



Technology



Efficiency



Morgan State University National Center for
Transportation Management, Research & Development

2008-09 Annual Report

Transportation: A Key to Human and Economic Development



Access



Safety

The 2008-09 Annual Report highlights research, education, and outreach activities conducted by the National Transportation Center at Morgan State University from September 1, 2008, to August 31, 2009.

The National Transportation Center (NTC) at Morgan State University is committed to transportation research and education that supports the well-being and economic development of communities.

Theme

The theme of this center is "Transportation: A Key to Human and Economic Development." This theme means we emphasize the human impacts of and interactions with multi-modal surface transportation systems, particularly socio-economics, equity, efficiency, technology, and safety. Complementing this theme is our goal of increasing the numbers of well-qualified minorities and women entering transportation careers. Our theme has been particularly appropriate to Morgan

State University's mission as an urban public university that is doctoral granting and research intensive.

History

Fully known as the Morgan State University National Center for Transportation Management, Research and Development, the NTC is part of the U.S. Department of Transportation's University Transportation Centers (UTC) Program. The NTC is also a member of the Council of University Transportation Centers.

The center was established by Congress under the Intermodal Surface Transportation Efficiency Act of 1991; reauthorized in 1998 by the Transportation Equity Act for the 21st Century; and reauthorized again in 2005 by the Safe, Accountable, Flexible, Efficient Transportation Equity Act - a Legacy for Users.

The National Transportation Center

Morgan State University
1700 East Cold Spring Lane
Montebello D-206
Baltimore, MD 21251

Phone: (443) 885-3666
Fax: (443) 885-8275
www.morgan.edu/soe/ntc

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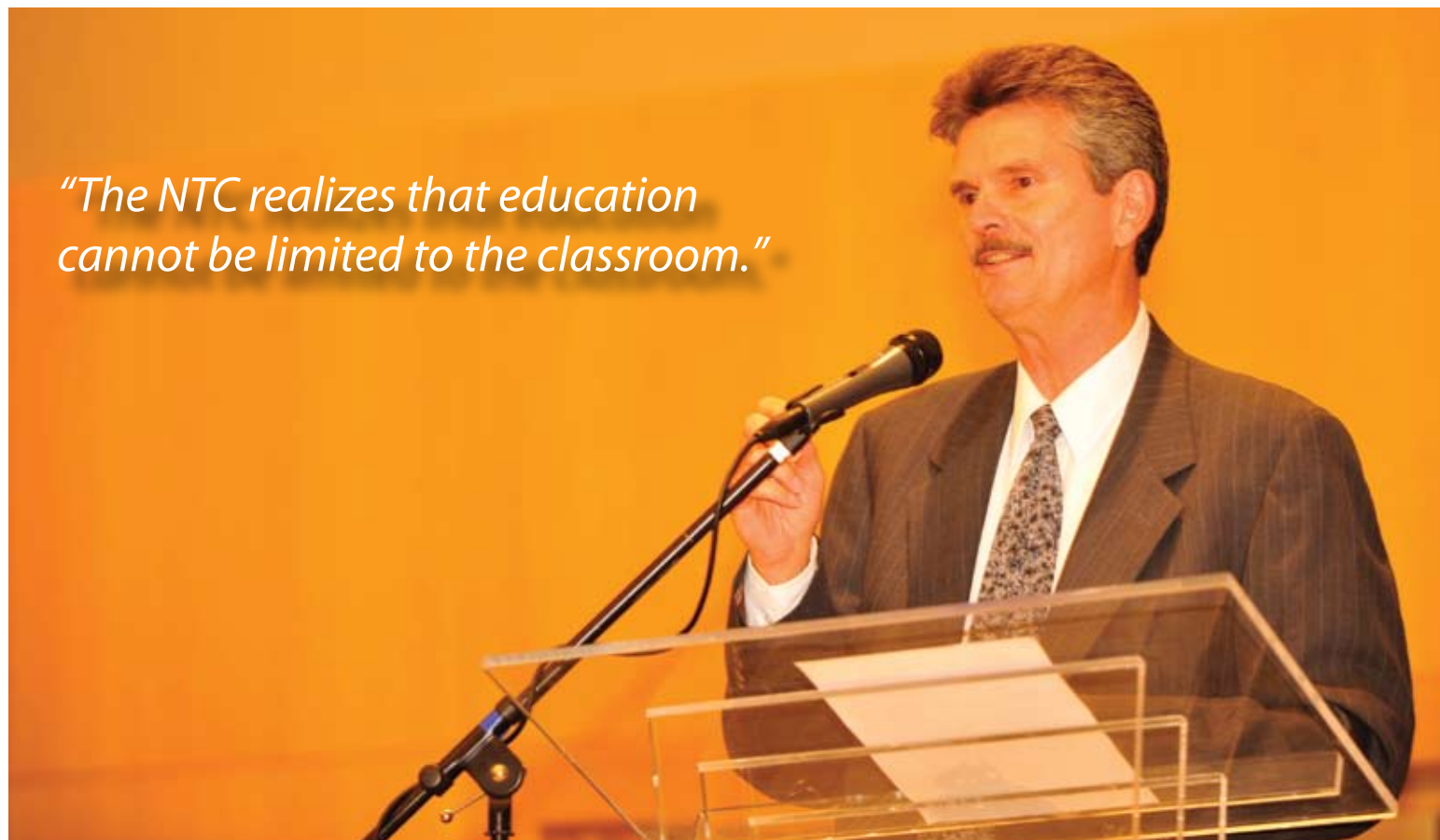
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DIRECTOR'S MESSAGE

DR. ANDREW FARKAS

"The NTC realizes that education cannot be limited to the classroom."



Morgan State University is a leader in higher education, but the NTC realizes that learning cannot be limited to the classroom. It's the thought that drives all of our efforts, from internships to research projects and conferences. The precarious condition of transportation funding in the United States has prompted us to re-focus on public education and outreach.

Roads and transit are funded primarily by motor fuel taxes flowing into trust funds dedicated to transportation projects. These trust funds do not generate public and legislative involvement like general funding issues do. As a result, the public does not fully understand how transportation is financed or why new revenue is now needed.

Motorists are driving fewer miles in more fuel-efficient vehicles, resulting in less revenue for federal and state highway trust funds. In fact, federal and Maryland trust funds are nearly empty. At the same time our roads and transit systems are wearing out, as illustrated by the

deadly failures of a signal on D.C.'s Metro system in June and the I-35W Mississippi River Bridge in Minneapolis in 2007.

What should be done? That's difficult to answer when there is insufficient outreach to an unaware public.

The NTC decided to co-sponsor the Transportation Research Board's 2010 conference in New Orleans — *Transportation Finance: Forging a Sustainable Future - Now!* — because of its focus on public outreach. Our sponsorship allows us to participate in formulating the agenda and provide conference travel grants for graduate students.

This grant year has been eventful and productive, and the NTC has worked to address issues of local and national significance. Please read the rest of this report to learn more.

MANAGEMENT STRUCTURE

Because the NTC is part of Morgan State University's School of Engineering, the center director reports to the dean of the School of Engineering.

The director

- manages programs and center staff;
- ensures that the center's objectives and contractual and financial responsibilities are met; and
- reports to the NTC Advisory Committee and seeks their guidance on center activities.

The director also meets with representatives from the U.S. Department of Transportation and other university transportation centers to share experiences and establish national priorities for transportation research and education.

The center's other employees all support the center's programs and report directly to the director. The NTC sometimes hires contractual personnel — graduate research assistants, faculty, and researchers — to fulfill specific project requirements.

Center Staff



Valencia Baker
Education Coordinator



Dr. Eugene DeLoatch
*Dean
Morgan State University
School of Engineering*



Dr. Andrew Farkas
Director



Erica Johnson
*Communications
Manager/Editor*



Anita Jones
Administrative Assistant



Sonia McDonald
Secretary

NTC Advisory Committee

Elizabeth Baker
*Regional Administrator
National Highway Traffic
Safety Admin.*

Nathan Beil
*President
KCI Technologies*

Nelson Castellanos
*Division Administrator
Federal Highway Admin.*

Alfred H. Foxx
*Director
City of Baltimore,
Department of
Transportation*

Ronald L. Freeland
*Executive Secretary
Maryland Transportation
Authority*

Bob Garrett
*Manager
Bureau of Municipal
Services
Pennsylvania Department
of Transportation*

Gail McFadden-Roberts
*Community Planner
Federal Transit Admin.
Region 3*

Adiele Nwankwo
*Senior Vice President & GM
Central Region
PB Americas*

Edward H. Power
*Senior Vice President
HDR Engineering, Inc.*

Clyde Pyers
*Retired
Maryland State Highway
Admin.*

Jay P. Watkins
*Chief Executive Officer
Construction Management*

Paul J. Wiedefeld
*Administrator
Maryland Transit Admin.*

Richard Y. Woo
*Director
Office of Policy & Research
Maryland State Highway
Admin.*



FUNDING & EXPENDITURES

The NTC's total revenue for the 2008-09 grant year was \$1,210,035; total expenditures were \$1,007,831.

With this money the NTC was able to:

- select three new research projects;
- provide a \$7500 scholarship to the four graduate students selected to be Eisenhower Fellows;
- fill the Summer Transportation Institute's curriculum with eight field trips, five hands-on projects, and daily SAT prep;
- establish the Teacher Transportation Institute;
- give paid internships to 13 undergraduate and graduate students;
- create a book scholarship for the majors in the new undergraduate program in transportation systems;
- present papers at national and international conferences; and
- host a research symposium and the 2008 Maryland TRAC Design Build Challenge.

Our funding sources for the year were the U.S. Department of Transportation's UTC program, the Maryland State Highway Administration (SHA), Federal

Highway Administration (FHWA), and Morgan State University.

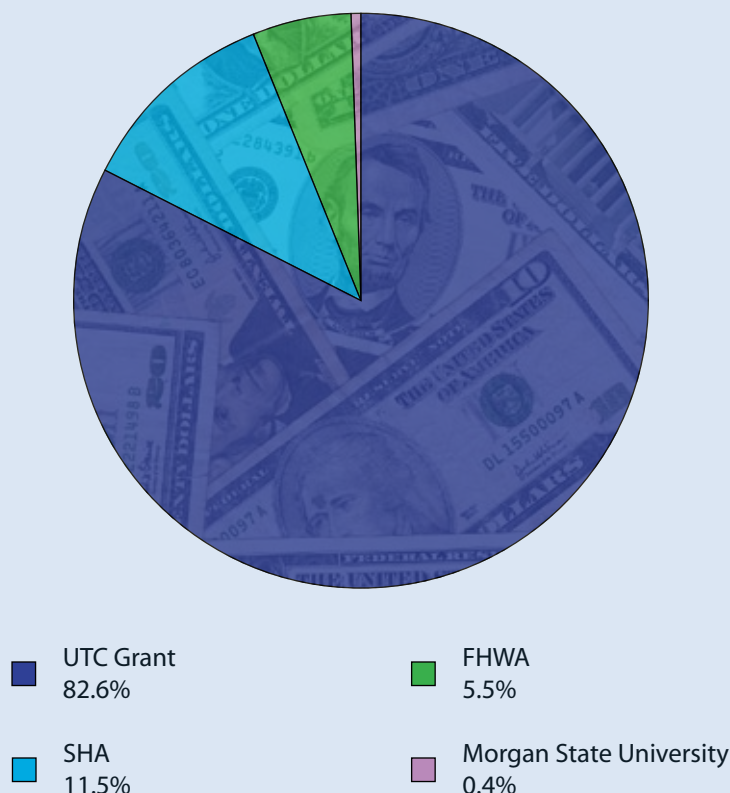
The SHA gave us \$124,875 as part of a multi-year research funding relationship. Four of the five research projects completed this year were done in cooperation with the SHA.

Nearly 40 percent of the NTC's expenditures — \$396,755 — financed the following research projects:

- "Assessing the Magnitude of Polycyclic Aromatic Hydrocarbon Loading from Road Surfaces and its Effect on Algal Productivity,"
- "A Comprehensive Review of Motorcycle Crashes in Maryland,"
- "Implementation of the Concrete Maturity Meter for Maryland," and
- "Line-Striping Life Cycle Analysis Phase II."

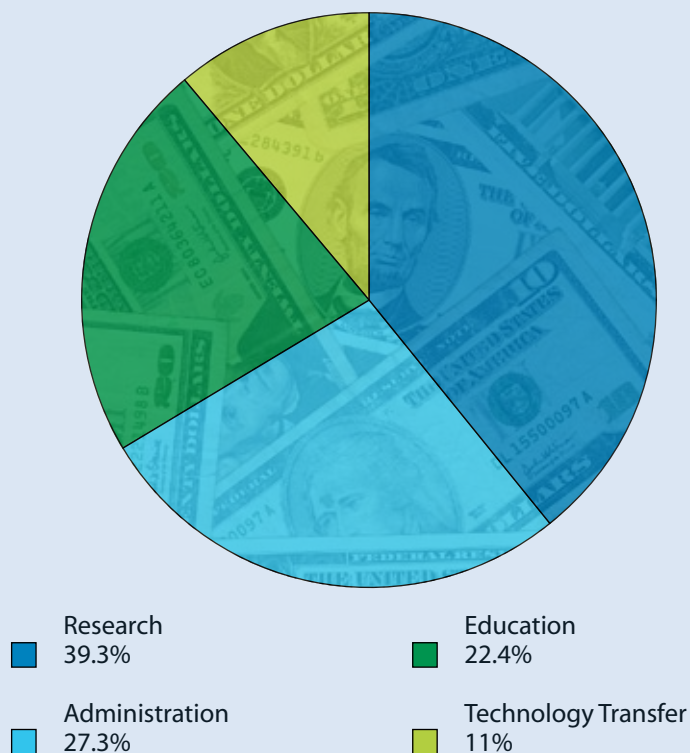
2008-09 REVENUE SOURCES

Total Revenue: \$1,210,035



2008-09 EXPENDITURES

Total Expenditures: \$1,007,831



EDUCATION

This year saw increased focus on the quality of math and science education in Maryland.

Months after the Abell Foundation published a study that found that the state's voluntary science curriculum for high school math does not adequately prepare students for college placement exams, Governor Martin O'Malley's P-20 Leadership Council presented their recommendations for improving math and science education in Maryland. The council, made up of business, education, and labor leaders, called for tripling the number of math and science teacher's produced by state universities, as well as increasing the number of science, technology, engineering, and math (STEM) graduates.

The council also recommended that the state provide meaningful educational opportunities for every student interested in STEM.

We are proud to report that our Summer Transportation Institute (STI) has been doing that for the last 13 years, and our new Teacher Transportation Institute (TTI) is working toward the state's goal of tripling the number of STEM-certified teachers in Maryland.

As you will read on the next eight pages, all of our educational efforts have been designed to ensure that all students have the experience, knowledge, and analytical skills to compete in and lead the transportation industry.



TTI trains local teachers in using technology to make and science concepts relevant to their students. Full story on page 14.

MS. DANIEL GOES TO WASHINGTON



Praised as ambitious and hardworking by Morgan faculty and staff, Angelica Daniel was named the NTC's Student of the Year at the Council of University Transportation Centers' annual awards banquet in Washington, D.C. Daniel received an all-expenses-paid trip to the Jan. 10 ceremony, as well as a \$1000 stipend and a certificate.

"The honor and recognition are the most exciting part of the award for me," Daniel said. "Throughout my academic career I have never received an award of this magnitude. It has been a humbling experience."

"I nominated her," said Dr. Mansoureh Jeihani. "She has been one of the best students in my classes and [research assistants on] my project."

Daniel's impressive resume helps explain her success. She received her B.S. in civil engineering from Morgan in 2002. While she pursues a master's degree from the Department of Transportation and Urban Infrastructure Studies, she works as a transportation engineer for the Maryland Transportation Authority. Her resume includes membership in the American Society of Civil Engineers; Intelligent Transportation Society of America; and the student chapter of the Institute of Transportation Engineers in which she serves as president. In addition to all of these activities, Daniel has participated in faculty-led research on transportation demand modeling and green infrastructure.

Daniel has also been researching the links between aquatic ecology, toxicology, and transportation infrastructure for the NTC and Morgan's Estuarine Research Center.

Said Dr. Farkas, the NTC's director, "She's playing a major role in developing research initiatives."

“Internships and programs like the Eisenhower are essential for preparing individuals for the workforce.”

Brandon Buckner
2008 Eisenhower Fellow

2008-09 INTERNS AND FELLOWS

Maryland State Highway Summer Interns

Justin Dean
Naomi Jones
Janay Smith
Shakia Word

Maryland Department of Transportation- Morgan State University Graduate Interns

Gladys Apolonio
Nadine Bennett-Darby
Yaw Osei Berkoh
William “Stacy” Boles
Marouf Diallo
Alex Kamamia
Toheeb Oridedi
Kortney Pinkney
Erimas F. Shiferaw

Eisenhower HBCU Fellowship Recipients

Devang Dave
Devkota Bimal
Sriram Jayanti
Francis Udentia

NTC Fellows

Ogechi Elekwachi
Shawn Jordan
Celine Kalembo
Naveed Shah
Farrah Spruill

WHERE ARE THEY NOW?

2008 EISENHOWER FELLOW BRANDON BUCKNER



Buckner (left) was happy to meet Robert Cervero (right) at the Eisenhower Showcase during the TRB Annual Meeting. "It was kind of cool because I cited him the most in my research, and he came up to my table and he was very interested in my topic," Buckner said.

Of the NTC's four Eisenhower fellows for 2008, Brandon Buckner was the only one to present at the Eisenhower Showcase during the TRB's Annual Meeting. His presentation — "An Analysis of Informal Transportation in Urban Communities: Hacking in Baltimore" — investigated whether inequities in transportation lead urban residents to seek alternatives that may not be safe or legal.

"A group of my colleagues went to a conference in Phoenix, Ariz., and, while they were there, they met some individuals who had seen my project at TRB and mentioned it to them," he said. "It was actually kind of cool because the TRB was in January, this was early September, and they remembered a student from Morgan State with a study

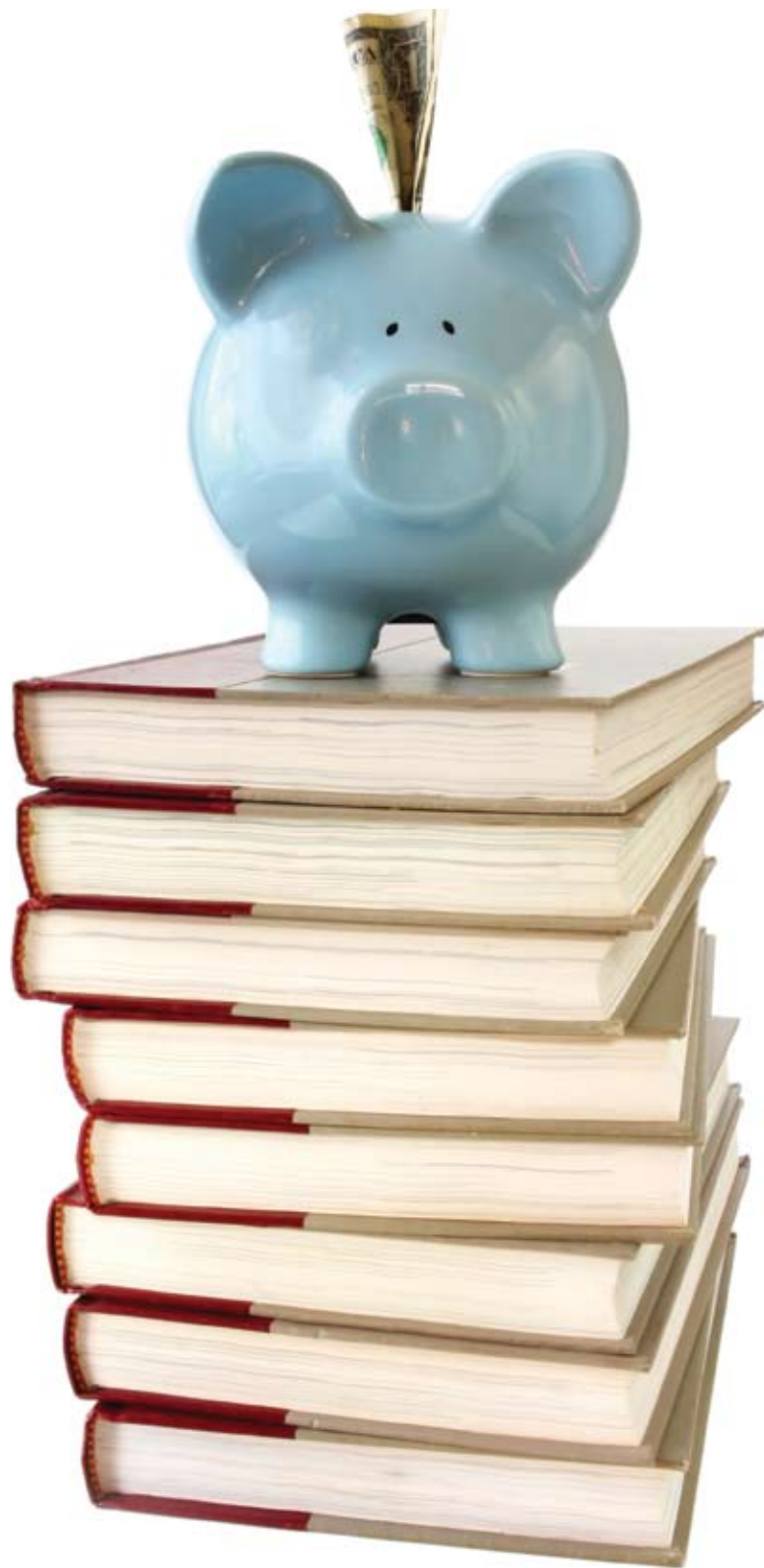
about hacking."

Bucker received his master's degree in city and regional planning in May, and was accepted into the Federal Highway Administration Professional Development Program.

"The Eisenhower fellowship has had a huge impact on my new job as a PDP community/transportation planner," he said. "The most important thing about being in the Eisenhower Program is that it allowed me to network with some high officials and get my name out there."

BOOK SCHOLARSHIP FOR TRANSPORTATION MAJORS

The NTC established a new financial aid source for students enrolled in Morgan's undergraduate program in transportation systems: a \$1000 per semester book scholarship. As of August, nine students have signed up for the major.





TRAC CONTEST BUILDS SKILLS & CONFIDENCE

Over fifty teens tested their bridge-building abilities at the 2008 Maryland TRAC Design Build Challenge. Hosted by the NTC and Morgan State University, the Nov. 1 event is part of a national effort by the American Association of State Highway and Transportation Officials (AASHTO) to encourage students to pursue careers in transportation and civil engineering through hands-on activities.

With their supplies limited to glue and craft sticks, the contest participants were charged with designing and building the lightest bridge that could carry

the most weight. The students, who ranged from grades 7-12, competed according to grade level.

A team of physics students from Thomas Stone High School in Waldorf, Md., were the day's big winners. Their 20-inch, 7.53 oz. bridge was able to support 59 lbs. As the Level 3 (grades 11 and 12) victors, the Thomas Stone team earned a \$300 savings bond for each of its members and a trophy for their school. They also represented the state of Maryland in the National TRAC Bridge Building Contest in Bedford, Pa., in May 2009.

2008 MARYLAND TRAC DESIGN BUILD CHALLENGE FIRST PLACE WINNERS

Level 1 (7th & 8th grade)

Lindale Team 1: Kunthaka Nilaweera
Lindale Middle School

Level 2 (9th & 10th grade)

INDian Builders: Chelsea Moss, Grace McClintock, Chelsea Conner
Institute of Notre Dame

Level 3 (11th & 12th grade)

A.P. Students of Thomas Stone: Joshua Cushenette, John Carr II, Nailah Baukman
Thomas Stone High School



Dr. Andrew Farkas presented Rep. Elijah Cummings with a plaque in appreciation of his support of the NTC and STI program.



Michael Greene's performance during the summer earned him the Maryland Department of Transportation Outstanding Achievement Award.



Daniel Woo's win of the STI Director's Award resulted in cheers from his classmates.



The TTI participants were also saluted at the banquet.

The 13th Annual Summer Transportation Institute Awards Banquet

July 31, 2009



Benta Horton-Gee, who won the Federal Highway Division Administrator's Outstanding Achievement Award, appreciated STI's focus on college classes and internships. "It really helped me to figure out what I want to do when I get older," she said.



Keith Crowell accepts the SHA Award from Dr. Farkas.

Jewel Black (1) and Jeremy Freeman (2) each received the STI Leadership Award. The plaques were presented by long-time STI teachers Dawn Ray and Karl Brown.

STI PUTS LOCAL TEENS ON THE ROAD TO SUCCESS



"The question is not whether you have a destiny. The question is whether you will do the things necessary to take advantage of your destiny," said Rep. Elijah Cummings, the keynote speaker at August's STI awards banquet.

For 13 years the Summer Transportation Institute at Morgan State University has shown high school students how a strong foundation in

math and science can lead to lucrative careers in the transportation industry.

Funded by the NTC and Federal Highway Administration, the free program includes four weeks of field trips, special projects, discussions with industry professionals, and daily SAT prep.

A popular addition to this year's curriculum was the book "The 7 Habits of Highly Effective Teens," which provides a step-by-step guide of how teens can achieve their goals and overcome personal and educational obstacles.

Keeping with that theme, Rep. Cummings challenged the students to stay motivated. The congressman, who chairs the Subcommittee on Coast Guard and Maritime Transportation, recited the following nautical-themed poem.

I'm tired of sailing my little boat,
far inside the harbor bar.
I want to go out where the big ships float,
on the deep where the great ones are.
And should my frail craft prove too slight
for waves that sweep those billows o'er,
I'd rather go down in the stirring fight
than drowse to death at the sheltered shore.



Antonio Forcellese, a preparatory math teacher at Hamilton Elementary/Middle School, perfects his paper airplane technique.

TTI TURNS TEACHERS INTO STUDENTS

Encourage students to make paper airplanes in class?

Allow students to take control of the learning process?

The 12 teachers who participated in our inaugural Teacher Transportation Institute would say yes. They learned how simple projects can help their students understand math and science concepts. The program was created as a complement to the STI program.

Over a week in July, the teachers were shown how to supplement their lesson plans with student-led activities that encourage problem-solving and illustrate the link between math, science, technology and transportation.

The teachers were also introduced to resources that can further challenge their students' skills, including the TRAC program designed by AASHTO.

The program continues during the school year with three follow-up sessions. The meetings are designed to provide support and help the participants develop and modify activities to address the specific needs of their students.

"The programs get teachers and students excited about learning and that is something to celebrate," said Valencia Baker, NTC education coordinator.



TECHNOLOGY TRANSFER

The NTC regularly hosts, sponsors, and participates in events that enhance the communication between industry professionals, academics, and students.

Papers by the center's investigators have been presented at national and international conferences. Their work has also been published in industry publications, including *Transportation Builder*.

SYMPOSIUM HIGHLIGHTS NTC RESEARCH



The National Transportation Center Research Symposium brought together industry professionals, researchers, and students for an in-depth discussion and analysis of the center's six most recently completed projects.

As Dean DeLoatch said in his opening remarks, "This is a very timely symposium ... as we look to the commitment that's being made at the national level to look through and work on the future of our national infrastructure."

Held on Feb. 25, the event featured presentations by two graduate students and five Morgan professors. Topics included the best type of paint for road markings; how a system based on GPS technology could improve congestion and traffic management; and how "second parenthoods" affect the travel needs and patterns of elderly African Americans.

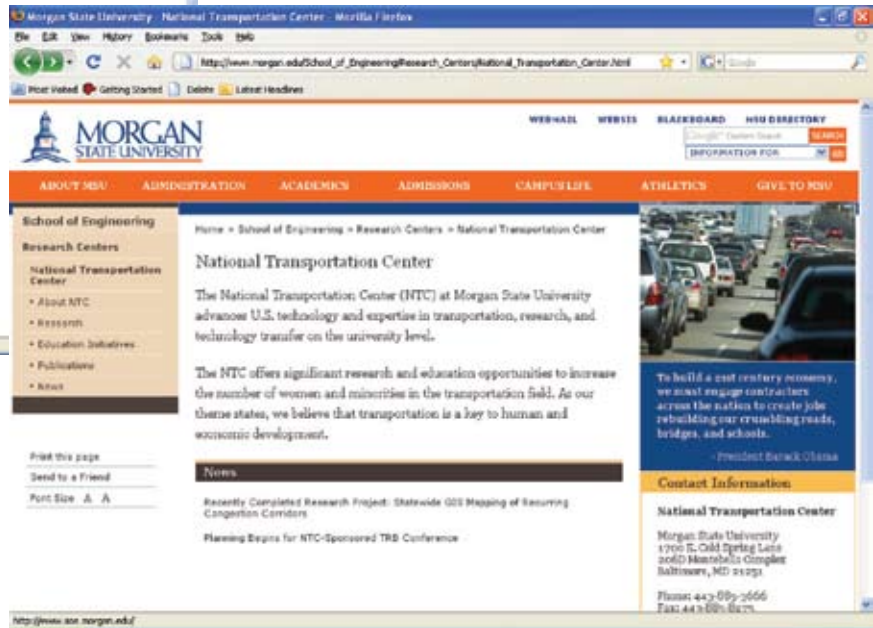
Four of the projects were funded by the SHA. Allison Hardt, the research division chief of SHA's office of policy and research, was pleased with what she saw.

"It's great," Hardt said. "I like hearing about all of the students that worked on the projects and how they're supported and learning. That's part of it, too — the education."

THE NTC'S NEW AND IMPROVED WEB SITE



Old Web site: www.eng.morgan.edu/~ntc



New Web site: www.morgan.edu/soe/ntc

The redevelopment and redesign of Morgan State University's Web site gave the NTC the opportunity to update its site.

The NTC's new Web site — which can be found at www.morgan.edu/soe/ntc — is easier to navigate, clearly describes who we are and what we do, and reflects our presence at Morgan State University.

All of the information that was on the old Web site, including projects and newsletters, can be found on the new site. In order to aid in the transition, an automatic redirect is on the old Web site. The old site will remain accessible until October 2010.

PAPERS PRESENTED

“Estimating Trip Generation Rates for Two New Development Types”

Author: Dr. Mansoureh Jeihani

Session: The 15th International Conference on Urban Transport and the Environment

Date: June 22-24, 2009

“Estimation of Traffic Recovery Time for Different Flow Regimes on Freeways”

Authors: P. James, Dr. Mansoureh Jeihani, and Dr. Anthony Saka

Session: Second International Symposium on Freeway and Toll Operations

Date: June 21-24, 2009

“Trip Generation Study for Special Generators”

Authors: Dr. Mansoureh Jeihani and R. Camilo

Session: Impacts of Changing Demographics on Transportation Conference

Date: October 27-28, 2008

PAPERS PUBLISHED

“Transportation Finance and Public Education”

Authors: Dr. Andrew Farkas and Robert Plymale

Publication: Transportation Builder, March-April 2009





Dr. Jeihani appreciated the response to her trip generation study. "Somebody told me to compare our results to the ITE results using a statistical test," she said. "I did a t-test and added it to the report."

Organized by the Wessex Institute of Technology, the 15th International Conference on Urban Transport and the Environment gave Dr. Mansoureh Jeihani the opportunity to promote the NTC's efforts to transportation experts from around the world.

Dr. Jeihani's "Estimating Trip Generation Rates for Two New Development Types" was accepted as a presentation at the conference. Her attendance not only resulted in useful feedback, but allowed her to extend Morgan and the NTC's network of contacts.

Several of the topics explored at the conference covered issues that are being explored in current NTC projects, including transport planning and management,

transport modeling and simulation, land use and transport integration, environment and ecology, and safety and security.

"There was a paper presented by Dr. Nicholas Garber [of the University of Virginia] that was related to automobile and motorcycle crashes," Dr. Jeihani said. "It was so useful for my current project on motorcycle crashes in Maryland."

NTC CO-SPONSORS TRB CONFERENCE IN NEW ORLEANS



The TRB's Transportation Finance Conference is set for May 19-21, 2010, in New Orleans. The conference — *Transportation Finance: Forging a Sustainable Future - Now!* — will focus on finding new funding sources for transportation surface projects, and present the latest research findings and policy analyses.

As a sponsor, the NTC has provided \$10,000 in participation grants that will allow a select number of graduate students from across the country to attend the conference for free. The grants will cover the cost of registration, three nights at the conference hotel, and travel costs.



A team of students and researchers gather run-off samples for "Assessing the Magnitude of Polycyclic Aromatic Hydrocarbon Loading from Road Surfaces and its Effect on Algal Productivity." The sampling is being done on a newly paved stretch of Route 4 in Port Republic, Md.

RESEARCH PROJECTS

The NTC's three new projects all address topics of state and national significance.

Urban and suburban runoff are the fastest growing source of Chesapeake Bay pollution, according to Scott Fulton, the Environmental Protection Agency's acting deputy administrator and general counsel. While agriculture is the largest source, run-off from roads and streets contributes to the bay's degraded water quality.

Our proximity to the bay, its fundamental influence on the lives of Marylanders, its threatened ecological richness, and the presence of Morgan's Estuarine Research Center (ERC) prompted us to solicit a new avenue of research

toward aquatic ecology impacts of transportation systems. Dr. Jon Anderson of the ERC answered the call with "Assessing the Magnitude of Polycyclic Aromatic Hydrocarbon Loading from Road Surfaces and its Effect on Algal Productivity." The project is being done in collaboration with St. Mary's College of Maryland and the assistance of SHA and the Baltimore City Department of Transportation.

Each year approximately 40,000 people lose their lives on our nation's highways and streets. That number has been declining for several years for all components of traffic except motorcycles. According to the Bureau of Transportation Statistics, both the

number of registered motorcycles and registered motorcycle fatalities have increased over the last ten years. The Pacific Institute for Research and Evaluation has found that more than half of highway fatalities nationwide are related to deficient roadway conditions. Motorcycles are particularly susceptible to roadway conditions.

It was clear to SHA's Office of Traffic Safety, faculty researcher Mansoureh Jeihani, and the NTC that research on motorcycle crashes and the influence of roadway conditions could reveal causal factors and needed infrastructure improvements. Thus, "A Comprehensive Review of Motorcycle Crashes in Maryland" was selected and funded.

Pavement markings are a major feature of road safety, and their visibility and durability are fundamental to keeping roads safe. NTC and SHA have supported research in this area for several years. Of high priority for the SHA's Office of Materials and Technology is "Line-Striping Life-Cycle Analysis Phase II." Led by faculty researcher Young-Jae Lee, the project is the result of a multi-year investigation into the durability and economic efficiency of durable pavement marking materials for specific weather and road conditions.

All of the NTC's projects undergo a peer-review process by stakeholders and independent experts. Project descriptions for new and ongoing projects and final reports for completed projects can be found on the NTC's Web site.

NEW PROJECTS

“A Comprehensive Review of Motorcycle Crashes in Maryland”

Principal Investigator: Dr. Mansoureh Jeihani

Contract/Grant # SP909B4J

Sponsoring Organizations: SHA and NTC

“Assessing the Magnitude of Polycyclic Aromatic Hydrocarbon Loading from Road Surfaces and its Effect on Algal Productivity”

Principal Investigators: Dr. Jon T. Anderson (Estuarine Research Center) and Dr. Randolph K. Larsen (St. Mary's College of Maryland)

Sponsoring Organization: NTC

“Line-Striping Life Cycle Analysis Phase II”

Principal Investigator: Dr. Young-Jae Lee

Contract/Grant # SP808B4P

Sponsoring Organizations: SHA and NTC

ONGOING PROJECTS

“A Social Network Analysis of Alcohol-Impaired Drivers in Maryland: An Egocentric Approach”

Principal Investigator: Dr. Ashraf Ahmed and Dr. Andrew Farkas

Contract/Grant # SP808B4E

Sponsoring Organizations: SHA and NTC

“Trip Generation Studies for Special Generators”

Principal Investigator: Dr. Mansoureh Jeihani

Contract/Grant # SP808B4J

Sponsoring Organizations: SHA and NTC

“The Influence of Custodial Care of Children Among Elderly African Americans on Their Travel Behavior and Transportation Needs”

Principal Investigator: Dr. Robert J. Smith and Dr. Stella Hargett

Contract/Grant # 0608-002

Sponsoring Organization: NTC

“Implementation of the Concrete Maturity Meter for Maryland”

Principal Investigator: Robert Johnson

Contract/Grant # SP708B4K

Sponsoring Organizations: SHA and NTC

COMPLETED PROJECTS



“Statewide GIS Mapping of Recurring Congestion Corridors”

Report Author: Dr. Anthony Saka
Contract/Grant # SHA-AX416A21
Sponsoring Organizations:
SHA and NTC

Results Summary:

Recurring congestion occurs when travel demand reaches or exceeds the available roadway capacity. This project developed an interactive geographic information system (GIS) map of the recurring congestion corridors (or hotspots) in Maryland.

The GIS map was created with the ArcGIS platform and plotted the hotspots from a list of SHA priority congestion locations, which included 95 intersections/ramp junctions and 31 highway segments. The interactive map allows users to obtain images, turning-movement counts, travel times, and roadway schematics for individual hotspots. The map was also converted to a keyhole mark-up list (KML) file so that it can be used in Google Earth’s 3-D environment, which traffic managers can view through any computer with Internet access.

This study has led to a statewide mapping of hotspots and helps the SHA allocate the necessary resources for the mitigation and management of recurring congestion.



“Life Cycle and Economic Efficiency Analysis: Durable Paint Pavement Markings”

Report Author: Dr. Young-Jae Lee
Contract/Grant # MD-08-SP608B4G
Sponsoring Organizations:
SHA and NTC

Results Summary:

This project examined the life cycle and economic efficiency of two pavement marking materials — inlaid tape and thermoplastic — to find the most economical product for specific traffic and weather conditions. Six locations in Maryland were selected for data collection

based on the amount of traffic and snowfall they receive, and the data was collected for one year. While one year of data yielded reliable and consistent results for “Durability Study: Waterborne Paint Pavement Markings,” the regressions for the durable materials in this study were unreliable and cannot be recommended. To ensure reliability and consistency in the estimation of the retroreflectivity of inlaid tape and thermoplastic, it is suggested that future studies include more extensive data.



“Durability Study: Waterborne Paint Pavement Markings”

Report Author: Dr. Young-Jae Lee
Contract/Grant # MD-08-SP508B49

Sponsoring Organizations: SHA

Results Summary:

This project examined the relationship between the retroreflectivity of waterborne paint pavement markings and various inputs (i.e., precipitation, traffic amounts, and days of exposure) that can affect it. Data was collected from eight locations in Maryland with different traffic amounts and weather conditions.

In general, retroreflectivity decreased with time, more traffic, more precipitation, and more snowfall. Among the inputs, retroreflectivity was most affected by the number of days of exposure and cumulated snowfall amount.

Yellow waterborne paint pavement markings last longer on roads with speed limits up to 55 mph (89 km/hr) and the reasonable snowfall amounts in Maryland. White waterborne paint pavement markings can last more than a year on roads with speed limits under 45 mph (72 km/hr), or on higher speed roads that receive little to no snow.



“Development of a Prototype Vehicle-Infrastructure Integration System for Real-Time Traffic Management”

Report Author:

Dr. Mansoureh Jihani

Contract/Grant # 07-08-01

Sponsoring Organization: NTC

Results Summary:

The vehicle-infrastructure integration (VII) system developed in this project assesses and predicts traffic conditions via wireless communication between roadside sensors and VII-equipped vehicles that have on-board processors, communication interfaces, and global positioning systems (GPS). The data gathered from the vehicles can predict travel time, detect incidents, and determine the location of incidents, and the likely number of lanes blocked.

Equipping vehicles and roadside infrastructures with wireless communication interfaces also makes it possible to provide the traffic surveillance system with changing data on speed, acceleration/deceleration, position, and maneuvers.

The proposed framework does not require all cars to be equipped with the device: The incident detection rate was almost 100 percent when only 25 percent of vehicles on the road were VII-equipped. The proposed system is hierarchical and ad-hoc enabled, meaning the data can be exchanged between vehicles through vehicle-to-vehicle or vehicle-to-infrastructure relay. The roadside sensors collect the data and send it to the local traffic center. Local traffic centers then send the necessary information to the regional center. This hierarchical organization prevents massive amounts of information aggregating to single point.

The expected substantial improvement in the quality and availability of this information would increase the safety and mobility of large-scale highway systems.



“Estimation of Traffic Recovery Time for Different Flow Regimes on Freeways”

Report Authors: Dr. Anthony Saka, Dr. Mansoureh Jeihani, and Petronella James

Contract/Grant # MD-09-SP708B4L

Sponsoring Organizations: SHA and NTC

This study uses Monte Carlo simulation techniques to estimate post-incident traffic recovery time along a freeway. In a total of 726 experiments, 121 traffic scenarios of traffic intensity, incident duration, and proportion of lane blockage were simulated. The freeway segment used in the simulation was a 10-mile, three-lane, unidirectional straight section with no off-ramps, on-ramps, or bottlenecks. An incident was simulated on each lane with a two-signal traffic light. Incident duration ranged from 5 minutes to 60 minutes, with 5-minute intervals for each level of traffic intensity.

Analysis of the simulated data for post-incident traffic recovery time showed a direct relationship between traffic intensity, incident duration, and recovery time. The results indicate that at each increase in traffic intensity level — with a corresponding increase in incident time — a higher post-incident recovery time is required for traffic to attain pre-incident travel conditions. In addition, within the same incident duration, recovery time increases proportionally as traffic builds. However, recovery time becomes indefinite as traffic intensity closely approaches the capacity threshold ($\text{Rho } [\rho] = 1$).

The ratio of traffic recovery time to incident duration also increases nonlinearly for higher levels of traffic intensity and lane closure. Depending on the proportion of lane closure, a five-minute incident at traffic intensity of 0.9 will likely result in delays of 15-45 minutes. For Rho of 0.95, a recovery time as high as 15 times the incident duration was observed for 100 percent lane closure. This underscores the need to swiftly detect and clear incidents particularly during periods of high traffic intensity.



NTC BY THE NUMBERS

RESEARCH SELECTION

Number of transportation research projects selected for funding using the NTC's grant funding: 3

Number of those projects that are

basic research: 1

advanced research: 1

applied research: 2

Total budget for the projects listed above: \$396,755

RESEARCH PERFORMANCE

Number of transportation research papers presented at academic/professional meetings that resulted from projects funded by the NTC: 3

EDUCATION

Cumulative number of transportation-related courses that have been added since the beginning of the grant: 63 undergraduate, 121 graduate

Number of students participating in transportation research projects: 10

HUMAN RESOURCES

Number of students enrolled in transportation-related advanced degree programs: 188 master's level, 38 doctoral

Number of students who received transportation-related degrees: 47 master's level, 2 doctoral level

TECHNOLOGY TRANSFER

Number of transportation seminars, symposia, or distance learning classes conducted by the NTC for transportation professionals: 1

Number of transportation professionals participating in those events: 23



Morgan State University National Center for
Transportation Management, Research & Development

The National Transportation Center

Morgan State University
1700 East Cold Spring Lane
Montebello D-206
Baltimore, MD 21251

Phone: (443) 885-3666
Fax: (443) 885-8275
www.morgan.edu/soe/ntc