

WAY TO THE FUTURE

STUDENTS HOPE CETAN Will LEND SPEED TO WATERCRAFT

In the fall of 1997, a group of engineering students and volunteers got together to build a human-powered watercraft. They named their project Cetan, after the hawk spirit of the Lakota, hoping that their hydrofoil will fly over the water just as swiftly as its namesake.

The watercraft—a double-hull, twin-foil hydrofoil powered by a single pilot in a recumbent position, with a design speed of 20 knots—won first place in the 1999 Engineering Open House category for class projects. About 30 undergraduate and graduate students have worked on this hydrofoil since its inception, advised by AAE Professor Scott White. Current participants from AAE include project leader Jim Liao, assistant project leader Jim Atwood, Bruce Brumfield, Brian Fukuda, Bill Gross, Jennifer Jones, James Moes, Perry Overbey, Damon Strom, and Eric Tuftedal, as well as students from Materials Science and Engineering, Mechanical and Industrial Engineering, and Theoretical and Applied Mechanics.

The Cetan underwent its first test run on June 2, 1999, at Crystal Lake Park in Urbana and is currently “going through several major redesigns,” according to Liao. Learning from the test runs, he said “the Cetan Evo will be much lighter and more efficient.” The Evo, which stands for evolution because it’s not quite Cetan II yet, “will feature a single-wing design underwater (not two wings



Taking the hydrofoil on its first test-run at Crystal Lake Park, Urbana.

anymore) and a monocoque superstructure.” A monocoque refers to a type of construction in which the outer covering assumes all or a major part of load stress. According to Scott White, the faculty adviser, the original aluminum tubing superstructure will be replaced by a superstructure of carbon-fiber epoxy. Liao says redesigning the hydrofoil will take a considerable amount of time, but the team hopes for a test-run record by August or September, at a site to be determined in central Illinois.

The current records for this class of vehicle are held by the Massachusetts Institute of Technology: the men’s record (18.5 knots) in 1991 and the women’s (13.9 knots) in 1992. Another hydrofoil, the Flying Fish, landed itself in the *Guinness Book of World Records* with a speed of 11.2 knots.



Cetan on display at the 1999 Engineering Open House.

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FROM THE DEPARTMENT HEAD

You may have noticed that the familiar face of Wayne Solomon is gone from this page and a new face has appeared. Wayne stepped down as head of Aeronautical and Astronautical Engineering (AAE) in January 1999, and I became the fourth head of the department. First, I would like to thank him for his 10-plus years as head of AAE. The department has made significant strides forward under his leadership. We now reside in Talbot Lab after moving from our cramped quarters in the Transportation Building that we called home for almost 50 years. The undergraduate and graduate programs have been updated, and many student teams have been able to participate in innovative design projects. The research program has grown steadily, so much so that we are now on a par with our peers; in some areas we are the leaders in the college and the nation. The department is strong—with a talented faculty and staff, outstanding students and programs, and a strong base of alumni and friends. We thank Wayne for his significant help in attaining these and many other goals.



Like most of you, I am an alumnus of the department, receiving a BS in 1976 and an MS in 1977. I have always taken great pride in my Illinois degrees and pride in the quality of the AAE Department and the College of Engineering. After returning to the department as a faculty member in January 1990, my respect for engineering at Illinois has continued to grow. I feel privileged to be a part of this special place but also feel a great responsibility to continue to improve on the excellent programs in the department.

The most recent rankings of U.S. aerospace engineering departments saw Illinois move from number 9 to 7; we hope to improve on this even more in the future. We are starting from a strong base to tackle the challenges that lie ahead. The downturn in the aerospace industry in the early and mid-90s affects the graduate programs of today. Many schools have turned to more and larger fellowships to attract the best graduate students. We need to find the resources to be competitive in this arena. Fortunately, our faculty continue to attract significant research. We are currently searching for two new faculty members who will help create exciting new research opportunities. We are fortunate at Illinois that the students and faculty have access to world-class computing facilities. Maintaining these resources requires almost constant attention because technology moves forward rapidly. Our undergraduate students are among the best in the nation. Today, many of these students participate in team-design projects, three of which are highlighted in this publication. These projects have been supported by alumni gifts, industrial gifts, and funding from other nonstate sources.

I look forward to working with the many alumni and friends as we tackle these and other challenges and move forward as a department. Please feel free to contact me if you have concerns or suggestions. I hope to meet many of you in the coming months and years.

A handwritten signature in black ink that reads "Mike Bragg". The signature is written in a cursive, flowing style.

Mike Bragg
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INTRODUCING AAE'S NEW DEPARTMENT HEAD

Michael B. Bragg, '76, MS '77, (PhD '81 Ohio State University), is the new head of the Department of Aeronautical and Astronautical Engineering. Bragg has been on the AAE faculty since 1990; he teaches aerodynamics and flight mechanics.

His two primary areas of research are aircraft icing and unsteady aerodynamics, both of which involve the study of unsteady and highly separated fluid flows. He conducts much of this research in the wind tunnels of the Subsonic Aerodynamics Laboratory, which he directs. Funding for his research comes from NASA, the Federal Aviation Administration (FAA), the Department of Energy, and industry.

Bragg has been active in national and international technical activities. He is a past chairman of the Society of Automotive Engineers' Aircraft Icing Technology Committee, has served on four American Institute of Aeronautics and Astronautics (AIAA) national technical committees, and is an associate fellow of the AIAA. In summer 1998, he presented an AIAA-sponsored short course in Albuquerque on the effects of roughness on aircraft aerodynamics. Also in 1998, he received the Losey Atmospheric Science Award from the AIAA for his research in aircraft icing. While at Ohio State University, he received the College of Engineering Research Award; he received the Outstanding Recent Alumnus Award from the AAE Department at Illinois in 1988. He is a consultant for several U.S. companies on matters concerning aircraft icing and serves on several committees of the FAA. Currently vice chair of the Applied Aerodynamics Technical Committee, he will serve as chair at the 2000 AIAA Aerospace Sciences Meeting.

BURTON IS CHOSEN AS ASSOCIATE HEAD

Michael Bragg announced the appointment of Rodney L. Burton as the department's associate head, with responsibilities for focusing on AAE's graduate program. Burton ('62, MA '64, PhD '66, all from Princeton University) has been an AAE faculty member since 1989.

His research emphasizes advanced propulsion. He has more than 35 years of experience in electric propulsion for spacecraft and concentrates on low-power propulsion, both steady and pulsed, for satellites. He has also developed advanced techniques for the study of high-energy particle combustion at high pressure, as occurs in solid rocket motors.



EDITOR'S NOTE:

Some of you may have noticed that you haven't received a newsletter recently. No, the newsletter is not defunct; I've been working on another AAE project with Diane Jeffers and many of our alumni and alumnae. Please bear with us as we try to bring our issues up to date. You will also notice that with this issue, we are changing the newsletter's numbering system. The previous system was confusing for readers and our office alike. We'd like to start this year with Volume 1, Nos. 1 and 2, because we have a lot of material to cover. Ideally, we plan to produce two issues a year.

—Alison Fong Weingartner

Funding for the three student projects reported in this issue—Cetan, Float'n Illini, and Design/Build/Fly—has come from the College of Engineering, AAE, industry, and alumni.

FLOAT'N ILLINI EXPERIENCE WEIGHTLESSNESS IN THE "VOMIT COMET"

During spring break 1999, when many students were probably whooping it up in beach hot spots, a group of AAE students was at the Johnson Space Center in Houston, Tex., experiencing weightlessness firsthand.

The Float'n Illini was one of 45 teams chosen nationwide that submitted proposals for the March flight to test its experiments in NASA's KC-135, more often known by its nickname, the "Vomit Comet." Four AAE students were on the seven-member team: Jennifer Jones, Kelly McAllister, Nidhi Patel, and Mark Wallace. The rest of the team included Kennda Lynch (GE); Gwendolyn Smith (Physics), and Graeme MacDonald (ECE/Astronomy). They proposed an experiment to study the effects of microgravity on the flow characteristics of immiscible fluids. According to the team's abstract for the project, it tried "to compare the injection profile of oil into water under a nominal gravity field and microgravity. The overall goal is to characterize the basic mixing properties of the test fluids



Kelly McAllister (left) and Jennifer Jones (right) experiencing weightlessness.

by varying the density of fluids, the volume ratio of fluid to water, the velocity of injection, and the nozzle shape for injection."

Before the students reached the experiment stage, however, they had to develop the proposal and "before we even started building equipment, NASA engineers had to approve our design," said Jennifer Jones, one of the four who got to fly. "While (at Houston), our experiment passed NASA's Test Readiness Review, our flight team completed physiological training, and we flew our

experiment twice on board the KC-135," she said.

During the two-hour, 42-parabola flight on the "Vomit Comet," the Illinois experiment "didn't go quite as planned," said Kelly McAllister, the other AAE student chosen to fly. "Our injection speed was not turbulent enough to let the oil off the needle. . . . We didn't see any mixing between the oil and water and were not able to test out our hypothesis. We do have important information to improve our experimental design, though." However, flying in zero gravity wasn't all work for the students. "The feeling of weightlessness is much like swimming and not at all similar to a roller coaster as I had imagined before our flight. . . . I felt an ease and lightness unlike anything else on Earth. In fact, the freedom one feels is close to euphoric," said McAllister.

The Reduced Gravity Student Flight Opportunities program is sponsored by NASA and administered by the Texas Space Grant Consortium.

COMPETITION CHALLENGES STUDENTS TO DESIGN ACE LIFTER

Design an aircraft from conception to flight using commercially available electric motors and batteries, and while you're at it, see how much water it can carry around a predetermined course in multiple sorties within 10 minutes. That, in essence, was the mission for the 1998-99 Design/Build/Fly competition, held at Patuxent, Md., on April 24 and 25, 1999.

Thirteen students from the University of Illinois took their plane, the RPP-1, to the fly-off at Webster Field, part of the U.S. Office of Naval Research's Naval Flight Test Center complex. Team members were advised by

Professor Kenneth Sivier. The team leader and plane pilot was Jason Merret. The other members of the team were Tim Alberts, Gabriel Benavides, Dave Hansen, Martin Klipp, Chris Lamarre, Eunice Lee, Shalin Mody, Vijay Ramasubramanian, Jessica Schiller, Patrick Schuett, Farhad Shroff, and Robert Tschanz. The Illini placed 9th in a field of 14 teams that brought aircraft to fly. Thirty-seven teams, including one from Italy and another from Turkey, entered the contest.

Utah State University took the first prize: its Dragon Fly carried 104 pounds of water over six

sorties. Oklahoma State University's Aggie Aquanauts was second, with 71.5 pounds over three sorties. Third place went to the H₂O Shark of the University of Southern California, which carried 49 pounds over five sorties.

The competition, which is in its third year, is organized under the auspices of the American Institute of Aeronautics and Astronautics (AIAA) and sponsored by the AIAA Foundation, Cessna Aircraft Company, and the U.S. Office of Naval Research, which also acted as host.

AAE AWARDS, 1998 AND 1999

In this combined issue, we present the 1998 and 1999 winners of AAE awards. The accomplishments of these people are a source of pride for the department. The 1998 ceremony, held April 28 at Jumer's Castle Lodge, was hosted by faculty member Lawrence Bergman. Michael Bragg, the newly appointed head of the Department of Aeronautical and Astronautical Engineering, welcomed the honorees and guests to the department's annual awards banquet for 1999, which was held at the Illini Union on April 15. Faculty member John Prussing hosted the ceremony.

ALUMNI AWARDS

DISTINGUISHED ALUMNUS AWARD

Given to alumni who have distinguished themselves by outstanding leadership in planning and direction of engineering and scientific work, by fostering professional development of young engineers, or by the contributions to knowledge in the fields of engineering and science. The first award was presented in 1965.

1998

Steven J. D'Urso, MS '89, is the senior principal technical specialist for the Boeing Company, St. Louis, Mo. He is a member of the air vehicle advanced design organization of Boeing St. Louis Phantom Works, where he leads air vehicle exploration efforts. He worked for two years at Boeing Military Aircraft Co. in Seattle, and for the last 18 years, he has been at Boeing-McDonnell Aircraft and Missile



Steven D'Urso, recipient of the 1998 Distinguished Alumnus Award, attends the AAE banquet with his mother, Betty, who lives in Urbana.

Systems (previously McDonnell Douglas Aerospace). D'Urso is experienced in the areas of structural design, aircraft configuration design and integration, and methods and tools development. He is also the principal investigator of the integrated helicopter design tools program, where he is researching the melding of integrated product development design and analysis tools; the project is being undertaken in conjunction with Boeing Helicopter Systems, Bell Helicopter, the U.S. Army, and NASA.

D'Urso maintains his links with academia by conducting workshops and delivering lectures at several universities, including the University of Illinois, University of Missouri-Rolla, University of Virginia-Arlington, and the U.S. Air Force Academy. He also conducts an annual series of aircraft layout workshops with the senior design classes at UIUC. D'Urso, who is an associate fellow of the American Institute of Aeronautics and Astronautics, is the current president of the AAE Advisory Board and was named the AAE Department's Outstanding Recent Alumnus in 1994.

1999

Scott Altman, '81, is a commander in the U.S. Navy and a NASA astronaut. After graduating from the University of Illinois, Altman entered Aviation Reserve Officer Candidate School and was commissioned as a navy ensign. He received his wings of gold in



Photos by Creative Images

AAE's newly appointed department head, Michael Bragg, presents a 1999 Distinguished Alumnus Award to Scott Altman (left).

February 1983 and was posted to NAS Miramar, San Diego, Calif., to fly the F-14. After two deployments to the western Pacific and the Indian Ocean, he was selected in August 1987 for the Naval Postgraduate School's test pilot coop program. He completed test pilot school in 1990 as a distinguished graduate and spent the next two years working on various F-14 projects. Altman was next chosen to help take the F-14D on its first operational deployment. He was awarded the Navy Air Medal for his role as a strike leader flying over southern Iraq in Operation Southern Watch. In December 1994, he was selected for the astronaut program. After completing his year of training at Johnson Space Center, he was initially assigned to work the technical aspects of orbiter landing and roll-out issues for the Astronaut Office Vehicle Systems branch. During April and May 1998, he served as pilot for the 16-day Neurolab mission on STS-90. The seven-person crew aboard the Space Shuttle Columbia served as subjects and operators for 26 life science experiments focusing on the effects of microgravity on the brain and nervous system.

Kenneth L. Atkins, PhD '74, is the project manager for NASA's Stardust mission to return samples from Comet Wild 2. Atkins, who is

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