1997, she has designed stall-plots for the Space Shuttle and Mir rendezvous and integrated a six-degrees-of-freedom simulator for the undocking of the X-38 crew return vehicle from the International Space Station.

In addition to receiving this year's Stillwell award, Jones has collected several other awards along the way. In 1999, she received the College of Engineering's Honeywell Award, which recognizes distinguished individual performance and leadership by a junior in the college, a National Science Foundation Fellowship, and AAE's McCloy Memorial Award in 1999. She is also a Bronze Tablet scholar, a universitywide recognition for seniors with grade-point averages in the top three percent of their college.

Her extracurricular activities included being the control system team leader for the human-powered hydrofoil and team leader in 1999 of the Float'n Illini for NASA's Reduced Gravity Flight Experiment. She is also the current vice president for the campus chapter of AIAA; in 1999, she was its Engineering Open House chair. In sports, Jones has won three intramural tennis championships and is on the Illini Women's ice hockey team.

After her graduation, Jones will be working at NASA Johnson Space Center on the X-38 and will enter graduate school in 2001.

Roger A. Strehlow Memorial Award

Presented annually to a graduate student in recognition of outstanding research accomplishments.

"Joyee" Zhu Qi of Jiangxi, a southeastern province of the People's Republic of China, seems

Faculty member Philippe Geubelle congratulates "Joyee" Zhu Qi as she receives the 2000 Strehlow Memorial Award.

to have a knack for research. According to her adviser, Professor Philippe Geubelle, she is systematic but independent thinking, intuitive, and dedicated. In receiving the Strehlow award, she is being recognized for these qualities. Her adviser has nothing but accolades for his student: "I have had the privilege to work with her over the past two and a half years on a National Science Foundation-sponsored research project dedicated to the analysis of a composite manufacturing process," he said. "Her role in the research project was to derive and implement the finite-element formulation of the complex chemical and mechanical phenomena taking place during the manufacturing of advanced composites." Not only did Zhu accomplish this task ahead of schedule, she also took on another task. "We are using numerical optimization techniques to systematically improve the manufacturing process for advanced composite materials," she said. Geubelle gave another example of Zhu's "exceptional aptitude for research": he acknowledged that because she did not take the "obvious path" in tackling a particular problem, her findings led the team to modify the focus of its project.

Zhu graduated with honors from the Shanghai Jiao Tong University in 1993 with a bachelor of engineering degree in engineering mechanics. For two years after her graduation, she worked as a structural engineer for the China State Shipbuilding Corporation, where she developed a model for analyzing the foundation behavior of high-rise buildings. She returned to graduate school in 1995, attending the Nanyang Technological University in Singapore to graduate in 1997 with a master's degree in structural engineering.

Zhu joined AAE in August 1997 to pursue a doctorate in AAE, specializing in finite-element modeling and polymer composites. In summer 1999, she interned with Caterpillar Inc. in its Advanced Materials Technology Group. She will also participate in a training program in summer 2000 at the General Electric Research Center in Schenectady, New York. Zhu will receive her doctorate in December 2000.

Dale S. Margerum Memorial Award

Presented annually to an undergraduate student for outstanding leadership qualities as exemplified by his or her participation in

Stephen Jaeger receives the Margerum Memorial Award from Diane Jeffers, AAE's coordinator of external relations.

departmental extracurricular activities.

Stephen C. Jaeger of Peoria, Illinois, has been in the thick of activities since his first semester at Illinois, when he was president of his residence hall floor in 1996–97. Since then, the senior has been treasurer for the Illini Space Development Society (August 1997 to May 1998) and president of the society (August 1998 to August 1999). He participated in the Ohio Aerospace Institute's 1999 summer internship program at the NASA John H. Glenn Research Center in Cleveland, where he designed and conducted an electric propulsion technology experiment and completed the initial design of an electric thruster. Since September 1999, he has been an undergraduate assistant in the Electric Propulsion Group at AAE, working under Professor Rodney Burton to engineer a state-of-the-art pulsed plasma thruster. This electric thruster is being designed to decrease the size and mass of current thrusters used for satellite maneuvering in orbit.

Jaeger is also an Eagle Scout and was an Edmund James Scholar in engineering in 1996 and 1997. He has been a student member of the American Institute of Aeronautics and Astronautics since 1997. He plans to graduate in August 2000 and will remain at the University of Illinois at Urbana-Champaign to pursue a master's degree in AAE, working with electric propulsion under Professor Burton.

AAE's Graduate Program Ranks in Top Ten

The *U.S. News and World Report*'s 2001 rankings for graduate studies are out, and both AAE and the university's overall engineering programs are once again in the top 10. The Aeronautical and Astronautical Engineering program ranked eighth while the University of Illinois at Urbana-Champaign's engineering program tied with that of the California Institute of Technology for sixth place.

The magazine used various measures of academic quality to rank the nation's 219 graduate engineering programs. Engineering school deans and deans of academic affairs as well as corporate recruiters were asked to rank the quality of the programs. The number of graduate students accepted into each program was assessed, as well as their GRE and other scores. Another criterion looked at the ratio of full-time master's and doctoral students to full-time faculty members and the number of PhDs granted. A department's total research dollars and research dollars per faculty member were also analyzed. Specialty rankings within engineering were based on reputation: engineering deans were asked to identify the 10 schools with the best programs in each subject area, and those with the most nominations were selected.

A check of some categories for UIUC's sixth-ranked engineering program and that of first-ranked Massachusetts Institute of Technology reveals, respectively:

	UIUC	MIT
Reputation ranked by academics:	5	1
Reputation ranked by recruiters:	8	1
1999 acceptance rate:	23%	30.3%
1999 PhD student/faculty ratio:	2.8	3.2
1999 engineering school research ($millions):	134.6	177.0
PhDs granted in 1998–99:	185	208

AAE Redefines Direction of Its Curriculum

The decade of the Nineties has heralded much change for the Department of Aeronautical and Astronautical Engineering as the department and its alumni advisers implemented revisions to its undergraduate curriculum. Has this exercise been worthwhile? Students who are taking courses under the revised curriculum agree that they come out of the program with a stronger ability to perform design and basic flight mechanics and that faculty members have taught them to "think outside the box."

The last major revision of the undergraduate curriculum occurred in the mid-1960s, according to AAE Professor **Lee Sentman** ('58), who co-teaches AAE 201, *Principles of Aerospace Systems*, with Professor **Victoria Coverstone-Carroll** ('85, MS '86, PhD '92). "The curriculum was heavily slanted toward the basic fundamentals of aerospace engineering," said Sentman. "The current revision shifted the emphasis from basic principles to

continued on next page

the application of these principles to systems design."

The revisions are a culmination of several factors, foremost of which is the desire of the department to turn out students whose knowledge is relevant to the aerospace industry. When the 1990s began, the industry was on the verge of a particularly severe, cyclical downturn; by mid-decade, student numbers had started to decline. "The biggest outside influence really came from industry, when they reviewed our curriculum," said Professor Wayne Solomon, who was AAE department head when the whole process began around 1990. "We needed to get some of the more important changes which our industry expected into the formal curriculum. The biggest change was the incorporation of design at all levels of the curriculum." Another objective of the revision was to provide students with basic flight mechanics, said Professor **Michael Bragg** ('76, MS '77), AAE's current department head.

The AAE Advisory Board played an important role in the curriculum redesign. With the board's input, the department ultimately decided to give up some depth of material in some courses to make room for new additions to the curriculum.

Solomon continued, "(The revision) was accomplished by adding courses in the freshman, sophomore, and senior year that are taught with the elements of engineering design. This framework very explicitly lets the student know that application of the core courses is encouraged and, indeed, expected." Traditionally at AAE, the first two years of an undergraduate's course-load are devoted to general technical education requirements, and only in the third year will a student begin taking any AAE courses. Incoming first-year students who want a taste of AAE right away get it by taking a revamped (now also a Discovery) course, AAE 199, *Introduction to Aerospace Engineering*. Second-year students take AAE 201, *Principles of Aerospace Systems*, which introduces them to aerospace systems design.

A second impetus behind the revision was the realization that there wasn't enough attention given to design and systems-based engineering. The senior design component now covers two semesters instead of one. "With the expansion of AAE 240/241, *Aerospace Systems Design I and II*, there's now a real emphasis on design in the curriculum," said Professor John Prussing, AAE's chief undergraduate adviser. "There's also more emphasis on systems engineering, and AAE 240 and 241 have enough writing in them to satisfy the general education requirement for advanced composition."

The students who were polled were not enthusiastic about AAE 240. "I didn't like that the course combined aircraft and spacecraft. In my opinion, the design part should be a full year," said Whitney Knudson, who just graduated in May 2000. According to Bragg, the curriculum redesign process is not static. "The faculty plan to continue refining the new curriculum, and the design sequence will continue to receive attention. Starting the team design projects earlier is under consideration."

AAE 241 was another matter entirely. The consensus was unanimous that although this was a course that required a lot of work, it was a great class. "It seems to have encompassed everything I have learned in my other classes," said Lesly Ramirez, a senior. Knudson: "Although I heard nightmare stories about it, I have really enjoyed it. It's the first course I've taken where I can actually see 'real world' applications. It's more than book learning: it's working as a team,

New AAE courses

201 Principles of Aerospace Systems
204 Introduction to Aerospace Dynamic Systems
206 Flight Mechanics
270 Computational Methods in Aerospace Engineering

Revised AAE courses

199 Introduction to Aerospace Engineering (now a Discovery course)
210 Aerodynamics I, Compressible Flow (was AAE 212)
211 Aerodynamics II, Incompressible Flow (was AAE 213)
220 Aerospace Structures, I (was AAE 224)
221 Aerospace Structures, II (was AAE 225)
240 Aerospace Systems Design, I
241 Aerospace Systems Design, II
250 Aerospace Dynamic Systems, I (was AAE 255)
251 Aerospace Dynamic Systems, II (was AAE 254)

To earn a bachelor's degree from AAE, a student must complete 134 semester hours, 100 from required courses and 34 hours from electives (6 hours of AAE electives, 3 hours of technical, 18 hours in the social sciences and humanities, with the remaining 7 hours as free electives).

organizing your time (and others!), research methods, contacting people in industry (who aren't always cooperative), and technical writing." This course "is what every freshman looks forward to when he or she first sets foot on the UI campus as a student," said Jim Liao, another May graduate.

A third reason that prompted the department to take a critical look at its offerings was that "Under the old curriculum, incoming AAE students may not take a course in their home department until their junior year," said Coverstone-Carroll. With the redesign, faculty see students every year, and students feel they are a part of the AAE department.

The revision has spread the curricular content over all four years, benefiting both the faculty and students. "Before the redesign, the students were hit with the 'hard-core curriculum' by the time they entered AAE," said Coverstone-Carroll. ". . . (Now) the faculty can talk to students about the whole physical system; for example, of aircraft, spacecraft, and launch systems. Then in their junior year, they can get into the nitty-gritty behind the big picture."

In their sophomore year, students are now required to take AAE 201, *Principles of Aerospace Systems*, and AAE 204, *Introduction to Aerospace Dynamic Systems*. In their junior year, the students take another new course, AAE 206, *Flight Mechanics*. "I really enjoyed AAE 201 because it was my first aero class and gave me a broad perspective of my chosen field," said Ramirez. Liao said AAE 201 introduced him to the very basics of space dynamics and fluid dynamics. "Throughout my college career, I've always used the text from 201 as a reference," he said. Ramirez allowed that it seemed "rather vague in how (AAE 204) would help me while I was taking it, but it proved useful in later classes."

There are now also required courses outside of AAE. Students must take ECE 205, *Introduction to Electric and Electronic Circuits*; its attendant lab, ECE 206; and MATSE 346, *Physical Metallurgy for Engineers*. Previously, these had been elective courses.

The full curriculum has now been implemented. In fact, the department has even added a new required course since the implementation, AAE 270, *Computational Methods in Aerospace Engineering*. "After the redesign, there was the realization that there was a computational hole in the curriculum," Coverstone-Carroll said. Said Sentman, "Industry today uses a lot of numerical tools in its work. AAE 270 gives students the background to use these tools intelligently."

"(Professor) Eric Loth and I introduced this course a couple of years ago," said Professor Philippe Geubelle. "So far, it has been taught as an elective but this fall semester (in 2000), it will be required for seniors. The emphasis is on hands-on programming exercises. The students are also exposed to some commercial packages (such as Ansys for the finite element method)." Geubelle said this course will serve as the foundation for more advanced and specialized numerical methods courses later on.

The department's objective of the redesign, to give students an improved and updated education, seems to have succeeded. The students are pleased, too. Said Liao, "Many things (I have learned) come to mind but I'll emphasize the important ones. . . . First off, the basic principles of aircraft dynamics and design. Secondly, the research methods that were acquired through research with AAE professors. Finally, and most importantly, leadership skills and team work. In today's engineering environment, it is critical to work efficiently in a team environment, and it takes a great deal from an individual to cooperate with another. And more importantly, I've learned to plan things ahead of time."

Knudson thinks it has been worthwhile, too. "I think that I learned how to 'think outside the box.' If the first solution isn't correct, you have to find an alternate way to get an answer. I've also learned a lot about working in a team—not just from AAE 241 but also from homework/study groups."

Ramirez said she learned discipline and versatility. "I think the most important thing that I have learned is how to do lots of work. Discipline, I guess. I hope I take away versatility from this major. I have learned so many different areas of engineering. . . . I would hope that if I were ever asked to do something related to a certain field, I would at least have some knowledge of it."

What will be next? Several faculty members recently received a grant from the university's Educational Technologies Board. They will use information technology to better integrate the experimental part of the curriculum with the theoretical courses. "Curriculum is an evolving thing and we are always fine-tuning it," said Solomon. "The biggest challenge ahead is an honest self-evaluation and feedback into the system."

—Alison Fong Weingartner, editor

"Phoenix" Rises To Capture Third Place in D/B/F Competition

Less than three weeks before the fly-off date, the University of Illinois at Urbana-Champaign's entry to the 1999/2000 Design/Build/Fly competition did the unexpected—it crashed to smithereens.

However, from that debacle, the 19 students were able to come up with a new plane, aptly named "Phoenix," which went on to take third place out of a field of 28 teams. "Our design for this year was a twin-motored monoplane that had the capacity to carry eight liters of water," said **Jason Merret** ('99), the team leader**.** The competition requirements change from year to year so engineering students are challenged to build a new aircraft each year.

"The name Phoenix came from the crash, since the airplane rose up from its ashes to live again," Merret said. "We crashed on March 19, 2000," he continued. "After building a new airplane, the team flew less than one month later. (The fly-off took place on April 15 and 16 in Wichita, Kansas.) Some of the internal structure was corrected to prevent any problems, but the aircraft was essentially the same. It flew exactly like the other aircraft although it was slightly heavier."

Project leader Jason Merret examines the wreckage of the D/B/F team's plane, which crashed less than one month before the competition. The team was able to build another plane, which went on to take third place.

He said this year was "a really good year" for the Illinois team, which is advised by AAE Professor Emeritus Kenneth Sivier. "The team was composed mainly of underclassmen (14) led by a handful of upperclassmen (5). The underclassmen all learned a lot and will be ready to continue the team next year." On the team were Christie Bozman, Justin Ford, Starsha Johnson, Tracy Kidd, Karl Klingebiel, Chris Lamarre, Eunice Lee, Carey Lunsford, Jason Merret, Shalin Mody, Robert Quirk, Michael Rynne, Jessica Schiller, Mike Sexauer, Leah Stefanos, Joseph Zimmerman (all from AAE); Vijay Ramasubramanian (AAE/ECE); Robert Tschanz (ME); and Andrew Young (FAA).

The fourth year of competition again elicited several overseas entries, with 2 teams from Turkey, 2 from Canada, and 1 from Italy. According to Merret, 28 teams arrived at the fly-off at Cessna Field, but only 24 teams ended up flying, with 19 teams scoring. This year's first- and second-place winners were the same as last year's: Utah State University took first prize, with Oklahoma State University taking the second.

The competition is sponsored by the American Institute of Aeronautics and Astronautics Foundation, the U.S. Office of Naval Research, and Cessna Aircraft Company, which hosted this year's event.