



# Virginia SpaceLink

Virginia Space Grant Consortium

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Aerospace Partnerships in Education ♦ Research ♦ Industry

Summer 2004

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TECHNOLOGY

## MicroMAPS - FROM STORAGE TO EIGHT MILES HIGH

On June 12, a NASA and Virginia Space Grant Consortium team successfully flight-tested a new instrument system, called MicroMAPS, that measures carbon monoxide in the atmosphere. The Proteus, a unique, record-setting high altitude aircraft, carried the instrument to an altitude of more than 51,000 feet above the Earth. Proteus was designed and built by Scaled Composites, LLC, the same company that recently flew Spaceship One, the nation's first commercial manned space vehicle.

The MicroMAPS instrument is so named because at a mass of 6.4 kg, it is very small (hence micro); and it evolved from an earlier instrument which flew in space called MAPS, which stands for Measurement of Air Pollution from Satellites.

The flight was the culmination of three years worth of work by forty students and seven faculty from three Virginia Space Grant Universities — University of Virginia (UVA), Old Dominion University (ODU), and Virginia Tech — working with a NASA Langley Research Center team. MicroMAPS was originally developed in the late 1990's for launch on the Clark spacecraft. When the spacecraft program was cancelled, MicroMAPS was placed in storage. NASA approached the VSGC in

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NASA Dryden Flight Research Center Photo Collection  
<http://www.dfrc.nasa.gov/gallery/photo/index.html>  
NASA Photo: EC99-45110-8 Date: July 26, 1999 Photo by: Patrick Wright

ERAST Program Proteus Aircraft in Flight

*Proteus has set several altitude records and can routinely fly more than 8 miles above the earth. The MicroMAPS instrument is installed in the nose fairing of the right tail boom.*

## The Director's Corner



There is much good news to report.

State funding for the VSGC was restored in the 2004 General Assembly. We are very grateful to the Governor's Office and the General Assembly members who recognized the Consortium's contributions and retroactively reinstated funding for the current fiscal year while providing funding for the next biennium.

The Commonwealth contributes \$170,000 per year in Consortium funding through the State Council of Higher Education. All of the funds from the State are used to provide scholarships and fellowships to students in science, engineering and technology disciplines at Virginia Space Grant universities.

The VSGC received an outstanding evaluation from NASA in the agency's recent competitive review process covering the five-year period 1998-2003. The VSGC was cited as performing at the highest level for all Designated consortia and was recognized for high performance in all program areas and management. In the cover letter for our evaluation, the NASA Program Manager wrote, "In closing, I rely on a reviewer's comment, which provides an elegant summary of your consortium, 'VSGC may be the premiere consortium in the Space Grant family.'" I thank the VSGC staff and affiliate members and partners for their outstanding work that brought this recognition. We have a wonderful staff and dedicated members and partners.

This newsletter issue highlights our 2004-2005 Academic Year scholarship and fellowship recipients. Congratulations to each of these awardees. We look forward to following their research and academic progress during the upcoming year.

I was recently asked by my colleagues to provide testimony on the impact and value of the National Space Program to the U.S. House of Representatives Veterans Affairs, Housing and Urban Development and Independent Agencies Subcommittee. It was a pleasure to go beyond Virginia's borders and to present the national impact of NASA's National Space Grant College and Fellowship program. With a Space Grant program in every state plus Puerto Rico and the District of Columbia and a network of 835 universities, colleges, federal research and development centers and NASA and business partners, the national network is making a huge grass roots impact. All the Consortia are united by the goals of improving science, technology, engineering and mathematics education from Kindergarten through the post-doctoral level, building the nation's university research infrastructure and government/industry partnerships, and providing real-world research opportunities and participation in aerospace missions. The Space Grant program is playing a significant role in ensuring that our nation will have a well educated, diverse aerospace, science and technology workforce and a strong research infrastructure.

*Mary Sandy*

## VIRGINIA SPACE GRANT CONSORTIUM

In 1988, Congress enacted the NASA National Space Grant College and Fellowship Program (also known as Space Grant). The Virginia Space Grant Consortium (VSGC) received its designation from NASA in 1989.

The VSGC is a coalition of five Virginia colleges and universities, NASA Centers, State educational agencies, Virginia's Center for Innovative Technology, and other organizations with a strong interest in math, science, engineering and technology education and the preparation of a qualified high technology workforce. The VSGC acts as an umbrella organization, coordinating and developing educational and research efforts for Virginia and the nation.

### VIRGINIA SPACE GRANT CONSORTIUM

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*Some of the MicroMAPS team members beside the Proteus in the Mojave Desert: (front center) Dr. Vickie Connors (NASA), principal investigator; (second row left to right) Patrick Hopkins (UVA) student, Neil Coffey and Dan Norfolk (NASA), data acquisition system designers; and (back row) Don Oliver (NASA), integration lead.*

2001 to engage university students in the process of exploring potential flight opportunities for MicroMAPS and to participate in system updates and redesign. Initially, the thought was to hitch a ride into orbit on a launch of opportunity. When an ODU student study concluded that there would be a long wait for such an opportunity, NASA Principal Investigator, Dr. Vickie Connors, proposed a change of plans that would provide an airborne ride for MicroMAPS. The Proteus aircraft, the highest-flying commercial aircraft in the world, was selected because it gave MicroMAPS a vantage point second only to being in orbit.

When the instrument was retrieved from storage at NASA Langley Research Center in 2002, the first step was to determine if it was still functional. UVA student Clayton Nunnally was involved in the bench check of the long-dormant instrument and the

original designer, Dr. Bill Morrow of Resonance Ltd., volunteered to oversee the checkout. Dr. Henry Reichle, who played a significant role in the precursor NASA-MAPS project that flew on a DC-8 and on the Space Shuttle, also volunteered to provide oversight to the mission.

Virginia Tech students developed the preliminary design and component specifications for the instrument package, while students at UVA worked on the data analysis algorithms. The data analysis was particularly challenging, since the original calibrations were developed for orbital altitude where the entire atmosphere was below the flight path. Flying at altitudes between 50 and 60 thousand feet puts most of Earth's atmosphere below the flight path. Consequently, all of the mathematics had to be redone to reflect that difference. Further

refinement will be based on the actual flight data.

VSGC worked with NASA instrument designers and aerospace technologists to refine the student designs based on long-term NASA flight experience. Scaled Composites fabricated a new nose cone fairing for the right hand tail

*"I was given the unique opportunity of helping out during MicroMAPS' first flight on the Proteus Aircraft in the Mojave Desert. My responsibility was to ensure that the MicroMAPS instrument was working properly during its integration onto the aircraft, the engineering test flight, and the data retrieval flight. During the week I was in the desert, I applied the theoretical modeling work I had previously done and employed the skills I gained at UVA to help the MicroMAPS team check the functionality and capability of the instrument. This was my first time participating in a real engineering environment. Not only was it exciting to work together with other scientists but it was gratifying to know that my part in this project helped lead to the success of the first flights of MicroMAPS.*

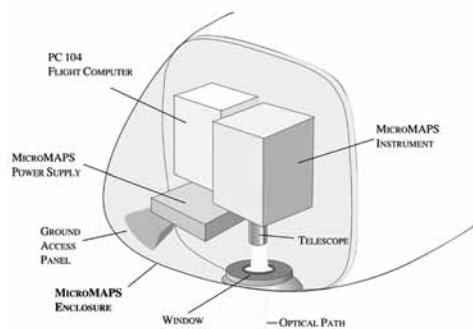
*The experiences and opportunities I have had working on this project with the VSGC have greatly influenced many important decisions during my undergraduate career. Working with VSGC allowed me to get involved in research early in college, which influenced my decision to pursue graduate studies, and helped me to get into my graduate school of choice. Also, I was given the opportunity of participating in the Langley Aerospace Research Summer Scholars (LARSS) program in which I can continue to work on MicroMAPS at NASA Langley Research Center. As I continue to become more involved with VSGC and NASA Langley, I am excelling in scientific research and my career objectives are becoming clearer. With the assistance of VSGC, my hopes of pursuing a career in applied science and engineering are becoming a reality."*

*—Patrick Hopkins, UVA student*

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*This drawing shows the orientation of the MicroMAPS instrument package as mounted on the aircraft. The instrument faces downward through an optical window. It uses gas filter correlated radiometry to measure the carbon monoxide mixing ratio in the troposphere.*

team to the Mojave Desert in California for the instrument's integration and first flights.

The aircraft is currently scheduled to deploy from NASA-Langley in late summer for flights over the East Coast. University of Virginia students will provide data analysis support for these flights. During the 2004-2005 academic year, a student team from Virginia Tech coordinated by Dr. Bill Mason will be introduced to the instrument system. The team will be working to adapt the MicroMAPS instrument to an UAV (Unmanned Aerial

boom of Proteus and shipped it to NASA-Langley for installation and final wiring of the instrument package. UVA student Patrick Hopkins came to NASA-Langley to assist in instrument checkout and then traveled with the NASA/VSGC

Vehicle) platform.

VSGC has proposed a project at ODU to geo-reference the MicroMAPS data as a useful resource for NASA Earth Science Enterprise research and applications. Discussions are also underway concerning the enhancement of the instrument's capabilities and the development of more projects based in part on MicroMAPS-produced data sets.

"This collaboration has been invaluable in providing real world design and research experience for university students," notes Mary Sandy, VSGC Director. "The MicroMAPS mission is significantly contributing to the development of future scientists and engineers while providing unique scientific data to help us better understand our world."

*For more information on the MicroMAPS project, contact John Companion at [jcompani@odu.edu](mailto:jcompani@odu.edu).*

*"The more than a year in which I worked as a member of the MicroMAPS team granted me an amazing perspective into the real world of research and atmospheric sciences, in particular. Experiences such as, presenting at the American Geophysical Union conference and working with NASA and VSGC, have enriched me both as a student and as an individual. I look forward not only to continued work with MicroMAPS, but also to graduate school and future opportunities that have been inspired by my participation in the MicroMAPS project."*

*—Steve Tangen, UVA student*

## **SANDY GOES TO CONGRESS**



*Mary Sandy, Director of the Virginia Space Grant Consortium, provides testimony on the impact and value of the National Space Program to the U.S. House of Representatives Veterans Affairs, Housing and Urban Development and Independent Agencies Subcommittee.*



*Sandy with Virginia Congressman Virgil Goode, Member, U.S. House of Representatives Veterans Affairs and Housing and Urban Development, and Independent Agencies Subcommittee.*

## VSGC CONDUCTS STUDENT RESEARCH CONFERENCE

The sixth annual VSGC Student Research Conference was held on April 2, 2004, in the Old Dominion University Peninsula Higher Education Center in Hampton. This conference provides a forum for all VSGC Graduate Fellows and Undergraduate Research Scholars to present their research funded by the VSGC during the 2003-04 academic year.

Attending the conference were 40 Undergraduate and Graduate researchers and Space Grant University professors and advisors. Donner Grigsby, an Engineer with NASA Langley Research Center presented the keynote address, "Space Propulsion Systems." Grigsby provided an update of NASA research on space exploration including wonderful information on different propulsion systems and dazzling pictures from space.

Graduate Fellows presented the results of their research through multimedia presentations while Undergraduate Scholars provided poster presentations summarizing their research. The oral presentations were grouped in sessions according to subject, and a Space Grant University Professor

served as a Session Chair for each subject. Conference attendees viewed student presentations on topics such as Aerospace Systems Concepts and Analysis, Structures and Materials, Aerospace Vehicle Systems Technology, Applied Physics, Human Factors, Astrophysics/ Planetary Science, and Computer Science. Following their presentations, presenters answered questions from both the attendees and the Session Chair.

Attendees viewed the Undergraduate Scholar poster presentations during two extended breaks, which gave all participants time to review and discuss their outstanding work with the students. Students and attendees enjoyed the full day of activities and were very positive about the conference. "It's so wonderful to be able to learn about the other students' research," stated one Graduate Fellow. "I really enjoy being able to discuss the results with the researcher. What a great learning experience!"

The Graduate Fellow and Undergraduate Scholar research briefs are posted on the VSGC website.



*Chris Carter, VSGC Educational Programs Manager, discusses research project with Anushka Lakdawala, ODU Electrical and Computer Engineering student.*



*VSGC Director Mary Sandy, Dr. Robert Ribando, Professor, School of Engineering and Applied Science at UVA, and Patrick Hopkins, UVA Mechanical Engineering student, discuss Hopkins' research on the monitoring of carbon monoxide in the atmosphere.*

## SOMETHING TO SHOUT ABOUT...



*VSGC staff celebrates an outstanding 15th year program evaluation by NASA Headquarters.*



## LOCATION, LOCATION, INFORMATION!

### *Space Age Technology Furthers Economic Development in Virginia's Fifth District at VSGC Symposium in Danville*

On April 21, 2004, all roads in Virginia's Fifth Congressional District led to Danville. At the invitation of Congressman Virgil Goode, the Virginia Space Grant Consortium (VSGC) organized a GIS awareness symposium focused on economic and workforce development applications.

The theme of the symposium was economic and workforce development and the primary objective was to demonstrate how GIS may be used to improve planning and management at the local level and to create a pathway into a burgeoning career field for students.

City planners and officials, economic development administrators, educators, town managers, emergency preparedness workers and police officials from all over the District arrived at the Institute for a full day of exposure to GIS concepts and demonstrations of practical, local applications, as well as interactive workshops.

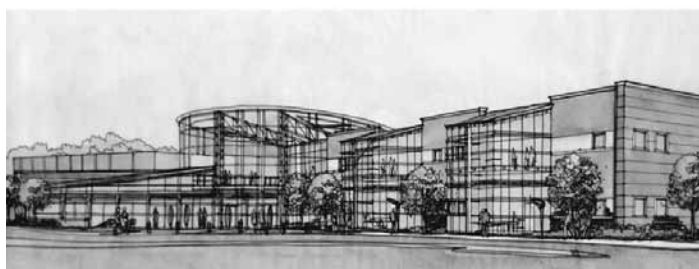
The Symposium was a tremendous success with 164 attendees who provided overwhelmingly positive responses to the Symposium. A District-wide Users Group is being formed so that members can share resources and experiences to help in the customizing and implementation of this new tool to the immediate needs of local government, industry and educators in the Fifth District.

In addition to Congressman Goode, VSGC partnered with Virginia Tech and the Virginia Geospatial Extension Program, Virginia Cooperative Extension, the City of Danville, Danville Community College and Averett University.



Additional sponsorship was provided by Environmental Systems Research Institute, Space Imaging, the Virginia Community College System's Institute of Advanced Technology and the Future of the Piedmont Foundation.

*Congressman Goode welcomes the attendees via video link from Washington.*



### ***The Institute for Advanced Learning and Research, Danville, Virginia***

***The Symposium was one of the inaugural events at this new, state-of-the-art facility.***

***For more information about geospatial sciences in your community go to>>>>[www.vsgc.odu.edu](http://www.vsgc.odu.edu) or [www.cnr.vt.edu/gep](http://www.cnr.vt.edu/gep)***



## THE COSMIC KIDS CLUB CREATES SUMMER SCIENCE FUN AT VIRGINIA AIR AND SPACE CENTER

Looking for something more fun and exciting than those Saturday morning cartoons? Then you should join the Virginia Air and Space Center's (VASC) Cosmic Kids club! Become a Rocket Kids Club member and take a different adventure every first Saturday of each month. From space to geology explore your world and beyond, meet special guests and make some really cool things!



### *Weather Watch – Saturday, August 7*

Batten down the hatches and join VASC as they keep a watchful eye on weather. Meet a meteorologist and discover the different forms of severe weather, how it affects our lives and how to stay safe during a storm. Create your own tornado to take home and then attempt to weather the storm with the IMAX film Forces of Nature!

### *Cosmic Spy Kids – Saturday, September 4*

Create a Cosmic Kid Spy Kit that you can use at home! Meet a U2 pilot from Langley Air Force Base and learn about spy planes. Build your own periscope that can see around corners. Learn how to write secret messages to your friends and experiment with DNA testing. Make your own burglar alarm to protect your room from intruders!

### *Plaque Attack – Saturday, October 2*

Bacteria that cause tooth decay love candy, just like we do! So, brush up on your oral hygiene and prepare for a plaque attack! Make home-made candy and figure out which ingredients cause tooth decay. Use a microscope to find tooth decay culprits and meet a dental specialist who fights them everyday!

*Presented in cooperation with Langley Federal Credit Union and co-sponsor Virginia Space Grant Consortium, the Cosmic Kids Club provides opportunities for children, ages 6 to 10 to explore their world and beyond.*

*For more information go to >>>>[www.vasc.org](http://www.vasc.org)*

## VSGC HOSTS SPACE QUEST PROGRAM AT THE AIRFIELD 4-H CENTER

The Virginia Space Grant Consortium co-sponsored this year's Space Quest program held March 27-28, 2004 at the Airfield 4-H Center in Wakefield, Virginia. The annual weekend affords youth ages 9-13 in the region opportunities to participate in hands-on learning activities focusing on aerospace topics. This year's program included the construction and blast-off of model rockets, the construction of a biosphere, a presentation regarding the use of amateur ham radios by the Western Tidewater Radio Association, a brief flight experience as part of the Young Eagle's program, and numerous other hands-on

“sci-tivities.”

This year's program was conducted for 41 participants from across the Tidewater and Eastern Virginia area. Participants evaluated the entire weekend highly, but particularly rated the educational program segments to be outstanding and rewarding. Many participants stated that they would like to return in 2005 in order to have another great aerospace adventure.

This partnership between the VSGC and the Airfield 4-H Center has been ongoing for several years.



*Students enjoy “sci-tivities” at Space Quest program at the Airfield 4-H Center in Wakefield, VA.*



## ***VIRGINIA SPACE GRANT CONSORTIUM SELECTS NEW SCHOLARS AND FELLOWS***

The Virginia Space Grant Consortium (VSGC) awarded \$254,500 in scholarships and fellowships to fifty-five students pursuing higher education at Virginia Space Grant Universities for the 2004-05 academic year.

Students in any field of study related to an understanding of aerospace are eligible, including but not limited to, engineering, science, math, computer science, physics, and technology. Students compete for the awards in a highly competitive application process.

VSGC provides monetary awards in four categories:

**Aerospace Graduate Research Fellowships** are \$5,000 renewable awards (up to three years) of add-on graduate support for students enrolled at a Virginia Space Grant university pursuing any field of graduate study (Masters or Doctoral level) with aerospace relevance. VSGC awarded \$150,000 in Graduate Research Fellowships to 30 students. The students' universities contribute matching funds.

**Aerospace Undergraduate Research Scholarships** are one-year, non-renewable support up to \$8,500 for undergraduate students enrolled in a Virginia Space Grant university pursuing any field of study with aerospace relevance and actively engaged in a research project. VSGC awarded \$88,000 in Undergraduate Research Scholarships to 12 students.

**Teacher Education Scholarships** are \$1,000 awards given to students enrolled at a Virginia Space Grant university in a track that leads to teacher certification in a pre-college setting. VSGC awarded \$6,000 in Teacher Education Scholarships to six students.

**Community College Scholarships** are \$1,500 awards made to students enrolled at a Virginia community college, who have completed at least one semester of

coursework and are pursuing a program of study that includes coursework related to an understanding of or interest in technological fields supporting aerospace. VSGC awarded \$10,500 in Community College Scholarships to seven students.

Space Grant Scholars and Fellows must be engaged in an identified research project with a faculty advisor as part of their academic program. The awards, which are determined by a committee of Consortium representatives, are based on evaluation of the applicant's research proposal, past scholastic achievement, and academic potential. Students receiving awards present their research findings at an annual student research conference.

The awards allow the students to actively engage in research during their academic careers, while providing support for their academic studies. "The range, caliber and contributions of the students' work are inspiring," notes Chris Carter, VSGC Educational Program Manager. "The students are very appreciative of the support they receive from the VSGC," added Carter.

"You are making dreams come true," commented one Scholar. A second-year Fellow added, "Without the award from VSGC, my research could not have continued. Thank you!"

Since the inception of the program in 1990, the Virginia Space Grant Consortium has awarded over \$3 million dollars in scholarships and fellowships to nearly 600 students.

Aerospace Undergraduate Scholars and Graduate Fellows are presented in this issue of *Virginia SpaceLink*. Teacher Education and Community College Scholars will be featured in the Fall edition of *Virginia SpaceLink*.

## 2004-05 UNDERGRADUATE SCHOLARSHIPS



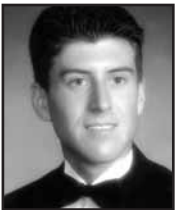
**Thomas K. Bliss** is a senior majoring in Mechanical Engineering at the University of Virginia from Attleboro, Massachusetts. He is conducting research on morphing structures technology and its application to flight control. An objective of his research is to control the shape of an airfoil internally by a system of trusses and activators and to subsequently test the airfoil in a wind tunnel.



**Colin P. Bateson** is a senior University of Virginia student majoring in Aerospace Engineering from Santa Cruz, California. He is conducting research on the prognosis of crack-failure in microdevices designed for lightweight, low-cost space applications. His research focuses on the fracture of extremely thin films, manufactured of gold and used in Microelectromechanical Systems (MEMS) telecommunication devices, such as radio frequency switches, high-and low-pass filters, and optical switches for fiber-optic networks.



**Rui Chen** is a senior Virginia Tech student majoring in Aerospace Engineering from Flushing, New York. His area of research is conducting computational and experimental studies of the Virginia Tech Hypersonic Wind Tunnel (VT HST). The reasons for his research are to improve the understanding of the working characteristics of the VT HST and the quality of data taken from it.



**Stargel R. Doane** is a junior Mechanical Engineering student at Old Dominion University (ODU). His research interests are space communications and remote sensing applications and he will demonstrate the usefulness of amateur satellite ground stations as they relate to scientists, educators, and technology. His research will be conducted at a satellite ground station that is currently being constructed on the campus of ODU with the intention of collecting images from the many amateur satellites.



**Matthew A. Ferguson**, a senior electrical and computer engineering major at Old Dominion University, is conducting research on the study of cosmic radiation effects on microelectronic devices in flight control computers. His research topic is single event upsets (SEU) in closed loop flight control computer systems. This research is necessary to ensure the integrity of vital aircraft functions.



**Sara D. Pechtel** is a senior mechanical engineering major at Virginia Tech from Winston-Salem, North Carolina. Her primary interests are in the combination of thermodynamics and fluid mechanics, particularly in high-speed, compressible fluid flow. Her research topic is the effects of high free-stream turbulence on the heat transfer of transonic jet turbine blades. Her research will observe the way heat is transferred in transonic, film-cooled turbine blades.



**Randy A. Scott**, a senior Hampton University student majoring in Aviation/Computer Science, intends to use isothermal (aerodynamic) surface temperature (O<sub>i</sub>) to estimate sensible heat flux in the Hampton Roads and Washington D.C. metropolitan area. His interest in sensible heat flux, which deals with the heat difference in the soil temperature and the temperature in the air, can be very beneficial because it helps balance the land surface energy budget.



**Timothy W. Streett** is a senior Aerospace Engineering major at Virginia Tech from Erie, Pennsylvania. His area of research is the investigation of rotary wing design for use in Mars exploration. The investigation will include determining the most efficient airfoil sections for use in low Reynold's number environments and the ideal placement of those sections out the span of the rotor.



**Steven A. Tangen**, a senior Aerospace Engineering major from Succasunna, New Jersey, is researching a theoretical model for carbon monoxide measurements with MicroMAPS at the University of Virginia. To do this, he will create a theoretical model of the atmosphere and instrument and a corresponding algorithm that uses the signals in conjunction with the universally accepted 1976 U.S. Standard Atmosphere and known surface conditions to extract carbon monoxide concentrations from the MicroMAPS data.



**Katherine H. Timpano** is a senior majoring in Aerospace Engineering at the University of Virginia. Her area of research is Microelectromechanical Systems (MEMS) Fatigue Reliability. Gold thin film specimens will be loaded with a microtensile testing apparatus that uses an inchworm actuator to deform the miniature specimens only microns in length. The results of her research will be essential for further MEMS development in the aerospace industry.



**Mythy T. Tran**, a senior at Old Dominion University majoring in electrical engineering, will investigate ways by which an optimum amount of information can be extracted from signals used for non-intrusive sensing. Both experimental and theoretical work will be performed.



**Errol Lars Yuksek** is a junior majoring in mechanical engineering at Old Dominion University. His area of research is the practical use and application of pressure sensitive paints in wind tunnels. Advantages and disadvantages of the application technique will be examined and recommendations will be made.

## 2004-05 GRADUATE FELLOWSHIPS



**Alan Scott Bellows** is a Ph.D. candidate at Old Dominion University majoring in Ecological Sciences. The primary objective of his research is to create a spatially explicit model for identification of areas within a landscape where mosquitoes are most likely to occur. This model will be based on a habitat

classification scheme that will identify, categorize, and rank suitable mosquito habitats. This scheme will be generated largely by the use of satellite remote sensing and GIS technologies.



**David A. Bryan**, a Ph.D. candidate in computer science at the College of William and Mary, will unify methods of active network bandwidth measurement and network topology discovery in his research. An objective of his research will allow for systems to characterize the interconnects between computer

cluster nodes and between multiple computer clusters. By combining probes with topology, he hopes to minimize the number of probes needed to obtain statistics, allowing for more frequent probes that will interfere less with the application running on a high performance network/cluster.



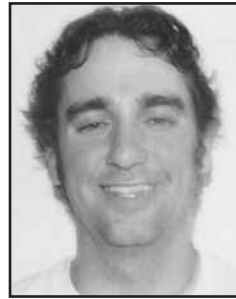
**Erin N. Elder** is a Master's candidate in Mechanical Engineering at Virginia Tech from Rome, Georgia. The main objective of her research is to experimentally study the cooling effectiveness of a combination of internal and external cooling on turbine blade. Friction factors and contours of heat transfer coefficients

will provide a means of evaluating several cooling configurations.



**Christopher S. Garcia** is a Master's candidate in Electrical Engineering-Material Science at Old Dominion University. The primary objective of his research is to characterize linear focal plan arrays detectors in order to determine device parameters. The parameters of interest are the

quantum efficiency, dark current, and gain coefficient. A characterization setup will be constructed in order to condition the device operation in terms of operating temperature and timing hardware. Data acquisition will be designed to statistically determine the device parameters.



**Patrick E. Hopkins** is a Mechanical Engineering Master's candidate at the University of Virginia. His research objective is to use information collected from the MicroMAPS instrument onboard the Proteus aircraft in conjunction with the radiative theoretical model of the atmosphere. As Proteus flies

throughout the next year, he plans to use the information from multiple flights and to reduce the data to produce carbon monoxide concentration and distribution plots. Eventually, he will be able to combine the data from all the flights to create these plots for all of North America, furthering our knowledge of carbon monoxide in the atmosphere.



**Ivy K. Jones** is pursuing a Master's degree in Physics (Optics) at Hampton University. Her research objective is the development of optical materials utilized for various laser applications: atmospheric analysis, medical procedures, and spectroscopic techniques. Her research will optimize the Cr

diffusion process in ZnSe (and other II-VI hosts) in terms of furnace temperature, diffusion time, dopant source (Cr, CrSe, CrTe, and CrCl<sub>2</sub>), dopant purity, and dopant morphology.



**Daniel B. Le** is pursuing a Master of Science degree in Aerospace Engineering at the University of Virginia. His research objective is to develop an understanding of the flow dynamics within an isolator-combustor assembly of a scramjet engine. Specifically, the research will focus on the relationship between the

equivalence ratio and the shock train that develops within the isolator assembly. From this research, the development of unfavorable operational conditions and phenomenon such as engine unstart can be more readily understood and

## 2004-05 GRADUATE FELLOWSHIPS

control systems can be developed to prevent such phenomenon from occurring.



**David Maldonado-Febus**, a Ph.D. candidate in Electrical Engineering at Virginia Tech, will conduct a research project to develop an “Interference Temperature” model to measure and quantify wireless systems interference as proposed by the Federal Communications Commission (FCC). Subsequently, this model will be used in a proposed frequency sharing plan between the existing satellite communication band users and new terrestrial services in an effort to improve spectrum utilization.



**Jonathan McGlumphy**, a Virginia Tech student from Chattanooga, Tennessee, is pursuing a Master’s degree in Mechanical Engineering. His area of research is improving gas turbine engine performance. He will investigate the “film” coolant technique, whereby air drawn from the compressor is used to cool turbine

blades. The work will build upon previous research done by members of the Virginia Tech Gas Turbine Group. The findings will allow for higher performance and longer lasting engines.



**Sam A. Miller** is pursuing a Master’s degree in Electrical Engineering at Old Dominion University. An objective of his research is to design a radio tracking device for immersive virtual reality and to construct and test this device using industry standard performance measures.



**Keoki Seu**, a William and Mary student from Hawaii, is pursuing a Ph.D. degree in Physics. The goals of his research are to elucidate the switching behavior in exchange biased thin films; to model this behavior using the Landau Lifshitz Gilbert (LLG) equations; and to explore and model the ultrafast energy transfer from the laser-excited electrons in the exchange biased system into the lattice.

The results from this research will help with the understanding of the switching behavior in magnetic thin films and of how to apply the results in designing efficient sensors and MRAM cells.



**Gregory R. Sivakoff** is pursuing a Ph.D. degree in Astronomy at the University of Virginia. His research will use two of NASA’s premier satellites, the Chandra X-ray Observatory and the Hubble Space Telescope to study low mass X-ray binaries (LMXBs) and globular clusters (GCs) in elliptical galaxies.



**Mennatoallah Youssef**, an Old Dominion University student pursuing a Master’s degree in Electrical Engineering, will evaluate the effectiveness of using commercial grade software intended for electromagnetic predictions within office buildings to develop models to analyze propagation inside airport terminals. The successful

development of these models will aid in future research to provide a means to design airport terminal wireless networks and to evaluate attack scenarios due to hostile RF or high power microwave (HPM) transmitters.



**Marcia Zangrilli**, a Ph.D. candidate in Computer Science at the College of William and Mary from Douglassville, Pennsylvania will conduct her research on the development of a hybrid approach where existing application traffic is used to measure bandwidth and to resort to injecting active probes into the network only when there is

insufficient traffic being generated by applications. A prototype of the Wren bandwidth monitoring tool has been completed which measures bandwidth using kernel-level packet traces of application traffic. Future plans are to analyze the effectiveness of Wren, identify weaknesses in the bandwidth techniques, extend Wren to actively inject traffic when needed, and compare Wren’s hybrid monitoring approach with other monitoring approaches.

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