information and Control Engineering Program (1971-1976). In 1977, Professor Rauch retired from the University, assuming the post of Chief Technologist, Telecommunications Science and Engineering Division, at Caltech’s Jet Propulsion Laboratory. He retired again from the latter in 1985 to his home in Los Angeles. He is survived by his wife, Norma Cable Rauch, two sons, Lauren and Maury, and four grand children.

2007 UNDERGRADUATE SUMMER RESEARCH

Application of Shape Memory Alloys in Heat Engines

Michael Dombroksi (Faculty adviser: John Shaw) The purpose of this project was to determine the feasibility of a large scale heat engine constructed using Shape Memory Alloys (SMAs). Flexinol, a commercially available SMA, contracts when it is raised above its transition temperature and relaxes to its original length upon cooling. Various designs were considered but the final design uses the Flexinol in axial tension to produce rotary motion. A manually operated prototype was constructed to test the various types of Flexinol and determine the power output of each.

Load Bearing Failure of Single-Bolted, Single-Lap Carbon Fiber Joints Subjected to Different Temperatures

Christopher Gromek (Faculty adviser: Anthony Wass) The load bearing failure of single-bolted, single-lap carbon fiber joints subjected to different temperature fields was investigated. An experimental program was designed to determine what, if any, effect an increase in temperature had on the failure load and mode of the joint. We developed results which indicate that an increase in temperature negatively affects the mechanical properties of the matrix material, and as the structural properties of the matrix degrade, the inter-laminar strengths (shear and normal) of the carbon fiber coupon deteriorate. This leads to lower peak loads and a shift from net-section failure to shear-out failure.

Structural Properties of a Feather

Edwin Kang (Faculty adviser: Anthony Wass) The feather is the most important part of bird flight. The wing is just the compilation of many feathers positioned in a specific way. Therefore, it is important to study the structural properties of a feather as well as the aerodynamic ones. I learned the structural properties through use of I-DEAS 11, in conjunction with simple structural tests of a feather shaft. The shaft properties vary along the length from the root to the tip, with the tip area having an elevated Young’s modulus. The aerodynamics of a feather were investigated by using a 2x2 wind tunnel.

Experimental Results of Liquid Instability and Particle Extraction in the Nanoparticle Field Extraction Thruster

Steven Morris (Faculty adviser: Alec Gallimore) The nanoparticle field extraction thruster (NanoFET) is an electric propulsion device currently under development in the University of Michigan Plasmadynamics and Electric Propulsion Laboratory (PEPL). This device has the potential to create low power, high efficiency thrust for various spacecraft applications. Several different configurations were investigated and experimented with to find the most beneficial design for the thruster. These design variations include conductive and nonconductive liquids, a liquid less configuration and different geometry particles.

The Optimization of Solar Panel Integrated Airfoil Design

Kevin Neitzel (Faculty adviser: Luis Bernal) Currently, in the field of solar powered micro-air vehicles (SPMAVs), designers must make a decision between high solar power production and high aerodynamic performance. Kevin studied an optimal airfoil design that balances these two parameters. This balance is important in the development of SPMAVs because for certain applications, neither solar panel performance nor aerodynamic performance can be fully compromised.

The Effects of Laminar Separation Bubbles on the SD7003 Airfoil Performance at Ultra-low Reynolds Numbers

Paul Wloszek (Faculty adviser: Luis Bernal) The current increase in the development of micro-air vehicles (MAVs) has led to the need to understand the effect of laminar separation bubbles (LSBs) on airfoils of this scale. While there has been significant experimental research into the effects of LSBs at higher Reynolds numbers (~50,000), our proposed Reynolds number (~5,000) was an order of magnitude lower. We used the SD7003 airfoil in our experiments because it is known that a bubble will occur over a broad range of angle of attack for Reynolds numbers under 100,000. Through simulations, we have determined that the effect of the LSB is highly dependent on the Reynolds number.

Current funding is for $1,500/month for three months. Please contact us for application & deadline information: 734-764-3310
HARM BUNING SCHOLARSHIP

We are pleased to provide a update regarding fundraising efforts for the Harm Buning Fund. The fund raising campaign was initiated by several Aero alumni in appreciation of the long-standing advice and help Prof. Harm Buning offered to generations of Aero students. Since the inception in July 2007, the direct gift total from alumni, friends, and employer matching gifts is approximately $135,000. This fund qualified for a University donor challenge recently initiated by President Mary Sue Coleman. Under this challenge the University will contribute one dollar for every two dollars donated to the Fund, bringing the Fund Total to more than $200,000.

Every year, the Department offers a summer stipend (currently at a level of $1,500/month for three summer months) to a limited number of undergraduate students. This recipient will be selected by the Aerospace Engineering Undergraduate Committee, which is responsible for evaluating all undergraduate summer research proposals.

The Bunting Fund kick-off was held on Friday, June 29, 2007 at the Inglis House in Ann Arbor. Key supporters included: Mrs. Harm (Susie) Buning, Harm Buning, Jr., and Pieter Buning, the College of Engineering, represented by Dean David C. Munson and Colleen Zimmerman, members of the Department’s Industry Advisory Committee, Karen Albrecht (BSEAE 1972, MBA 1983), alumni: Bruce G. and Connie L. Malcolm, Harm G. Buning, Jr., Paul Burstall, Raymond T. and Deborah M. Bush, Nov Kaag and M. Cappelletti, David A. and Linda Caughhey, Carl E.S. Corisk and Dr. Cibele Barbosa-Cesnik, David M. Choppman, and Dmitriy Lapshin, David A. Christopher and Orest and Lubomyra Chapelsky, Michael D. Champness and Charles G. Alexander.

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