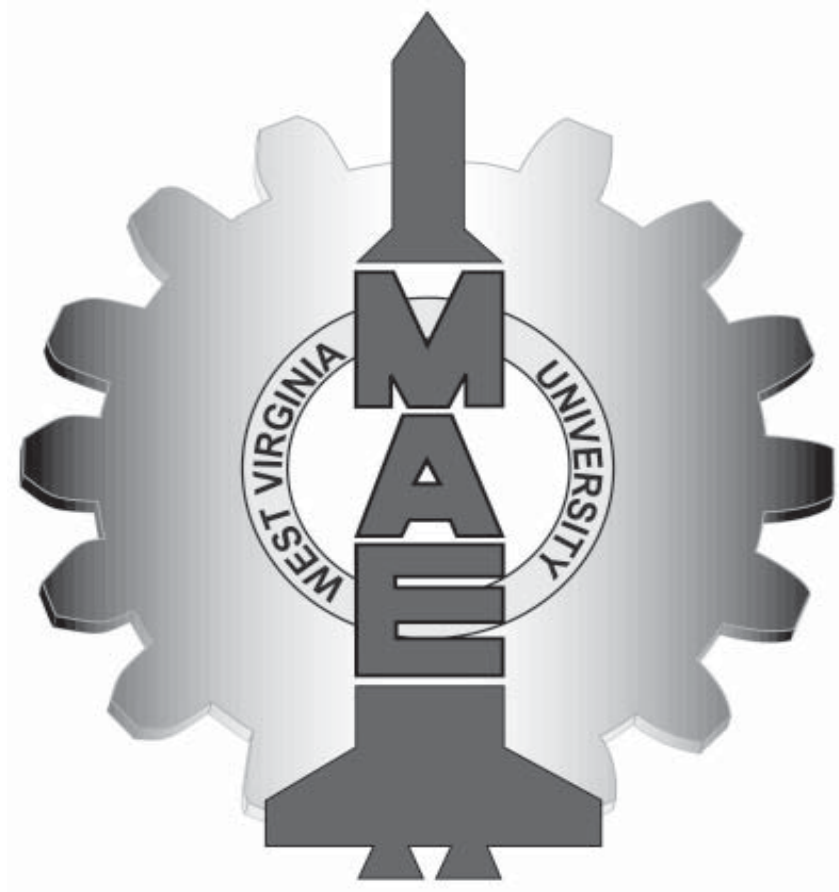


Mechanical and Aerospace Engineering at West Virginia University



2002-2004
Biennial Report

www.mae.wvu.edu

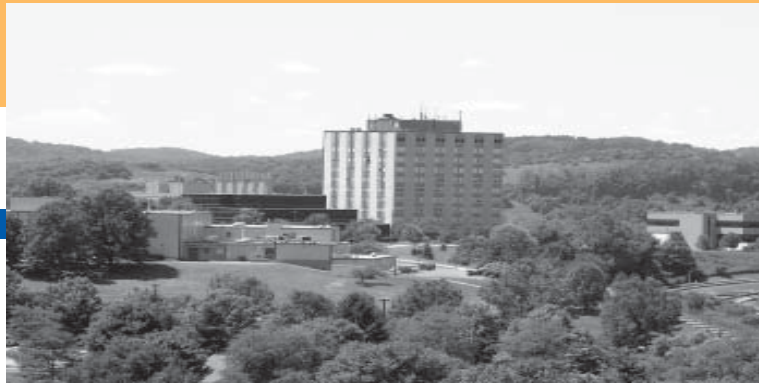


Table of Contents

Department News

New Faculty	4,6,8
Editorial and Professional Service	12
Faculty Awards	13

Student Information

Student Projects	5,7,9,11
Enrollment Trends	14
Graduation Trends	15
Degrees Awarded	16-19

Research

Feature	10
Awards	20-23

Publications and Patents

24-28

Donors

29-30

Advisory Committee

31

Performance Summary

Back Cover



A Message from the Chair

Ever Barbero, PhD



Mechanical and Aerospace
Engineering

A Couple of Years to Catch Up

In *Rising Sun*, Sean Connery invites Wesley Snipes to play “the most American of sports” –and it’s not baseball, it’s “catch up.” That’s what we’ve been doing for the last 24 months. And here is our result, the belated 2002-2004 Biennial Report.

In this report, we’ll give you a glimpse of two arduous years. The faculty worked feverishly preparing for the Fall 2003 visit by the Accreditation Board of Engineering and Technology (ABET), for which we received a Next General Review (NGR) from ABET. This is the best available evaluation awarded by ABET, meaning that our programs are sound, not needing a review for six years—the longest accreditation possible. The department strengthened its accounting practices, spent thriftily, and productivity soared. The result was a transition from a reportedly substantial debt to balanced books. In the midst of it, the WVU budget had a mid-year (January 2003) reversion of 3.4% and a budget cut of 13% effective July 2003. Nevertheless, we hired three new faculty –Andrei Smirnov, Greg Thompson and Mario Perhinschi.

The department was able to operate and grow thanks to our extraordinary research program. FY04 ended with almost \$8 million of research expenditures and an astonishing \$9.1 million of new awards. All of this was accomplished with a shrinking state budget.

Undergraduate enrollments and graduations continued to grow along with tremendous popularity for our dual AE/ME degree –a unique degree-combination in the Academic Common Market. The ACM is a program of cooperation between the states of Alabama, Arkansas, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Oklahoma, South Carolina, Tennessee, Virginia and West Virginia which allows residents of those states to attend West Virginia University to study an engineering major not available in their home state, while paying in-state tuition rates. One of the majors the residents of the above states can pursue is the integrated dual major in Mechanical and Aerospace Engineering.

The capital campaign went into full gear as the deadline of December 31, 2003 approached. The department had been blessed with an unprecedented \$1.3 million donation from the estate of alumnus Bernard L. Judy, so we went to work renovating the west wing of the Engineering Sciences Building, now renamed "Bernard Judy Laboratory Wing." About one-half of the gift was used to renovate 7510 sq-ft into nine laboratories. Currently these undergraduate laboratories are for heat transfer, fluid mechanics, mechatronics, advanced mechatronics, dynamics and strength, microgravity, bioengineering, and automotive technology. The CAD laboratory and the design laboratory were also renovated in the process.

Our students continued to make us proud of their work in student organizations and student projects. The WVU sections of AIAA, ASME, SAE, and SAMPE, and the student teams for SAE Baja, SAE Future Truck, AIAA Design-Build-Fly, NASA Microgravity, and NASA Balloon Satellite were very active and brought tremendous recognition to our institution. I invite you to browse our web-site at www.mae.wvu.edu for more information.



New Faculty Member Andrei Smirnov



Andrei Smirnov

Most Recent Projects

2000-present: Development of Multi-Physics Simulation System

2001-present: Parallel Computations of Two-Phase Turbulent Flows

2003-present: Application of High Performance Computing to Modeling of Coal/Syngas Based SOFC Stacks

Born in Moscow, Russia, Dr. Andrei Smirnov was hired in 1998 as a Research Assistant Professor in MAE. In 2002, he became a tenure-track Assistant Professor, teaching Thermodynamics and Fluid Dynamics. During this time he took part in four research projects and authored 40 publications. He conducted research on turbulence modeling and reactive flows (fuel cells). His current research activities are focused on multi-physics simulations of discrete and continuum systems.

Aside from his research and academic achievements, Prof. Smirnov has had much success in his personal life. He and his wife Irina are the proud parents of two sons, Michael and Alex. Prof. Smirnov used to have hobbies of writing poems and composing music. After joining WVU and parenting two children, he turned his poetic skills into proposal writing, and reduced his musical ambitions to a less time-consuming hobby of playing a piano. He exercises this latter hobby under the strict supervision of his wife, who is a piano teacher at the Monongalia Arts Center, and only if it does not interfere with the affairs of the kids. His wife's mother, Lydia, recently married Mr. Alan Keiser and they have settled in Morgantown.

Education

1982: MS Degree in Physics from Moscow State University, Moscow, Russia

1995: Eng. Licenciate from the Department of Thermo and Fluid Dynamics of Chalmers University of Technology, Gothenburg, Sweden

1998: Ph.D. from the Department of Thermo and Fluid Dynamics of Chalmers University of Technology, Gothenburg, Sweden.

Student Projects

Future Truck Team

Future Truck is a student design competition in which 15 universities from across North America participate. Ford Motors Co. and the U.S. Department of Energy are the major sponsors for this event. The goal of the competition is to design and build a hybrid vehicle based on the 2002 Ford Explorer platform. In doing this, the teams are expected to improve fuel economy by 25% and reduce harmful emissions while maintaining the performance of the stock vehicle.

WVU has participated in this competition since 2000. Last year's entry, titled Exclaim!, traveled to Ford's Michigan Proving Grounds in Romeo, Michigan to compete in the 2003 Future Truck Competition, along with faculty advisor Nigel Clark. The WVU team won first place in greenhouse gas emissions and third place in modeling of the vehicle using the Argonne National Laboratory code PSAT.

The 2004 WVU Team, built a parallel hybrid electric vehicle, also titled Exclaim!, using a 2.5 liter Detroit Diesel engine and an 18 horsepower 48 volt Leeson electric motor. In addition, a particulate matter trap was installed in the exhaust system to reduce harmful pollutants produced by the diesel engine. A selective catalytic reduction system, as well as a urea injection system, was installed to reduce nitrogen oxides in the exhaust. The vehicle was also equipped with standard transmission to increase fuel economy. The Exclaim! was an electronically intensive vehicle, using National Instruments electronics to control the hybrid system and several other vehicle functions.

In this final year of the Future Truck competition, Team Exclaim! came in second in greenhouse gas emissions despite two technical setbacks early in the competition. The vehicle easily maneuvered through the treacherous off-road course, and completed the trailer tow event with no problems. The team vehicle achieved 21.8 miles per gallon compared to 17 for the stock vehicle on a city and highway drive cycle in the fuel economy event. The WVU team received the third best fuel economy rating out of the 15 teams that competed.

In the year 2005, WVU will begin a new student design competition, called Challenge X, based on advanced vehicle technologies. This competition is sponsored by General Motors,

the U. S. Department of Energy and other supporters, and is based on the new GM crossover vehicle, the Equinox.



WVU Hosts Baja Race

Between 450 and 500 college students from the eastern U.S., Canada, Mexico and Puerto Rico converged on Morgantown in May 2002, when WVU hosted an all-terrain vehicle competition.

"About 50 schools participated in the Mini Baja East at Mylan Park," said Ken Means, MAE professor and faculty advisor for WVU's team. This is the fourth time WVU has been the host for the competition, which is sponsored by the Society of Automotive Engineers

"WVU was proud to be the host school for the competition," Dr. Means said. "In the past, both SAE and the competing schools have enjoyed the way WVU runs the competition. It also gave us a chance to show off West Virginia. Early May is a very nice time to visit the area, and the site for this year's competition is a beautiful setting."

WVU has been participating in Mini Baja competitions since the early 1980s, winning four times and usually finishing in the top 10. For the first time, the competition included a live Web broadcast, courtesy of West Side Telecommunications.

New Faculty Member Greg Thompson



Gregory J. Thompson

Most Recent Projects

The CTHA Low Noise, Isentropic Antenna for Helicopter Use, sponsored by Bell Helicopter Textron Inc.

Staten Island Ferry Emissions Reduction Program, sponsored by M.S. Bradley & Associates, Inc.

Hot Smart Emissions Benefits of a Fuel Modifier, sponsored by Oryxe Energy International, Inc.

Emissions Benefits of a Fuel Additive Enhancer, sponsored by Oryxe Energy International, Inc.

Dr. Gregory J. Thompson earned his Ph.D. from West Virginia University in 1995. He was a Research Assistant Professor in the department from 1995 to 2003 until he accepted his present position in the fall of 2003.

His primary research is in the area of engine emissions and includes engine design, engine control, and emissions. His research has focused on measuring emissions from heavy-duty diesel engines and examining technologies to reduce these emission's impact on the environment. He currently operates the Engine and Emissions Research Center at the National Center for Fuels, Engines, and Emissions at West Virginia University. Recent research efforts include determining the chemical characterization of the exhaust from heavy-duty engines using alternative fuels and after-treatment devices, developing artificial neural network-based engine control scheme, developing a portable in-use mobile emissions measurement system for diesel-fueled engines and developing technologies to reduce the emissions from marine vessels, including work to reduce the environmental impact during the New York Harbor dredging project. He has authored 30 conference proceedings and seven journal articles, and three patents related to engine and emissions research.

Dr. Thompson is a recipient of the Society of Automotive Engineers Teetor Education Award, the Society of Automotive Engineers Forest R. McFarland Service Award and the College of Engineering and Mineral Resources Young Researcher Award.

Education

1989: BS Degree in Mechanical Engineering from West Virginia University.

1991: MS Degree in Mechanical Engineering from West Virginia University.

1995: Ph.D. Degree in Mechanical Engineering from West Virginia University.

Student Projects

Design-Build-Fly

Every year, senior Aerospace Engineering students design, build and fly an electrically powered, remote controlled aircraft. The aircraft is designed to compete in a national event under strict rules that change every year. This year's 2004 Cessna Office of Naval Research Student Design-Build-Fly (DBF) competition was held at the Cessna East Field facility in Wichita, Kansas over the weekend of April 23rd to 25th. This year's mission was a fire bomber mission where up to four liters of water had to be carried in the aircraft, and then dropped over a designated area. The West Virginia University DBF team went to Wichita with two entries this year incorporating innovative aerodynamics and aerospace composites. This year's team consisted of 15 students, with Dr. John Loth and Ph.D. student Richard Guiler as the team advisors. The WVU team had the generous support of the Department of Mechanical and Aerospace Engineering, West Virginia NASA Space Grant, many local Morgantown businesses, and WVU alumni. The WVU team's first entry, the Sting Ray, featured a fuselage, which acted as a water tank and a half duct for the propeller to improve the propulsion efficiency. Unfortunately, the airflow from the duct-fuselage interacted with the tail control surfaces. Without adequate control surface response, Team Sting Ray remained grounded throughout the competition despite numerous attempts to complete mission objectives. WVU's Sting Ray team has been called the most innovative aircraft at the competition this year despite its 23rd out of 35 finish. The second design, called the Right Flyer, was the first pure tailless aircraft ever to complete in the competition. The team worked hard to fix damage caused by a crash early in the competition, but was only able to get one of its three scoring flights in before 5:00 pm Sunday. This flight was worth the trouble with an average speed of 81 feet per second. Even with only one of three scoring flights completed, the Right Flyer finished 19th out of 35 and made history with its unique design.



Balloon Satellite

Every year, Aerospace Engineering students design and build a sensor package to be lifted to the stratosphere by a NASA balloon. The satellite includes observation instruments and



recording devices for atmospheric studies and other uses. Also, it contains global positioning (GPS) tracking that allows the students to track the satellite's travel path and to ultimately find and recover the satellite upon return to earth's surface.

New Faculty Member Mario Perhinschi



Mario Perhinschi

Most Recent Projects

Development of a Machine Vision Software for Future Use Within Onboard UAV Platforms, sponsored by NASA West Virginia Space Grant Consortium.

Design and Flight Testing of Intelligent Control Laws with the WVU YF-22 Research Aircraft Model, sponsored by NASA Dryden Flight Research Center.

Dr. Mario Perhinschi was hired at WVU in 2001 as a Research Assistant Professor. In 2004, he became an Assistant Professor, teaching Mechatronics and Flight Modeling and Simulation. Dr. Perhinschi has an outstanding research record. His area of interest is mostly centered on modeling and simulation of aerospace systems, artificial intelligence techniques, and autonomous air vehicles. He was involved in all major aeronautical programs in Romania in the past 20 years, including subsonic and supersonic fighter, short and medium transport aircraft, utility aircraft, helicopter, unmanned air vehicle (UAV), and flight simulators. He was involved in the manufacturing of ROMBAC 1-11, a medium jet transport built under UK license, which was at that time the biggest and most complex technological transfer operation ever. He participated in the design of the first 6-DOF motion-base flight simulator in Romania for the IAR 330 helicopter, providing the aircraft's mathematical model and the motion base control laws.

Dr. Perhinschi's hobbies are numismatics, scripophily, and philately (collecting coins, banknotes, and obsolete stock certificates and stamps). After purchasing a house in Morgantown with a large backyard, he discovered that he enjoys gardening.

Dr. Perhinschi and his wife Gabriela have a 16-year-old son, Andrei. Young Andrei has a strong interest in advanced technology too. He is a member of the Technology Student Association and he earned 1st and 3rd prizes this summer at the US national competition representing Morgantown High School.

Education

1999. Doctor in Aerospace Engineering, Department of Aerospace Engineering, Polytechnic University of Bucharest, Romania. Specialization: Aerospace Flight Dynamics.

1994. Master of Science in Aerospace Engineering, School of Aerospace Engineering, Georgia Institute of Technology, Atlanta, Georgia. Specialization: Flight Dynamics and Controls.

1984. Aerospace Diploma Engineer (MS), Aerospace Department, Polytechnic Institute of Bucharest, Romania. Specialization: Flight Mechanics, Aircraft Controls and Structures.

1984. Aerospace Engineer (BS), Aerospace Department, Polytechnic Institute of Bucharest, Romania. Specialization: Flight Mechanics, Aircraft Controls and Structures.

Student Projects

Projects with Industry

Senior Mechanical Engineering students must complete a capstone design course MAE 471 and can elect to take the follow up course MAE 472 as one of their technical electives. MAE offers several capstone design tracks, including Projects with Industry (PWI), Future Truck, and Mini Baja, etc.

A team of students and a supervising faculty member concentrate their system design efforts for a semester at a particular manufacturer and identify plant and/or process enhancement to improve the company's energy efficiency, cost effectiveness and/or product competitiveness.

Teams of seniors perform design projects with industries in West Virginia. Most projects deal primarily with tasks to enhance aspects of the current production in the company's plant. These students gain an increased awareness of energy and environmental issues through these real-world experiences.

Mechanical and Aerospace Engineering has been conducting this program as a part of its mission of service to the State of West Virginia since 1990. One-hundred and twenty-three projects have been completed in this period.

Year	Semester	Company	City	Number of Students
2002	Summer	Swanson Ind.	Morgantown	7
2002	Fall	Ball Co.	Wierton	4
		Hinchcliff Lumber	Parsons	3
		Mayflower Co.	South Charleston	3
2003	Spring	Judel Products	Salem	12
2003	Summer	Century Aluminum	Ravenswood	12
2003	Fall	Sexton Can Co.	Martinsburg	10
		Danser Co.	Parkersburg	9
2004	Spring	Eagle Glass Specialties	Bridgeport	15
2004	Summer	Ames True Temper	Parkersburg	12

Projects with Industry is partially supported by a grant from the West Virginia Development Office (WVDO).

Projects with Industry has a direct impact on WV industry. For example, Royal Vendors Inc. of Kearneysville, WV, won the coveted EPA Energy Star Award directly as a result of a project on the energy efficiency of the vending machines.

Projects with Industry has a great impact on WV in other ways as well. They help to place graduating engineers from the PWI teams with the companies for which they worked during their projects.

Support for capstone senior design projects, including PWI, is the #1 priority of the Capital Campaign efforts of Mechanical and Aerospace Engineering. Additional funding would allow us to expand this program in several ways:

- Include more teams serving more industries
- Tackle larger/longer projects
- Involve graduate students for more challenging development projects
- Conduct more projects involving expensive technologies

Featured Research Program

Center for Alternative Fuels Engines and Emissions

Reduced dependence on petroleum imports is a national concern and improved air quality through reduced exhaust emissions is critical to both the nation and world. Both of these issues are central to the research program mission of the National Research Center for Alternative Fuels, Engines, and Emissions (CAFEE) at West Virginia University. Housed in the Department of MAE, the Center has as its principal faculty members MAE Professors Nigel Clark, Gregory Thompson, Scott Wayne, Mridul Gautam, and Donald Lyons, shown from left to right in the left photograph below.



CAFEE directs the largest research program in the College. Since its inception in 1989, it has received over 250 new research contract awards with total funding to WVU of over \$57 million. In the last several years the Center has received about 25 new contract awards per year.

The research team has conducted exhaust emissions studies on engines that power lawn mowers to airplanes, and mining machines to ferry boats. The center pioneered techniques for accurate field measurement of vehicle exhaust emissions through development of its unique Transportable Emissions Testing Laboratories (photograph below right) and Mobile Emissions Measurement System (MEMS). Currently, CAFEE researchers are working to create new test procedures for measuring emissions from stationary and portable engines and recently

received major grants of \$3.5 million from the USDOT Federal Transit Administration to conduct a four year study to evaluate new technology for reduced exhaust emissions from transit buses. This latest study includes hybrid electric, fuel cell, and ultra clean diesel vehicle technologies.

CAFEE has also evaluated alternative fuels such as bio-diesel, natural gas, hydrogen, ethanol, and advanced petroleum-based fuels. The study results have had significant impact on the establishment of new federal and state exhaust emissions standards, and the development of new fuels, engines, and exhaust treatment devices to reduce engine exhaust emissions.

Many of the 180+ Mechanical and Aerospace Engineering graduate students whose thesis or dissertation research was part of the program have risen to high management and technical positions in the field, establishing WVU as an internationally recognized center of expertise. Currently, over 30 graduate students are supported by the program, and each year around 15 undergraduate students gain valuable experience as student assistants or summer interns supported by CAFEE.



In addition, undergraduate students have been involved in the development of new prototype low emissions vehicles for national competitions such as FutureTruck, FutureCar, and Challenge X. Past accomplishments include an award-winning methanol fueled automobile, a natural gas fueled pickup truck, three hybrid electric automobiles, and two hybrid electric sport utility vehicles. One of the hybrid electric SUVs was awarded first place overall in a U.S. DOE/SAE FutureTruck Competition.

Student Projects

Mountaineers in Space

For about four weeks a year, NASA sponsors and administers the Reduced Gravity Student Flight Opportunities Program. This program provides undergraduate students with the opportunity to design and build an experiment of their choice that will be conducted in microgravity. This program encourages first-hand knowledge of the documentation, building and designing necessary for an experiment and outreach to academic, professional and general communities.

WVU has been participating in this project since 2001, when MAE students conducted an experiment on paramagnetic fluids. In 2002, MAE students designed an experiment involving a solution for common problems with microgravity propulsion using Kelvin force to aid in propellant acquisition in microgravity. The 2003 team of eight MAE students, the "Magnetic Microgravity Mountaineers," designed an experiment to position bubbles away from the heat rejection surfaces they can damage, and performed it on the "Weightless Wonder" airplane, a jet similar to a 707 that flies a special trajectory to create microgravity conditions within it.

"Number one on my 'Things I Want to Do List' has recently been crossed off. Since I became involved with the WVU Microgravity Research Team, I've had experiences that I never would have expected," said Shannon Glaspell, member of the WVU team. The team also conducted an outreach program to increase awareness and promote interest in WVU's participation in NASA programs. Some of the team members visited high and middle schools while others created presentations or spoke at conferences. Dr. John M. Kuhlman and Dr. Donald D. Gray are the faculty advisors for WVU's Magnetic Microgravity Mountaineers team.

Mexico Capstone Design

The MAE Industrial Outreach Program in Mexico is a six-week summer capstone design program, in coordination with the Council for Science and Technology of the State of Queretaro (CONCyTEQ), Mexico. WVU senior engineering students team up with engineering students from various universities in Mexico. Groups are assigned to work at an industrial site in Queretaro, Mexico. Students do practical

engineering work with the added dimension of cultural and language immersion.

This year, ten WVU students participated in eight industrial projects teaming up with thirteen students from three different institutions in Mexico: Queretaro's Institute of Technology, Autonomous University of Queretaro, and Monterrey Tech-Queretaro. The program counts with the enthusiastic support of CONCyTEQ's Director Dr. Alejandro Lozano and other Mexican professionals.

Teams comprised of four students from up to three different institutions, teamed up to conduct designated industrial projects working alongside with engineers from industry and with faculty from the local institutions. This year's projects took place in six companies in Mexico: GE-Air Craft Engines, Arvin-Meritor, Condumex-Gabriel, GE-Appliances (MABE), Turboreactors-Industry (Pratt&Withney) and CENAM (NIST equivalent). The projects ranged from design assessment and trouble shutting to industrial design process analysis and development, including fieldwork, engineering design and system modeling and analysis.

By teaming up with Mexican students, WVU students acquire a cultural exposure that is reciprocated to the Mexican students. The mix of professional environment with a different culture brings an added dimension to the experience. Students fine-tune their engineering skills while they hone their communication and interpersonal skills. At the end of the six week program, students give a professional presentation to the sponsored industries in Spanish, which they learn while working with Mexican professionals, while Mexican students deliver their presentation in English, which they learn with the help of our students. This is a character-building exercise that brings the cultures and personalities to the forefront of the projects. Students live with local families who provide a home away from home environment for a total cultural immersion.

In eight years, this program has impacted more than 120 students in Mexico and WVU, through over 40 industrial projects, with five universities and about 20 industries in Mexico. This year's WVU students were Charles Adams, Robin Ames, Rebecca Armstrong, Thomas Baker, Victor Chew, Mark Mewshaw, Kurt Harpold, Derek Reynolds, Mike Schillenber and Zachary Witzgall.

Editorial and Professional Service

Associate Editors

Ismail Celik, Journal of Fluid Engineering, ASME

James Smith, International Journal of Computers and their Applications

Professional Service Positions



James Smith, Member of the Board of Directors of SAE International and Chair of the Engineering Meetings Board

Editorial Boards

Ever Barbero, Journal of Mechanics of Advanced Materials and Structures, Taylor and Francis

Ever Barbero, Journal of Advanced Materials, SAMPE

Ever Barbero, Journal of Natural Disasters Accidents and Civil Infrastructure, ASCE

James Smith, Journal of Engines, SAE

Donald Lyons, International Journal for Agile Manufacturing, ISAM, and International Journal for Advanced Manufacturing Systems, ISPE

ASME Fellows

ASME recognizes its most accomplished members with the grade of Fellow, the highest membership grade available. MAE is fortunate to have faculty who have been recognized by ASME for this prestigious honor.

Ever Barbero, Professor and Chair

Richard "Dick" Bajura, Professor and Director of the National Research Center for Coal and Energy

Ismail Celik, Professor

John Kuhlman, Professor

Faculty Awards

MAE Academy of Distinguished Alumni Award

Donald Lyons and **Gary Morris** received the Academy of Distinguished Alumni Award in 2003 and 2004, respectively, for their dedication to both graduate and undergraduate teaching. The MAE Department is lucky to have an outstanding roster of distinguished alumni in its Academy of the Mechanical Engineering and Mechanics and in its Academy of Aerospace Engineering. The two academies jointly sponsor a teaching award to recognize the most notable teachers. The Promotion and Tenure Committee of the Department nominates a candidate every year.

George W. Weaver Award

Samir Shoukry and **Jacky Prucz** received the George W. Weaver award in recognition of their excellent teaching of courses in Engineering Mechanics. Engineering Mechanics includes the subjects of Statics, Dynamics and Mechanics of Materials, which are covered in three courses that form the foundation of several engineering disciplines. This award is made based on recommendations by the Promotion and Tenure Committee, and on the Student Evaluations of Instruction for the faculty teaching the appropriate courses.

Donald T. Worrel Award

Larry Banta and **Charles Stanley** received the Donald T. Worrel Award in recognition of their exemplary dedication to the department and excellence in performing MAE's mission of teaching, research and service. This award was established in memory of an esteemed former faculty member in the MAE department. The award is made based on recommendations by the Promotion and Tenure Committee.

AIUME Award for Professional Excellence Abroad

Victor Mucino received the 2003 AIUME (Association of University Mechanical and Electrical Engineers) Award, which recognizes the outreach activity between WVU and Mexico. Each summer, Dr. Mucino teaches a section of the ME capstone design course MAE471 in Mexico along with the elective complement to that course MAE 472. Eight to twelve WVU students join a similar number of Mexican students. Teams with equal number of Spanish-speaking and English-speaking students are formed and placed in Mexican industries to perform their projects for the two courses.

CEMR Faculty Awards

CEMR Teacher of the Year

Ken Means (2004)

CEMR Outstanding Teachers

Wade Huebsch and Marcello Napolitano (2003)

John Kuhlman and Ken Means (2004)

CEMR Researcher of the Year

Nigel Clark (2004)

CEMR Outstanding Researchers

Ismail Celik, Nigel Clark and Mridul Gautam (2003)

Nigel Clark and Marcello Napolitano (2004)

CEMR Outstanding Young Researchers

Wade Huebsch (2003)

CEMR Outstanding Advisor

Nithi Sivaneri (2004)



Student Enrollment Increases in MAE

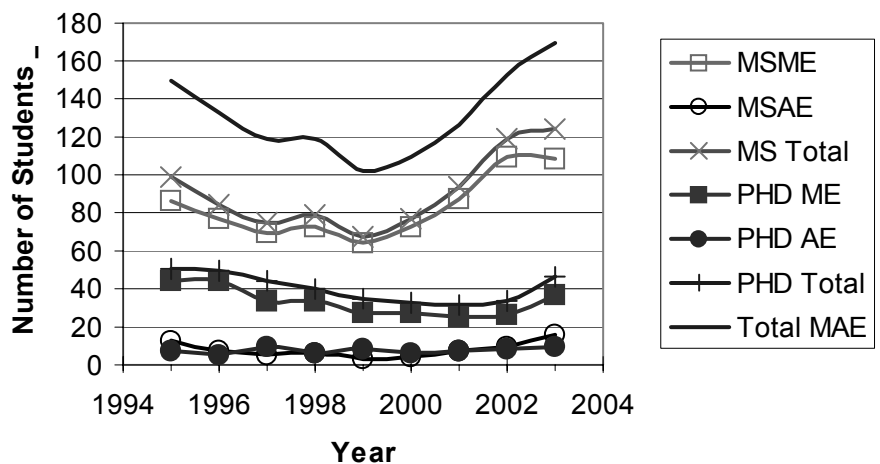
Since 1994, Mechanical and Aerospace Engineering has seen a general increase of enrollment in its undergraduate programs, with the graduate program rebounding around 1999.

Specifically, there has been a steady enrollment increase in the Dual Degree Undergraduate Program. This program allows students to enroll in a five year curriculum leading to two degrees, one in Mechanical Engineering and another in Aerospace Engineering.

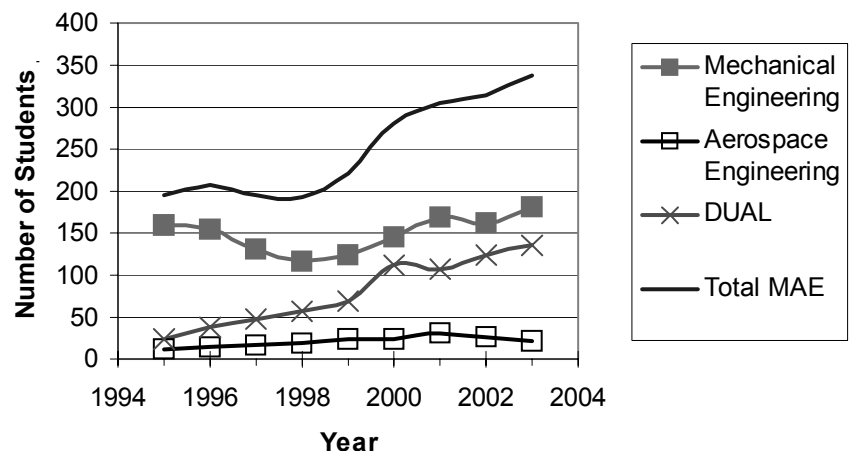
Although the number of students enrolled in MAE's Ph.D. programs has remained relatively steady for the past eight years, there has been a rise in enrollment for the Master of Science in Mechanical Engineering program.

Each year MAE drives to continue this trend of increasing enrollment. The Department's efforts will raise the interest of more students in Mechanical and Aerospace Engineering, providing them with an education that will further advance their careers.

Graduate Enrollment



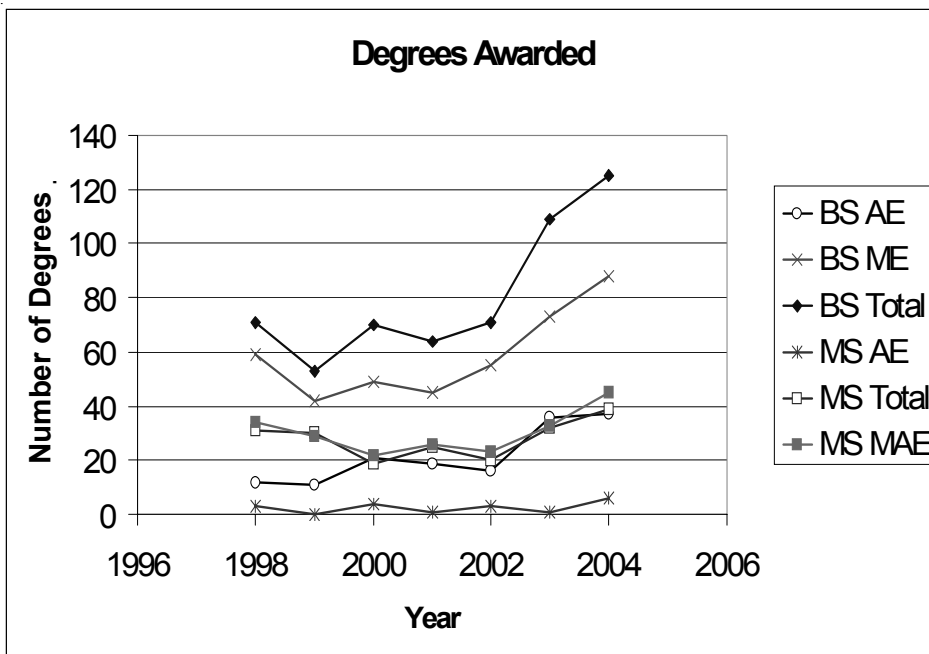
Undergraduate Enrollment





Graduation Trends

Aerospace Engineering graduations from 1995 to 1999 were in the teens in synch with the crisis in the AE industry. The recovery began in 2000, with an increasing interest in AE education reflecting a strength in the AE industry. About four years later, Bachelor of Science in Aerospace Engineering graduations started to reach numbers above 30 per year, which were normal for West Virginia University during the 1980s.



The graduation rate of the Bachelor of Science in Mechanical Engineering is more stable, reflecting average national trends for all engineering disciplines. Recent high graduation numbers result from increased interest in engineering over the preceding four or five years. Perhaps as a result of the dot-com slowdown, more and more college-bound students choose stable engineering disciplines like Mechanical Engineering.

Aerospace Engineering graduations grew by 131% in 2004 with respect to 2002 while Mechanical Engineering grew by 60%. This is a notable accomplishment considering the fact that graduations in the college as a whole grew by only 5%.

The dual degree program has helped stabilize the AE enrollment and graduation rate. Students enrolled in a dual program earn degrees in both AE and ME in about five years. Popularity of the dual degree option has grown steadily from 12% of the total enrollment in the department in 1995 to 40% in 2003. About 47% of the 2004 graduates received two diplomas, one for AE and the other for ME. Total undergraduate enrollment in the department has grown steadily in absolute size, as well as in relative size with respect to the college, to become 21% of the total college enrollment in 2003, a rise from only 13% in the late 1990s.

MS graduations per year grew by 96% since the year 2002. Ph.D. graduations are currently lower than our traditional average of about eight Ph.D. degrees per year. Scarcity of Ph.D. candidates fueled by a strong job market for Master of Science (MS) graduates is one of the factors leading to this decline. In addition, shorter duration of research contracts and dwindling state support makes it difficult to retain MS graduates for the Ph.D. program. Aggressive recruiting and a concerned effort by the faculty at large over the recent years can be credited with the 35% increase in enrollments in the AE and ME doctoral programs from 2002 to 2003. However, it will take a few years until their efforts result in larger doctoral graduating classes.



Undergraduate Degrees 2002-2003

2002-2003 Bachelor of Science in Aerospace Engineering

Benjamin Thomas Asbury
Austin Scott Barnard
Justin Michael Beachy
Trea She Boyer
Ting Yee Chin
Colton Bryce Dixon
Peter L. Donatelli
Lawrence Anthony Feragotti
Jeffrey Colin Field
Jason William Gill
Thomas Alan Grindo
Jennifer Beth Hazelton
Charles Andy Hunnell
Dave Shivanka Jayasinghe
Aaron David Judy
Daniel J. Judy
Kevin M. Lewis
Tara Marie Little
Heather Nicole Lynch
William Anthony McCartney
Gwendolyn Elizabeth Moffett
Bryant Joseph Nulph
Kathryn McKay Ogens
Michael David Plyler
Anthony Michael Rich
Sommer Renee Roach
Larry Wayne Rowe II
Benjamin Shaun Samples
Aaron Bryant Sheets
Zachary Wilson Spritzer
Kenneth Duke Wells
Glen Andrew Wilt

2002-2003 Bachelor of Science in Mechanical Engineering

Peter James Ahern
Benjamin Thomas Asbury
Ramon Walton Bain
Austin Scott Barnard
Christopher A. Barnes
Matthew Alan Barnes
Justin Michael Beachy
Joseph Robert Bidwell
Ting Yee Chin
Luke Benjamin Colville
Colton Bryce Dixon
Peter L. Donatelli
Michael Evans Doolittle
Brian Jack Downie
Jason Paul Drennen
Adam Glenn Ensminger
Michelle Renee Felice
Lawrence Anthony Feragotti
Jeffrey Colin Field
Mark Robert Frosino
Kenneth Jeffrey Golding
Thomas Alan Grindo
Jacob de Gruyl
Jennifer Beth Hazelton
Aaron David Judy Soderholm
Aaron Michael King
Jill Yvonne Kowaleski
Dech Laosiriphong
Michael L. Leek
Tara Marie Little
Heather Nicole Lynch
Emmanuel Malenya

Nedal A. Mansour
James Joshua Maybury
William Anthony McCartney
Kenneth Martin McGinnis
Kenneth John James McGowan IV
Zachary Daniel Militello
Adam Conan Naternicola
Matthew Michael Orwig
Travis Matthew Petri
Mark Eric Phillips
Michael David Plyler
Daniel S. Porter
Lucas N. Reese
Anthony Michael Rich
Sommer Renee Roach
Richard George Rothey
Larry Wayne Rowe II
Benjamin Shaun Samples
Petr Sindler
Christopher R Sprankle
Nicholas Ryan Thompson
Krista Zaniewski
Jeffrey Patrick Zumbrun



Undergraduate Degrees 2003-2004

Bachelor of Science in Aerospace Engineering

Robert Richard Almond
Micah Arter
David Eric Bartlett
Charles E. Battleson
Michael Joseph Campanelli
Jason Robert Cheslock
Todd Charles Dawson
Jason Matthew Douglass
Kimberly Dawn Foraker
Jason Stuart Gesner
Shannon Lynnette Glaspell
Bruce Joseph Goff
Christopher Douglas Griffin
Luke Jonathan Holbert
Raven Lynn Honsaker
Stefan Ivanescu
Amna Khraibut
Anastasia Jade Kozup
Paul Joseph Kreitzer
Eric Scott MacFarlane
Kenneth Michael Marn
Justin Nathaniel Martin
Howard Andrew Mearns
Tracy Allison Mick
Nathan Ashley Moynahan
Brian M. O'Hara
Ryan Plumley
Tabitha Ann Reese
Lucas Seeto Roselius
Andrew Allen Slezak
Derek Brandon Smith
Matthew Morgan Swartz

Patrick Woods Thomas
Kuntal A. Vora
Thomas Reed Widmyer
Brienne Yvonne Williams
Steven Michael Wiseman

Bachelor of Science in Mechanical Engineering

Michael K. Agyiliran
Robert Richard Almond
Matthew Thomas Armstrong
Joshua Benjamin Arose
Micah Arter
David Erid Bartlett
Charles E. Battleson Jr.
Noah Watson Bezell
Adam Stephen Bugden
John William Byers Jr.
Michael Joseph Campanelli
Jason Robert Cheslock
Andrew George Cullipher
Michael John Cunningham
Anthony Raymond Dami
Jason Matthew Douglass
Jack Anthony Evelyn Jr.
Clayton Thomas Ewen
James Adam Flory
Kimberly Dawn Foraker
Todd Richmon Gaertner
Anthony Dennis Giannini
Shannon Lynnette Glaspell
Taylor James Glotfely
Bruce Joseph Goff
Christopher Douglas Griffin

Kevin Albert Groll
Ryan Daniel Gum
Jared Jay Hartsell
Steve Eric Herron
Kenneth Michael Hershberger
Casey Patrick Himel
Joseph Paul Hockman
Luke Jonathan Holbert
Andrea Rae Holladay
Raven Lynn Honsaker
Stefan Ivanescu
Robert Lee Kern
Amna Khraibut
Ted Michael Klemetti II
Thomas John Knell
Anastasia Jade Kozup
Paul Joseph Kreitzer
Jared Christopher Larew
Michelle Renee Lechliter
Daniel Keith Lemasters
Scott C. Litwinowicz
Eric Scott MacFarlane
Brian Wesley Marple
Justin Nathaniel Martin
Thomas Gibson McConnell
Ray McFarland
Howard Andrew Mearns
Tracy Allison Mick
Gregory Kurt Miller
Nathan Ashley Moynahan
Brian M. O'Hara
Adam Michael Paff
Mary Virginia Paletta

continued on page 19



Graduate Degrees 2002-2004

2002-2003

Doctor of Philosophy

Philip Biedler
Thomas Damiani
Keith Hustosky
Jian Mao
Brad Seanor

Master of Science in Aerospace Engineering

Gerald M. Angle, II

Master of Science in Mechanical Engineering

Khaled Alkhalidi
Mokhtar Awang
Sasikumar Chandramohan
Jason Conley
Congxia Dai
Kevin Ford
Matthew J. Fox
Andrew Fox
Marcus Gilbert
Miguel Gomez
Timothy S. Hall
Gusheng Hu
Micahel Julius
Jason Knight
Asif M. Mohammad
Praveen Narasimhamutry
Rohit K. Paramatmuni
Shalini Rangarajan
Chad Riba

Juan Rincon
Jeremiah Rohrbaugh
Stephen G. Rosepiler
Jay Sherman
Travis Shultz
Sumeeth Sivangere
James Snider II
Azadeh Tehranian
Ranjit Unnikrishnan
Venkatesh Vasudevan
Vidhyashankar Venkatesan
Ryan Ware

2003-2004

Doctor of Philosophy

Allen Badeau
Zeynep Necef Cehreli
Ehab Fouad Shoukry
Yuwen Yao

Master of Science in Aerospace Engineering

Jennifer Beth Hazelton
Matthew Christopher Lechliter
Deepak Mehra
Christopher Patrick Menchini
Zachary Wilson Spritzer
Andrew Douglas Starn

Master of Science in Mechanical Engineering

Krishna Chaitanya Adivi
Nicholas Paul Amandus
Aparna Aravelli
Thomas Michael Buffamonte
Indumathi Chera
Angel Marie Dorsch
Rajeev Eluripati
Lawrence Anthony Feragotti
Sam George
John Curtis Gibble
Vasudha Goteti
Christopher Keith Jackson
Chandra Sekhar Jinka
Mohan Krishnamurthy
Sailaja Malladi
Vinu Z. Mathew
Sri Vani Sirisha Motamarri
Vijayakumar Nachiappan
Fovindan Nagappan
Vinay Nagendran
Venkatakrishnan Natarajan
Santosh Kumar Pagadala
Suryanarayana Raju Pakalapati
Venkatesh Parthasarathy
Suresh Pasumarty
J. Axel Radermacher
Srikanth Ramasubramanian
Jereym Lynn Register
Karthik Kannan Sikkil

continued on page 19



Graduate and Undergraduate Degrees

Undergraduate, cont'd from p. 17

Paul Joseph Parise
 Michael C. Pitzer
 Ryan Plumley
 Brain Jeffrey Rabbitt
 Tabitah Ann Reese
 John Thomas Ross
 Matthew Harold Rutherford
 John Michael Sakacsi
 Bruce Michael Schlicker
 Dayton Perry Schneider
 Steven Michael Seachman
 Christian Edward Shaffer
 Andrew Allen Slezak
 Derek Brandon Smith
 Corey Michael Strimer
 Matthew Morgan Swartz
 Bradley Adam Taylor
 We Leng Tee
 Glen Cameron Tempest
 Patrick Woods Thomas
 Jessica A. Vann
 Jason Chad Vincent
 Kuntal A. Vora
 Chad Edward Warren
 Jeremy Scott Watts
 Thomas Reed Widmyer
 Steven Michael Wiseman
 Erica Rae Yoho
 Andrew James Zimmerman

Graduate, cont'd from p. 18

Matthew S. Smith
 Padmanabhan Srinivasan
 Shannon Rae Stillwagon
 Dongxiang Sun
 Emre Tatli
 Ashok Varadarajan
 Appalaraju Vetsa
 Balakrishnan Viswanathan
 Janet Marie Wood
 Ming Zhang



Research Awards 2002-2003

- Airpark Sales & Service, Inc., DoD CounterDrug C-130 Pallet Design and Support, Smith/Thompson/Nutter, \$283,161
- Appalachian-Pacific Coal Mine Methane Power Company, LLC, Coal Mine Methane Project, Gautam/Bajura/Ebron/Trumbull, \$22,752
- BAE Systems, Characterization of Performance & Emissions of an Advanced Hybrid Vehicle, Clark/Wayne/Gautam/Lyons/Thompson, \$90,827
- BAE Systems, Characterization of Performance & Emissions of an Advanced Hybrid Vehicle, Clark/Wayne/Gautam/Lyons/Thompson, \$15,000
- Bell Helicopter, Textron, Inc., Blending of CFD Tools with Ice Microphysics for Investigation of Downstream Ice Roughness, Huebsch, \$59,000
- Bell Helicopter, Textron, Inc., Doppler Global Velocimetry for Model Rotorcraft Downwash Data Acquisition, Kuhlman, \$45,000
- Bell Helicopter, Textron, Inc., Circulation Control for Downwake Reduction in the V-22 Aircraft, Smith/Thompson/Huebsch, \$50,000
- Bell Helicopter, Textron, Inc., The CTHA Low Noise, Isentropic Antenna for Helicopter Use, Thompson/Smith, \$75,000
- Booz Allen & Hamilton, Inc., Emissions Characterization of Particulate Trap Equipped Existing Off-Road Heavy-Duty Construction Equipment Operating on Low-Sulfur Diesel Fuel, Gautam/Clark/Wayne/Thompson/Lyons, \$9,517
- Brookhaven National Laboratory, Natural Gas and Landfill Gas Vehicle Emissions, Lyons/Clark/Gautam, \$180,000
- Brookhaven National Laboratory, Natural Gas and Landfill Gas Vehicle Emissions, Lyons/Clark/Gautam/Wayne/Thompson, \$255,000
- Caterpillar, Inc., Evaluation of In-Use Heavy-Duty Vehicle Emissions Using the Mobile Emissions Measurement System (MEMS) - Phase IV, Gautam/Lyons/Thompson/Carder/Clark, \$1,136,529
- Concurrent Technologies Corporation, ACTD Support for Advanced Fuels Research and Coal Characterization Program, Gautam/Bajura/Zondlo/English
- Coordinating Research Council, Inc., Medium Heavy Duty Truck Test Cycle Evaluation, Clark/Gautam, \$50,001
- Coordinating Research Council, Inc., California Heavy-Heavy Duty Diesel Truck Emissions Characterization for Project E55/59-1.5, Clark/Gautam/Wayne/Lyons/Thompson, \$474,025
- Cummins Engine Co., Inc./Mack Trucks Inc./Volvo/Caterpillar Inc./Internat'l Truck & Engine Co., Design, Development and Evaluation of an In-Use Heavy Duty Mobile Emissions Measurements System, Gautam/Clark/Lyons/Thompson/Wayne, \$368,054
- Cummins, Inc., Evaluation of In-Use Heavy-Duty Vehicle Emissions Using the Mobile Emissions Measurement System (MEMS) - Phase IV, Gautam/Lyons/Thompson/Carder/Clark, \$1,136,529
- DHHS/CDC/NIOSH, Comparison of Concentrations at Personal Exposure Sampling Locations, Celik, \$103,357
- DHHS/CDC/NIOSH, Real-Time In-Use PM Measurement from Diesel Engines, Gautam/Peng, \$154,462
- DHHS/PHS/CDC/NIOSH/ALOSH, Development of a NIOSH Auto ROPS Using Fiberglass Reinforced Plastic, Means, \$10,000
- DoD/Dept. of the Air Force/AFOSR, Electromagnetic Control of High-Heat Flux Spray Impingement Boiling under Microgravity Conditions (DEPSCoR), Gray/Kuhlman, \$260,589
- Environmental Protection Agency, Diesel Aerosol Instrument Evaluation Phase II, Clark/Thompson/Gautam/Lyons/Nine, \$44,999
- Environmental Protection Agency, Characterizing a Portion of the WVU Emissions Database, Clark/Wayne/Gautam/Lyons, \$7,131
- Institute for Scientific Research, Inc., Intelligent Flight Control System Simulation Research, Napolitano, \$105,000
- Institute for Scientific Research, Inc., Simulation Support for the V&V of the Neural Networks of the 'Gen_1' IFCS F-15 Flight Control Laws, Napolitano, \$30,000
- Institute for Scientific Research, Inc., NASA F-15 Intelligent Flight Control System Project, Napolitano/Campa/Cukic, \$100,000
- Integrated Concepts & Research Corporation (ICRC), Ultra-Clean Transportation Fuels, Lyons/Clark/Gautam, \$32,388
- Las Palmas Oil & Dehydration, Transient and Steady State Emissions Effects of a Diesel Fuel Additive, Clark/Thompson/Gautam/Lyons, \$34,853
- Las Palmas Oil & Dehydration, Characterizing Additized Diesel Fuel Performance in a Class 8 Tractor, Clark/Wayne/Gautam/Lyons/Thompson, \$20,000
- Mack Trucks, Inc., Evaluation of In-Use Heavy-Duty Vehicle Emissions Using the Mobile Emissions Measurement System Phase IV, Gautam/Lyons/Thompson/Carder/Clark, \$303,276
- NASA Dryden Flight Research Center, Addressing Control Research Issues Leading to Piloted Simulations in Support of the NASA IFCS F-15, Napolitano, \$94,000
- NIOSH, In-Vitro Cytotoxicity and Genotoxicity Assays of Surfactant-Solubilized Samples of Mineral Dust and Engine Exhaust Particulate Materials, Gautam, \$66,788

Research Awards 2002-2003

- Norfolk Southern Railroad Co., Locomotive Emissions Study, Lyons/Clark/Gautam, \$18,000
- North Carolina Department of Transportation, Emissions Effects of Lubricants for Heavy Duty Diesel Engine, Clark/Lyons/Gautam/Wayne/Nine, \$33,099
- NSF, Near-Surface Tornado Intensification, Lewellen/Lewellen, \$107,314
- Office of Naval Research, Modeling of Cloud-Top Research, Lewellen/Lewellen, \$38,293
- Office of Naval Research, Demonstration of CAM Techniques for Precision Fabrication of Large Steel Structural Curved Plate Beam Component for Shipbuilding and Other Industries, Mucino/Klein.
- Office of Naval Research, Cloud Structure and Entrainment in Marine Atmospheric Boundary Layers, Lewellen/Lewellen, \$45,000
- Parsons Infrastructure & Technology Group Inc., Analysis of Flow Distribution for a Fuel-Cell Stack, Celik, \$10,000
- Parsons Infrastructure & Technology Group Inc., High Performance Computing Using Clusters, Celik, \$30,134
- Parsons Infrastructure & Technology Group Inc., Analysis of Flow Distribution for a Fuel-Cell Stack, Celik, \$20,002
- Parsons Infrastructure & Technology Group Inc., Application of High Performance Computing to Modeling of Coal Syngas Based Fuel-Cell Stacks, Celik/Smirnov, \$299,917
- Penn State University, Effect of FWD Testing Position on Modulus of Subgrade Reaction, Shoukry, \$54,664
- Penn State University, Evaluation of Load Transfer Efficiency Measurement, Shoukry, \$23,479
- South Coast Air Quality Management District, Fischer-Tropsch Synthetic Fuel Demonstration in a Southern California Vehicle Fleet, Clark/Lyons/Gautam, \$189,854
- South Coast Air Quality Management District, Development & Demonstration of Aftreatment Technologies for PM Emissions Control of CNG-Fueled Heavy-Duty Engines, Gautam/Lyons/Clark/Wayne/Thompson, \$447,042
- South Coast Air Quality Management District, Characterization of Exhaust Emissions from Natural Gas Fueled Refuse Trucks, Gautam/Wayne/Clark/Lyons/Thompson, \$49,718
- Transit Resource Center, Westchester County Diesel Engine Retrofit Program, Wayne/Clark/Gautam/Thompson/Lyons, \$81,581
- Turbo & Compressor Maintenance, LLC, TCM Locomotive Emissions Study, Wayne/Lyons/Gautam/Clark/Thompson, \$36,000
- University of Delaware, Evaluation of Emissions from Biodiesel Fuel, Lyons/Clark/Gautam/Thompson/Wayne, \$45,000
- University of Pittsburgh, University NETL Student Partnership Program, Cilento/Wilder/Wilson/Turton/Kono/Famouri/Zondlo/Gautam, \$35,000
- US EPA, Heavy-Duty Vehicle Protection Agency, Clark/Wayne/Gautam/Lyons, \$20,000
- USDOE, Life Improvement of Pot Hardware in Continuous Hot Dipping Processes, Chang/Kang, \$136,901
- USDOE, Understanding and Improving High-Temperature Structural Properties of Metal-Silicide Intermetallics, Kang/Cooper, \$98,340
- USDOE, A Transportable Heavy Duty Engine Emissions Testing Laboratory, Lyons/Clark/Gautam/Wayne/Thompson, \$1,100,000
- USDOE, Structural Characterization and Joining of MMC Components for Heavy Vehicles, Prucz/Shoukry/Lyons, \$121,000
- US Department of Energy EPSCoR State Implementation Award Program WV, Sneckenberger/Bajura/Feliachi/Celik/Douglas, \$34,018
- USDOE/NETL, Selective Nox Recirculation for Stationary Lean-Burn Natural Gas Engines, Clark/Thompson, \$200,000
- USDOE/NETL, Acoustic Detecting and Locating Gas Pipeline Infringement, Loth, \$243,000
- USDOT/FTA, Transit Vehicle Exhaust Emissions Evaluation, Lyons/Clark/Gautam/Thompson/Wayne, \$1,363,600
- UT-Battelle, LLC, Integrated Research for Predicting Higher Dimensional Phase Diagrams with Emphasis on Ternary Diagrams of Molybdenum, Silicon, and Boron, Kang/Cooper, \$14,000
- Virginia Tech, Center for Advanced Separation Technology (CAST), Kang/Johnson, \$94,325
- Volvo Powertrain Corporation, Evaluation of In-Use Heavy-Duty Vehicle Emissions Using the Mobile Emissions Measurement System Phase IV, Gautam/Lyons/Thompson/Carder/Clark, \$176,776
- West Virginia Development Office, Industries of the Future, Irwin/Cullen/Means/Creese, \$11,186
- West Virginia Division of Highways, Remote Bridge Condition Monitoring, Shoukry, \$187,618
- WV Development Office, Industries of the Future, Chang/Irwin/Kang/Sneckenberger/Turton/Gupta/Creese/Gopalakrishnan/Morris/McNeel, \$30,287
- WV Development Office, Conversion of Sawdust to Liquid Fuels, Johnson/Russell/Stiller.

Research Awards 2003-2004

Airpark Sales & Service, Inc., DoD Counter Drug C-130 Pallet Design and Support, Smith/Thompson/Nutter, \$134,169

Appalachian Laboratory for Occupational Safety & Health, Collection & In-Vitro Genotoxicity Analyses of Respirable Particulate Exhaust Materials from On-Highway Diesel Engines, Gautam, \$68,215

Appalachian Laboratory for Occupational Safety & Health, Real-Time In-Use PM Measurement from Diesel Engines, Gautam/S. Peng, \$161,101

Appalachian Laboratory for Occupational Safety & Health, NIOSH AutoROPS Pendulum Analysis and Testing, Means, \$5,308

Appalachian Laboratory for Occupational Safety & Health, Operational Effectiveness of the NIOSH JamAlert Prototype, Means, \$14,500

Appalachian Laboratory for Occupational Safety & Health, Refinements of a Composite NIOSH AutoROPS, Means, \$13,000

Bell Helicopter Textron Inc., The CTHA Low Noise, Isentropic Antenna for Helicopter Use, Thompson/Smith, \$100,000

Bell Helicopter Textron, Inc., Investigation of New Mechanisms in Ice Accretion, Huebsch, \$97,800

Bell Helicopter Textron, Inc., Doppler Global Velocimetry for Model Rotorcraft Downwash Data Acquisition, Kuhlman, \$70,000

Bell Helicopter Textron, Inc., Downwash Wake Reduction for the V-22 Osprey, Smith/Huebsch, \$200,000

BP America, Regulated Emissions from a Heavy-Duty Truck for Fuel Effects Evaluation, Clark/Wayne/Thompson/Gautam/Lyons, \$15,499

Coordinating Research Council, Inc., California Heavy-Heavy Duty Diesel Truck Emissions Characterization for Project E-55/59-2.0, Clark/Gautam/Wayne/Lyons/Thompson, \$833,466

Detroit Diesel Corporation, Evaluation of In-Use Heavy-Duty Vehicle Emissions Using the Mobile Emissions Measurement System (MEMS) - Phase IV, Gautam/Lyons/Thompson/Carcler/Clark, \$1,136,529

Federal Highway Administration, Center of Excellence - Characterization, Evaluation, and Implementation of Fiber Reinforced Polymer Composite for Highway Infrastructure, GangaRao/Chen/Cho/Creese/Gupta/Halabe/Petro/Klinkhachorn/Liang/Shekar/MAE 2002-2004 Biennial Report

Siriwardane/Vijay/Aluri/Sivaneri, \$58,960

Federal Transit Administration, Transit Vehicle Exhaust Emissions Evaluation, Lyons/Clark/Gautam/Thompson/Wayne, \$967,669

Georgia Institute of Technology, National Guard Bureau Counterdrug Technology Consortium: Standardized C-130 Pallet Design, Smith/Thompson/Nutter, \$410,155

Integrated Concepts & Research Corporation (ICRC), Ultra-Clean Transportation Fuels, Lyons/Clark/Gautam, \$277,612

M.S. Bradley & Associates, Inc., Staten Island Ferry Emissions Reduction Program, Thompson/Clark/Lyons/Wayne, \$80,000

Mack Trucks, Inc., Truck Emissions Characterization to Evaluate Advanced Exhaust Aftertreatment, Clark/Wayne/Thompson/Gautam/Lyons, \$145,468

NASA West Virginia Space Grant Consortium, Development of a Machine Vision Software for Future Use Within Onboard UAV Platforms, Perhinschi, \$20,000

NASA Dryden Flight Research Center, Design & Flight Testing of Intelligent Control Laws with the WVU YF-22 Research Aircraft Model, Napolitano, \$200,000

National Energy Technology Lab, Selective NO_x Recirculation for Stationary Lean-Burn Natural Gas Engines, Clark/Thompson, \$108,432

National Energy Technology Lab, Acoustic Detecting and Locating Gas Pipeline Infringement, Loth, \$163,462

National Renewable Energy Laboratory, Natural Gas Heavy-Duty Transit Bus Emission Testing, Washington Metro Area Transit Authority, Wayne/Clark/Gautam/Lyons/Thompson, \$286,620

National Science Foundation, Near-Surface Tornado Intensification, Lewellen/Lewellen, \$109,372

Norfolk Southern Corporation, SD70 Railroad Locomotive Emissions Study, Wayne/Clark/Gautam/Lyons/Thompson, \$110,217

Office of Naval Research, Cloud Structure and Entrainment in Marine Atmospheric Boundary Layers, Lewellen/Lewellen, \$20,000

Oryxe Energy International, Inc., Preliminary Investigation of Emissions Reduction with a Fuel Modifier Using the CARB Procedure, Thompson/Wayne/Gautam/Clark/Lyons, \$27,000

Research Awards 2003-2004

Oryxe Energy International, Inc., Hot Smart Emissions Benefits of a Fuel Modifier, Thompson/Wayne/Gautam/Clark/Lyons, \$27,000

Oryxe Energy International, Inc., Emissions Benefits of a Fuel Additive Enhancer, Thompson/Wayne/Gautam/Clark/Lyons, \$27,000

Oryxe Energy International, Inc., Hot Smart Emissions Benefits of a Fuel Enhancer, Thompson/Wayne/Gautam/Clark/Lyons, \$27,000

Parsons Infrastructure & Technology Group, Inc., Fundamental Fuel Processing Studies, Celik, \$91,877

Parsons Infrastructure & Technology Group, Inc., Analysis of Flow Distribution for a Fuel-Cell Stack, Celik, \$20,000

Parsons Infrastructure & Technology Group, Inc., Application of High Performance Computing to Modeling of Coal Syngas Based Fuel-Cell Stacks, Celik/Smirnov, \$60,000

Phoenix Helicopter, LLC, AirShark Light Utility Helicopter Design, Smith/Thompson/Prucz, \$134,003

Seaboard Coast Line Railway Supplies, Inc., CSX Transportation Locomotive Emissions Study, Wayne/Clark/Gautam/Lyons/Thompson, \$45,000

South Coast Air Quality Management District, Characterization of Exhaust Emissions from Natural Gas-Fueled Refuse-Trucks-Phase II, Gautam/Wayne/Clark/Thompson/Lyons/Carder, \$255,000

Southern California Gas Co., Characterization and Control of PM Emissions from Natural Gas Fueled Heavy Duty Engines, Gautam, \$100,000

STT EMTEC, Inc., Evaluation of a Low Pressure EGR Retrofit System for Transit Bus Application, Wayne/Clark/Gautam/Lyons/Thompson, \$15,092

The Boeing Co., Sensitivity Study on the Evolution of Contrails Behind Aircraft, Lewellen/Huebsch/Lewellen, \$110,003

U.S. Department of Energy, Life Improvement of Pot Hardware in Continuous Hot Dipping Processes, Barbero/Irwin/Kang/Loth/Liu/Gopalakrishnan, \$364,062

U.S. Department of Energy, Graduate Automotive Technology Education (GATE) Center of Automotive Technology Excellence in Advanced Hybrid Vehicle Technology at WVU, Clark/Famouri, \$50,000

U.S. Department of Energy, Understanding and Improving High-Temperature Structural Properties of Metal-Silicide Intermetallics, Kang/Cooper, \$76,081

U.S. Department of Energy, A Transportable Heavy Duty Engine Emissions Testing Laboratory, Lyons/Clark/Gautam/Wayne/Thompson, \$1,091,982

U.S. Department of Energy, Structural Characterization and Joining of MMC Components for Heavy Vehicles, Prucz/Shoukry/Lyons, \$214,998

U.S. Department of Energy, DOE EPSCoR State Implementation Plan, Bajura/Feliachi/Waffle/Sneckenberger/Douglas/Celik/Davari/Saymansky/Lai, \$34,137

University of Pittsburgh, University NETL Student Partnership Program, Cilento/Wilder/Wilson/Turton/Kono/Famouri/Zondlo/Gautam, \$35,000

University of Tennessee-Battelle, LLC, Integrated Research for Predicting Higher Dimensional Plant Diagrams with Emphasis on Ternary Diagrams of Molybdenum, Silicon and Boron, Kang/Cooper, \$25,805

Virginia Polytechnic Institute & State U., Crosscutting Technology Development at the Center for Advanced Separation Technologies, Kang/Bajura/Saus/Johnson/Peng, \$135,241

W.V.U. Research Corporation, Polymer Electrolyte Fuel Cell Test Bench, Celik, \$25,000

West Virginia Development Office, Glass Industry Assistance Program & Glass Industry of the Future Program, Banta.

West Virginia Development Office, Industry of the Future West Virginia: Biofuels Program, Russell/Stiller/Johnson.

West Virginia Development Office, Industries of the Future - West Virginia (IOF-WV) 2003 State Energy Program Special Projects, Irwin/Gupta/Turton/Creese/Gopalakrishnan/Banta/Liu/Kang/Means/Dawson-Andoh/Mcneel/Morris/Cullen, \$18,485

West Virginia Division of Highways, 4th International Symposium of 3D Finite Element, Shoukhry, \$25,054

West Virginia Division of Highways, Remote Bridge Condition Monitoring: Phase II, Shoukhry, \$284,101

Publications 2002

- Barbero, E.J.** and P. Lonetti. 2002. An inelastic damage model for fiber reinforced laminates. *J. Composite Materials* 36(8): 941-962.
- Wen, E.A., **E.J. Barbero**, and P. Tygielski. 2002. Autofretage to offset CTE mismatch in meal-lined composite cryogenic feed lines. *AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials* 4: 2555-2563.
- Barbero, E.J.** and E.A. Wen. 2002. Compressive strength of production parts without compression testing, ASTM STP 1383 Composite Structures: Theory and Practice 470-483, ASTM, PA. Modular Fiber Reinforced Polymer Composite Deck System. US Patent No. 6,455,131.
- Lopez-Anido, R., H.V.S. GangaRao, and **E. Barbero**. 2002. Modular FRP composite deck systems. US Patent No. 6,455,131.
- Campa, G.**, M.L. Fravolini, **B. Seanor**, **M.R. Napolitano**, D. Del Gobbo, and G. Yu. 2002. On-line learning neural networks for sensor validation for the flight control system of a B777 research aircraft model. *Journal of Robust Non-Linear Control* 12: 987-1007.
- Song, Y., **G. Campa**, **M.R. Napolitano**, **B. Seanor**, and **M. Perhinschi**. 2002. On-line parameter estimation techniques comparison within a fault tolerant flight control system. *AIAA Journal of Guidance, Control and Dynamics* 25(3): 528-537.
- Celik, I.** and A. Gel. 2002. A new approach in modeling phase distribution in fully developed bubbly pipe flow. *Journal of Flow, Turbulence and Combustion* 68: 289-311.
- Kern, J., **N.N. Clark**, R. Nine, and C.M. Atkinson. 2002. Factors affecting heavy-duty diesel emissions. *Journal of the Air & Waste Management Association* 52(1): 84-94.
- Gilbert, M.S. and **N.N. Clark**. 2002. Measurement of particulate matter from diesel engine exhaust using a tapered element oscillating microbalance. *International Journal of Engine Research*. 2(4): 277-287.
- Clark, N.N.**, A. Azu, R. Jarrett, T. Balon, P. Moynihan, S. Lynch, and T. Webb. 2002. Operating envelopes of hybrid bus engines. *Journal of Engines* 110(3): 2214-2225.
- Clark, N.N.** 2002. Book review of motion. *Applied Mechanics Reviews* 55(3): B56.
- Clark, N.N.** and R. Jarrett. 2002. Evaluation of methods for determining continuous particulate matter from transient testing of heavy duty diesel engines. *SAE Transactions 2001 Journal of Fuels & Lubricants* 110(4): 1938-1947.
- Ganesan, B. and **N.N. Clark**. 2002. Relationships between instantaneous and measured emissions in heavy duty applications. *SAE Transactions 2001, Journal of Fuels and Lubricants*. 110(4): 1798-1806.
- Gautam, M.**, **G.J. Thompson**, **D.K. Carder**, **N.N. Clark**, B.C. Shade, and **D.W. Lyons**. 2002. Measurement of in-use, on board emissions from heavy duty diesel vehicles: mobile emissions measurement system. *SAE Transactions, Journal of Fuels & Lubricants* 110(4): 2256-2269.
- Kim, Dong-Hee, D. Gera, and **M.G. Gautam**. 2002. Modeling nucleation and coagulation modes in the formation of particulate matter inside a turbulent exhaust plume of a diesel engine. *Journal of Colloid and Interface Science* 249(1): 96-103.
- Kim, Dong-Hee, **M.G. Gautam**, and D. Gera. 2002. Parametric studies on the formation of diesel particulate matter via nucleation and coagulation modes. *Journal of Aerosol Science* 33(12): 1609-1621.
- Xu*, Z., **M.G. Gautam**, and S.Mehta. 2002. Cumulative frequency fit for particle size distribution. *Applied Occupational and Environmental Hygiene Journal* 17(8): 538-542.
- Lapin, C.A. **M.G. Gautam**, B. Zielinska, V.O. Wagner, and R.O. McClellan. 2002. Mutagenicity of Emissions from a Natural Gas Fueled Truck. *Mutation Research* 519: 205-209.
- Huebsch, W.W.** and A.P. Rothmayer⁺. 2002. The effect of leading-edge ice roughness on dynamic stall. *AIAA Journal of Aircraft* 39(6): 945-953.
- Kang, B.**, **X. Liu**, C. Cislouiu, K.M. Chang. 2002. High temperature moire interferometry investigation of creep crack growth of inconel 783-Environment and b-phase effect, *Materials Science & Engineering A* 347½ : 205-213

Publications 2002

- Kuhlman, J.**, L. Burton, and T. Scarberry. 2002. Doppler global velocimetry data in circular jets. *Measurement Science and Technology*. 13: 1154-1162.
- Lewellen, D.C.** and **W.S. Lewellen**. 2002. Entrainment and decoupling relations for cloudy boundary layers. *J. Atmos. Sci.* 59: 2966-2986.
- Brown, A.R., R.T. Cederwall, A. Chlond, P.G. Duynkerke, C. Golaz, M. Khairoutdinov, **D.C. Lewellen**, A.P. Lock, M.K. MacVean, C.H. Moeng, R.A.J. Neggers, A.P. Siebesma, and B. Stevens. 2002. Large-eddy simulation of the diurnal cycle of shallow cumulus convection over land. *Quarterly J. of Royal Met. Soc.* 128: 1075-1093
- Liu, X.**, **B. Kang**, and K.M. Chang. 2002. The effect of hold-time on fatigue crack growth behaviors of WASPALOY alloy at elevated temperature. *Materials Science and Engineering A*, 341(1-2): 2-8.
- Fu, J.G., W.G. Wang, and **D.W. Lyons**. 2002. Development of continuous dilution factor for CVS emissions sampling and calculation. *SAE Transactions Journal of Commercial Vehicles* 110(2): 503-510.
- Etherton, J.R., R.G. Cutlip, J.R. Harris, M. Ronaghi, **K.H. Means**, and A. Gillispie. 2002. Static load test performance of a telescoping structure for an automatically deployable ROPS. *Journal of Agricultural Safety and Health of ASAE* 8(1): 119-126.
- Etherton, J.R., R.G. Cutlip, J.R. Harris, M. Ronaghi, **K.H. Means**, and A. Gillispie. 2002. Dynamic performance of the mechanism of an automatically deployable ROPS. *Journal of Agricultural Safety and Health ASAE* 8(1): 113-118.
- Morris, G.J.** 2002. Portable electric power generator with remote control and safety apparatus. US Patent No. 6,392,312.
- Brown, C.U., **T.L. Norman**, V.L. Kish III, T.A. Gruen, and J.D. Blaha. Time-dependent Circumferential deformation of cortical bone upon internal radial loading, *J. Biomechanical Engineering* 124: 456-461.
- Taylor, M., N. Clovis, **T.L. Norman**, W. Post, and J.D. Blaha. 2002. Mechanical strength increases in rabbit patellar tendons after injection of autologous blood. *Medicine and Science in Sport and Exercise* 34(1): 70-73.
- Prucz, J.C.**; **S. Shoukry**, and S. Chandramohan. 2002. Stiffness modeling and analysis of circular, laminated composite flanges. *International Journal of Agile Manufacturing*, 5(1): 51-76.
- Shoukry, S.N.**, G.W. William, and S. Srinivasan. 2002. Analysis of mid-slab transverse cracking in jointed concrete pavements. *International Journal of Pavements (IJP)* 1(3): 81-94.
- Shoukry, S.N.** and G. William. 2002. Characteristics of Concrete Contact Stresses in Doweled Transverse Joints. *The International Journal of Pavement Engineering* 3(2): 117-129.
- Jayasuriya, A., S. Dwivedi, **N. Sivaneri**, and **D.W. Lyons**. 2002. Doubly curved laminated composite shells with hygrothermal conditioning and dynamic loads, Part 2: FEA and numerical results of shells of revolution. *Mechanics of Advanced Materials and Structures* 9: 69-97.
- Jayasuriya, A., S. Dwivedi, **N. Sivaneri**, and **D.W. Lyons**. 2002. Doubly curved laminated composite shells with hygrothermal conditioning and dynamic loads, Part 1: A theoretical development and semielastic solution using higher-order displacement field. *Mechanics of Advanced Materials and Structures* 9: 53-68.
- Smirnov, A.**, **I. Celik**, and S. Shi. 2002. Large eddy simulations of a bubbly mixing layer. *American Society of Mechanical Engineers, Fluids Engineering Div.* 257(2A): 319-326.
- Smith, J.E.**, R.P.M. Craven, **J.L. Loth**, and R. Bond. 2002. Piezoelectric actuators for circulation controlled rotorcraft, US Patent No. 6,425,553.
- Craven, R.P.M., **J.E. Smith**, L. Hawks, R.S. Nutter, and F.A. Pertl. 2002. Contrawound antenna. US Patent No. 6,437,751.
- Yavuz, I.**, **I Celik**, and M. McMillian. 2002. Knock prediction in reciprocating gas-engines using detailed chemical kinetics. *SAE Transactions, Journal of Engines* 110(3): 981-987.
- Yavuz, I** and **I. Celik**. 2002. Turbulence generation mechanisms in IC engine flows: A numerical study. *Thermo and Fluid Dynamic Processes in Diesel Engines*, Book Chapter, Whitelaw, J.H.; Payri, F, Desantes, J., Springer-Varlag, Heidelberg.

Publications 2003

Banta, L., Cheng, K., Zaniewski, J. 2003. Estimation of Limestone Particle Mass from 2-D Images. *Powder Technology* 132: 184-189.

Barbero, E., and Wen, E. 2003. Autofrettage to Offset Coefficient of Thermal Expansion Mismatch in Metal-Lined Composite Pipes. *ASTM STP 1436, Composite Materials: Testing and Design* 14: 193-204.

Barbero, E., and Damiani, T. 2003. Interaction Between Static Fatigue and Zero-Stress Aging in E-Glass Fiber Composites. *ASCE Journal of Composites for Construction* 7(1):3-9.

Barbero, E., and Damiani, T. 2003. Phenomenological Prediction of Tensile Strength of E-Glass Composites from Available Aging and Stress Corrosion Data. *Journal of Reinforced Plastics and Composites* 22: 373-394.

Lonetti, P., **Barbero, E.**, Zinno, R., and Greco, F. 2003. Interlaminar Damage Model for Polymer Matrix Composites. *Journal of Composite Materials* 37: 1485-1504.

Barbero, E., and Lonetti, P. 2003. An Inelastic Damage Model for Fiber Reinforced Laminates. *Journal of Composite Materials* 36: 941-962.

Barbero, E., and Wen, E. 2003. Compressive Strength of Production Parts Without Compression Testing. *ASTM STP 1383, Composite Structures: Theory and Practice*: 470-483.

Abdelal, G., Caceres, A., and **Barbero, E.** 2003. A Micromechanics Damage Approach for Fatigue of Composite Materials. *Journal for Composite Structures* 56: 413-422.

Barbero, E. 2003. Modular Fiber Reinforced Polymer Composite Deck System. US Utility Patent Number 6,544,624.

Gajendran, P., and **Clark, N.** 2003. Effect of Truck Operating Weight on Heavy Duty Diesel Emissions. *Environmental Science & Technology* 37:4309-4317.

Clark, N., Gajendran, P., and Kern, J. 2003. A Predictive Tool for Emissions from Heavy-Duty Diesel Vehicles. *Environmental Science & Technology* 37: 7-15.

Shoukry, E., **Clark, N.**, Taylor, S., and Famouri. 2003. Numerical Simulation for Parametric Study of a Two-Stroke Direct Injection Linear Engine. 2002 SAE Transactions: *Journal of Engines* 111: 2297-2308.

Kamel, M., Lyford-Pike, E., Frailey, M., Bolin, M., **Clark, N.**, Nine, R., and **Wayne, W.** 2003. An Emission and Performance Comparison of the Natural Gas Cummins Westport Inc. C-Gas Plus versus Diesel in Heavy-Duty Trucks. 2002 SAE Transactions: *Journal of Fuels & Lubricants* 111: 1409-1421.

Jarrett, R., and **Clark, N.** 2003. Weighting of Parameters in Artificial Neural Network Prediction of Heavy-Duty Diesel Engine Emissions. *SAE Powertrain & Fluid Systems Conference, 2002 SAE Transactions: Journal of Fuels & Lubricants* 111: 1974-1983.

Weinblatt, H., Dulla, R.G., and **Clark, N.N.** 2003. Vehicle Activity-Based Procedure for Estimating Emissions of Heavy-Duty Vehicles. *Transportation Research Record (Journal of the Transportation Research Board)* 1842:64-72.

Gautam, M., **Clark, N.**, Riddle, W., Nine, R., **Wayne, W.**, Maldonado, H., Agrawal, A., and Carlock, M. 2003. Development and Initial Use of a Heavy Duty Diesel Truck Test Schedule for Emissions Characterization. 2002 SAE Transactions: *Journal of Fuels & Lubricants* 111:812-825.

Publications 2003

Craven, R.P.M., **Smith, J.E.**, and Rolland, Jr., J.J. 2003. Flexible Printed Circuit Board Antenna. US Patent Number 6,593,900.

Gautam, M., Riddle, W., **Thompson, G.**, Carder, D., **Clark, N.**, and **Lyons, D.** 2003. Measurement of Brake-specific NO_x Emissions using Zirconia Sensors for In-use, On-board Heavy-duty Vehicle Applications. 2002 SAE Transactions: Journal of Fuels & Lubricants 111: 825-841.

Kang, B., **Liu, X.**, Cisloiu, C., and Chang, K.M., 2003. High Temperature Moire Interferometry Investigation of Creep Crack Growth of Inconel 783-Environment and b-Phase Effect. Materials Science & Engineering A 347: 205-213.

Xia, J., **Lewellen, W.S.**, and **Lewellen, D.C.** 2003. Influence of Mach Number on Tornado Corner Flow Dynamics. Journal of the Atmospheric Sciences 60: 2820-2825.

Siebesma, A.P., Bretherton, C.S., Brown, A.R., Chlond, A., Cuxart, J., Duynkerke, P.G., Jiang, H., Khairoutdinov, M., **Lewellen, D.C.**, Moeng, C-H., Sanchez, E., Stevens, B., and Stevens, D.E. 2003. A Large-Eddy Simulation Intercomparison Study of Shallow Cumulus Convection. Journal of Atmospheric Sciences 60:1201-1219.

Liu, X., **Kang, B.**, Chang, K-M. 2003. The Effect of Creep on Hold-time Fatigue Crack Growth Behavior of Waspaloy at Elevated Temperature. Materials Science & Engineering A. A340: 2-8.

Loth, J.L., **Morris, G.J.**, and Ware, R. 2003. Design Aspect of a New Material Wear Tester. Computational Mechanics, Semi-Annual Review: 133-142.

Morris, G. Environment Condition Detector with Audible Alarm and Voice Identifier. 2003. US Patent Number 6,600,780.

Morris, G. Communicative Environmental Alarm System with Voice Identifier. 2003. Australian Patent Number 758304.

Morris, G. Environmental Condition Detector with Audible Alarm and Voice Identifier. 2003. United Kingdom Patent Number 2,363,234.

Sanyal A., Clemens, V., Fitzsimmons, J. S., Reinholz, G., Sarkar, G., **Mukherjee, N.**, O'Driscoll S. W. 2003. Induction of CD-RAP mRNA During Periosteal Chondrogenesis. Journal of Orthopedic Research 21:296-304.

Heisel, C., **Norman, T.L.**, Rupp, R., Mau, H., and Breusch, S.J. 2003. Stability and Occlusion of Six Different Femoral Cement Restrictors. Orthopade 32:541-547.

Heisel, C., **Norman, T.L.**, Rupp, R., Pritsch, M., Ewerbeck, V., and Breusch, S.J. 2003. In-vitro Performance of Intramedullary Cement Restrictors in Total Hip Arthroplasty. Journal of Biomechanics 36/6: 835-838.

Prucz, J.C., **Shoukry, S.N.**, Chandramohan, S., and Mitchell, S. 2003. An Analytical Model for Design of Cylindrical Composite Ducts with Upright Bolted Flanges. Composite Structures 61:221-233.

Shoukry, S.N., William, G., and Riad, M. 2003. Nonlinear Temperature Gradient Effects in Dowel Jointed Concrete Slabs. The International Journal of Pavement Engineering 4: 131-142.

Selezneva, O., Darter, M., Zollinger D., and **Shoukry, S.N.** 2003. Characterization of Transverse Cracking Spatial Variability Using LTPP Data for CRCP Design. Transportation Research Record, Journal of Transportation Research Board, No. 1849: 147-155.

Smirnov, A.V. 2003. Tool Assisted Mesh Generation Based on a Tissue-Growth Model. Medical and Biological Engineering and Computing 41: 494-497.

MAE 2002-2004 Biennial Report

Publications 2003

Tracy, T.S., Glover, D.D., Callery, P.S., Brancazio, L.R., McFarlin, B.L., Soisson, A.P., and **Smith, J.E.** 2003. Cervical Drug Delivery System. US Patent Number 6,526,980.

Smith, J.E., Craven, R., Vance, K., Duhn, C., and Pertl, F.A. 2003. Method and Apparatus for Determining Document Authenticity (DFS). US Patent Number 6,621,916.

Odon, J.V., **Smith, J.E.**, Craven, R.P.M. and El-Sherbeeney, A. 2003. Non-Invasive Ocular Dynamic Monitoring Assessment Method and Associated Apparatus. US Patent Number 6,626,537.

Odon, J.V., **Smith, J.E.**, and Craven, R.P.M. 2003. Non-Invasive Ocular Assessment Method and Associated Apparatus. US Patent Number 6,631,989.

Tracy, T.S., Glover, D. D., Callery, P. S., Brancazio, L. R., McFarlin, B. L., Soisson, A. P., and **Smith, J. E.** Cervical Drug Delivery System. United States Patent Number 6,526,980, March 4, 2003.

Thompson, G., Clark, N., Gautam, M., Carder, D., and **Lyons, D.** 2003. Inference of Torque and Power from Heavy-Duty Diesel Engines for On-Road Emissions Monitoring. SAE Transactions: Journal of Fuels & Lubricants 111: 279-285.

Lev-On, M., Letavec, C., Uihlein, J., Kimura, K., Alleman, T., Lawson, D., Vertin, K., **Thompson, G., Clark, N., Gautam, M., Wayne, W.**, Okamoto, R., Rieger, P., Yee, G., Zielinska, B., Sagebeil, J., Chatterjee, S., and Hallstrom, K. 2003. Speciation of Organic Compounds from the Exhaust of Trucks and Buses: Effect of Fuel and After-treatment on Vehicle Profiles. SAE Transactions, Journal of Fuels & Lubricants 111: 1948-1973.

Lev-On, M., Letavec, C., Uihlein, J., Alleman, T., Lawson, D., Vertin, K., **Thompson, G., Gautam, M., Wayne, W.S.**, Zielinska, B., Sagebiel, J., Chatterjee, S., and Hallstrom, K. 2003. Chemical Speciation of Exhaust Emissions from Trucks and Buses Fueled on Ultra-Low Sulfur Diesel and CNG. SAE Transactions- Journal of Fuels and Lubricants 111: 220-241.

Letavec, C., Uihlien, J., Vertin, K., Chatterjee, S., Hallstrom, K., **Wayne, W., Clark, N., Gautam, M., Thompson, G., Lyons, D.**, Chandler, K., and Coburn, T. 2003. Year-long Evaluation of Trucks and Buses Equipped with Passive Diesel Particle Filters. SAE Transactions: Journal of Fuels & Lubricants 111: 242-266.

Wayne, W., Clark, N., Nine, R., and Elefante, D. 2003. A Comparison of Emissions and Fuel Economy from Hybrid-Electric and Conventional Drive Transit Buses. American Chemical Society: Energy and Fuels Release Dec 19, 2003 on ACS Website.



Donors

Fiscal Year 2002-2003

Alcoa Foundation
 American Energy Corp
 ASEE Inc
 Corning Construction Corp
 Cummins Business Services
 Delphi Automotive Systems
 Detroit Diesel Corporation
 Dyne Systems Co., LLC
 Ergon-West Virginia Inc
 First Energy
 Hartford Electric Light Co
 Lubrizol Foundation
 Texaco Foundation
 US Filter
 Robert J. Alvarez
 Gregory Scott Babe
 Ravi K. Bahl
 Larry Banta
 Ronald Barr
 David Beorn
 Richard E. Blankenship
 George E. Booth Sr.
 David Bungard
 Mark A. Byers
 William A. Campbell
 Hsi Frank Chou
 Robert John Cochenour
 Edmond R. Cokeley
 Charles W. Collins
 Forrest DL Coontz
 Vincent S. Dimsa Jr.
 Lionel Ray Farr
 Edgar C. Fearnow
 Thomas A. Ferris
 Gary Lee Forman
 Craig S. Gerhard
 Harry Gibson
 Matthew G. Goff
 Walter P. Goodboy
 Everett A. Hamilton
 James E. Hardy
 Richard Hinkelman

Donald R. Holland
 Robert L. & Catherine Huss
 Jerome T. Imrich
 Charles E. Jamison II
 Richard J. Kacik
 Thomas Karastamatis
 Robert L. Karr
 Abdul Wahab Khair
 Fred W. Kuhn
 Thomas E. Leach
 Eric T. LeMasters
 Nicholas M. Lengyel
 Robert R. Lenhart
 Terry G. Lilly
 David R. Linger
 Brandon H. Lockard
 Thomas R. Long
 James P. Loretta
 Daniel James Marinacci PE
 Carl Martinez
 Steven A. & Tina Mascaro
 Fredrick C. Meinzer III
 Robert D. Mills
 Paul T. Mills Jr.
 Thomas V. Murphy
 Mark E. Nall
 Jeffrey Newel
 Frank Montgomery Offutt
 John E. Olashuk Jr.
 James P. O'Leary Jr.
 Terrence L. Parsons
 Harold Ray Payne
 James E. Porter
 Richard L. Rood
 John C. Rovansek
 Phillip M. Sabree
 Sarah Sandolfini
 Christopher J. Schmid
 Jeanette & Greg Schorn
 Gary J. Schweitzer
 Stan T. Serpento
 Shelley Lee Shalvis
 Linda Slonksnes
 Marcella P. Steerman

Marcus S. & Alison
 Steinhardt-Gilbert
 James B. Stenger
 J. Robert Stockner
 James Lee Stolze
 Frank Russell Summers
 Howard F. Swint
 Robert O. Thoman
 Stefan Thynell
 Dennis P. Townsend
 David A. Velegol Sr.
 Karl E. Waltzer
 Donal D. Wiebe
 Jack S. Willey
 Russell E. Winck
 M. Larry Witsberger
 Youmei Zhao

Fiscal Year 2003-2004

Accessories LTD
 American Electric Power
 American Energy Corp
 American Society for
 Engineering Education Inc.
 Astute PC
 Ford Motor Company
 General Electric Fund
 Merck Company Found.
 Metallurgical Services
 MHS Boy's Soccer Boost-
 ers Inc
 Mount View Nursery
 RAD Management Associ-
 ates Inc
 Robert D Henderson
 Insurance Agency Inc
 Science Applications
 Star Motor Company
 Texaco Foundation
 Tri-State Roofing & Sheet
 Metal Company
 United Technologies Corp
 John T Ach

James D Adams
 James F Alexander
 Robert J. Alvarez
 Larry J Andrews
 Larry J Andrews
 Ravi K Bahl
 Jimmy P Balsara
 Larry Banta
 Donald L Bellia
 John C Benner
 Donald W Bennett
 David Beorn
 Jery D & Margaret A Black
 Jerry D Blue
 Walter R Boggess
 Mark W Boggs
 Paula Fitzgerald Bone
 John W Botts
 Stanley B Bowman, Jr
 John Kent Bowyer
 John Kent Bowyer
 Jack Brannan
 Arthur M Bree
 Timothy Bubnick and Emily
 Jolley
 D Scott Butler
 Larry K Carpenter
 William C Cavage
 Ismail Celik
 David Allen Ciccini
 Steven B Clagett
 Nigel Clark
 Nigel Clark
 Benjamin Cutler Clark
 Bruce E Clinton
 Robert A Clise
 Randy Cober
 James M Coffman
 Christopher J. Coffman
 Edmond R. Cokeley
 Craig F Coleman
 Charles W Collins
 James G Couch
 Alva R. Cummings

Donors

Rebecca Danise Cutlip
 Ronald Lynn Cutright
 David Czerniak
 Gregory L Davis
 Alan de Olloqui
 Ralph R Deakins
 John A Depasquale
 Roger E Detrick
 Robert E & Betty M Diehl
 Lawrence Doolittle
 Roger E Dowler
 Roger E Dowler
 Ronald G Eckard
 James F Edwards, Jr
 Raymond J Ehrig, Jr
 Jason D Ellis
 John S Engle
 James C Evans
 Robert Lynn Eyler
 David L Faber
 J Donald Faber
 Richard L. Falkinstein
 Michael J Feinberg
 Kevin D Fields
 Marvin D Fisher
 Guy Fizer
 David & Wanda Fizer
 A Robert Foreman
 Michael F Ganter
 Harry G Gibson
 Sheree Lynn Gibson
 James T Giffin
 John L Giuliani
 Dennis P. Glaeser
 Devendra B Godbole
 Matthew G Goff
 Leonard E Graham
 Donald G Gusso
 Matthew K Hackney
 Walter R Haddad
 Charles F Haller
 Francis J Halterman, Jr
 Francis J Halterman, Jr
 David C Hartley
 Chad R Henry
 Carl Ray Hickman
 Alan S Hofses
 David L Hollenbeck
 Sharon W & Lucius R
 Horne
 Karen Hsiao-Ling Wang
 Kaye I Hutter
 Gerard Iacouzze
 Jerome T. Imrich
 Nabil M Jabbour
 Michael & Constance
 Jacobs
 William A James, III
 Charles E. Jamison, II
 Steve B Jarvis
 Richard & Lilane Johnson
 Teresa M Jones
 Peter J Joseph, Jr
 Ralph W Judy, Jr
 Ralph W Judy, Jr
 Joseph P Kanosky
 Vaughn L Kiger
 Jeffrey L Kincaid
 Thomas R Kolankiewicz
 Glenn C Larew
 Thomas E Leach
 David Wayne Leach
 David Wayne Leach
 Nicholas M. Lengyel
 Keith L Lilly
 Meade A Livesay
 Thomas R Long
 James P. Loretta
 F Russell Lorince
 David Ryan Lowe
 Sandra & Donald Lowe
 Joesph S & Victoria C
 Luchini
 Anthony J Mancuso
 Charles B Marushi
 Charles B Marushi
 Sandra Lee Mattocks
 Derek McClung
 Richard L. McCormick, Jr
 Jason P McDonald
 P Brian McGrath
 Sean C McNew
 Gregory H Miller
 Franklin Keith Miller
 Thomas L Moore
 James A Morris
 Mark W Mosser
 Frederick N Mudge
 Thomas V Murphy
 Frank Offutt
 John E Olashuk, Jr
 Janna G Ott
 Anthony J Paris
 Jon J Parrinello
 Thomas E Parsons
 Henry B Patterson
 James F Patton
 Anna Woolwine Rasmussen
 Samuel E Reckley
 Mark F Reeder
 John A Reynolds
 Peter B Rich
 John W Rosenlieb, Sr
 Craig P Ruckert
 Clarence B Ruppenthal, Jr
 Timothy P & Joy F Saab
 Phillip M Sabree
 Steven P Shaver
 Bernie W Shepard
 Charles J Shoemaker
 Charles J Shoemaker
 Morris M Shor
 Morris M Shor
 Frank J Shuler
 Anne B Simmons
 Laurie M Simpson
 Thomas W Sirk, Jr.
 William B Smith
 Randolph Lee Smith
 Jerry J Smutney
 Jerry J Smutney
 Dean W Spencer
 James L Spenik
 Robert H Stamm
 James B Stenger
 David N Strickland
 Jeff A Summers
 Daniel R Taylor
 Alan K Tennant
 Roger E Thibaudeau, Jr.
 Gergory J Thompson
 Michael L Tiberio
 David J Turcsanyi
 Malcolm H Ullock
 David A Velegol, Sr.
 David W Vincent
 Lance Byron Wagner
 Robert W Walter
 Michael D Walters
 Michael D Walters
 Gary W Wamsley
 Kathryn & F Randolph
 Watkins
 Jean C Weaver
 William A Whetzel
 John L White
 Jack S Willey
 Jeffrey A Wilson
 Thomas R Wilson, Jr
 David Craig Winter
 Marvin C Woodie, Jr
 Vincent Lewis Zirkle



Advisory Committee

	Position	Company
Mr. Robert J. Aquaro	Vice President	Mitsubishi Motors
Dr. John Benner	Program Manager	Los Alamos National Lab
Mr. Darius Brant	Manager Aerothermophysics	Lockheed Martin Corporation
Mr. Gregg Corley	Director of Engineering	ATK Tactical Systems Company
Mrs. Christine Cropp	Engineer	Arion Systems, Inc.
Mr. James G. Direnzi	Chief Engineers Office	General Electric Aircraft Engines
Mrs. Judy Fain Dolan	Adjunct Professor	Fairmont State College
Mr. Charles Ebeling	Program Manager	Allegany Ballistics Laboratory
Dr. Paul R. Evans	Chief Engineer	Allegany Ballistics Laboratory
Dr. William L. Fourney	Professor & Chair	University of Maryland, AE Dept.
Mr. Charles Jamison	Hoechst Celanese Corp. (Retired)	Hoechst Celanese Corp.
Mr. Neil Jubeck	Naval Air Warfare Center (Retired)	Naval Air Systems Command
Dr. Richard E. Kleine	Executive Director	Cummins Inc.
Mr. Robb Lenhart	Senior Consultant	Concurrent Technologies Corp.
Dr. Steve Lewellen	Research Professor of Mech. & Aero. Eng.	West Virginia University
Mr. A.D. McKisic	General Motors – Engineering	A. Stucki Co.
Mr. Will Miller	Staff Engineer	Mack Trucks, Inc.
Dr. B. Robert Mullins Jr.	Dir. Research & Technology Programs	Bell Helicopter Textron, Inc.
Mr. George K. Oss	President & CEO (Retired)	Versar Laboratories, Inc.
Mr. Robert J. Pokorski	Asst V-President, Strategic Maintenance	Strategic Maintenance, TTX
Mr. John J. Richard	Exec. Asst. to General Manager (Retired)	Westinghouse Electric Corporation
Dr. John Tomblin	Interim Director, Nat. Inst. Aviation Research	Wichita State University
Dr. Dick Walters	Professor Emeritus	West Virginia University



Spring 2004 Advisory Committee Meeting

Department of Mechanical and Aerospace Engineering
 College of Engineering and Mineral Resources
 West Virginia University
 Morgantown, WV 26506-6106

Nonprofit Organization U.S. Postage PAID Morgantown, WV Permit No. 34

Performance Summary

Fiscal Year	2001-2002	2002-2003	2003-2004
No. of Faculty	25	24	24
Research Awards	\$7,218,212	\$10,259,843	\$9,126,475
Research Expenditures	\$6,955,691	\$ 7,608,796	\$7,901,476
Journal Papers (Jan - Dec)	63	52	66
Undergrad Enrollment	304	314	339
MS Enrollment	94	119	124
Ph.D. Enrollment	32	34	46
Undergrad/Graduate Degrees	109	109	125
MS Degrees	23	33	45
Ph.D. Degrees	8	5	4
Undergrad Student Credit Hrs.	7335	7180	7983
Graduate Student Credit Hrs.	2313	2723	2722
Total Student Credit Hrs.	9648	9903	10705
Undergrad Course Credit Hrs.	226	209	220
Graduate Course Credit Hrs.	57	43	45
Total Course Credit Hrs.	283	252	265