NEWSLETTER FOR ALUMNI, FRIENDS AND STUDENTS

SPRING 2000

THE STREAMLINE

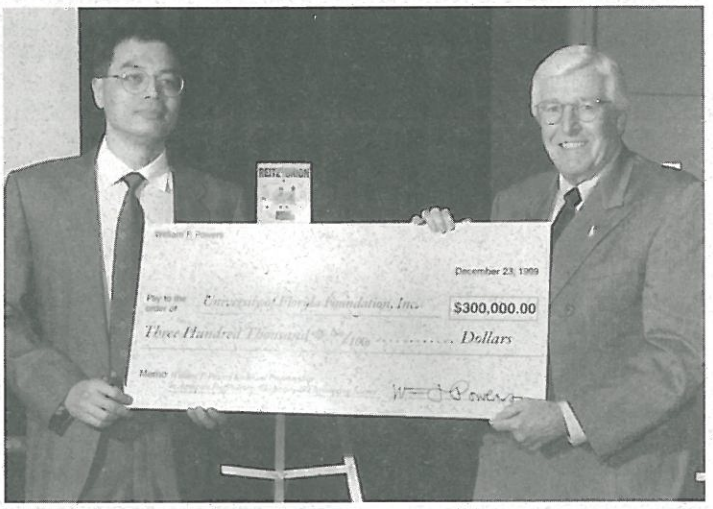
AEROSPACE ENGINEERING, MECHANICS & ENGINEERING SCIENCE

WILLIAM F. POWERS ENDOWED PROFESSORSHIP FOR AEMES

The University of Florida Engineering Advisory Council (EAC) meeting was held Feb. 17-18. The meeting commenced with a banquet on Feb. 17, where **Dr. William F. Powers**, Vice President for Research at Ford Motor Company and University of Florida Aerospace Engineering Alumnus, was the guest of honor and speaker. On Feb. 18, he presented the Aerospace Engineering Department with a $300,000 check to establish the William F. Powers Endowed Professorship in the AeMES Department. With a $150,000 state match, the endowment will total $450,000. This marks the first endowed professorship in our department. We are extremely grateful for this generous contribution.

The endowment will allow the AeMES Department to attract and retain truly talented teachers and scientists who can proudly hold the Powers Professorship. Additionally, it will enhance our national standing among the best departments of aerospace engineering.

Dr. W.F. Powers giving a speech at the EAC meeting.



Dr. Shyy receiving the endowment check from Dr. Powers.

Dr. Powers has been with the Ford Motor Company since 1979. He has been serving as the Vice President of Research since 1996, after serving as the Executive Director of Information Technology as well as the Executive Director of the Ford Research Laboratory. Bill earned his B.S. in Aerospace Engineering from the University of Florida in 1963, after which he received a Ph.D. in Engineering Mechanics from the University of Texas at Austin. His career includes numerous awards and appointments to prominent positions. He has served as Editor of the Journal of the Astronautical Sciences and Associate Editor of the AIAA Journal of Spacecraft and Rockets, Journal of Optimization Theory and Applications, Optimal Control Applications and Methods, and IEEETransactions on Automatic Control Systems Magazine. He is a member of the National Academy of Engineering, a fellow of the Institute of Electrical and Electronics Engineers, and a fellow of the American Society of Mechanical Engineers.

HIGHLIGHTS

Department Chair: Wei Shyy

Editor:
Loc Vu-Quoc, Tel: (352) 392-6227,
E-mail: vu-quoc@ufl.edu

Associate Editors:
Roger Tran-Son-Tay
Peter Ifju

Design and layout:
Ramji Kamakoti

AeMES Web page URL:
http://www.aero.ufl.edu/

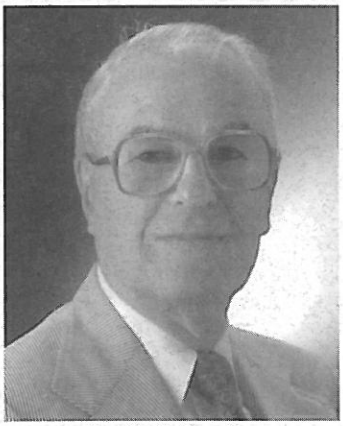
Millsaps-Taylor Memorial Lecture by Prof. Stephen C. Cowin, City College of New York, Spring 2001

UNIVERSITY OF FLORIDA

He is a foreign member of the Royal Swedish Academy of Engineering Sciences, a member of the ITS America Board of Directors, as well as numerous other government, university and professional societies. For further information, we refer the readers to the Fall '96 issue of *The Streamline* for a story on Dr. Powers, who came back to UF to give the Benton League.

During his speech at the EAC banquet, he elaborated on how Ford Motor Company supports research at major universities. He explained the four basic forms of philanthropy. First, he explained how Ford participates in "brick-and-mortar philanthropy." This is money that the company spends on field houses, libraries, and endowed chairs. The second form includes industrial sponsorship of generic research, where the results are reported in the open literature. The third category includes recruiting and continued education programs that place an emphasis on the university's primary product—educated people. Finally, there is the category where most of the industrial money is spent, near-term problem-solving. He explained that industry looks at the university as a fire department that comes to the rescue when problems need to be solved in an efficient manner. In this category alone, Ford has over the past four years provided, to the University of Florida, more than one million dollars on the development of strain sensitive paint for experimental stress analysis. He also speculated on how Ford's industrial sponsorship may change in the future as a result of new technologies such as the internet.

AeMES faculty received Panetti-Ferrari Prize and Gold Medal



Dr. D.C. Drucker

It is our pleasure to announce that **Grad. Res. Prof. Emer. Daniel C. Drucker** has been awarded the *1999 Prof. Modesto Panetti and Prof. Carlo Ferrari International Prize and Gold Medal* for his distinguished research in Applied Mechanics by the Academy of Sciences of Turin. The Prize amounts to 50 million Italian lira.

The Prof. Modesto Panetti and Prof. Carlo Ferrari International Prize was awarded to 1999 for the first time. Formerly, before the fund was increased by Prof. Ferrari's generous legacy, the Prize was called "Prof. Modesto Panetti International Prize and Gold Medal."

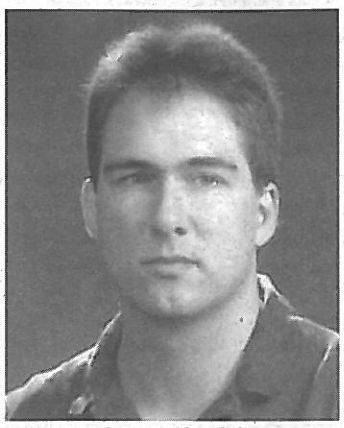
Historically, the Prof. Modesto Panetti Prizes have been awarded to outstanding mechanicists: G.I. Taylor (1958), J.M. Burgers (1960), W. Prager (1963), M.J. Lighthill (1965), C. Truesdell (1967), N.I. Muskelishvili (1969), W.T. Koiter (1971), R.S. Rivlin (1975), P. Germain (1978), G. Grioli (1982), L. Crocco (1985), R. Hill (1988), and G.I. Barenblatt (1995).

Due to the health condition of his wife, Dr. Drucker could only attend the award ceremony in spirit. He jokingly said that before lira were converted into dollars, he enjoyed the status of a multimillionaire.

AeMES faculty won ONR Young Investigator Award

Assist. Prof. M. Sheplak was conferred The Young Investigator Award by the U.S. Office of Naval Research (ONR). This year, 26 researchers were selected for the award from a pool of 178 applicants nationwide. The award provides up to $150,000 per year for three years to pay for research operating costs.

Dr. Sheplak's research focuses on the development of a micro-electro-M. mechanical systems (MEMS)-based measurement device to provide feedback control information regarding the shape and state of the gaseous cavity surrounding a high-speed supercavitating vehicle (HSSV). The high velocity of HSSVs is made possible by supercavitation, which results in the entire vehicle being encapsulated in a gaseous cavity or bubble, thus greatly reducing wetted friction drag. Given that the gaseous cavity leads to a reduction in wetted viscous drag, it provides a mechanism for guidance and control of the vehicle. The main goal of the proposed research is to combine multi-domain design methods, novel MEMS device structures, and advanced digital signal processing techniques to develop a distributed acoustic-based cavity monitoring system to provide feedback to an active cavity control system. This subtask is part of a larger ongoing ONR project with Drs. Cattafesta, Kurdila, Shyy, and Nishida (ECE) aimed at developing technology for the modeling and control of HSSVs.



Dr. M. Sheplak

AeMES's new Anechoic Aeroacoustic Test Facility

The University of Florida gas been awarded $287,212 from the DOD Defense University Research Instrumentation Program 9DURIP). The one-year award, together with an additional $50,000 in matching funds from the College of Engineering and the Department, will be used to construct an anechoic aeroacoustic test facilty that will promote both existing and future Air Force/DOD research projects. The PIs are **Drs. L.N. Cattafesta III, M. Sheplak, B.F. Carroll,** and **A.J. Kurdila**.

The test facility consists of a versatile anechoic chamber possessing a test volume of about 25' x 17' x 11' and a low-frequency cutoff of 100 Hz. It will leverage the recently completed high-pressure air facility to provide supersonic (and subsonic) jet flows and will be located in the basement of the Aerospace Building. The test chamber will have removable floor wedges to provide either anechoic or semi-anechoic test environments. It will be equipped with a 5 DOF traverse to allow a myriad of detailed flow noise and vibration measurements. In particular, the experimental capabilities of this facility will include full-field flow measurements via PIV automated sound-intensity mapping and source localization capabilities via beamforming arrays, and complete surface vibration characterizations via scanning laser vibrometry.

The tools described above will provide a unique capability to study fundamental aeroacoustic problems and structure-borne noise phenomena. The uniqueness stems from the combination of low cutoff frequency (100 Hz), large chamber size, a high-speed flow capability, the ability to switch between a semi- and fully-anechoic chamber, and advanced instrumentation for flow, acoustic, and vibration measurements. Most existing anechoic chambers, particularly the few available at universities, have only some of these features, thereby limiting their utility. Pertinent applications of the facility include aeroacoustics, structural acoustics, and industrial noise/vibration control. Aeroacoustic applications include jet noise and mixing, self-sustaining flow oscillations, fluid-structure interactions (e.g., flutter), and noise from, for example, rotating machinery. Potential structural acoustic applications include control of radiated noise from vibrating structures and vibration control. Finally, industrial noise and vibration control studies of large machinery can be conducted in the facility.

Dr. Lou Cattafesta

In addition to the fundamental research issues of interest to the military, the proposed research will have an immediate and tangible effect on research-related education at the University of Florida. An industrial advisory board to our Aerospace Engineering and Engineering Science

degree programs identified acoustics as an area requiring further attention. The award will help produce a viable, multidisciplinary flow noise and vibration control research and education program.

Collaboration between AeMES and Russian colleagues

The city of Zheleznogorsk did not appear on the maps of Siberia until recently because it was a nuclear facility built in the mid-'60s to enrich plutonium for military applications. Several years after this small community appeared in the middle of a vast and harsh environment, with an average population density of only 2.2 inhabitants per square kilometer and man-high snow every winter, a satellite development facility was added to take advantage of the security features already in place.

AeMES faculty with Russian colleagues.

A few years ago, the nuclear plant was downgraded to produce only the electricity needed to maintain the community. Since then, security has been relaxed somewhat, even to the point that Westerners have been allowed to visit. Yet, the city remains surrounded by a barbed wire fence and a checkpoint that thoroughly verifies and registers the visitors' entrance. Last August in Zheleznogorsk, Drs. Shyy, Fitz-Coy, and Segal were the guests of the NPO-PM, the manufacturers of over 1000 successful satellite launches.

The visit was initiated by a group of scientists from Russia that included members of NPO-PM, the Siberian Aerospace Academy and members of the School of Cosmonautics from Zheleznogorsk. The purpose of the visit was to develop projects of common interest in the areas of space education and small-scall satellite development. In December, members of these institutions returned to visit our department in Gainesville. Funding for the first round of interaction was provided by Mr. A. Arbuckle of Tampa, Fla.

The Siberian Ac ademy of Aerospace (SAA), located in Krasnoyarsk, the Siberian capital, prepares undergraduates and graduate students for a broad range of air- and space-related activities. The NPO-PM began as a satellite manufacturer but has developed educational facilities with several of its members assuming teaching responsibilities in conjunction with SAA. In turn, the School of Cosmonautics, which is licated in Zheleznogorsk and is part of the Krasnoyarsk Regional Talented and Gifted Center, represents a unique educational intitiative. The center maintains a list of approximately one hundred thousand fifth- through eight-grade students from the entire region who have been identified by their teachers as having superior potential. These capabilities are determined using a broad range of criteria beyond strictly scholastic performance. Every year about 100 to 200 students are selected from this list to attend a two-week examination session, at the end of which up to 20 students are selected to continue high school studies at the School of Cosmonautics.

The visit in the Krasnoyarsk area included meetings at SAA, NPO-PM and the School of Cosmonautics. It was a useful interaction to understand each other's goals and mission. In an economy as centralized as the former Soviet Union'sm even higher education centers such as SAA were devised to serve a narrowly determined economic role. Therefore, the academy is geared to educated graduate students for a narrow specialty to have an immediate impact on industry. Since our educational system's goals are to provide the graduates with a broad-based engineering knowledge, most of the interactions held at both SAA and NPO-PM revolved around understanding each other's educational structures.

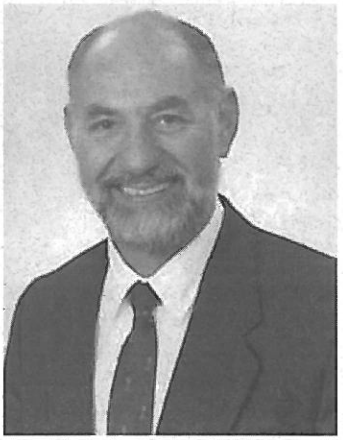
Visiting Zheleznogorsk was a pleasant surprise considering the town's general aspect in comparison with other cities in Russia. Clean and well maintained, the city has large green spaces and a beautiful artificial lake. A large theater resides in the center of the town, with a pleasant architecture and an open space surrounding it. In one of the town's squares, a Geiger counter displays the current level of radiation much like the time and temperature are displayed in some American shopping centers, presumably with the same level of accuracy.

In contrast, Krasnoyarsk displays all of the negative effects of former Russian economy: dilapidated buildings, bad roads, dust, etc. Despite all these negative aspects, a particular charm is brought to this region by the river Enisei as it flows through the city displaying beautiful scenery with birch forests on its banks and often changing landscape in its meandering course.

We have been received with extreme courtesy and friendship and appreciate the hospitality.

Millsaps-Taylor Memorial lecture by Prof. Sia Nemat-Nasser

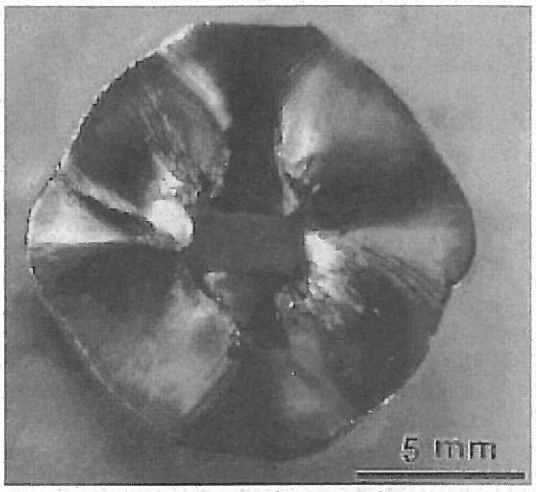
On Fri., 28 Jan. 2000, Prof. Sia Nemat-Nasser, John Dove Isaac Chair in Natural Philosophy, Applied Mechanics and Engineering Science, University of California at San Diego, came to UF to deliver the Millsaps-Taylor Memorial lecture titled *"Dislocation-based dynamic flow stress of BCC, FCC, and HCP metals over temperatures from 77 to 1300K."*



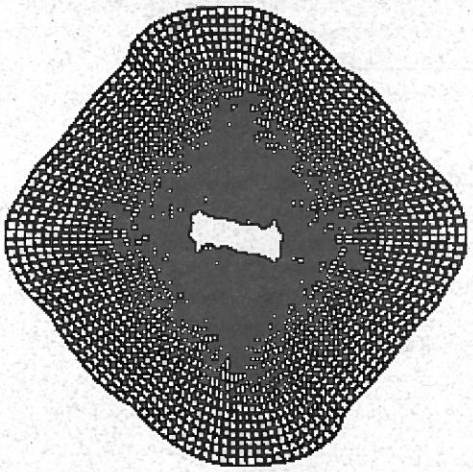
Dr. Sia Nemat-Nasser

Dr. Nemat-Nasser is also the currect Director of the Institute of Mechanics and Materials, Director of the UCSD's Center of Excellence for Advanced Materials (CEAM), Editor-in-Chief of the international journal *Mechanics of Materials*, and past Chair of the ASME Materials Division. He received his BS degree from Sacramento State College in 1960, and his MS degree from UC Berkeley in 1961. Dr. Nemat-Nasser then returned briefly to the Sacramento State College as an Assistant Professor in Civil Engineering in 1961-1962. After that, he rejoined Berkeley and earned his Ph.D. degree in 1964. After a stint of two years as a Postdoc at North-western University, he joined UCSD in 1966, where he stayed until 1970. He rejoined Northwestern in 1970 as Professor of Civil Engineering. In 1985, Dr. Nemat-Nasser moved back to UCSD, where he remains today.

He has written two books and edited or co-edited some 14 other books, organized 35 workshops, published some 300 papers, and delivered some 400 lectures in many countries. Dr. Nemat-Nasser received numerous international honors and awards; a few notable ones are cited: He is a Fellow of the American Academy of Mechanics, a Fellow of the ASME, a Fellow of the Society of Engineering Science. He was the past President of the Society of Engineering Science and the American Academy of Mechnics. Dr. Nemat-Nasser is not only an accomplished researcher with an international reputation, he is also an outstanding teacher who was bestowed with the Teacher-of-the-Year Award and the Outstanding Teacher Award from the College of Engineering at UCSD. In 1996, in honor of his 60th birthday, his colleagues and former students organized



Collapse of a single-crystal copper tube: Experiment



Collapse of a single-crystal copper tube: Simulation

an International Symposium on Deformation Characteristics and Modeling of Materials in Sendai, Japan.

Dr. Nemat-Nasser's research covers a wide area, including the dynamic behavior of ductile and brittle materials; environmental effects and aging of polymeric composites; physically-based computational modeling of saturated soils; a new approach to structural reliability in fatigue failure; dynamic response, residual strength, and failure modes of rock, concrete, ceramic, ceramic/metal composites, and ceramics-metals-polymeric composite hybrids.

Before his lecture, Dr. Nemat-Nasser was introduced to the audience by Graduate Research Prof. Dan Drucker—whose own work, together with the work of Prof. Emer. Larry Malvern and Prof. Emer. Charles Taylor, were the source of admiration and inspiration for Dr. Nemat-Nasser. The focus of the lecture was dislocation-based plasticity for a certain class of metals with the BCC, FCC, and HCP crystal structures. The origin of dislocation-based plasticity dates back to 1934 in the publications of G.I. Taylor—for whom this lecture series was named after (together with the founder of the lecture series, the late AeMES Prof. Knox Millsaps)—and of two Hungarians Orowan and Polanyi. Dr. Nemat-Nasser jokingly tolf the audience that he had to mention the contributions of the Hungarians since his own wife is also Hungarian. Essentially crystal dislocation gives rise to plastic deformation, while resistance to plastic flow gives rise to flow stress and hardening. The approach adopted by Dr. Nemat-Nasser, illustrated using Tantalum, an expensive metal used in military and civilian applications, is to combine experiments and micromechanics, while being guided by first principles, to arrive at a model with parameters that can be estimated based on the structure of the crystal, and then tuned through experimental data.

Dr. Nemat-Nasser has devised novel experimental techniques that can be used to develop isothermal flow stress of metals at various strain rates, up to 10^4 and greater. Using these experimental capability, it is possible to quantify separately various phenomena, such as temperature effects, strain-rate effects, and the material hardening effects. The methodology can be used directly to develop physics-based constitutive models for various polycrystalline metals. It can also be applied to first characterize single-crystal plasticity and then by using an averaging technique, such as the Taylor averaging method (which satisfies compatibility but not equilibrium), to obtain the overall constitutive relations of the corresponding polycrystal. There are many averaging methods (such as the self-consistent method, the Sacks method that satisfies equilibrium but not compatibility) for this problem. Dr. Nemat-Nasser found that the Taylor averaging method provided results in good accord with experimental data. What he proposed for tantalum (and many other metals, e.g., molybdenum, niobium, vanadium, stainless steels, copper and titanium) was a model that needed a few experiments to compute a few parameters. What was new was his novel experimental method that can separate the different effects that occurred simultaneously in the deformation process. The lecture was finished with an illustration of the application of the model to numerically simulate the large deformation of a single-crystal copper tube that had been dynamically collapsed. (see figure)

Dr. Nemat-Nasser came to San Francisco in July 1958 with $200 of traveller's checks and a one-way ticket, after two years of undergraduate study at the University of Tehran. He tried to get admitted to Berkeley, the dream place to be as viewed by students from his university, but July was too late to apply for admission. The late '50s were the years of turmoil in Iran, with the Shah already in power. From July to August 1985, Dr. Nemat-Nasser worked as a dishwasher at the Huberg resort north of Sacramento. He then applied to enter Sacramento State College and was admitted on probation based on his excellent undergraduate record at the University of Tehran. Three years later he returned to this college as an Assistant Professor, as mentioned above, and was invited to join an interesting group of faculty (that included the Dean who admitted him to the college on probation) known as the "Bird Watchers," named for their tendency to sit around and philosophize on the matters of their time. In his childhood, Dr. Nemat-Nasser was a self-motivated student who was not pushed by his parents. His father was a French-trained chemist and his mother the first actress and a well-loved movie star in Iran. When his mother died three years ago, many Iranians mourned her death. He recalled the difficult educational environment during this time, before the petroleum economic boom in Iran. At Berkeley, while working part-time, Dr. Nemat-Nasser completed his Ph.D. in two years and moved rapidly up the ranks in academia.

Dr. Nemat-Nasser's lecture generated excitement and several questions from the audience, which had to be interrupted only by the need of the lecture room for another class. The participants continued their discussion during the customary coffee-and-cookies refreshment that followed the seminar.

Taylor/Millsaps Lecure in 2001: Prof. Stephen C. Cowin

Prof. Stephen C. Cowin will present the Taylor/Millsaps Lecture in spring 2001. He has been selected based on his scholarly activities in the field of Biomechanics. Prof. Cowin is the City College of New York (CUNY) Distinguished Professor of Mechanical Engineering.

Dr. Cowin received a B.S.E. and M.S. in Civil Engineering from Johns Hopkins University in 1956 and 1958 respectively and a Ph.D. in Engineering Mechanics from Penn State University in 1962. He is a Fellow of AAM, AIMBE, ASME and AAAS. He is a recipient of the Melville Medal from ASME, which was awarded in 1993, and the H.R. Lissner Medal from ASME awarded in 1999. He was honored with the European Society of Biomechanics Research Award in 1994 and the Best Paper Award from ASME Biomechanics Division in 1992.

Dr. Cowin's research interests include mechanics of materials, particularly in the determination of the influence of microstructure on the gross mechanical behavior of granular composite, and biological materials. His current publications are in orthopedic biomechanics and anisotropic elasticity.

DEPT NEWS

Honors and awards

Prof. and Vice Provost G. Hemp received the Outstanding Civilian Service Award, the highest civilian award from the Department of the Army.

Dr. P. Hubner was promoted to Assistant Adjunct Professor in fall '99 while keeping a partial appointment with the department.

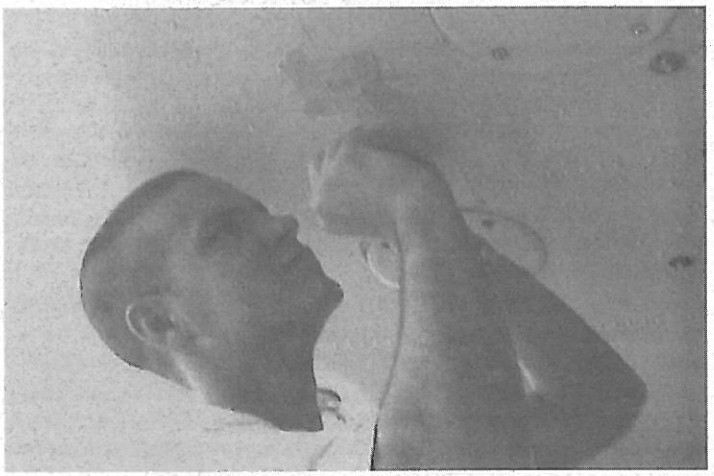
Prof. W. Shyy was elected Fellow of the American Society of Mechnical Engineering. Dr. Shyy has also agreed to serve as one of the two general editors of the Cambridge Aerospace Series published by Cambridge University Press. The goal of this series is to publish scholar texts related to aeronautical and astronautical engineering. About 10 books have been published to date.

TEACHING ACTIVITIES

AeMES Cessna 172: Flight Test Engineering

The department operates a four-passenger Cessna 172M, which is used in each of the three aspects of university education: teaching, research and service. This article will discuss the use of the Cessna in our undergraduate teaching curriculum.

The principle role of the airplane in the undergraduate program is with the course *Flight Test Engineering* (FTE). The FTE course, given during the spring semester, provides the undergraduate Aerospace Engineering students with design opportunities, team efforts, and practical field experience. The course provides interdisciplinary interaction in our curriculum and is supported by other courses in the department. Specific activities are described below.



A student mounting a strain-gauge rosette on the wing.

The activities of FTE were developed initially in collaboration with NASA engineers and flight test pilots and employ many of the procedures used in a NASA flight test program. The students, working in teams, conduct "standard classic" flight tests such as climb performance, air speed calibration, CL/alpha, i.e., lift coefficient vs. angle of attack, tests and others. At the same time, the students, in teams, develop new experiments for future use. As an example, a recent FTE team coordinated the mounting of strain gauges on one of the wing struts of the Cessna. During a flight test, the students can monitor the force in the strut during various aerodynamic maneuvers, such as a 60-degree bank that results in a 2G force, i.e., a doubling of the straight and level force in the strut. The test involved students from the Experimental Methods course, and is of interest to the students in Aerospace Structures.

In addition to making strain measurements during flight, the aircraft is equipped with pressure tubes. Both wings of the Cessna are configured with 30 pressure tubes running through the wings from couplings mounted on the lower surface of the wing near the support pylons (described below) to inside the aircraft, where they are connected to a pressure scanner for any tests involving pressure measurements. Several of these experiments are described below.

Dr. E. Walsh

An important aspect of FTE is the interaction with other elements of the aerospace curriculum. Students of FTE are working with the instructor and students of the course Aerospace Structures 1 to obtain in-plane strain measurements on a section of the lower surface of the airplane wing located between two wing ribs and two wing spars in an area that should be amenable to analytical calculation of wing skin shear strains, subject to expected normal pressure distributions. The pressure distribution information necessary to predict the loading of the wing surface for the shear strain calculations can be obtained from a pressure belt positioned around the wing airfoil (an interesting experiment in itself, which will be described in a future issue of *The Streamline*). FTE students will coordinate the location, mounting, and wiring of the gauges and provide a help service for in-flight measurement of structural strains. Aerospace Structures students will make the flight, obtain the strain data, reduce and analyze the strain data, and compare the results with analytical predictions obtained by the class in their academic studies. Of course, wing strut strain measurements, as described above, can also be used for comparison with analytical results by the structure class. Future tests will include strain measurements on sections of the fuselage.

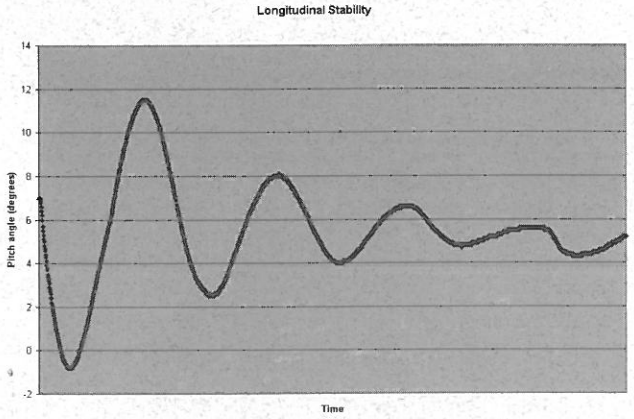
Another collaborative effort between FTE and the Aero curriculum involves Stability and Control. FTE is involved with a test to determine the longitudinal dynamic stability of an aircraft. The FTE class will demonstrate the capabilities of the measurement of pitch, altitude, and airspeed necessary to determine the longitudinal or symmetrical stability of the aircraft. The Stability and Control class will plan and fly the flight, record and analyze the data, and present the results to the class.

There is another interesting test that the airplane is equipped for that is particularly useful for the new aerospace students in the Introduction to Aerospace Engineering course. The test is flow visualization. A small Industrial CCD video camera is placed in a special mount on the vertical stabilizer of the aircraft and is directed toward the upper surface of the right wing. Three rows of yard tufts are taped to the upper wing surface. During straight and level flight, the yard tufts are straight and steady in the direction of the airflow over the wing. As the angle of attack of the aircraft increases, there is a point where flow separation occurs near the trailing edge of the aircraft, which is observed as a somewhat sudden random oscillation of the row of tufts nearest the trailing edge. Ss the angle of attack increases, the line of separation, i.e., the line of turbulent behavior

The AeMES Cessna 172M.

of the tufts, moves forward toward the leading edge of the wing. At the point of stall, all of the lines of tufts are in random oscillation. This is a vivid demonstration of the conditions that lead to the stall of an aircraft.

There are two hardpoints on our Cessna, built into the aircraft by Cessna at the time of manufacture, symmetrically placed under each wing for the attachment of airborne experiments. They are used to hold sample airfoils that are equipped with pressure taps for measurement of airfoil pressure distributions during flight maneuvers and other tests involving attached equipment, such as our five-hole pitch and yaw probe, which will be described at length in a future issue of *The Streamline*. The aircraft equipment also includes three GPS receivers and a three-axis gyroscope.



Results of a longitudinal stability test of the Cessna.

A very new aspect of FTE is the capability to telemeter to a ground station all of the experiments that, until now, were only measured and monitored on the aircraft. Pressure data from either the pressure belt, the five-hole pitch and yaw probe, or an airfoil section, along with GPS data, three-axis gyro data, and strain gauge data are collected in a multiplex box where they are combined and sent to a Vertical Blanking Interval (VBI) encoder in which the data is inserted in the VBI of the CCD television picture signal. The result is the transmission of a video signal only that contains all of the digital data encoded into the unused horizontal sweep lines of the picture. At the ground station, part of the GPS signal is directed toward a tracking-receiving antenna, thus automatically keeping the receiving antenna aimed toward the airplane. The experimental data is split from the received signal and the appropriate test displayed along with the video signal on a computer monitor in the form of a virtual instrument (VI).

All of the electrical power required for the in-flight experiments is provided; no aircraft power is used. The primary power source is a 12V DC 65 AH gelcell battery. Much of the equipment used either has internal battery power or can be energized by the gelcell 12V DC source. For any equipment that required 60 cycle, 120V AC power, we use a Pure Sinwave 12V DC to 60 cycle 120V DC inverter.

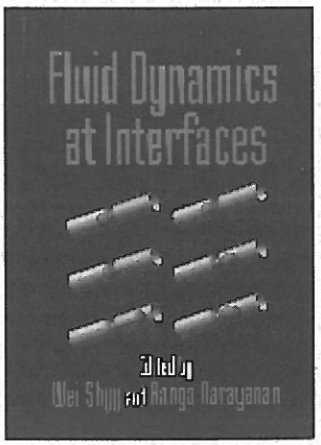
Much of the equipment described in the above sections was obtained during two Instrumentation and Laboratory Improvement Program (ILI) grants from the National Science Foundation over the past several years. The most recent ILI grant provided for the development and installation of the telemetry system, which allows the test data obtained in the aircraft to be shared in realtime with the FTE students on the ground.

The AeMES Cessna 172 has been used in several interesting research and service projects that will be described in a future issue of *The Streamline*. For more information, please contact **Prof. E. Walsh**.

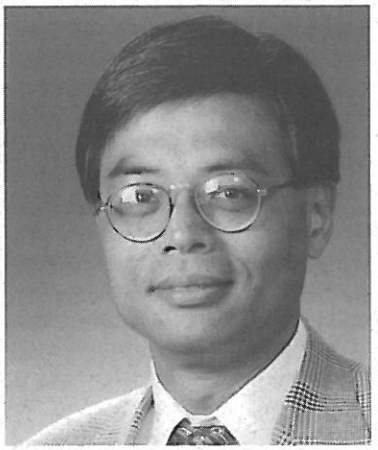
Service to profession

New Book: *Fluid Dynamics at Interfaces*, edited by **Wei Shyy** and Ranga Narayanan, Cambridge University Press, 1999, 461 pp.

Dr. W. Shyy, AeMES Prof. and Chair, co-edited with UF Chemical Engineering professor R. Narayanan the above book. Many of the significant issues in fluid dynamics occur at interfaces, that is, at the boundaries between differing fluids or between fluids and solids.



Cover of Dr. Shyy's book



Dr. Wei Shyy

Interfacial fluid dynamics is important in areas ranging from the flight of an aircraft to the flow of blood in the heart to chemical vapor deposition. The subject is also an area of active research and development, owing to improved analytical, experimental and computational techniques.

This book describes current research and applications in interfacial fluid dynamics and stability. It is organized around five topics: Benard and thermocapillary instabilities, shear- and pressure-induced instabilities, waves and dispersions, multiphase systems, and complex flows. Chapters have been contributed by internationally recognized experts, both theoreticians and experimentalists.

Because of the range and importance of topics discussed, this book will interest a broad audience of graduate students, faculty and reseachers in mechanical, aerospace, materials, and chemical engineering. As well as in applied mathematics and physics.

Collaboration with Kennedy Space Center

Welcome to our latest visitor, **Ms. Peggy L. Evanich**! Ms. Evanich joined us last September and will be staying a year with us. Ms. Evanich is employed by the Office of Space Science at NASA Headquarters in Washington, DC, where she is assigned to the Mission and Payload Development Division. In addition to her flight assurance duties in the division, she recently led the Office of Space Science in the successful implementation of ISO 9001, contributing to the overall ISO Registration of NASA Headquarters, the first U.S. government agency headquarters operation to obtain this distinction.

From August 1994 to July 1998, Ms. Evanich served as Director of the Payloads and Aeronautics Division at NASA Headquarters. As part of her Senior Executive Service Career Development Program, completed in June 1994, Ms. Evanich's assignments including serving as Deputy Division Director in the Advanced Programs Division at NASA Headquarters and serving as Deputy Director in the Technology Programs and Commercialization Office at the Kennedy Space Center.

Ms. Evanich has 27 years experience in aerospace research and technology development. As the Deputy Director, Space Research Division at NASA Headquarters, she directed the Agency's Space Research and Technology Base program, comprised of research programs in aerothermodynamics, space propulsion and power, space materials and structures, information technology, and space communications. Prior to that, as a program manager, she was responsible for directing the agency's life support technology program, as well as aeropropulsion research and

Ms. Peggy Evanich

development programs. As a researcher at the Glenn Research Center from 1974 to 1985, Ms. Evanich conducted studies in the areas of automotive and aircraft propulsion and aircraft icing, and managed the icing flight research program.

In her current duties at the University of Florida, Ms. Evanich hopes to seek out opportunities for University science and engineering research that can be developed into joint programs with NASA Centers, providing increased student involvement in a variety of NASA endeavors. However, the major component of her duties at UF is to assist the University in developing a stronger relationship with the Kennedy Space Center in support of KSC's efforts to transition to a *Spaceport Technology Center*. If successful, benefits will accrue to both the University of Florida and to NASA. It is anticipated that the University of Florida, a major force in science and engineering research, may realize increased involvement with NASA programs, providing additional educational opportunities for numerous students. Increased UF involvement in KSC research efforts will provide needed scientific and engineering expertise, and prestige, to the Kennedy Space Center. KSC will benefit by establishing close ties with researchers at the University of Florida, who may be called upon to assist in solving technical issues of prime importance to not only NASA, but to the space launch industry throughout the U.S.

STUDENT SOCIETY ACTIVITIES

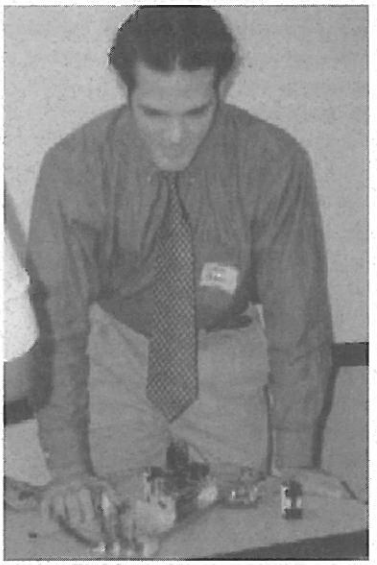
AIAA News

The student chapter of AIAA has been active and successful this semester. The AIAA display at the University of Florida E-Fair on Feb. 22-24 was a resounding success. The display included a wind tunnel that the AIAA members built from scratch to display a micro aerial vehicle (MAV), and a demonstration of temperature-sensitive paint. The display earned third place overall in four categories: Visual Presentation, Audience Participation, Oral Presentation, and Theme Integration. On Feb. 25, AIAA members travelled to Kennedy Space Center for a behind-the-scenes tour. The students visited the Orbitor Processing Facility Vehicle Assembly Building, Launch Control Center, Launch Pads 39-A and 39-B, Cape Canaveral Air Station, a Solid Rocket Booster Retrieval Ship, and the Space Station Processing Facility. This semester, AIAA has also made available a list of research projects for students interested in getting involved in AeMES research. Additionally, AIAA sponsored a presentation given by Boeing recruiters on how to improve resumes, how to act at the Career Fair, and interview tips. Currently, a tour to Pratt & Whitney in West Palm Beach is being considered. In addition, the micro aerial vehicle team is preparing for this year's competition on May 19-20 hosted by Arizona State. The University of Florida is the defending champion of the event and has recently made major design improvements to the MAVs.

The 2000 AIAA Southeast Regional Student Conference took place this year in Savannah, Ga. from April 13 to April 15. The AeMES Department and UF were well represented by one of the largest student delegations of 14 students. The conference gave students the opportunity to see what projects take place at other schools and to showcase their own work. The conference also included a talk given by a manager on the F-22 Program, a panel discussion with industry and NASA representatives, and a speech by astronaut Norm Thagard. The five AeMES students who presented at the conference were **Stuart Hoelle**, **Domenico Ruggiero**, **Andrew Sinclair**, **Jacob Williams** and **Samuel Wolfson**. Jacob Williams placed third overall in the Undergraduate Competition. The conference concluded with a breakfast, during which the officers from each school shared their activities of the past year.

BMES Design Competition

The Biomedical Engineering Society held its second annual Biomedical Engineering Design Competition Saturday, March 25, at the UF Brain Institute. The competition gave undergraduate students from universities around the country the option to design and prototype a device to help an individual in need. This year, participants included one team from Virginia Polytechnic Institute and State University, six from Duke University, and two projects from the University of Florida. The University of Florida was represented by John Louis Peach, a student in electrical engineering, by his project titled "The Multifingered Prosthetic Human Hand," and by James Mellman and William Robinson of Engineering Science for their work on the Removable Table for the Wheelchair of Ms. Marie Golden. Judges for the competition included Dr. David Jenkins, Dr. Roger Tran-Son-Tay, Ms. Iona Dy-Liacco and Mr. David Santamaria.



Student presenting a design.

The competition was a great opportunity not only for students to demonstrate their engineering design capabilities but also to come and learn more about what students from other schools are designing. The first- and second-place winners came from Duke University and were titled "Spinner for Moogie" and "Desk for Ryan," and the third-place went to John Louis Peach from the University of Florida. "Spinner for Moogie" is a fun device to give a physically disabled child the ability to sit up and pivot unattended. "Desk for Ryan" is an automatic desk for a child suffering from Duchenne Muscular Dystrophy that swings into and out of place electronically. "The Multifingered Prosthetic Human Hand" is a prosthesis for upper-limb amputees that allows them to manipulate objects by the use of actuator cables attached to radial servomechanisms. This project is currently actuated with the help of a sensory glove; however, as work continues on the project, the hand commands will eventually be controlled by myoelectrical sensory information or by the user's voice.

AeMES faculty attending the competition.

The competition also gave students insight into the BME programs at other universities. In attendance was Dr. Larry Bohs, an Assistant Research Professor at Duke University, and the professor of the design class take by all of Duke's participating teams. Dr. Bohs' interests include multidimensional flow quantification and imaging, and building custom devices for disabled persons.

Students and professors who participated felt the competition was a very worthwhile event, especially in the promotion of Biomedical Engineering both to other universities and within our own university. BMES would like to thank Valerie Karandy for her hard work as Competition Director and congratulate her on a successful event. We would like to extend our invitations to you for our third annual Design Competition to be held next spring. For information about next year's competition, or if you would like to become a judge or sponsor of the event, please send questions or comments to Carly Panchura at ufbmes@aero.ufl.edu.

Congratulations to the four AeMES undergraduate students who have received the **University Scholars Award for Summer 2000**. The four recipients are: Mr. **Phillip B. Jackson** (Dr. Loc Vu-Quoc, mentor), Mr. **Ryan P. Merritt** (Dr. Bhavani Sankar, mentor), Ms. **Cecile M. Perez** (Dr. Roger Tran-Son-Tay, mentor), and Ms. **Priya Prasad** (Dr. B. J. Fregly, mentor). This aard comes with a summer stipend of $2,500 and a research allowance of $500.

Congratulations also to the five AeMES undergraduates who received the award last summer. They were Mr. **David S. Hoelle**, Mr. **Andrew J. Sinclair**, Mr. **Brian Lin**, Mr. **Vishal M. Patek**, and Ms. **Iona A. Dy-Liacco**.

On 16 March 2000, Ms. **Shirley Robinson**, who joined the Department on 10 March 1980 and who is now the Student Records Secretary, received the 20-year Service Pin.

Welcome to our newest secretary, **Sokha Ward**! Sokha was hired on October 29, 1999 to replace Barry Luther, who was promoted to the College of Fine Arts. Sokha came to us from Physiological Sciences. She is in charge of Purchasing/Processing and Travel for the department. Sokha has been with the University of Florida for five years.

Prof. Philippe Trompette, who recently stepped down as the head of the mechanics program at the University of Lyon, France, visited the Department from January 2000 till the end of April 2000 to work with Disting. Prof. R. Haftka.

Obituary

Prof. John Hoover passed away at the age of 83 at the Life Care Nursing Center in Orange Park, Florida. Dr. Hoover taught in the AeMES Department for more than 30 years; he joined the Department in 1951 and retired in 1984. He served as Interim Chair of the Department in 1956-57. The readers are referred to the first issue of *The Streamline* in spring 1996 for a history of the Department since its founding in 1946.

Dr. J. Hoover

Dr. Hoover was born in Demopolis, Ala. and raised in Marion, Ala. He lived in Gainesville for more than 30 years. He was a long-time member and past President of the University City Kiwanis Club. He was a member of the Institute of Aeronautics and Science and the past President of the Florida Engineering Society. Dr. Hoover was preceded in death by his wife, Clarence Jones Hoover. Survivors include a daughter, Sister Rose Failey Hoover of Metairie, La.; a son, John Wesley Hoover, Jr. of Orange Park, Fla.; two sisters, Lillian Epps of Tulsa, Okla. and Katherine Creager of Peachtree City, Ga.; and two grandchildren.

Alumni corner

It is our pleasure to announce that **Dr. Donald C. Daniel**, an AeMES alumnus (BS '64, MS '65, PhD '73) and currently the Deputy Assistant Secretary of the Air Force, will receive a *Distinguished Alumnus Award* from the University of Florida on 6 May 2000 at the Spring 2000 commencement. Don and his family came to UF to accept this honor. We refer the readers to a story on Don in the Spring 1998 issue of *The Streamline*.

USAF Captain **Clark J. Quinn**, BSAE '91, has just completed his pilot training and will be flying the F-16 in Phoenix, Ariz. Clark received the Distinguished Graduate Award, the Academic Training Award, and the Commander's Award. His wife, Christine Geraghty, attended UF for two years and is currently a biologist for Bayer Pharmaceutical Company at the Research Triange Park, N. Car. The couple currently reside in Morrisville, N. Car.

Susan Welch, BSAE '96, is currently working as a thermal engineer at Hughes Space and Communications. After graduating from UF, Susan went to Georgia Tech to receive a master's in Mechanical Engineering, with a specialization in fluid flow and heat transfer. There, she wrote her MS thesis on two-phase (air and liquid) flows. In April '98, she moved to Southern California to join Hughes Space and Communications. As a thermal engineer, she is responsible for predicting temperatures for antenna and electrical units on Hughes communication satellites. Susan finds her job challenging. She also had the opportunity to work on several satellite programs like Superbird 4 (a Japanese communication satellite), Spaceway (high speed internet access and communication satellites), and GOES (NASA EOS satellites). In her free time, she enjoys going to the beach and visiting the many museums in the Los Angeles areas. Susan can be contacted at Susan.Welch@hsc.com.

Editor's note: *All news items and articles that did not appear in the present issue of the newsletter will appear in future issues. We thank you for your support and understanding.*

UNIVERSITY OF FLORIDA

Aerospace Engineering, Mechanics &
Engineering Sciences
PO Box 116250
Gainesville FL 32611-6250

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