WINTER/SPRING 2005 | Vol.6, No.2

AEROCONTACT

AEROSPACE ENGINEERING

A newsletter for alumni and friends of the Department of Aerospace Engineering

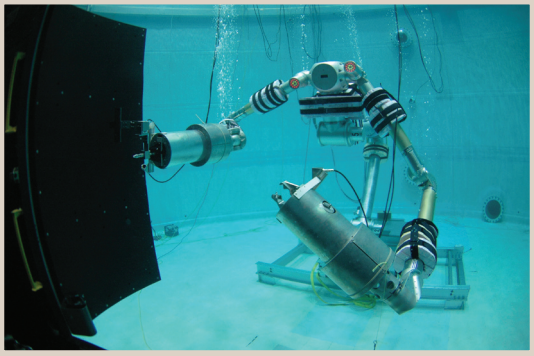
INSIDE

The **Real** Power Ranger

-written by Brian Roberts, Aerospace Engineering Faculty Research Assistant

For 25 years, the robotics team at the Space Systems Laboratory (SSL) has been developing and testing robotic systems capable of performing complex end-to-end on-orbit spacecraft servicing tasks in a neutrally buoyant environment.

One of these robotic servicing systems is Ranger, a spaceflight qualified dexterous robotic servicing system developed under funding from NASA as part of their Space Telerobotics Program. As you will read here, Ranger is quite busy these days, working on various robotics projects with NASA, Georgetown University and the Army. Additional information, photos, and videos for these and other projects can be found on the web at http://robotics.ssl.umd.edu/



How May I Serve You? Ranger and the Hubble Space Telescope

Starting last summer, the SSL-designed and built Ranger Dexterous Servicing System was modified to more closely represent the kinematics and capabilities of the Special Purpose Dexterous Manipulator (SPDM), a

continued on page 3

Mono Tiltroter Research

Last summer, the United States House and Senate Appropriations Conference Committee approved over $1 million in research funds for Mono Tiltrotor Research as part of the Defense Appropriations Bill. Dr. J. Gordon Leishman and the Alfred Gessow Rotorcraft Center will receive a substantial amount of these funds to develop a subscale model of the Tiltrotor. This model will subsequently be tested in the Glenn L. Martin Wind Tunnel.

The Mono Tiltrotor (MTR) is a proposed, innovative heavy-lift rotorcraft architecture. The emerging military strategies most suited to potential application of the MTR are Navy Sea Basing with Ship to Objective Maneuver, and Army Future Combat Systems with mounted maneuver and air mobility.

The capabilities of the MTR are predicated on the combination of an advanced coaxial rotor system and sophisticated kinematics that morph the aircraft

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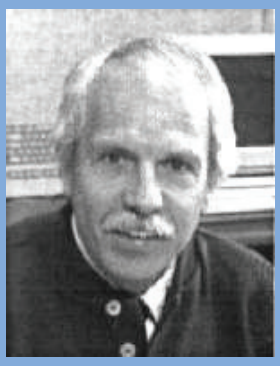


Message From the Chair
Dr. William Fourney

GREETINGS...I hope that you will enjoy reading the information that appears in this latest newsletter from the Aerospace Engineering Department here at Maryland.

At the current time our undergraduates within the department stand at 353. This number has increased from 232 students in the fall of 1999. In addition, there are 163 graduate students. This number has increased from 121 students in the fall of 1999. At the undergraduate level we have more freshmen and sophomores than we do juniors and seniors. At the graduate level we have slightly more master students than we have doctoral students. Over the six year period, the total number of students within the department has increased from 344 to 516 students.

At the current time we have a total of 18 faculty members. As I have informed you in past newsletters, Dr. Mark Lewis is away from the campus for two years serving as Chief Scientist for the U S Air Force, and Dr. Darryll Pines is also not at campus and is serving a two year commitment at DARPA as a program manager. Fortunately, Dr. Pines is in the second year of a two year absence and will be returning in the fall.

The student to faculty member ratio is currently 19.6 at the undergraduate level, and 9.06 at the graduate level (or 28.7 overall), ignoring the fact that Pines and Lewis are gone. If their absence is factored in, these ratios increase to 22.06 at the undergraduate level and 10.2 at the graduate level (or 32.25 overall). You might recall that up until last year we had 20 faculty members within the department so the loss of two faculty have really increased the ratio numbers, as has the increasing number of students.

In spite of this increase in student numbers, and the decrease in faculty numbers, we are managing quite well. This is possible due to the large number of very qualified people working in the aerospace industry in the Washington, DC area, and we have a portion of the salaries of Pines and Lewis with which to hire these people to teach for us on a temporary basis.

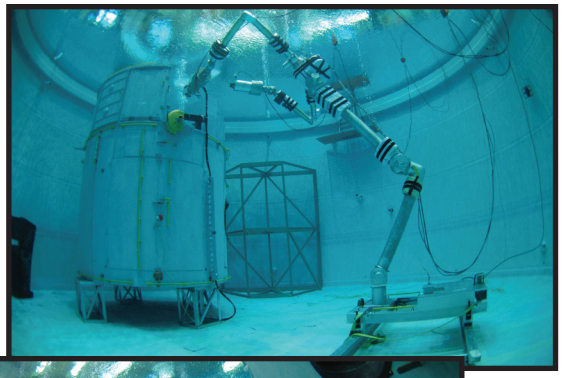
The latest news on the research front involves the design of a mono tiltrotor helicopter (MTR) intended for heavy-lift by the military. This effort involves Dr. J. Gordon Leishman and his students. They are working in conjunction with Baldwin Technology Company located in Port Washington, NY on the development of the aircraft which features a coaxial rotor, a folding lifting wing system, a lightweight airframe, and an efficient cargo handling system that is capable of rapidly and economically transporting different types of mission tailored payloads. The funding for the development phase of this aircraft comes from a plus up from the U.S. House Appropriations Committee. Although Dr. Leishman and his students have been working on the design for some time, the new accelerated phase is due to start during the spring semester. In addition to a story on this latest research activity, you will find other articles including the current efforts in the Space Systems Lab and the Ranger Robot, Dr. Jymn Hubbard's latest patent, the work of Dr. Ella Atkins on UAV's, and many additional articles.

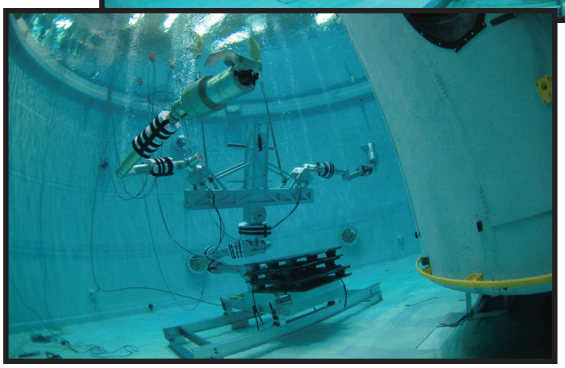
I hope that you will enjoy reading about what is happening here within the department. I invite you to stop by any time you are in the area to see what has changed since you were here, or to communicate with me either by phone 301.405.1129, or email four@eng.umd.edu, if you have questions or concerns.

Headline Ranger story from front page

continued from page 1

robotic system being developed for a possible robotic servicing mission to the Hubble Space Telescope (HST). The modifications included lengthening the dexterous arms from 54 inches to 132 inches, developing and integrating first-generation underwater versions of the SPDM Orbital Tool Changeout Mechanism, and adding ten feet to the length of the Ranger positioning leg.





Last fall, a HST neutral buoyancy training mock-up was placed in the SSL's Neutral Buoyancy Research Facility and the neutral buoyancy robot spent over 41 hours during 10 dives conducting evaluations of HST robotic servicing tasks (since 19 December 2002, the underwater Ranger Dexterous Servicing System has been in the water over 107 hours on 54 dives). Over the winter months, the Discovery Channel filmed students, researchers, and faculty in the Neutral Buoyancy Tank with Ranger and the Hubble Mock-up for a television program recently aired on their channel discussing the merits of, and concerns with, the Hubble Space Telescope. Over 1,500 photos were taken as part of the HST servicing evaluations and they are archived on the web at http://spacecraft.ssl.umd.edu/SSL.photos/NBtest.photos/NBtest.2004/NB04.index.html

The team is working on extending the body of the robot to more closely simulate SPDM, and HST robotic servicing will continue this spring. Although funding will be ceased for the Hubble Space Telescope by NASA, the SSL has been able to learn vast amounts of knowledge for use in future space missions.

Ranger's In the ARMy Now: The Maryland-Georgetown-Army (MGA) Exoskeleton

The Maryland-Georgetown-Army (MGA) Exoskeleton (pictured below to right) is an upper arm robotic exoskeleton being developed for assessment and rehabilitation of shoulder pathology. There are five degrees of freedom in the robot: three joints for shoulder rotation, one for elbow flexion/extension, and one for scapula elevation/depression. The exoskeleton will be used to assess arm strength, speed, and range of motion using onboard sensors, and function as both a resistance trainer and virtual reality tool for rehabilitation. Operation of the device will be monitored by a computer-controlled safety system based on an architecture developed by the SSL for the Ranger Telerobotic Shuttle Experiment, a robotic system developed to demonstrate telerobotic servicing in the space shuttle cargo bay.

This project is a joint venture between the Georgetown University Imaging Science and Information Systems (ISIS) Center and the SSL. The robotic hardware will be built, tested, and integrated by the SSL robotics group, and the ISIS Center will lead the controls effort and assist with the kinematic design, electronics, and operations.

ASTEPing Out of the Woods, Woods Hole That Is...

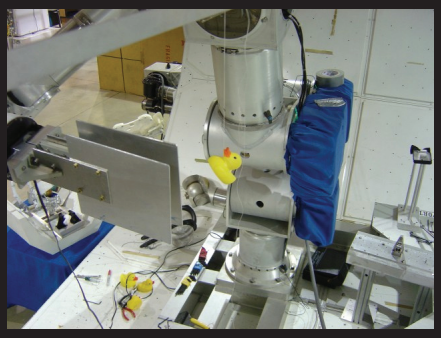
Under funding from NASA, the SSL is working closely with the Woods Hole Oceanographic Institute (WHOI) under NASA's Astrobiology Science and Technology Experiment Program (ASTEP), to develop technologies enabling autonomous planetary sample

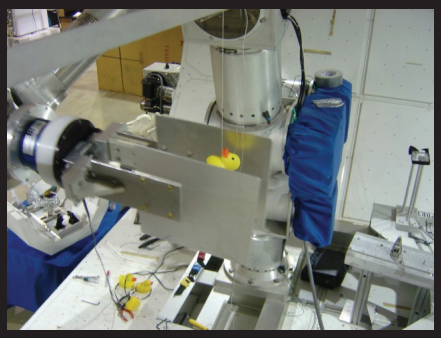
continued on page 4

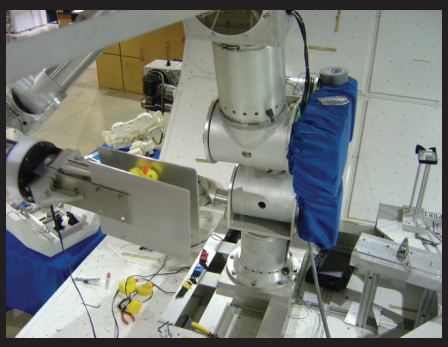
collection by merging NASA-supported robotics technologies with advanced autonomous undersea vehicles.

The team is developing a submersible capable of autonomously collecting samples from the floor of the Arctic Ocean and returning them to the surface. The addition of dexterous robotic technology from the SSL's dexterous robotics group to the existing WHOI SeaBED/JAGUAR autonomous undersea vehicle, along with autonomous vision based control algorithms developed by SSL for its SCAMP free-flying vehicle, will form a system that will be able to sample hydrothermal vent exit fluids under the ice sheet of the Arctic's Gakkel Ridge location. The autonomous undersea vehicle will descend 5,000 meters to the hydrothermal vent fields of the Gakkel Ridge, perform its sampling tasks, and return to the surface without any direct human interaction.

Hydrothermal vents provide perhaps the most "alien" settings for science investigations available without space flight; however, technology does not currently exist to sample the life forms around these Arctic vents. The underwater environment at great depths in the Arctic gives the entire mission direct and immediate relevance to one of Jupiter's satellites, Europa, which many feel is the most likely place for extant nonterrestrial life. With such similarities, this development for autonomous sampling and return missions allows us to simulate future complex planetary missions, while doing real science that is valuable in its own right. This will be the first mission ever to obtain biological samples autonomously, and the first to return biological samples from the Arctic sea floor.







As part of the autonomy effort for ASTEP, one of the Ranger Satellite Servicing System's dexterous manipulators is being used to develop the procedures for autonomously grasping objects in the Arctic. During the month of January and February, the software team developed the techniques to autonomously move the Ranger dexterous arm to grasp an object. More photos and videos of this work can be found in the News/Status section of the ASTEP web page http://robotics.ssl.umd.edu/astep/

Watch for the SSL on the tube and on the web:

The Discovery Science channel features the SSL in a program called "The Great Observatories." The episode covers the work on robotic repair of Hubble Space Telescope in which they filmed in and around the Neutral Buoyancy Research Facility during a testing run for NASA Goddard.

Jim Lehrer News Hour on PBS recently spent the day filming in the Neutral Buoyancy Research Facility for an upcoming feature on space robotics. The feature will be on the News Hour sometime in the early weeks of spring.

Visit http://www.president.umd.edu/fromthepresident/ to view a new four-minute video, narrated by University of Maryland President Dan Mote (an engineer by training), featuring exciting aerospace and biotech programs based in the Clark School of Engineering. The video emphasizes our students' full participation in advanced research. Programs include the robotic mission to repair the Hubble telescope, rotorcraft design competitions, and the Bioprocess Scale-Up Facility.

Headline MTR story from front page

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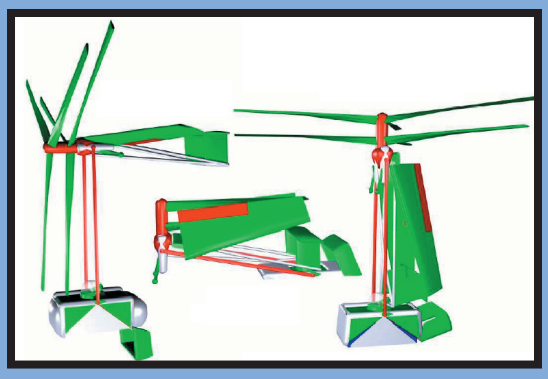


typology for efficient flight over the entire operational envelope. The MTR rotorcraft integrates a coaxial motor, a folding lifting wing system, a lightweight airframe and an efficient cargo handling system that is capable of rapidly and economically transporting different types of mission tailored payloads (above).

The present work involves a conceptual design study to predict the sizes and weights of the MTR architecture and to objectively examine its potential performance. A detailed weight budget has been determined based on historical component data for helicopters and airplanes. A thorough component drag breakdown has allowed for good estimates of the overall lift-to-drag ratio of the MTR concept in both the helicopter mode and airplane cruise conditions.

Various sizes of MTR have been examined, ranging from small machines with relatively light payloads of less than 5 tons to large heavy-lifters with payloads of 20 tons or more. A requirement was that the machine carry its payload over an unprecedented unrefueled distance of 1,000 nautical miles.

The ability to morph the MTR so that its lift is created by a fixed wing when in cruising flight gives the machine a relatively high lift-to-drag ratio of about 14, good specific fuel consumption, and excellent net vehicle transportation efficiency in terms of payload carried per unit of fuel expended. It is has been shown that if technically realizable, the MTR architecture allows for a relatively compact and lightweight rotor design, with an accompanying lightweight airframe and relatively low fuel load compared to competing helicopter concepts. Our work also shows that structural weight efficiency is one key to the potential value of the MTR vehicle.

departmentNEWS

Invention Disclosures

The following members of the Aerospace Engineering Department have filed for invention disclosures:

Dr. Benjamin Shapiro, with Drs. Elisabeth Smela (ME) and Pamela Ann Abshire (ECE), *Cell Canary*

Dr. Benjamin Shapiro, with Dr. Elisabeth Smela (ME), *Micro-Fluidic Pumping*

Dr. Christopher Cadou, *Combustion-Powered Shape Memory Alloy Actuator*

Dr. Benjamin Shapiro, *Predicting the Shear Stresses on Formations of Plaque in Arteries*

Drs. Suok-Min Na and Alison Flatau, *Method of Selectively Texturing Polycrystalline Fe-Ga Alloys to the <100> Orientation*

Suneel Sheikh, *Absolute and Relative Position Determination Using Variable Celestial Sources (Radio and X-ray Pulsars)*

New Staff Members

Dale Stephenson began last summer as the Director of Administration in which he handles the business and personnel administration for the department. Dale is a native of Johnston County, North Carolina (home of Ava Gardner), receiving his BS from Appalachian State University in 1972. After completing his MA at UMCP in 1975, he joined the university system. In almost thirty years of system service, he has worked in six departments on three campuses of the University System of Maryland.

Rosalia Morrison began in March as the Assistant Director of Graduate Studies. She will be assisting Dr. Mary Bowden with oversight of the aerospace graduate program, including recruitment, admissions, and retention of graduate students, as well as the graduate studies curriculum. Rosalia will also be overseeing the department's website. She has been in the field of education for the past thirteen years. A native of Philadelphia, she received her undergraduate degree from Penn State University and her graduate degree from Temple University. Rosalia most recently worked at the University of Maryland University College as an academic and student affairs advisor and administrator.

Seven Up and Seven Down...

"The ***basic*** theme of the competition," stated Josh Ellison, "was to design a helicopter for high altitude mountain rescue operations." In reality, there was nothing ***basic*** about this year's requirements for the AHS International Student Design Competition. But for a 7th time in a row, the Maryland Graduate Student team ran away with first place. The name of the 2004 team's helicopter is the UMD-Condor.

UMD-Condor

This year, AgustaWestland, Inc., sponsor of the 21st annual competition, challenged participants to develop a helicopter specifically designed for high altitude rescue operations. Design objectives and requirements included cruise speeds of 145 knots, hovering capability at 15,000 feet, hoisting recovery of two patients at 12,000 feet, snow landing capability, and a variety of onboard medical equipment for in-flight care of patients. In addition, the aircraft had to be certified for single pilot, day or night operations.

The AHS Design Competition, which challenges students to design a vertical lift aircraft that meets specified requirements, provides a practical exercise for engineering students at nationally accredited colleges and universities. This competition also promotes student interest in vertical flight technology and features undergraduate and graduate competition categories.

UMD-Condor team members from left to right are: (top) Robin Preator, Dr. Inder Chopra, Dr. Marat Tishchenko, Dr. V.T. Nagaraj, Josh Ellison, team leader Jaye Falls, (bottom) Abhishek Abhishek, Shaju John, and Joe Conroy.

studentNEWS

Seven 2004 Vertical Flight Foundation Scholarships were awarded to University of Maryland students. In the B.S. Category, **Kevin Calabro** and **Joseph Schmaus**; M.S. category winners were **Andrew Drysdale** and **Joshua Ellison**; and the Ph.D. category includes **Shreyas Ananthan, Felipe Bohorquez,** and **Ronald Couch**. In 1977, the Foundation established this scholarship program for promising undergraduate and graduate students who plan to pursue careers in vertical flight. Each year, the VFF awards scholarships to gifted students who demonstrate an interest in pursuing engineering careers in the vertical flight industry. The Foundation has awarded more than 170 scholarships to students from throughout the world in the three decades since it was established.

ARCS FOUNDATION INC

Carlos A. Malpica and Falcon Rankins were presented with Foundation Scholarships from the ARCS Foundation, Inc., Metropolitan Washington, D.C. area chapter for 2004-2005. ARCS, which stands for Achievement Rewards for College Scientists, named Malpica as the Booz/Allen/Hamilton Scholar, and Rankins was named The Boeing Company Scholar.

A total of four Clark School of Engineering graduate students were honored at a formal reception in October at the National Academy of Sciences in the District. In addition to Carlos and Falcon, Brian Morgan (EE) and Vitaly (Victor) Ovchinikov (ME) were awarded a fellowship. The ARCS Foundation is dedicated to providing scholarships to outstanding graduate students pursuing scientific degrees.

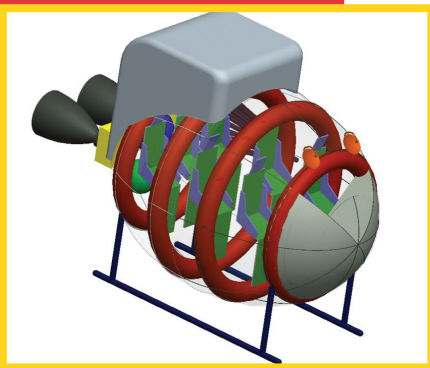
C. MALPICA

Malpica is an Aerospace Engineering, Ph.D. candidate, who studied as an undergraduate at National University of Colombia. He is researching the behavior of an actively controlled helicopter rotor, and identifying the role of periodicity and nonlinearities in rotor control under the advisement of Dr. Roberto Celi.

F. RANKINS

Rankins, also an Aerospace Engineering, Ph.D. candidate, received both his undergraduate and Master's degrees from the University of Maryland. He is performing research in the field of hypersonic vehicle design, flight, and control under the advisement of Dr. Darryll Pines and Dr. James Baeder.

Above (l to r): Dr. Roberto Celi (Aerospace Professor), Carlos Malpico, Brian Morgan, Dr. Bill Destler (UMCP Provost), Angie Delaney (ARCS member), Victor Ovchinikov, and Falcon Rankins celebrate at the National Academy of Sciences.



The University of Maryland took third place in the 2004 AIAA Space Design Competition, behind two teams from University of Illinois-Urbana. The University of Maryland team, composed of **Abraham Daiub, Dan Kim, David Pullen, Jesse Reich, Daniel Senai, Luke Twarek, Evan Ulrich,** and **Bryan West**, won a cash prize of $1,000 and a certificate for each team member and their faculty project advisor, **Dr. Dave Akin**.

The topic this past year was to develop a conceptual design for a low-cost space transportation system to provide space flight experiences for space tourists and ultimately capture the low Earth orbit space tourism market. The vehicle was required to have a minimum crew of two (pilot and co-pilot), and had to carry a minimum of five passengers. The space flight had a minimum duration of two orbits and the vehicle was directed to return to the original launch site and the end of its mission. The team hopes that their success will prompt other aerospace undergraduates to pursue this competition in the future.

alumniNOTES

Wendy Frank, BS '03, has received her Master of Science in Engineering in Aerospace Engineering at the University of Michigan. She is working as a Systems Engineer with Orbital Sciences, Inc.

Meghan Baker, BS '03, began working at NASA's Johnson Space Flight Center as a flight controller for International Space Station Environmental Control and Life Support Systems in December 2004. In her position, she supports the Life Support Systems on-board the Space Station and is currently in training to receive certification to work on the console during mission operations.

Andy Long, BS '03, has received his Master of Science from MIT. He is working for Booz, Allen Hamilton as a consultant on advanced planning and systems engineering for future military satellite communications networks.

Beatrice Roget, MS '01, Ph.D '04, and **Jinwei Shen**, Ph.D. '03, are at the National Institute of Aerospace and Army Research Laboratory at NASA Langley working with the rotor aeromechanics group.

Jayanarayanan Sitaraman, Ph.D. '03, **Gaurav Gopalan,** Ph.D. '04, and **Anubhav Datta,** Ph.D. '04, have joined the Department of Aerospace Engineering (UMCP) as Assistant Research Scientists working on the DARPA Helicopter Quieting Program, and are performing research with Stanford University and Advanced Rotorcraft Technologies Inc. based in San Francisco.

Joseph Stecher, BS '03, has received his Master of Science from the University of Minnesota in Aerospace Engineering.

Brook Sullivan, Ph.D. '04, is a Senior Scientist, at Valador, Inc. in Virginia. He has joined a team working on modeling, simulation, and analysis of mission architectures under consideration by NASA's exploration office for return to the moon.

In Memoriam

John Edward Gorozdos, BS '86, a bluegrass musician and sales representative for classical and traditional music labels, died September 6, 2004, in Phoenix, Maryland. He was born in the District and grew up in Silver Spring and Burtonsville, graduating from Paint Branch High School in 1981. He lived in Laurel from 1987 to 1994 before moving to Owings Mills. He had lived in Phoenix, north of Baltimore, since 2001.

Mr. Gorozdos, a Washington native, performed for a variety of bluegrass, Celtic and traditional groups the past 20 years. Most recently, he played banjo and was the lead singer for 'Jericho Bridge,' a bluegrass band. He gave his final performance, at Boordy Vineyard in Hydes, Md., one day before his death. Jericho Bridge released an album that includes Mr. Gorozdos' performances this past fall.

He was a longtime member of Ship's Company, a traditional maritime music group that performed on the Constellation, which is moored in Baltimore's Inner Harbor. He was also a member of the Blue Line bluegrass band and the English folk group Cornucopia.

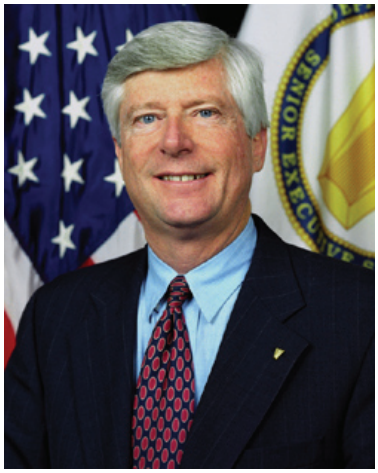
He had performed in a production of "Hamlet" at the Shakespeare Theatre at the Folger in Washington and with the Peabody Renaissance Ensemble and the Baltimore Composers Forum. He sang and played banjo, guitar, recorder, piano, trumpet and percussion.

Since 1999, Mr. Gorozdos had been the East Coast sales representative of Harmonia Mundi, a classical music label. Between 1990 and 1999, he was a sales representative for Rounder Records, a blues and traditional music label, and Allegro, a classical label. From 1987 to 1990, he was a clerk and record buyer at the House of Musical Traditions in Takoma Park.

Survivors include his companion of two years, Lori Brown of Baltimore; his parents, Terry and Dick (Richard) Gorozdos of Burtonsville; two brothers, David Gorozdos of Glen Burnie and Steven Gorozdos of Washington; and three sisters, Linda Benade of Haymarket, Lisa Gorozdos of Charles Town, WV, and Susan Ehrlich of Clarksville.

Miller Selected as ARL Director

John M. Miller, BSAE '69, MSME '74, has been named Director of the U.S. Army Research Laboratory (ARL) where he had been serving as acting director since March of 2003. In November, the ARL was named the 2004 Department of the Army Research and Development Laboratory of the Year for large research laboratories. The achievement marked the first time ARL had received the award.



JOHN M. MILLER

Before working for the federal government, Miller was a project manager at Pratt and Whitney Aircraft Co. He has worked in a number of positions at ARL and the U.S. Army Harry Diamond Laboratory. In 1980, he received the U.S. Army Research and Development Award for outstanding technical Achievement, and in 1998 he was appointed to the federal government's Senior Executive Service.

ARL, part of the U.S. Army Research, Development and Engineering Command, is the Army's corporate laboratory for fundamental and applied research. ARL provides key technologies and analytical support as well as critical links between the scientific and military communities to help American soldiers in the battlefield.

Information for this article obtained from RDECOM magazine and the ARL.

Graham Member of Aircraft Design Award Team

David H. Graham, BS '82, was one of three engineers from Northrop Grumman Corporation to receive the American Institute of Aeronautics and Astronautics' (AIAA) 2004 Aircraft Design Award. Graham and his fellow engineers led a team that demonstrated a method to reduce the intensity of sonic booms. This DARPA sponsored effort demonstrated that sonic boom shaping can be used to reduce sonic booms on future aircraft such as supersonic transports or supersonic business jets.

Graham led the effort to define the shape of the modifications required to change the sonic boom of an aircraft and measure the results in a real atmosphere. He also was responsible for the aircraft performance and insuring it met the safety of flight requirements to obtain a flight clearance from NAVAIR.

The AIAA award is presented annually for the conception, definition or development of an original concept leading to a significant advancement in aircraft design or design technology. Graham received his award in September at a special awards luncheon.

Below: Mr. Graham is standing in front of the modified U.S. Navy F-5 fighter aircraft that was used in the Shaped Sonic Boom demonstration flights in August 2003 and January 2004.

Information for this article courtesy of the AIAA Communications Office; picture courtesy of Northrop Grumman Integrated Systems.

DAVID H. GRAHAM

faculty NEWS

Six Faculty Named Campus 'Rainmakers'

The University of Maryland's Division of Research honored five aerospace faculty members on October 20, 2004. Professors David L. Akin, Inderjit Chopra, Alison Flatau, William Fourney, Mark J. Lewis, and Benjamin Shapiro were recognized for receiving more than $500,000 in grant funding for the fiscal year and given the distinction of campus 'Rainmakers.' The Honorable Jacques Gansler, Vice President for Research, C. Dan Mote, University President, and William Destler, Provost and Senior Vice President, welcomed and recognized the Rainmakers.

Chopra and Lewis Serve as NIA Fellows

Drs. Inderjit Chopra and Mark Lewis have been named as members of the NIA Committee of Fellows. The Committee is composed of a group of prominent faculty from the NIA's member universities. The group involved 25 faculty who are nationally and internationally known for their work in aerospace research, earth science and related fields. The Committee met for the first time in September 2004 and will meet on occasion to discuss and provide suggestions on potential strategic areas for technical cooperation between NASA, NIA and the member universities.

Hubbard Appointed to National Academies Committee

Photo courtesy of Elizabeth Warner, Department of Astronomy

James E. Hubbard, Jr., UMCP Professor at NIA Langley, has been appointed to the National Research Council's Committee to Review NASA's Capability Roadmaps. Dr. Hubbard will be on the panel that will review the Roadmaps for Advance Telescopes and Observatories and Scientific Instruments/Sensors due to his area of expertise in materials and structures. The National Research Council is part of the National Academies, which also comprise the National Academy of Sciences, National Academic of Engineering, and Institute of Medicine.

Anderson Keynotes at 75th Anniversary Celebration

John D. Anderson, Jr., Professor Emeritus, was the keynote speaker for the University of Minnesota's 75th anniversary celebration for the department of Aerospace Engineering & Mechanics in September of 2004. His keynote, titled "Breaking the Sound Barrier: The Intellectual Breakthroughs in Aerodynamics That Made it Possible," kicked-off three-days of anniversary events. In attendance was a graduate of their first class of 1933 and students graduating in 2005, thereby spanning the history of department. *Photo courtesy of the University of Minnesota's Department of Aerospace Engineering and Mechanics.*

Leishman Named Minta Martin Professor

J. Gordon Leishman has been named a Minta Martin Professor for the A. James Clark School of Engineering. The Clark School announced two Minta Martin Professorships to recognize outstanding senior faculty in aerospace research and education and affiliated fields. Gary W. Rubloff, professor in the Material Sciences and Engineering department, is the recipient of the second Minta Martin Professorship.

The professorships are funded through an endowment established by Glenn L. Martin in 1954 in honor of his mother, Minta. Some $2.5 million was originally designated for the fund for aeronautical research, which has grown to become the single largest account in the university's endowment.

Dr. Leishman is an internationally recognized specialist in rotorcraft aerodynamics whose work spans experimental, theoretical and numerical approaches. Previously, Leishman was a senior aerodynamicist for Westland Helicopters Ltd. in England, where he worked on the Lynx and EH-101 helicopter programs. He was involved in the British Experimental Rotorcraft Program (BERP), the outcomes of which resulted in a Westland Lynx helicopter breaking the world speed record in 1986.

He has authored more than 200 journal papers, conference papers and other technical reports on rotorcraft aerodynamics and topics in fluid mechanics. Leishman received a B.Sc., first class honors, a Ph.D. and a D.Sc (Eng.) in aeronautics and fluid mechanics and in aerospace engineering from the University of Glasgow.

Leishman is the author of the highly acclaimed textbook Principles of Helicopter Aerodynamics as is editor-in-chief of the Journal of the American Helicopter Society. He is an associate fellow of the American Institute of Aeronautics and Astronautics and was recently named a fellow of the Royal Aeronautical Society of Great Britain for his contributions to the theory and analysis of helicopter rotor aerodynamics. Election as a fellow is the highest distinction for aerospace achievement.

Aviation pioneer Glenn L. Martin (right) was, and continues to be posthumously, instrumental in providing funding to support education in the aeronautical sciences at the University of Maryland.

currentRESEARCH

Dr. James E. Hubbard, Jr. was awarded U.S. Patent 6,840,117,B2, entitled, "Patient Monitoring System Employing Array of Force Sensors on a Bedsheet or Similar Substrate." This product is a system that monitors patient activity in a hospital bed or wheel chair. The system specifically uses a sensing sheet or pad made of smart materials to process information about patient motion.

The product can, for example, detect patient agitation (which can lead to incontinence and falls), and lack motion (a precursor to the development of bed sores in patients), and ultimately provide a patient safety and security. This information is automatically logged and transmitted to the appropriate caregiver.

The same technology used in this product can be used to measure lift and drag on a wing. The smart material-based sensors can be used on a wing to look at the motion of the air over the wing. In this regard, it can be used to look at flow separation, boundary layer transition and all of the pressure moments associated with the flow.

Prof. Hubbard's research group will ultimately use such sensors to morph-control the wing load distribution as part of a research program called Morpheus. Morpheus is a University of Maryland research effort focused at the National Institute of Aerospace directed by Dr. Hubbard. It currently consists of a collaboration between NIA, Langley Research Center, the Army Research Lab and the University to increase the range and endurance of air vehicle by exploiting energy in the environment such as thermals and updrafts.

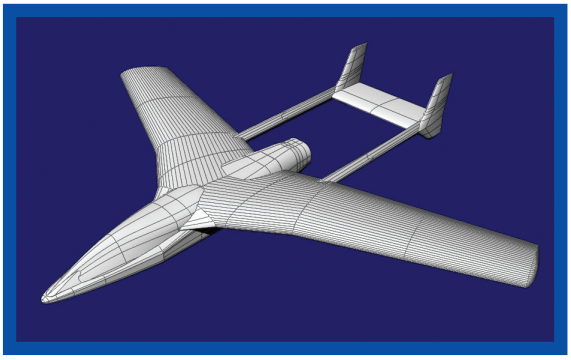
current RESEARCH

-written by Evandro Valente,
Aerospace Engineering Graduate Student

One of Aerospace Engineering's hottest applications is the Unmanned Aerial Vehicle (UAV). The push for advancement of remotely or autonomously operated vehicles requires careful design and operational strategies beyond those in place for piloted aircraft. A variety of UAV designs have been successfully flown, but each new set of requirements poses its own challenges. From the tiny palm-sized to the large-scale classes, all vehicles must balance structure, fuel (gas or battery), and payload weight while ensuring the best possible endurance, controller performance, and aerodynamic/structural stability. A number of researchers at the University of Maryland have begun to tackle UAV research from different perspectives ranging from smart structures to combustion to autonomous controls research.

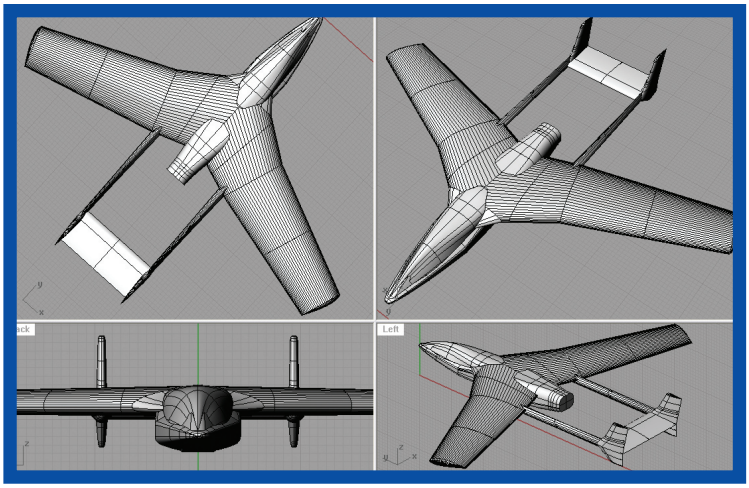
Solus, a UAV in operation at the University of Maryland, serves as a platform for the development of sensor technologies, online system identification tools, and autonomy research. The current electronics box features two complete inertial measurement units (IMUs) of varied fidelity and cost, enabling quantification of the trade-off between sensor quality and cost both for dynamic parameter estimation (system identification) and autonomous flight controller performance. The motivation for this research is to create a reconfigurable electronics and software package that offers "the most bang for your buck". Presently, the two graduate students involved in the project are Jason Smith (system identification and software development) and Evandro Gurgel Valente (aircraft design and vehicle piloting).

In addition to the electronics, a new UAV, currently named Pixel, is being designed to replace Solus. Pixel will feature an all-composite construction using molds and vacuum bagging. The creation of molds will allow quick turn around time for the fabrication of fuselage, booms and rudders. Expected to weigh ~35lbs, Pixel is projected to have a cruise speed of ~70 mph and will allow collaborative research activities ranging from autonomy and controls to UAV component design.



In addition to a highly-stable baseline configuration for autonomy research, Pixel will enable testing of a variety of wing concepts. A wet wing is currently being designed by Justin Kearns and will be manufactured and flown as a modular wingtip pair on Pixel. The current wet wing system features an all-composite, modular wing design using cellular core composite structures, which are fabricated by laying up conventional glass fiber on blow-molded hollow plastic molds yielding a structure with an internal web-like geometry. This type of structure is characterized by low weight and manufacturing costs, as well as inherently high rigidity in shear and torsion. Cellular core will be used to capitalize on its hollow internal volumes for supplementary fuel stowage to increase endurance and/or off-load fuel tank space for useful payload volume such as electronics, sensors, and downlink transmitters.

The Autonomous Vehicle laboratory is actively pursuing innovative designs in other areas applicable to UAVs, including the integration and testing of an inflatable wing pair on Pixel. The ultimate goal is to create a low cost UAV package that performs well beyond what one would expect for its price. If you are interested in our mission feel free to contact Evandro Valente at (301) 403-4159 or Ella Atkins at (301) 405-1124.



MARYLAND DAY 2005

explore our World!

SATURDAY, APRIL 30, 2005

Dear Friends of Maryland,

The planning for our seventh annual Maryland Day program is well underway. Hundreds of campus citizens are busy planning their departments' Maryland Day 2005 events.

Last year we offered more than 400 events and activities and attracted over 70,000 visitors to campus. This year, we intend to create specific events and marketing materials that promote public awareness of how Terrapins throughout history have contributed to the State of Maryland and the Mid-Atlantic Region.

Every year, the Maryland Day Planning Committee strives to create a program that engages, entertains and educates visitors. So, mark those calendars for April 30, and invite others to do the same!

Sincerely,

Brodie Remington
Vice President for University Relations
Chair, Maryland Day Committee

come and explore science & tech way

glenn l. martin wind tunnel

space systems lab

alfred gessow rotorcraft center

engineering student society competition

composite materials lab

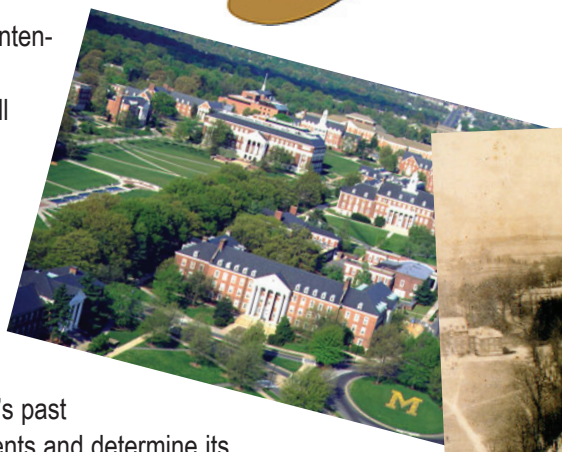
aerospace program information table

meet the engineering dean

Starting in the Fall 2005, the campus will began a year-long celebration of the University's 150th anniversary. As many in the Maryland community know, the University of Maryland was founded in 1856 as an agricultural college and a land-grant institution. At it's inception, the college had three faculty members and 34 students who could study three subjects. As the Flagship of the State's university system, today we are a top-twenty public research university with 13 schools and colleges spread over 1,200 acres. Our current faculty numbers are approximately 3,000 and our student population is over 35,000 choosing among 100 subjects.

150 YEARS 1856–2006
UNIVERSITY OF MARYLAND

This sesquicentennial university celebration will encompass numerous activities and provide opportunities for us to celebrate the University's past accomplishments and determine its future. The theme of the Anniversary Celebration is: "Celebrating the University of Maryland: A Model of the Modern Research University." The Department of Aerospace Engineering and the A. James Clark School of Engineering, in addition to a number of campus units across campus, will be planning activities to highlight the University's excellence and innovation, while showcasing how the University personifies the qualities of The Modern Research University.



The 150th Anniversary Celebration of the University of Maryland promises to be a comprehensive program applauding the University's past 150 years of accomplishments. Beginning in fall 2005 and ending in fall 2006, the spirit and energy will envelop members of the Maryland community across the University, State, and region. The Celebration's emphasis on Maryland as A Model of The Modern Research University will showcase the University's commitment to excellence, access, and unmatched dedication to higher education. Participation and enthusiasm from the entire community will ensure success.

We invite you to celebrate this monumental event with us. Please visit the 150th Anniversary website at http://www.umd.edu/150years/. There you can view the celebration plan, guiding principles, a timeline of events, and most importantly, a place to share your ideas with the campus Anniversary Planning Committee. Alumni and student involvement is imperative for the success of this celebration.

Happy Anniversary, University of Maryland!

Bachelor of Science
August 2004

Matthew R. Balkam
Bradley T. Cooper
Abraham Daiub
Jesse Reich

~

Master of Science
August 2004

Julie E. Blondeau
Marie-Laure Chauffour
Vinit Gupta
Sadie K. Michael
Jeffrey R. Smithanik

Bachelor of Science
December 2004

John W. Albritton
Nichol J. Augustus
Kevin C. Eisenhower *
Nelson M. Guerreiro +
Syed Hasan
Brandon P. Renehan
Geoffrey A. Slipher
Susumu Yamamoto

~

Master of Science
December 2004

Raquel Jarabek
Kristen Pilotte
Joseph Simons

*** Co-op with distinction**
+ cum Laude

Ph.D.
August 2004

Gaurav Gopalan, Quasi-Static Acoustic Mapping of Helicopter Blade-Vortex Interaction Noise,
Advisor: Dr. Fred Schmitz

Ph.D.
December 2004

Jinsong Bao, Development of Mach Scale Rotors with Composite Tailored Couplings for Vibration Reduction,
Advisor: Dr. Inder Chopra

Anubhav Datta, Fundamental Understanding, Predicyion and Validation of Rotor Vibratory Loads in Steady-Level Flight,
Advisor: Dr. Inder Chopra

Marc Gervais, Tiltrotor Noise Reduction Through Flight Trajectory Management and Configuration Control,
Advisor: Dr. Fred Schmitz

Sarah E. Hall, Model Following Control Strategies and Human Interface Techniques for the Treatment of Time Delay During Teleoperation,
Advisor: Dr. Rob Sanner

Manikandan Ramasamy, Contribution to the Measurement and Analysis of Helicopter Blade Tip Vortices,
Advisor: Dr. J. Gordon Leishman

Beatrice Roget, Individual Blade Control for Vibration Reduction of a Helicopter with Dissimilar Blades,
Advisor: Dr. Inder Chopra

Brook R. Sullivan, Technical and Economic Feasibility of Telerobitic On-Orbit Satellite Servicing,
Advisor: Dr. David Akin

AEROCONTACT is published several times a year for alumni and friends of the Department of Aerospace Engineering at the A. James Clark School of Engineering.

Your alumni news and comments are welcome. Please send them to:
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Fax: 301.314.9001

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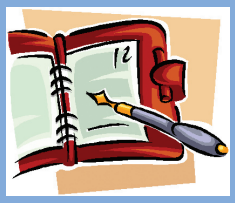
Department Chair:
Dr. William Fourney
Director, Undergraduate Program:
Dr. Alison Flatau
Associate Director, Graduate Program:
Dr. Mary Bowden



Calendar of Events

March	Samuel Riggs Alumni Center Construction Completion and Occupation to begin
March 21-27	Spring Break,
March 21-23	Campus Closed
April 7	2nd Annual School of Engineering Baltimore Alumni Networking Event
April 13	Clark School of Engineering Scholarship Luncheon 11:30 a.m., Riggs Alumni Center
April 30	Maryland Day, 10:00 a.m. to 4:00 p.m.
May 21	Campus-wide Commencement Ceremony, 7:00 p.m., Comcast Center
May 22	Clark School of Engineering Commencement Ceremony, 1:00 p.m. Cole Student Activities Building
May 26	2nd Annual Engineering Alumni Chapter Golf Outing
May 30	Memorial Day Holiday, Campus Closed

A. JAMES CLARK
SCHOOL OF ENGINEERING

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University of Maryland
College Park, MD 20742-2111

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