Department of Aerospace Engineering and Mechanics
University of Minnesota

# AEM Update

2001-2002

## Chairman's Corner

This has been a year of comings and going for the Department and the University. In the Department, Ted Wilson retired in June after 38 years of service as a member of our faculty. Ted will remain as Professor Emeritus and continue his distinguished research program in biomechanics of the lung. Mehran Mesbahi left us to join the faculty at the University of Washington. We wish Mehran well. Dr. Demoz Gebre-Egziabher will join us this fall from Stanford where he is completing a Post Doc in the GPS Laboratory. Demoz works in sensor systems for navigation, guidance and control for aerospace vehicles. He was an Officer in the U. S. Navy, is a pilot, and has a strong aerospace orientation. We look forward to his arrival this fall. We have two faculty searches going this year, one in Aerospace Systems and one in Solid Mechanics and Structures.

I am sure that most of you know that President Mark Yudoff left us this summer to re-join the University of Texas System as President. As an alum of the UT System, I am pleased to see them acquire a strong leader; however, having spent my career at Minnesota, I was very sorry to see President Yudoff leave. He provided us with strong, innovative leadership. Due to President Yudoff, we are undergoing the largest building program in the history of the University and faculty and student morale is as good as I have ever seen it. I believe that President Yudoff did much to strengthen the image of the University, particularly in Minnesota. In visiting many other Universities, including the big name schools, I am impressed with how well our programs compare with those acknowledged as the very best. I am always surprised that within Minnesota itself the quality of the U seems to not be appreciated at times. We need another strong President who will provide creative leadership and who will enhance the prestige of the U both in the state and nationally.

As an example of the strength of the U and the Department, Professor Ivan Marusic was one of 25 individuals who received one of the prestigious Packard Faculty Fellowships in Science and Engineering. The Packard Award will support Ivan's research in turbulence. This is an extremely competitive program as only 50 of the most outstanding Universities in the United States are allowed to compete. Each University is allowed two nominees. The competition within the U to be a nominee is fierce and the selection process among the 100 nominees is rigorous. This year both the nominees from the U were awarded Fellowships. This is very rare. Faculty members from our Department have received two Packard Faculty Fellowships. I am not sure if any other Department at the U has received more than one. Given the small size of our faculty this is very good indeed. In addition, Professor Krishnan Mahesh received a NSF CAREER Award to support his program of teaching and research in computational fluid mechanics. Mahesh's research has great promise for simulating flows

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What's Inside

in complex configurations such as those encountered in jet engines. The CAREER Awards are very prestigious awards for junior faculty and are very competitive.

This spring, one of our graduates, Lt. Col. Duane Carey, piloted the Space Shuttle Columbia on its successful mission to service and improve the Hubble telescope. Duane was my Masters advisee 20 years ago and I was very proud of him. Both astronauts who graduated from the University of Minnesota, Duane and the late Deke Slayton, were graduates of our Department. Duane will give a talk here this fall and you are encouraged to attend. Details are given in this copy of the Update. The other pilot, Scott Altman, was a student in the Parachute Systems short course that I organized and co-taught in fall of 1998, so I felt a very personal connection with this particular mission.

Another exciting event this year was the participation of two more student groups from the Department in the NASA reduced gravity program. This program gives students a chance to perform an experiment in zero gravity on board a NASA KC-135 aircraft. This is the second year students from the AEM Department have participated in this program and groups have already been formed for this coming academic year.

The job market was not red hot for our graduates this year; however, most were able to find professional employment. We had a total of 32 graduates in academic 2001-02. Fourteen are attending graduate school, one is an officer in the U.S. Air Force, seven joined aerospace companies, and two went to engineering firms outside the aerospace field. Of the remaining ten, four took jobs outside the engineering field and we do not have information as to where the other six are employed.

As part of our continuous quality improvement evaluation processes, we made two changes in our program. First, we changed our system of upper division advising. Previously, each faculty member had been assigned undergraduate advisees; however, students believed that some faculty were more knowledgeable about our program and more interested in advising undergraduates than others. We identified the subset of our faculty who are our best advisors and now they will be doing all of the undergraduate advising. The faculty doing the advising will receive a reduction in some of their other assigned duties. We also added more comprehensive treatment of ethics to several of our courses.

As mentioned in the last Update, we were visited by ABET (Accreditation Board for Engineering and Technology) as part of the regular evaluation and accreditation cycle. The faculty and staff worked hard to prepare for the visit and we were re-accredited. The Department has been continuously accredited since 1936. As part of our process for evaluating how well we achieve our educational objectives and outcomes, I have written a short section on our objectives in this Update. I would appreciate hearing your comments on how well you think we are achieving these.

Although the University managed for the most part to dodge the bullet during the spring legislative session, tuition was increased by almost sixteen percent. The Department suffered a small budget reduction, but I am much more concerned about the future. The State is facing a large budget deficit that is ominous for future higher education funding. The State does not provide funding for scholarships and student projects such as the reduced gravity experiments. We depend on support from our alums and friends for these programs and we hope that you will consider giving to one of our many funds.

Bill Garrard
Professor and Head



# Academics: Where Are We Now?

## AEM Graduate Program

A total of 156 applications came in from prospective students seeking entry into the AEM graduate program for the 2001-2002 academic year. The admissions faculty reviewed 135 of these applications, the remainder being incomplete. Seventy-five prospective students were admitted while 60 were rejected whose credentials were not sufficiently strong enough to warrant admission. Financial aid was offered to 42 of the admitted students in the form of teaching assistantships, research assistantships, and graduate school fellowships. Seventeen of the offers were declined, however, twenty-two were accepted and those 22 students enrolled in our graduate program in Fall, 2001. Fourteen of those students were from the United States, three were from China, 2 were from Korea and one each from Mexico, India and Canada.

During the 2001-2002 academic year, 12 students received graduate degrees in AEM. Two received their M.S. in mechanics and eight received their M.S. in aerospace engineering. Two other students received their Ph.D., one in mechanics and one in aerospace engineering. Of the M.S. graduates, 6 continued on in the Ph.D. program in AEM and one in another area at the university, 2 returned to their home countries and one secured employment here in the United States. Both the Ph.D. graduates were employed by the university in postdoctoral positions, one in AEM and the other in a related area.

Gordon S. Beavers
Director of Graduate Studies

## AEM Undergraduate Program

As in the past, we had a very active group of seniors this year. For the second year in a row, we had two groups of students develop experiments that were flown on NASA's KC-135. This plane, nicknamed the vomit comet, flies parabolic paths to simulate the free fall of spacecraft in orbit. The projects this year looked at the role of microgravity on random packing of spheres (supervised by Professor Shield) and a study of the pinch-off of liquids under microgravity conditions (supervised by Professor Longmire). We also had an active design class, with projects on an autonomous slow flyer, and a two-stage-to-launch vehicle, with separate groups working on each stage as well as a group building an RC model of the first stage. Professors Balas and Vano supervised the design class this year.

As always, the Department would like to keep in touch with all of our alumni to find out how everyone is doing. You can add any information you may have by checking our alumni web site, at:

http://www.aem.umn.edu/alumni/Alum_Network.html .

You can also submit your e-mail address if you would like to be contacted that way. Alternatively, please feel free to contact me (phleo@aem.umn.edu) if you have any questions or comments on the program.

Perry Leo
Director, Undergraduate Studies

# Undergraduate BAEM Program Evaluation and Improvement

As part of the continual assessment and improvement process implemented by ABET, we will continue to report on the changes to the undergraduate program. These changes are based on inputs from students, employers, alumni, and faculty members. As you may recall, the program underwent several changes on the switch from quarters to semesters in Fall 1999. These changes included going from Fortran to C/C++ as a programming language, introducing a new Instrumentation Laboratory (which uses C/C++ programming), requiring a full year of capstone design, and adding a required Space Flight Dynamics course. We have also addressed new concerns by adding Matlab to the Mechanics of Flight course. Also this past year, we added a project to the design course supervised by Professor Balas, re-organized our upper division advising system, and added more comprehensive treatment of ethics to our senior design and lab courses.

We have been considering other possible program improvements. For example, we have been discussing better ways to integrate some of the computer programs used in the senior design sequence into other courses. One suggestion to accomplish this is to introduce a new course in which these programs are introduced, but it is difficult to see where to fit this in an already crowded schedule. We are also adding more topics in engineering ethics into the curriculum, and especially in the design sequence. Finally, we are working to improve the quality of advising in AEM. We have trained a group of faculty as core advisors, and they will be responsible for all Upper Division advising. The implementation of our new web-based course database system has proven to be a huge help in tracking student progress, prerequisite chains and so on.

We are very excited by the possibilities that our new faculty member, Demoz Gebre-Egziabher, will bring to the undergraduate program. Professor Gebre-Egziabher specializes in navigation, guidance and control, and will add new courses and directions to both the undergraduate and graduate curriculum.

Perry Leo
Director of Undergraduate Studies
and Associate Head

# Educational Objectives – How Are We Doing?

As part of our process for continuous quality improvement for our undergraduate program, we have formulated educational objectives for graduates with the BAEM degree. ABET (Accreditation Board for Engineering and Technology) mandates that such objectives be developed with inputs from all of our constituents. Our constituents are the faculty, students, employers and alumni of our program. The AEM Update is one of the primary methods we have for communicating with alumni so I am soliciting your opinion regarding our educational objectives and how well we are achieving them. If you are a recent graduate or if you work with or employ recent graduates of our program, we want to hear from you. The best way to contact me is by e-mail at:
garrard@aem.umn.edu.

Educational objectives are statements that describe the expected accomplishments for graduates during the first few years after graduation. These objectives should so far as possible be unique to the program and institution.

The educational objectives for students graduating from the Department of Aerospace Engineering and Mechanics at the University of Minnesota are:

1. To produce graduates with a broad background in aerospace engineering and mechanics, including fluid mechanics, structural mechanics and aerospace systems.
2. To produce graduates who can apply their knowledge of aerospace engineering and mechanics to achieve success in the aerospace industry, related government agencies, and other engineering industries.
3. To produce graduates with skills in the essential tools used in aerospace and other industries. These include experimental methods, problem-solving techniques, computational methods and engineering design.
4. To produce graduates with the ability to both seek out assistance when needed and to learn new skills throughout their careers.
5. To produce graduates with the oral and written communication skills needed to successfully work in a modern multidisciplinary environment.
6. To produce graduates who can be successful in graduate level work in engineering, as well as in other professional schools.

Thanks for your help.
Bill Garrard



# AEM Students with the "Right Stuff"

For a second year, two groups of AEM students participated in NASA's reduced gravity flight experiments (see http://microgravityuniversity.jsc.nasa.gov/) April 3-10, 2002, at the NASA Johnson Space Center in Houston Texas. Students went through training and performed their in-flight experiments aboard NASA's KC-135, better know as the "Vomit Comet" or the "Weightless Wonder", used for astronaut training and experiments. The KC-135 flies in a series of parabolas, typically 30 per flight in a designated area over the Gulf of Mexico. The climbs and dives are similar to a roller coaster and each parabola contains a 25 second float time at the top of the curve. The two experiments, which the students performed, are described below:

## Effects of Microgravity on Random Close Packing Arrangements

Topic Area: Materials Science
Team Name: Metrology Junkies
Team Members: Bryan Henneman, David Kubat, Adam Creuziger, Jennifer Bonin, Ryan Wold and Richard Russell
Faculty Advisor: Professor Thomas Shield

The packing of spheres in a box can be used to model the spacing of particles in a composite material. Our experiment will provide physical data concerning the volume ratio of ball bearings in a box as one of the box's walls is moved inwards. By measuring how the volume ratio varies with the wall velocity, we determined a relationship between wall speed and average packing volume ratio at the system's maximally jammed state. We then compared this relationship to the current computational models of random close packing. By conducting this experiment in microgravity, the biasing effects of gravity can be considered negligible, as the computational models required.

Flight photographs courtesey of NASA

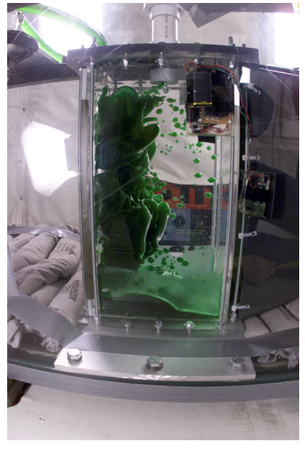
## Study of Pinch-Off of Liquid-Liquid Flow in Micro- and Macro-gravity Conditions

Topic Area: Fluid Dynamics
Team Name: The Floating Gophers
Team Members: Nenad Bjelogrlic, Shirin Salber, Phillip Boigenzahn, Scott Williams, and Brandon Crook
Faculty Advisor: Professor Ellen Longmire

The pinch-off of immiscible fluids in a liquid-liquid flow is studied under micro- and macro-gravity conditions, and new methods of producing a constant droplet size are explored. The controlling variables were velocity of the flow, frequency and amplitude of the forcing signal. Surface tension reducing agents (surfactants) were introduced into the system and their affect on the pinch-off is recorded.

This program provides students with a unique, hands-on learning experience, and we hope to be able to continue their participation in the program.

Financial sponsors for the student teams were: the Minnesota Space Grant Consortium, the Alumni Sponsored AEM Program Support, and the Department of Aerospace Engineering and Mechanics and the Undergraduate Research Opportunities Program.



Flight photographs courtesey of NASA



# AEM Alumnus Duane Carey Flies Space Shuttle Columbia

Duane Carey graduated from Highland Park High School, St. Paul, Minnesota in 1975; received a Bachelor of Science degree in Aerospace Engineering and Mechanics and a Master of Science degree in Aerospace Engineering from the University of Minnesota-Minneapolis in 1981 and 1982. After he completed his studies, Carey joined the U.S. Air Force and served as a fighter pilot in the Persian Gulf War and later as a test pilot and rose to the rank of lieutenant colonel.

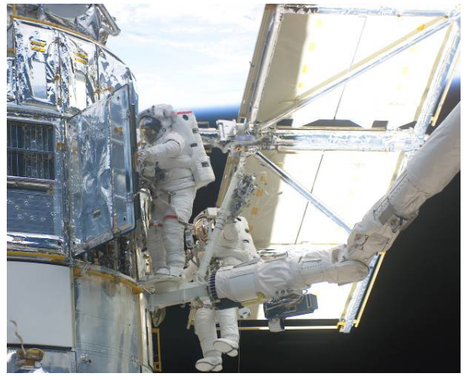
He was selected as an astronaut candidate by NASA in April 1996 and reported to the NASA Johnson Space Center in August 1996. Having completed two years of training and evaluation, he is qualified for flight assignment as a pilot. Initially, Carey was assigned technical duties in the Astronaut Office Spacecraft Systems/Operations Branch. He served as pilot on STS-109 Columbia (March 1-12, 2002).

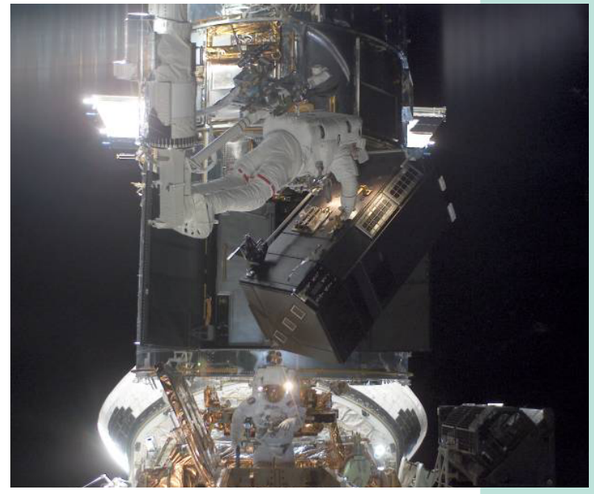
STS-109 was the fourth Hubble Space Telescope (HST) servicing mission. The crew of STS 109 successfully upgraded the Hubble Space Telescope leaving it with a new power unit and a new camera which made Hubble's imaging capability 10 times more powerful. It also received new solar arrays that are more powerful and less susceptible to damage.

HST servicing and upgrade was accomplished by four crewmembers during a total of 5 EVAs (Extra Vehicular Activity) in 5 consecutive days. The space walkers were assisted by crewmates inside Space Shuttle Columbia. Carey also helped document the EVA activities with video and still images. STS-109 orbited the Earth 165 times, and covered 3.9 million miles in over 262 hours. On his flight, Duane Carey carried a banner that was created by the Department to honor his alma mater.

Astronaut pilot Duane Carey (right) with commander Scott Altman (left).

More information on flight can be found at: http://sm3b.gsfc.nasa.gov/. Lt. Colonel Duane Carey will giving a seminar in the department for students and participating in some other activities at the University on Friday, October 25th.





Flight photographs courtesey of NASA

# The Hubble Project: An Astronaut's View

Lt. Colonel Duane G. Carey

IT alumnus and NASA Astronaut

Lt. Col. (USAF) Duane Carey (AEM '82, MS '82) will share his experiences from his first flight aboard the space shuttle Columbia earlier this year. During the mission, Carey and others shuttle crew members upgraded and serviced the Hubble Space Telescope, installing the Hubble's newest scientific instrument, the Advanced Camera for Surveys, as well as a new power unit and solar arrays. Carey has logged more than 3,700 hours in more than 35 types of aircraft. NASA selected him as an astronaut candidate in 1996.

Free and open to the public.

Sponsored by the Department of Aerospace Engineering and Mechanics, The Institute of Technology Alumni Society and the Department of Astronomy.

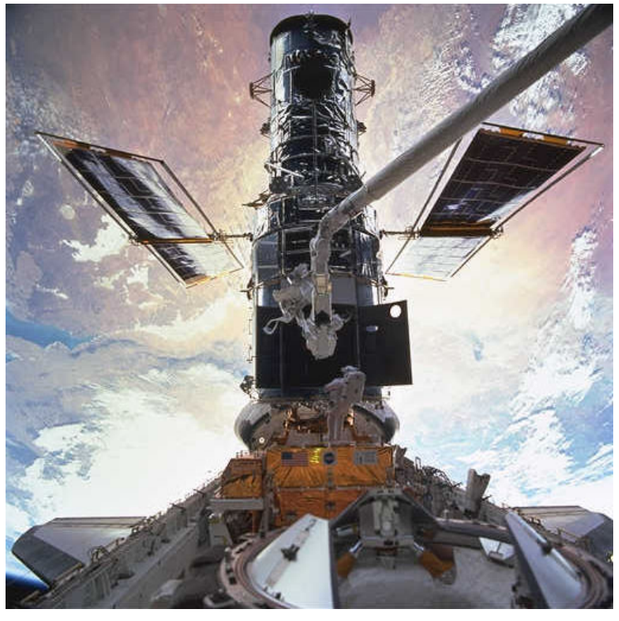
October 25, 2002

6:00 – 7:30 P.M.

125 Willey Hall
225 - 19th Ave. S.
West Bank Campus
See map at:

http://onestop.umn.edu/Maps/WilleyH/index.html

UNIVERSITY OF MINNESOTA





Flight photographs courtesey of NASA

# Astronauts with Minnesota Connections

Robert D. Cabana

(Colonel, USMC) NASA Astronaut

Born January 23, 1949, in Minneapolis, Minnesota Graduated from Washburn High School, Minneapolis, Minnesota, in 1967; received a bachelor of science degree in mathematics from the United States Naval Academy in 1971. A veteran of four space flights, Cabana has logged over 1,010 hours in space. He served as pilot on STS-41 (October 6-10, 1990) and STS-53 (December 2-9, 1992), and was mission commander on STS-65 (July 8-23, 1994) and STS-88 (December 4-15, 1998) the first International Space Station assembly mission.

Duane G. "Digger" Carey
(Lieutenant Colonel, USAF)

NASA Astronaut

Born April 30, 1957 in St. Paul, Minnesota.Graduated from Highland Park High School, St. Paul, Minnesota in 1975; received a Bachelor of Science degree in Aerospace Engineering and Mechanics and a Master of Science degree in Aerospace Engineering from the University of Minnesota-Minneapolis in 1981 and 1982, respectively. Carey was selected as an astronaut candidate by NASA in April 1996. He piloted the STS-109 Columbia (March 1-12, 2002). STS-109 was the fourth Hubble Space Telescope (HST) servicing mission.

Dale A. Gardner

NASA Astronaut (former)

Born November 8, 1948 in Fairmont, Minnesota. Grew up in Sherburn, Minnesota and Savanna, Illinois. Graduated as Valedictorian of his class from Savanna Community High School, Savanna, Illinois, in 1966. Received bachelor of science degree in Engineering Physics from the University of Illinois (Urbana-Champaign) in 1970. Gardner was selected as an Astronaut Candidate by NASA in January 1978. STS-8 launched from the Kennedy Space Center, Florida on August 30, 1983. This was the third flight of the Orbiter Challenger and the first night launch and landing mission of the Shuttle program.

Karen L. Nyberg (Ph.D.)
NASA Astronaut Candidate

Born on October 7, 1969 in Parkers Prairie, Minnesota. Her hometown is Vining, Minnesota. Graduated from Henning Public High School, Henning, Minnesota, 1988. B.S., Mechanical Engineering, University of North Dakota, 1994. M.S., Mechanical Engineering, University of Texas at Austin, 1996. Ph.D., Mechanical Engineering, University of Texas at Austin, 1998

She was selected as a mission specialist by NASA in July 2000, Dr. Nyberg reported for training in August 2000. Astronaut Candidate Training includes orientation briefings and tours, numerous scientific and technical briefings, intensive instruction in Shuttle and International Space Station systems, physiological training, ground school to prepare for T-38 flight training, as well as learning water and wilderness survival techniques. Following initial training, she will serve in technical assignments until assigned to a space flight.

Heidemarie M. Stefanyshyn-Piper
(Commander, USN)
NASA Astronaut

Born February 7, 1963 in St. Paul, Minnesota. Graduated from Derham Hall High School, St. Paul, Minnesota, in 1980; received a bachelor of science degree in mechanical engineering from Massachusetts Institute of Technology in 1984, and a master of science degree in mechanical engineering from Massachusetts Institute of Technology in 1985.

Selected as an astronaut candidate by NASA in April 1996, Stefanyshyn-Piper reported to the Johnson Space Center in August 1996. Having completed two years of training and evaluation, she is qualified for flight assignment as a mission specialist. Initially assigned to astronaut support duties for launch and landing, she has also served as lead Astronaut Office Representative for Payloads and in the Astronaut Office EVA branch. Stefanyshyn-Piper is assigned to STS-115, scheduled to launch in 2003.

Photographs courtesey of NASA

George D. (nickname Pinky) Nelson (Ph.D.) NASA Astronaut (former)

Born July 13, 1950, in Charles City, Iowa. Considers Willmar, Minnesota, to be his hometown. Graduated from Willmar Senior High School, Willmar, Minnesota, in 1968; received a bachelor of science degree in Physics from Harvey Mudd College in 1972 and a master of science and a doctorate in Astronomy from the University of Washington in 1974 and 1978, respectively.

Dr. Nelson was selected as an astronaut candidate by NASA in January 1978. He flew as a scientific equipment operator in the WB 57-F earth resources aircraft; served as the Astronaut Office representative in the Space Shuttle Extravehicular Mobility Unit (space suit) development effort. A veteran of three space flights, Dr. Nelson served aboard STS-41C Challenger in 1984, STS-61C Columbia in 1986 and STS-26 Discovery in 1988.

STS-26 Discovery (September 29 to October 3, 1988) was the first mission flown after the Challenger accident. During the four day flight, the crew successfully deployed the Tracking and Data Relay Satellite (TDRS-C), and operated eleven mid-deck science experiments.

Deke Slayton (Mr.)
NASA Astronaut (Deceased)

Born March 1, 1924, in Sparta, Wisconsin. Graduated from Sparta High School; received a bachelor of science degree in Aeronautical Engineering from the University of Minnesota, Minneapolis, Minnesota, in 1949.

Mr. Slayton was named as one of the Mercury astronauts in April 1959. He was originally scheduled to pilot the Mercury-Atlas 7 mission but was relieved of this assignment due to a heart condition discovered in August 1959. Slayton became Coordinator of Astronaut Activities in September 1962 and was responsible for the operation of the astronaut office. In November 1963, he resigned his commission as an Air Force Major to assume the role of Director of Flight Crew Operations. Slayton was restored to full flight status and certified eligible for manned space flights in March 1972, following a comprehensive review of his medical status by NASA's Director of Life Sciences and the Federal Aviation Agency. Mr. Slayton made his first space flight as Apollo docking module pilot of the Apollo-Soyuz Test Project (ASTP) mission, July 15-24, 1975—a joint space flight culminating in the first historical meeting in space between American astronauts and Soviet cosmonauts.

This information was extracted from the National Aeronautics and Space Administration at: http://www.jsc.nasa.gov/Bios/astrobio.html#g



# Minnesota Space Grant Consortium

Augsburg College held the 2001 Sverdrup Visiting Scientist Lecture Program in April, featuring Dr. Christopher P. McKay. Dr. McKay is a Planetary Scientist with the Space Science Division at the NASA Center in Ames. His lecture was titled "From Antarctica to Mars: The Search for Life in Cold and Dry Places."

Concordia College located in Moorhead, Minnesota is home to one of the world's four and the United States' only hypervelocity microparticle accelerators. This machine was brought to Concordia in 1975 by NASA scientist Otto Berg, Concordia College physics Professor, Heidi Manning, and California Institute of Technology graduate student, Daniel Austin, hope to use the accelerator to study dust— planetary dust that is. Manning describes this dust as "tiny, talcum-powder-sized bits of cosmic dust constantly encountering the planets and moons in the solar system." This cosmic dust, presumably left over from our solar system's creation, has enough force to churn soil and create craters.

Mars Madness! The 5th Annual Space Science Across the Curriculum Conference was a success! The conference, Mars Madness! A Conference for K - 12 Educators, was held at the Science Museum of Minnesota in March, 2002. The Mars Pathfinder, Mars Global Surveyor, and Mars Odyssey probes mark the first wave of the Planet Earth's coming invasion of the red planet, changing our views of the past and future of the planet and the possibilities of life. This year, the conference keynote speaker was Geoffrey Landis, a physicist in the Power and On-Board Propulsion Technology Division from NASA John Glenn Research Center.

The NASA Aeronautics Blueprint - ATechnology Vision for Aviation: This new NASA blueprint primarily addresses the challenges that confronted aviation in the United States before the terrorist attacks of September 11, 2001. Safety and security have taken on a whole new perspective since that event and technology solutions are presented in the Aeronautics Blueprint. It is recognized that the issues that were facing air travel prior to September 11 will return and require innovative technology solutions. The Blueprint addresses how new technologies can be brought to bear on these issues.

Read these and other happenings in 2001-2002 on the Minnesota Space Grant Consortium web site at: (http://www.aem.umn.edu/msgc/north_star/).

# Control Science and Dynamical Systems (CSDy) Center

--Interdepartmental Ph.D. Program

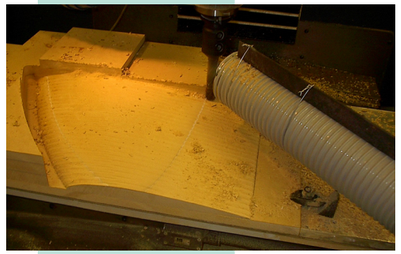
The CSDy Interdepartmental Ph.D. Program provides an opportunity for interdisciplinary research in control science and dynamical system theory. The CSDy program coordinates scholarly and scientific activity of these areas within IT and the University and coordinates its activities with industrial firms in the Minnesota region. CSDy faculty are drawn from the Departments of Aerospace Engineering and Mechanics, Chemical Engineering, Electrical Engineering and Mechanical Engineering, as well as from the Departments of Computer Science, Mathematics and Statistics, all in IT, and from the Departments of Economics and Political Science. The Co-Directors of the CSDy Center are Prof. Gary J. Balas (AEM) and Prof. Tryphon Georgiou (ECE), and Prof. Balas serves as CSDy Director of Graduate Studies. The CSDy Program has 8 students pursuing the Ph.D and all are Research Assistants working on various research projects related to the control and dynamics of systems.

The Control Science and Dynamical Systems is proud to sponsor and host a workshop in honor of Professor E. Bruce Lee on the occasion of his 70th birthday on September 20-21, 2002 at the University of Minnesota. Professor Lee and Professor Larry Marcus founded the CSDy Center at the University of Minnesota in 1961. Professor E. Bruce Lee is a pioneering contributor to the field of optimal control and systems theory, with extensive service to the Control Community and the University of Minnesota. For detailed information please see the web site: http://www.ece.umn.edu/users/georgiou/workshop/

For more information regarding the Control Science and Dynamical Systems Program contact Kristal Belisle at 612.625.3364 (email:kristal@aem.umn.edu).

# Senior Capstone Design Class

The Design Class learning objectives were changed this academic year to provide additional emphasis on professional ethical issues. Case studies from "Engineering Ethics: Concepts and Cases" were used to stimulate and explore questions the students had about their future professional responsibilities. Author James Chiles came to Akerman Hall and presented a special AEM seminar "A Fracture in the System" highlighting several technological catastrophes from his book "Inviting Disaster: Lessons from the Edge of Technology". Mr Chiles met with the design class after his presentation to discuss details and answer questions.



Other highlights during the academic year included a classroom presentation by AEM graduate Terry Johnson of Pemstar about ISO 9000, and a trip to Cirrus Design in Duluth where the students saw the engineering, manufacturing and quality control operations for their SR 20 and SR 22 high performance, four place, all composite airplanes. We thank everyone that contributed to our students' design class experiences.

This year, students were given three design-project options: Autonomous Slow-Flyer (ASF) , Reusable Two Stage to Orbit (R2STO) and Radio Controlled (RC) Launcher. Professor Balas worked with the ASF teams and Professor Vano worked with the R2STO and RC Launcher teams.


The RC model industry has developed very lightweight, electric powered slow-flying airplanes. The objective of the ASF project was to design and integrate a flight control system into an off-the-shelf slow-fly airplane to make it easy to fly (attitude commands in lieu of rate commands), make it autonomous, then down link GPS information and have the airplane fly a search pattern. During Fall Semester, the ASF students were divided into two competing teams then combined into one team during Spring Semester to build and fly their aircraft. The ASF Team included Shannon Farrell, A.J. Piskor, Shaun Leik, David Kubat, Scott Williams, Brandon Crook, Carly Joecks, Nathan Miller, and Richard Russell.

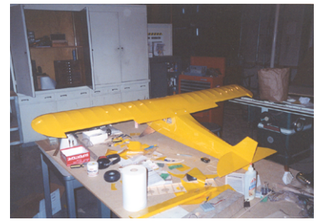
During Fall Semester, the R2STO team prepared a conceptual design of a two stage to orbit vehicle which would provide ISS crew transfer and small satellite launch for the next several decades.

The team was split into two groups for Spring Semester: Stage Two Wind Tunnel Model Test Group consisting of Mike Becker, Jennifer Bonin, Kelly Knutson, Ryan Wold, and Camille Yu, and Stage Two RC Model Build/Fly Group consisting of Timothy Bredemus, Adam Creuziger, Andrew Henslin, Jeremy Hill, Jonathan Phillips, Shirin Salber, and Adam Schroeder. The Stage Two Wind Tunnel Model Test Group investigated the subsonic flight characteristics and control surface effectiveness of the design using a scale model in the department's 38X54 Closed Return Wind Tunnel. For control surfaces, students took two fins of different lengths and tested them at two dihedral angles. The Stage Two RC Model Build/Fly Group then used the configuration determined to be statically stable and controllable to build a flight model scaled to fit on the RC Launcher.

Students on the RC Launcher team designed a large 13 ft wingspan RC airplane to provide a suitable platform to launch the Stage Two RC Model glider. The team was divided into two groups during Spring Semester. A wind tunnel model/test group consisting of Curtis Anderson, Michael Barnhardt, Nenad Bjelogrlic, Travis Ottenbacher, and Daniel Troolin built a scale model of the Fall Semester design and verified it was stable and controllable using the department's 38X54 Closed Return Wind Tunnel. The remainder of the group, Bryan Henneman, Jason Platz, Nenad Bjelogrlic, Richard Pennertz, Ryan Ingvalson, Steve Herring, Daniel Troolin, Jason Lorfing, and Craig Mueller, built the RC Launcher airplane. The RC Launcher airplane was powered by two Super Tiger 90 engines equipped with 14 inch propellers. The wing was made of composite materials donated by Northwest Airlines. Northwest Airlines also made their autoclave available to form the wing on two molds fabricated by the AEM Shop using Solidworks CAD files generated by the students. Students completed the construction of the RC Launcher and Stage Two RC Model glider but were unable to fly them as they ran out of time. Plans are to fly them in the Fall when students come back to classes.

## J-3 Cub Radio Control Model

A small group of students consisting of Neil Gorham, Charlene Knealing, Kim Lay, and Eve Skoog approached Professor Vano to see if they could build a flying RC model. The group worked together to create a student centered project. The objective of the project was to construct an aircraft that will serve as a future test bed for several different experiments, including an existing electronic Data Acquisition System. The plane was completed in early November 2001; the delayed winter allowed the students to make two test flights at the Jensen airfield in Rosemount before the cold and snow kept the students grounded for the winter. The fall test flights went very well for the students.



Confident with their two successful fall flights, the students resumed flying in the spring at a somewhat more compact flying field — the west bank river flats. However, during the first spring flight, engine failure, coupled with high winds and pilot error, the aircraft landed in the water and floated down the Mississippi River. Luckily, the University rowing crew was out practicing and was able to recover the model.

# News About Our Faculty

Professor Graham Candler received the Taylor Research Award and is an Associate Editor of the AIAA Journal.

Professor William Garrard has been re-appointed as one of three AIAA Representatives to the Engineering Accreditation Committee (EAC) of the Accreditation Board of Engineering and Technology. He was also appointed as a Program Evaluator for INTAC, the international section of ABET.

Professor Ellen Longmire, gave invited presentations at the: DOE Workshop: Defining Scientific Issues in Multiphase Flow, University of Illinois at California Institute of Technology, GALCIT at the University of Michigan, Department of Aerospace Engineering; and at the University of Colorado, Department of Mechanical Engineering.

Professor Richard James was named to the editorial advisory board of the SIAM Journal of Multiscale Analysis, and was appointed as contributing editor of Mechanics of Advanced Materials and Structures. He gave invited lectures at NASA Langley, the School of Mathematics at the University of Minnesota, the Department of Mechanical Engineering, Caltech, and a plenary lecture at the International Conference on Adaptive and Smart Technologies at the University of Maryland. He also participated in a "Jam Session" on multiscale methods at Villard de Lans, France, a MURI Workshop on Multiscale Physics, Newport, RI, an NSF Conference on "Future Directions in Solid Mechanics" at Northwestern University and a meeting on Magnetic Sensor Materials and Devices at Iowa State University. Professor Richard James will visit Cornell University during Fall semester 2002 and will hold the Mary Upson Visiting Chair.

Professor Ashley James gave a presentation at the American Physical Society - Division of Fluid Dynamics meeting, San Diego, CA, November 18-20, 2001.

Professor Daniel Joseph was honored at the Symposium on Multi-Component and Multiphase Fluid Dynamics, in conjunction with the 14th U.S. National Congress of Applied Mechanics, June 24-26, 2002, in Blacksburg, Virginia. The Symposium celebrated the pioneering contributions to all kinds of fluid mechanics by Professor Joseph.

Professor Roger Fosdick gave the invited Plenary Talk at the 2nd Canadian Conference on Nonlinear Solid Mechanics,Vancouver, British Columbia, Canada June 19—23, 2002.

Professor Ivan Marusic received the Taylor Career Development Award. He also received a David and Lucile Packard Faculty Fellowship. Only 25 of these very competitive awards are made annually. This year both of the University's nominees were awarded, a very rare occurrence. Professor Ivan Marusic was promoted to Associate Professor with tenure this past year.

Professor Krishnan Mahesh received the CAREER award from the National Science Foundation. He organized a symposium on "Numerical simulation of turbulent flows" at the 14th United States National Congress of Applied Mechanics at Virginia Tech, and delivered an invited tutorial on turbulence simulation at the Summer Program of the Center for Turbulence Research at Stanford University. He gave invited presentations at Honeywell Technologies and an Army workshop at Clark Atlanta University.

Professor Mehran Mesbahi left the department at the end of this past academic year to join the faculty at the University of Washington, in Seattle, WA.

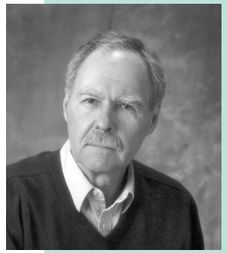
Dover Publications has reprinted the two textbooks Statics and Dynamics by Professors Lawrence E. Goodman and William H. Warner. Engineering students of the sixties and early seventies will remember these. Professor Warner is somewhat bemused to have a work of his described in the Publisher's blurb as "This long out-of-print classic ....".

# Dr. Demoz Gebre-Egziabher Joins the Faculty Fall 2002

Dr. Demoz Gebre-Egziabher will join the AEM Faculty in October of this year in the area of Aerospace Systems. He is currently a Research Associate at the Department of Aeronautics and Astronautics, GPS Laboratory at Stanford University. He received his B.S. in Aerospace Engineering from the University of Arizona, Tucson in 1990; his M.S. in Mechanical Engineering from The George Washington University, D.C. in 1996 and his Ph.D. in Aeronautics and Astronautics from Stanford University, Stanford in 2002. He was an officer in the U.S. Navy for six years and is a Registered Professional Engineer. His research interests are in the areas of sensor fusion; design of multi-sensor systems for navigation; guidance and control of aerospace vehicles; global positioning system (GPS); inertial navigation; and GPS-based precision landing systems.



# Professor Theodore Wilson Retires



Ted Wilson was born in Elgin, Illinois in 1935. His father was a civil engineer and his mother was a housewife. He attended the public schools of Elgin, and he enjoyed the benefits of a quiet childhood.

He received a scholarship to attend Cornell University, and both his undergraduate education in engineering physics and his graduate education in aeronautical engineering were taken at Cornell. The education he received at Cornell provided the capital to support 38 years of professional life.

He has been a conscientious teacher. He taught courses in all three subfields in the Department, solid mechanics, fluid mechanics, and dynamics; both laboratory and lecture courses; and courses at all levels, from sophomore mechanics to courses at the graduate level. He advised 15 students to the Ph. D., and all of these went on to successful careers at universities in the US and abroad, in industry, or in medicine.

Ted served the Department as director of graduate studies and as associate head, the college as member and chair of the Dean's Advisory Committee on Promotion and Tenure, and the national scientific community as a member of the Respiratory and Applied Physiology Study Section of NIH.

At the beginning of his career, his research included studies in fluid mechanics and acoustics. He was also one of the earlier workers in biomedical engineering, and for most of his career, his research focused on respiratory physiology. He collaborated closely with several outstanding physiologists, most at Mayo Clinic, in developing mathematical models for the mechanics of respiration. This work contributed to understanding the relation between micro- and macro-mechanics of the lung, stress in the lung, flow, ventilation distribution, and the action of the respiratory muscles. His tenure at Minnesota was leavened by time spent in Oslo, Berne, Boston, Houston, Brussels, Naples, and Rochester. He was an author of more than 100 research papers, his work received continuous external support from his 2nd to his 38th year at Minnesota, and he became an authority in his primary field, respiratory mechanics.

He was married twice and has four children from those marriages. His children have been and continue to be a joy.

He feels that he was fortunate to find work that suited his temperament and to live at a time and in a place that provided the opportunity to do what he enjoyed.

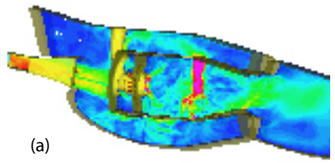
# Research Focus

Each year we will be reporting on some of the current research of one of our faculty members.

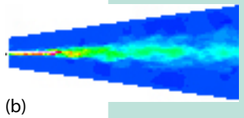
Professor Krishnan Mahesh has been an Assistant Professor in AEM since Fall 2000. Professor Mahesh and his research group use supercomputers to unravel the mysteries of the "last unsolved problem in classical physics"— turbulent fluid motion.

Turbulence features prominently in a wide range of applications in nature and technology. Turbulence increases the drag on airplanes, improves mixing and reduces pollution inside engines, transports nutrients in the oceans, makes jet exhaust noisy, and causes buffeting inside computer disk-drives. Despite its considerable importance, our ability to control or even predict turbulent flows is very limited. This difficulty was expressed in 1932 by British scientist, Sir Horace Lamb as follows: "I am an old man now, and when I die and go to heaven, there are two matters on which I hope enlightenment. One is quantum electro-dynamics and the other is turbulence of fluids. And about the former, I am really rather optimistic."

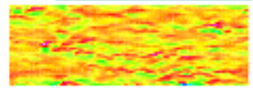
Lamb's comments are relevant even today.



(a)



(b)



(c)

(a) Simulation of flow inside a Pratt & Whitney gas-turbine combustor. The speed of the fluid is shown in color; red corresponds to high speeds and blue regions have slow moving fluid.

(b) Simulation of a turbulent jet flow.

(c) Contours of velocity immediately adjacent to the wall of a turbulent channel.

The equations that govern turbulent flows are well-known, and are called the Navier-Stokes equations. Numerically solving these equations to simulate turbulence is extremely challenging. This is because turbulent flows are very chaotic; they consist of eddying motions of various sizes and shapes. A complete description of a turbulent flow would require that all these eddies be represented on the computational

grid. This is practical only for the simplest flows; for most flows, representing all eddies requires an impossibly large number of computational elements.

As a result, the first experimentally validated turbulence simulation was only performed about twenty years ago. Presently, simulations of turbulence have two important limitations — they are restricted to very simple geometries, and to very low Reynolds numbers (defined as the ratio of inertial to viscous forces; airplane wings fly at Reynolds numbers of approximately $10^6$, while presently simulations are performed around $10^3$). As a result, they are not directly applicable to the complex flows encountered in practice. The numerically generated data have largely been used to develop simpler models for practical use. However, there is considerable evidence that these models lack the accuracy to predict many critically important flows; e.g. pollutant formation in engines, airplane jet exhaust noise, and the drag on aircraft at high speeds.

Professor Mahesh's research aims to overcome this obstacle. His group is developing numerical methods and models that are for the first time, allowing three-dimensional, unsteady turbulent simulations to be used as predictive tools for engineering flows in complex configurations. Moreover, the high fidelity of their simulations allow fundamental turbulence data to be obtained in configurations that are beyond the reach of current simulation methods. This work involves the development of novel numerical algorithms, turbulence models and large-scale simulation.

By recognizing that turbulence is inherently non-linear, Professor Mahesh has recently developed a novel simulation method that mimics the relevant non-linear properties of turbulent flows. The result is an algorithm that is accurate enough to compute the eddying motions in turbulent flows, and robust enough to handle complex engineering geometries. In collaboration with colleagues at Stanford University, Professor Mahesh's approach has made possible three-dimensional unsteady simulations in the exceedingly complex geometry of a Pratt & Whitney gas-turbine combustor. These simulations are the first in a configuration with this level of complexity and were reported as one of the Science Successes in 2002 by the National Partnership for Advanced Computing Infrastructure (www.npaci.edu/successes/2002_jet.html).

Professor Mahesh's research is currently supported by the Department of Energy, the National Science Foundation and the Office of Naval Research. His group of graduate and undergraduate students study how dilution jets inside modern gas-turbine combustors mix cold air with combustion products (Mr. S. Muppidi), the mixing properties of turbulent jets (Mr. P. Babu), turbulent compressible flows (Mr. Y. Hou), marine propeller crashback - a procedure where the propeller suddenly reverses direction (Mr. A. Dande), near-wall turbulence (Mr. P. Lommel) and the effect of cacti geometry on their resistance to high winds (Mr. J. Graham).

# Research Projects of AEM Professors for 2001-2002

Air Force Office of Scientific Research

Continuum and Particle Computations of Hypersonic Shock Interaction Flows
Graham Candler

Large-eddy Simulation of Turbulent Hydrosonic Flows
Graham Candler

An Integrated, Multi-Layer Approach to Software-Enabled Control: Mission Planning to Vehicle Control
Gary Balas & Yiyuan Zhao

Computational Tools for the Atomic/Continuum Interface: Nanometer to Millimeter Scale Aircraft
Richard James, Graham Candler, Mitchell Luskin (Math), & Chris Palmstrom (CEMS)

Scaled Up Nonequilibrium Air Plasmas
Stanford Univerisity (AFOSR Prime)
Graham Candler

Cavity Running Bodies
Roger Arndt, Gary Balas, Ivan Marusic

Army High Performance Computing Research Center

High Performance Computation of Compressible Flows, Turbulent Flows
Graham Candler

Army Research Office

Advanced Methods for Interceptor Flow Simulations
Graham Candler

Numerical Simulation of Atmospheric Pressure Air Plasmas (with Stanford University)
Graham Candler

Department of Energy

Large-eddy Simulation of Gas-turbine Combustors (with Standord)
Krishnan Mahesh

Multiphase Pipeling
Daniel Joseph

Nonequalibrium and Structural Effects on Models of Interfacial Motion in Multicomponent Alloys
Perry Leo

Topological Transitions in Liquid/Liquid Flows
John Lowengrub(Math) & Ellen Longmire

National Aeronautics and Space Administration (NASA)

Advanced Models for High Enthalpy Flow Simulations
Graham Candler

Real-time Motion Path Planning for Autonomous Rotocraft
Yiyuan Zhao

Switching Control Laws for Constrained Formation Maneuver (with JPL)
Mehran Mesbahi

Comprehensive Computer Simulation of Air Traffic Systems
Yiyuan Zhao

Applications of Linear Parameter-Varying Techniques to Safety Critical Aircraft Flight Systems (Langley)
Gary Balas

The Minnesota Space Grant College Consortium (Headquarters)
William Garrard

National Heart, Lung, and Blood Institute (NIH)

Respiratory System Mechanics (with Baylor College of Medicine)
Theodore Wilson

National Science Foundation

A Novel Approach for Large Eddy Simulation on Unstructured Grids Applied to Turbulent Jets in Cross-Flow
Krishnan Mahesh

A Physical Modeling Approach to Wall Turbulence and Enhancing the Educational Experience through the Beauty of Fluid Motion
Ivan Marusic

Comparative Theoretical and Experimental Studies of Breakup, Outgassing and Stress Induce Polymerically Thickened Liquid
Daniel Joseph and Gordon Beavers

Distributed Space Systems Control via Graph-Driven Hybrid Systems and Matrix Inequalities
Mehran Mesbahi

Dynamic Feature Extraction and Data Mining for the Analysis of Turbulent Flows
Ivan Marusic, Ellen Longmire, Graham Candler, Victoria Interrante(CS&E), George Karypis(CS&E), Sean Garrick (ME), Vipin Kumar(CS&E)

Dynamic Performance of MEMS in Liquid Environments
Ellen Longmire & Sue Mantell (ME)

Fundamental Fracture Mechanisms in Ductile Single Crystals
Thomas Shield

GOALI: Direct Numerical Simulation of Slurry Trnasport Focusing on Engineering Correlations
Danield Joseph

KDI: Direct Numerical Simulation and Modeling of Solid-Liquid Flows
Daniel Joseph

Mathematical Theory and Numerical Methods for Microscale Biomedical Devices
Richard James & Mitchell Luskin (Math)

Mathematical Models of Materials with Multi-Stability at the Micro-Level
Lev Truskinovsky

Office of Naval Research

Multiferroic Materials in Smart Structures and Device (University of Maryland (ONR Prime)
Richard James & Thomas Shield

The David and Lucile Packard Foundation

Packard Fellowship
Ivan Marusic

## New Departmental Post-docs and Other Academicians

Camille M. George, was hired as a research associate by Professor Graham Candler to work on a research project on the numerical simulation of air plasma flows and discharges. She also participates in the preparation and presentation of results to collaborators and grant technical monitors. Camille earned her Ph.D. in Mechanical Engineering at the University of Minnesota.

Taehwan Ko, was hired as a postdoctoral associate by Professor Daniel Joseph upon completing his Ph.D. in the department. Professor Joseph was looking for someone who could work on his project on the direct numerical simulation and modeling of solid liquid flows. Dr. Ko is also involved in 3D simulations of solid liquid flows to extend project 2D results to 3D, which include code development using computational fluid dynamics and computer science and modeling for applications for project industrial collaborators.

## Alumni News

Richard T. Richtman (1948 MS Aeronautical Engineering), died June 3, 2001. He had been residing in Dallas, TX.

Merrill H. Mead (1946 BAE), died May 7, 2001. He had been residing in Milpitas, CA.

Robert St. John, (1952, Master of Science), died December 2, 2001.

David Sippel, who received his BS. degree in 1960 and his graduate degree in 1970 in Mechanics under Professor William Warner, was appointed by Dean Davis to the Deans Advisory Board in the Institute of Technology.

## Alumni Student News

Stamatios Pothos (Ph.D. Aero Eng 2002) is currently Technical Sales Manager at TSI in Shoreview MN.

Terry Johnson (BEAM, '94) is Manager of Mechanical Design Engineering at PEMSTAR in Rochester, MN.

## Alumni Dollars at Work

Students that participated in the microgravity projects from 2000-2001 met with Richard DeLeo at a reception this past fall.

Students have been able to participate in these excellent learning opportunities from financial sponsors of the student teams such as the AEM Richard and Shirely DeLeo Scholarship & Engineering Fund; the AEM Alumni Program Support Fund; The Minnesota Space Grant Consortium; and the University Undergraduate Research Opportunities. More information on the microgravity projects can be found at: http://www.aem.umn.edu/info/highlights.shtml

The Department infrastructure is in great need of refurbishing. The University has not been able to supply significant funding for this, nor do we envision them doing anything about it soon. If anyone has any ideas on potential fund raising in this area, let us know at dept@aem.umn.edu. We have done small pieces periodically however, there are a number of large projects which need to be done. We know that this is a big undertaking.



Thanks to all of our Alumni who have been supportive of the needs of the Department. As many of you already know, these elements are key to the successful of any program:

✓ A department's reputation often is measured by the caliber and success of its students, both at the undergraduate and graduate level. Talented graduate students bring intellectual strength, dedication, a strong commitment to change, and intense curiosity to the resolution of real problems that have local, national, and international implications. They assist faculty in research and teaching, participate in field research and connect people and projects throughout the college departments. Undergraduate students are the basic core that is molded into the Foundation of strong talented faculty.

✓ A strong talented faculty is the lifeline of a great department. They attract top students, bring in valuable research dollars, and educate the leaders of the future. Our faculty are nationally known for their expertise.

By your support, you have given many of our students opportunities to participate in unique learning opportunites such as participating in the reduced gravity projects, and other student research projects.

## Donations: You Can Make a Difference

Donations can be made anytime during the year and sent to the University of Minnesota Foundation, McNamara Alumni Center, University of Minnesota Gateway Center, 200 Oak Street SE, Suite 500, Minneapolis, MN 55455. Just designate the fund you wish to support. Checks should be made payable to the University of Minnesota. If you have questions on donating, you can contact the University Foundation at phone: 612-624-3333 or 800-775-2187 fax: 612-625-4305. There are many ways to give to the Department of Aerospace Engineering and Mechanics at the University of Minnesota to help create excellence in addition to contributing to your own personal and financial goals. More information on types of gifts (Outright Gifts, Planned Gifts, or Corporate & Foundation Gifts) can be found at the Foundation web site at: http://www.foundation.umn.edu/frameset_5.html

The funds to which you can contribute are as follows:

AEM Program Support:
Used as the main source of discretionary funds to support all funds. Fund No. 3739

Aeronautical Class of 1943 Wind Tunnel Fund:
Created by the Class of 1943 to defray costs of a new wind tunnel and instrumentation. Fund No. 3585

The Chester Gaskell Aeronautical Engineering Scholarship Fund:
Used for undergraduate scholarships for outstanding first-year aerospace students. Fund No. 2898

The John D. Akerman Memorial Fund:
Supports the Akerman Professor of Design of our year-long capstone senior design course. Fund No. 3191

The AEM Laboratory Equipment Fund:
Used to purchase instructional and research equipment. Fund No. 2500

The AEM Excellence Fund:
Used to sponsor lectureships by distinguished individuals in aerospace engineering and mechanics. Please note that this fund also supports the Sethna Lecture. Fund No. 2281

The B.J. Lazan Fund:
Supports activities that promote faculty/student interactions and educational activities.

John A. & Jane Dunning Copper Fellowship in Aerospace Engineering & Mechanics.
Provides fellowships for AEM graduate students. Fund no. 5330

Lawrence E. Goodman Scholarship in Theoretical & Applied Mechanics.
Provides a prize to a graduating student with a baccalaureate degree from AEM who is deemed by the faculty to have achieved the best record in the field of theoretical and applied mechanics. Fund No. 5594.

Richard & Shirley De Leo Scholarship & Engineering Fund.
Provides undergraduate scholarships to Aerospace Engineering students and provides discretionary funds to the Department of Aerospace Eng. & Mechanics. Fund no. 5470.

Robert H. & Marjorie F. Jewett Fund.
Provides supports program support to the Department of Aerospace Engineering and Mechanics. Fund No. 4810.

# AIAA Student Group Activities

The AIAA student group sponsored a fall 2001 barbecue. The barbecue provides a good way for faculty, staff and students to interact outside of the classroom. Approximately two hundred participated in this event.


The AIAA Office (305 Akerman Hall) provides a place for aerospace students to study or relax between classes, as well as help each other with homework and projects. Additionally, we also sell a variety of candy bars and pop during the school year. Everyone is always welcome to drop by.

Four undergraduate AEM students, Neil Gorham, Kim Lay, Marin Bigwood, and Mike Holtz, participated in the AIAA student paper conference which was held at Parks College of Engineering and Aviation in St. Louis, Missouri, April 17-19th. The conference provided an excellent opportunity for undergraduate and graduate students to present technical papers on a wide variety of aerospace related topics. Paper topics included, but were not limited to: CFD analysis of hypersonic model, two-stage to orbit designs, Mars missions, cruise missiles, hypersonic flighter – interceptors, supersonic sport aircraft and many more. The conference also featured several seminars which were presented by industry leaders representing Boeing, Raytheon, and other aerospace corporations. Over sixty students attended the conference, representing Iowa State, Parks College, Texas A&M, the U.S. Air Force Academy, the University of Missouri – Rolla, and Wichita State. Any undergraduate or graduate student who is interested in presenting a paper at this year's conference should contact Neil Gorham at gorh0005@umn.edu. This year's conference date has not been set, but they usually occur sometime in April (2003). The host school will be one of the Rocky Mountain schools (either Denver, Boulder, or the Air Force Academy).

Students flew to St. Louis on a Cessna 180, shown above at a fuel stop in Moline, Illinois. Left to right: Kim Lay, Maria Bigwood, and Mike Holtz (not pictured: Neil Gorham).

2001-2002 AIAA Officers at the Gateway Arch Museum in St. Louis. Left to right: Mike Holz, Kim Lay, Maria Bigwood, and Neil Gorham.

AIAA Officers for 2001-2002
- Neil Gorham - President
- Mike Holtz - Vice President
- Phillip Boigenzhan - Treasurer
- Maria Bigwood - Secretary
- Kim Lay – Secretary
- Faculty Advisor: Mehran Mesbahi



## Student Honors

Tim Jackson received an Astronaut Scholarship.

Wayne Falk won a Doctoral Dissertation Fellowship from the Graduate School at the University of Minnesota for his doctoral research on the mechanics of Bacteriophage T-4.

Jamie Strandmark received a Co-op Flag Award fall semester 2001 for outstanding achievement from the Lyndon B. Johnson Space Center. She was 1 of 15 recipients selected for this award from 60 students.

## Other Student/Postdoctoral News

Dr. Richard Cui Jun received a Ph.D. and wrote a thesis on the Martensitic Phase Transformation and Ferromagnetic Shape Memory Effect in Fe-Pd Single Crystals. He accepted a Postdoctoral Fellowship atthe University of Maryland where he will continue work on multiferroic materials.

Dr. Bill Qi Pan accepted a position with Micron Technology, Inc. He will do research and development of RAM based on magnetic devices.

Dr. Martin Tijssens completed a postdoctoral fellowship with Prof.Richard James, funded by the Dutch government. He returned to the Netherlands in January and began an Assistant Professorship at Delft University of Technology, where he is continuing work on the use of atomic scale calculations for the study of martensitic phase transformations.

## Student Awards

2001-2002 Rose Minkin Aerospace Engineering Scholarhips
- Sam Kuchinka

2001-2002 Chester Gaskell Aeronautical Engineering Scholarships
- Nathan Koelln
- Muhmmad H. Hashim

2001-2002 Boeing Scholarhips
- Richard Johnson
- Beth Nollenberger

2001-2002 Robert H. & Marjorie F. Jewitt Scholarhips
- Zachary Kahly

2002-2003 Graduate School Fellowships
- Joseph L. Stecher

2002-03 Doctoral Dissertation Fellowship
- Wayne Falk
- Gary Kunkle
- Zulfaa Mohamed-Kassim

2001-2002 University of Minnesota, Minnesota Space Grant Scholarhips

- Alberto Baez
- Reynaldo Cantu
- Charlene Knealing
- Alexander Medved
- Brian Naslund
- Eve Skoog
- Charles Steidl
- Patrick Tague
- Ryan Wold
- Julie Zogg
- Craig Lewandowski
- Nicholas Velander
- Christopher Regan
- Megan Johnson
- Elliott Payne
- Kristopher Carver

# Degrees Awarded 2001-2002

## Bachelor of Aerospace Engineeirng and Mechanics

August 17, 2001
Steven Balisteri Jr.
Steven Botts
Travis Drayna – with distinction

December 22, 2001
Paul Hannah
Christopher Italiano
Peter Lucking
Terrance Mulenburg
Adam Timm

May 18, 2002
Curtis Anderson
Michael Barnhardt – magna cum laude
Nenad Bjelogrlic
Timothy Bredemus
Jeffifer Bonin – cum laude
Brandon Crook
Adam Creuziger
Benjamin Exley – with distinction
Shannon Farrell
Bryan Henneman – cum laude
Michael Holtz
Ryan Ingvalson – cum laude
Carly Joecks
Kelly Knutson
David Kubat
Nathan Miller
Andrew Piskor
Johnathan Phillips
Richard Russell – cum laude
Adam Schroeder
Daniel Troolin
Camille Yu
Ryan Wold – summa cum laude
Scott Williams

## Master of Science

MS (Mechanical)
Matthew Carper
Gilberto Pena

MS (Aero)
Abbey Eichman
Jo-Einar Emblemsvag
Bharathram Ganapathi Subramani
Weston Daniel Heuer
Yoonsoo Kim
Ilija Milosevic
Alin Moss
Tikeswar Naik

## Doctor of Philosophy

PhD (Aero)
Galyna Vasko

PhD (Mech)
Taehwan Ko



# Regular Faculty

Professors
Gary J. Balas
Gordon S. Beavers, Director of Graduate Studies
Graham V. Candler
Roger L. Fosdick
William L. Garrard, Department Head
Richard D. James, Russell J. Penrose Professor, Distinguished McKnight University Professor
Daniel D. Joseph, Regents' Professor
Perry H. Leo, Director of Undergraduate Studies and Associate Head
Theodore A. Wilson

Associate Professors
Ellen K. Longmire
Lev Truskinovsky
Thomas W. Shield
Yiyuan Zhao

Assistant Professors
Ashley James
Krishnan Mahesh
Ivan Marusic
Mehran Mesbahi

Akerman Professor of Design
Andrew Vano

Adjunct Associate Professor
Dale F. Enns

# Other Faculty & Staff

Professor Emeritus
J. L. Ericksen
Philip G. Hodge, Jr.
C.C. Hsiao
Thomas S. Lundgren
Robert Plunkett
William H. Warner

Associate Professor Emeritus
Eugene Stolarik

Contract Faculty
Thomas Cunningham
Yohannes Ketema

Part-time Contract Assistant Professor
David Korepla
Satish Ramadhyani

## Research Staff

Postdoctoral Associates
Runyuan Bai
Heath Johnson
George Papageorgiu
Krishnendu Sinha
Robert Tickle

Research Associates
Jozsef Bokor
Marie-Claude Druguet
Qi Pan
M.G.A. Tijssens
Michael Wright

## Technical Staff

Jim Frame, Scientist
Dave Hultman, Managing Research Engineer
Ray Muno, Scientist
John Tucker, Scientist
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