NATIONAL TRANSPORTATION CENTER AT MORGAN STATE UNIVERSITY

Annual Report 2007-08

Transportation: A Key to Human and Economic Development

2007-08 Annual Report

The National Transportation Center at Morgan State University

The 2007-08 Annual Report highlights research, education, and outreach activities conducted by the National Transportation Center at Morgan State University from September 1, 2007 to August 31, 2008.

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. As our theme states, we believe that transportation is a key to human and economic development.

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 Program. 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 by the Safe, Accountable, Flexible Transportation Act , a Legacy for Users in 2005.

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Director's Message

Dr. Z. Andrew Farkas

The NTC dedicated much of the 2007-08 grant year to collaborative projects. Collaborative projects can be more difficult to manage and plan, but they leverage valuable resources, expertise, and perspectives that enhance the research process and benefit our students, staff, and researchers. As every UTC is required to publicize its activities and research results, you could call collaborative projects the ultimate technology transfer because the people who need the information the most are part of the research process.

The NTC's four new projects for 2007-08 included researchers, funding and or assistance from Clemson University, the University of Maryland College Park, the Maryland State Highway Administration (SHA), the Maryland Highway Safety Office, and the Motor Vehicle Administration. Six graduate students were able to work on these research projects as well.

Through the 12th annual Summer Transportation Institute, a national education initiative co-funded through the Federal Highway Administration, the NTC introduced local high school students to the career opportunities available in the transportation industry. In addition to MDOT and SHA partnerships that provided students with practical work experience and mentors, the NTC also co-sponsored a national conference that gave students learning and networking opportunities.

The successes of these activities and many others are further detailed in this report. The 2007-08 grant year has been productive, and we look forward to greater progress next year.

Management Structure

The National Transportation Center at Morgan State University is part of the School of Engineering. Dr. Z. Andrew Farkas, the center's director, reports to Dr. Eugene DeLoatch, dean of the School of Engineering.

CENTER STAFF

Valencia Baker
Education Coordinator

No Photo

Erica Johnson
Communications Manager/Editor

Dr. Eugene DeLoatch
Dean
Morgan State University
School of Engineering

Anita Jones
Administrative Assistant

Dr. Andrew Farkas
Director

Sonia McDonald
Secretary

NTC ADVISORY COMMITTEE

Elizabeth Baker
Regional Administrator
National Highway Traffic Safety Admin.

Nathan Beil
President
KCI Technologies

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

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Central Region
PB Americas

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Senior Vice President
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Clyde Pyers
Retired
Maryland State Highway Admin.

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Director
Office of Policy & Research
Maryland State Highway Admin.

Funding

The revenue that helps us fulfill our theme, mission, and goals

What a difference a year makes. The 2007-08 grant year marks the National Transportation Center's first full year operating under a federal grant since it was reauthorized as a university transportation center (UTC) in 2005. For the 07-08 fiscal year, the NTC received a $1 million federal grant from the U.S. Department of Transportation's UTC Program.

The total revenue for 2007-08 was $1,450,662; total expenditures were $913,585. This money allowed the NTC to fund four new research projects; present papers at academic and professional meetings; provide students with paid fellowships and internships; host our 12th annual Summer Transportation Institute; and co-sponsor a national conference that was attended by over 200 industry professionals, academics, and students.

Total Revenue: $1,450,662

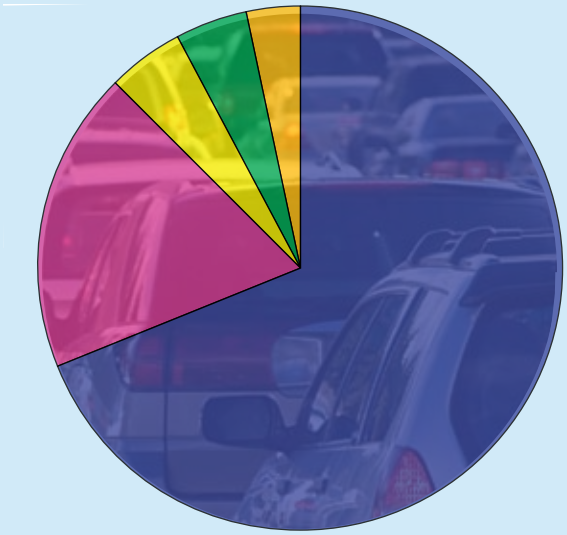
The UTC grant accounts for 68.9 percent of the NTC's income. Other revenue sources were the Maryland State Highway Administration (SHA), Morgan State University, Clemson University, and Federal Highway Administration (FHWA).

Of the $269,580 that the NTC received from SHA, about 93 percent went toward research projects. The remaining $19,780 provided salaries for the students participating in the SHA Summer Internship program.

The FHWA provided $48,167, which included $20,000 that was used to fund the Eisenhower fellowships, and $28,167 that went towards the Summer Transportation Institute.

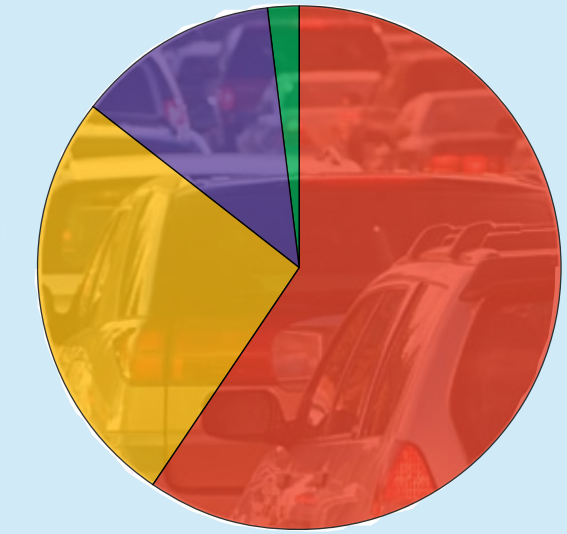
"Other" represents a an in-kind donation from Clemson University that went towards the joint research project between Clemson and Morgan State ("Development of a Prototype Vehicle-Infrastructure Integration System for Real-Time Traffic Management and Control").

2007-08 FUNDING SOURCES
Total Revenue: $1,450,662



- UTC Grant 68.9%
- Other 4.3%
- SHA 18.6%
- FHWA 3.3%
- Morgan State University 4.9%

2007-08 EXPENDITURES
Total: $913,585



- Administration 25.9%
- Technology Transfer 1.9%
- Research 59.7%
- Education 12.5%

Education

Preparing the next generation of transportation professionals for the future

Among university transportation centers, the NTC has one of the highest percentages of graduate students who find transportation jobs after graduation. A large part of that is due to the center's commitment to providing students with the research and analytical skills needed to compete in today's job market.

Mesgana Ayele is the 2007 NTC Student of the Year. In 2008, Ayele graduated from Morgan with an M.S. in transportation.

NTC STUDENT OF THE YEAR

On Jan. 12, 2008, Mesgana Ayele was named the NTC Student of the Year. The announcement was made at the Council of University Transportation Centers' annual banquet in Washington, D.C. In addition to bragging rights, Ayele received a $1000 stipend and an all-expenses-paid trip to the ceremony.

Ayele was selected by the NTC because of his research accomplishments, academic performance, and leadership skills. Ayele's resume includes a graduate internship with the Maryland State Highway Administration (SHA), work with the Maryland Transportation Authority, and an Eisenhower Graduate Fellowship. Ayele also worked with Dr. Anthony Saka and Dr. Mansoureh Jeihani on their development of a prototype vehicle-infrastructure integration system for traffic management.

NEW UNDERGRADUATE PROGRAM APPROVED

In August, the state of Maryland approved the undergraduate program in transportation systems. Starting in Fall 2009, Morgan State will be the only university on the East Coast to offer a four-year undergraduate degree program in transportation systems. Modeled after the graduate program in transportation and urban infrastructure studies, the undergraduate curriculum will prepare students for entry-level positions or advanced degrees in transportation engineering, planning, management, and distribution logistics. The program will also provide students with the opportunity to obtain a Master of Science in transportation in one year.

SUMMER TRANS-PORTATION INSTITUTE 2008

19 students,
4 weeks,
lots of learning,
lots of fun

Micah Bush (right) gets hands-on experience in ship-building techniques during the STI field trip to the Frederick Douglas-Issac Meyers Maritime Museum.

The Morgan State University STI Class of 2008 pauses to take a group photo.

At the STI closing banquet, these three students were given awards for their outstanding leadership skills. From left to right: Alicia Wolf, Paul Lee, and Destiny Moore.

2008 STI PROVIDES VEHICLE TO SUCCESS FOR 19 LOCAL TEENS

From July 7-Aug. 1, the 2008 Summer Transportation Institute provided 19 local high school students with the practical experience and skills necessary for a successful career in the transportation industry.

Through four weeks of special projects, field trips, and discussions with various transportation professionals, participants got a sneak peak of what their futures could be. The students built bridges and model cars and researched alternative fuels. Their nine field trips included an Amtrak ride to Philadelphia, and visits to the Baltimore City Traffic Management Center, Full Moon Farm, and a UPS shipping center. Career insight was also gained from talks with the coordinator for Baltimore's Red Line Transit Project, an air traffic controller, and a structural engineer.

In addition to encouraging students to think about transportation careers, STI included a financial planning workshop, daily SAT prep drills, and writing assignments. Each participant also received a $200 stipend.

On Aug. 1, the students' achievements were honored with a closing banquet attended by their families and STI staff and sponsors. The career advice continued with the keynote address from Wesley Mitchell, a Morgan alum who is District 3 engineer for the Maryland State Highway Administration. Karl Brown, an instructor who has been with STI since 2001, received a special award for his years of service to the program.

While many of their peers may have had leisurely summers, these teens feel their time was well spent. As Destiny Moore said, "It's a really good feeling to know that some people are interested in the things I'm interested in... I don't feel out of place."

2007-08 INTERNS AND FELLOWS

Maryland State Highway Summer Interns
Jennifer L. Bohager
Naomi James
Love Joyner
Nadim Maharjan
Janay Smith

MDOT-Morgan State University Graduate Interns
Adjei Agoe-Sowah
Olugbena Akinbiola
Bankole Fasanya
Judith Howerton
Emma Kamanja
Olusola Laniyi
James Ngeru
David Rodgers
Amaro Thiam
Wayne L. Wiggins

Eisenhower HBCU Fellowship Recipients
Brandon Buckner
Oegchi Elekwachi
Petronella James
Gautham Karri

"My supervisor has...been phenomenal in helping me to understand how things work and even introducing me to people that might help my future career."

Judith Howerton
Government & Community Relations Intern
Division of Capital Planning
Maryland Transportation Authority

"The focus, cooperation, and commitment of the MSU interns is outstanding ."
Rodney Wynn
SHA Team Leader

NTC PARTNERSHIPS CREATE INTERNSHIPS

Fifteen students had paid internships thanks to the NTC's partnerships with the Maryland Department of Transportation (MDOT) and SHA.

This year's interns included ten graduate students and five undergraduates. Assignments varied depending on in which department students were placed, but interns got to do everything from research to writing proposals to reviewing anticipated bills for the state legislature.

Rodney Wynn, an SHA team leader, has supervised five Morgan graduate students and raved about the experience.

"The focus, cooperation, and commitment of the MSU interns is outstanding," he said. "The interns are always interested in learning and obtaining as much information and exposure as possible."

The year-long MDOT-Morgan State University Graduate School Internship is designed to give graduate students meaningful and practical experience in a modal administration. The internship is open to students pursuing post-graduate degrees in engineering, transportation, landscape architecture, finance, and information technology. Interns work part-time during the school year and full-time in the summer.

The Maryland State Highway Administration Summer Internship is limited to undergraduates. Over the course of ten weeks, students get hands-on experience and gain agency mentors. SHA and NTC share the cost of student salaries.

"The internship has changed my idea of a career in transportation," said Morgan senior Jennifer Bohager. "At first I thought that it involved lots of office work and some field work, but it really deals a lot with the public…Who would have thought that my many years of working with customers would come in handy for my future career in civil engineering?"

Technology Transfer

Enhancing the communication between professionals, academics, and students

The NTC's technology transfer plan is based on the idea that knowledge cannot exist in a vacuum. As a result, The NTC is committed to enhancing the communication between industry experts and students.

NTC CO-SPONSORS NATIONAL CONFERENCE

Over 200 industry professionals, academics, and students attended the Transportation Research Board's 8th National Conference on Access Management, an event that was co-sponsored by the NTC. Due to the NTC's co-sponsorship of the national conference, the NTC was able to take traffic management theories out of the classroom and into the real world for several students.

"As a university transportation center, we're supposed to engage in technology transfer activities, which basically means transferring information and outreach," said Dr. Andrew Farkas, NTC director. "This was a way for us to participate in that. It was also a way for us to enhance the education of our students."

Held at Baltimore's Renaissance Harborplace Hotel from July 13-16, the conference brought together public officials, planners, engineers and academics interested in sustainable approaches for improving roadway safety and efficiency. The National Transportation Center paid registration fees for four Morgan students who agreed to be conference volunteers, allowing them to sit in on presentations, network and supplement what they've learned in the classroom.

"The most important thing that I learned at the conference was the link between transportation planning and land use," said Brandon Buckner, a senior majoring in city and regional planning. "As future planners and engineers, we must understand the relationship between the two because our cities are changing everyday. New developments are being built and people need to get to and from these sites via car, bike or public transportation. The field is now demanding us to be diverse in our skills and that was stressed at the conference as well."

Access management seeks to make roads more efficient for more people at the lowest possible cost and inconvenience through the systematic design of roadways. While it centers on thoroughfare design, it also involves the environment; land use; the engineering of roads; and the technology that controls the use of roads. If done properly, access management can mean faster travel; safer use of roads by motorists, cyclists and pedestrians; and increased business for the company owners along major roadways.

As Ricardo Camilo, another student-volunteer said, "My desired career is supply chain/logistics/transportation. Some of the things I learned can really help me with my future."

"The most important thing I learned was the link between transportation planning and land use."

Brandon Bucker,
Morgan senior majoring in city and regional planning

FACT: During the 2007-08 grant year, 225 students enrolled in transportation-related advanced degree programs at Morgan.

MORGAN WINS NO-BID CONTRACT FOR WMATA EXECUTIVE TRAINING PROGRAM

The Washington Metropolitan Area Transit Authority (WMATA) is the second largest rail transit system and the fifth largest rail bus network in the United States. It's also the transportation of choice for more than one-third of federal employees. And when WMATA decided that it needed a training program in transportation management and entrepreneurship for their mid-level employees, WMATA turned to Morgan.

Approved in Summer 2008, the WMATA Senior Leadership Development Program will be offered through Morgan's Advanced Certificate Program in Transportation. The 18-credit curriculum will provide WMATA employees with comprehensive training in engineering, planning, management, logistics, and policy. WMATA will pay for students' tuition and books.

Morgan's reputation and proven track record led to its selection as the site for the program. WMATA researched several schools in the Baltimore-Washington area and decided that Morgan was one of two schools that had the facilities and resources to best serve its needs. The other leadership development program is at George Mason University in Washington, D.C., and focuses solely on policy.

The first group of students in the WMATA Senior Leadership Development Program begin classes at Morgan in Fall 2008 and are expected to complete the program in less than two years.

PAPERS PRESENTED

"Retroreflectivity and Life Cycle Study of Waterborne Paint Pavement Markings: Case Study for the State of Maryland"
Authors: Young-Jae Lee, Randal Reed, Gautham Karri
Session: Transportation Research Board Annual Meeting
Date: January 13-17, 2008

"Modeling Travelers Behavior in the Presence of HOT Lanes Using a Traffic Assignment Method"
Authors: Mansoureh Jeihani and S. Sibardi
Session: Annual Meeting of the Northeast Science Institute
Date: March 28-30, 2008

"Estimation of Post-Incident Traffic Recovery Time for Different Flow Regimes on Freeways"
Authors: Mansoureh Jeihani, Petronella James, Anthony Saka
Session: 88th Transportation Research Board Meeting
Date: July 28, 2008

Research Projects

Advancing U.S. technology and expertise in transportation

Research is an integral part of the NTC's activities. Four new research projects were started during the 2007-08 grant year. All of the NTC's research projects are listed on the NTC's web site, www.eng.morgan.edu/~ntc. Once completed, final reports are available online as well.

NEW PROJECTS

- **A Social Network Analysis of Alcohol-Impaired Drivers in Maryland: An Egocentric Approach**
  Principal Investigators: Dr. Ashraf Ahmed and Dr. Andrew Farkas
  Contract/Grant #: SP808B4E
  Sponsoring Organizations: SHA and NTC

  In Maryland, about 40 percent of highway fatalities are related to drunk driving. This study by Dr. Ahmed and Dr. Farkas explores why.

  In the past decade, researchers have relied on social network analysis (SNA) to understand human behavior. SNA is based on the idea that personal, household, and social-structural attributes are manifested in human behavior, and any effective change in personal behavior must be made with an understanding of the individual's social network.

  Through surveys and interviews with drunk drivers and their friends and family, Ahmed and Farkas will attempt to understand the social networks of alcohol-impaired drivers in Maryland; show how communication and activity-travel patterns emerge from social networks; and explore how a change in their network's knowledge level can modify a driver's behavior.

- **Trip Generation Studies for Special Generators**
  Principal Investigator: Dr. Mansoureh Jeihani
  Contract/Grant #: SP808B4J
  Sponsoring Organizations: Maryland Department of Transportation and NTC

  The Institute of Transportation Engineers (ITE) Trip Generation Manual is an industry-accepted guide for how various land uses will affect traffic patterns, but does it accurately predict how town center and senior housing developments affect roadways and transit in Maryland? Dr. Jeihani's project studies the actual number of trips originating from several different town center and senior housing developments across Maryland and compares the observed rates with those in the ITE manual.

- **A Statewide GIS Mapping of Recurring Congestion Corridors**
  Principal Investigator: Dr. Anthony Saka
  Contract/Grant #: AX416A21
  Sponsoring Organizations: SHA and NTC

  Most of the recurring congestion on roadways is due to the fact that those roads were not built to accommodate the increasing number of cars that they are forced to carry. While permanent solutions are being developed, they will likely require a lengthy planning, design, and construction process. Through the development of an interactive web-based GIS map, this project will identify the transportation corridors in Maryland that experience congestion, and develop cost-effective short-term strategies for the alleviation of problems caused by road capacity deficiency.

- **Development of a Prototype Vehicle-Infrastructure Integration System for Real-Time Traffic Management and Control**
  Principal Investigators: Dr. Anthony Saka and Dr. Ronnie Chowdhury (Clemson University)
  Contract/Grant #: 07-08-01
  Sponsoring Organizations: NTC and Clemson University Department of Engineering

  While the vehicle-infrastructure (VII) concept has existed for a decade, its operational model and implementation strategy remain unclear. What is clear is that the VII infrastructure, must be able to support incident management, congestion, mitigation, air pollution management, driving assistance, and disaster evacuation.

  Researchers from Morgan State University's National Transportation Center and Clemson University have developed a new traffic surveillance system that detects accidents and traffic problems faster and more accurately than California Algorithm #7, an incident detection system widely used by traffic control centers across the United States.

  The proposed system assesses and predicts traffic conditions via wireless communication between roadside sensors, the increasing number of cars that have GPS technology, and traffic

STUDENT RESEARCHER SPOTLIGHT

Six graduate students served as assistants on NTC research projects during the 2007-08 grant year. These research projects not only solve urban transportation problems, but give students the opportunity to put their classroom lessons in action. Here are two stories.

Franklin Okonkwo is the lead graduate researcher on the development of the Morgan-Clemson vehicle-infrastructure prototype. As the lead graduate researcher, Okonkwo has been actively involved in the calibration and validation of the model, which included entering network inputs for traffic volume, signal planning, timing plan, and speed limits. In fact, Okonkwo lists learning PARAMICS, the new traffic simulation software, as his personal highlight of working on this project.

"This project has improved my understanding of the fundamentals in micro-computer applications," he said. "...This project has given me the most profound practical experience."

control centers. Data gathered from this communication can estimate the speed of traffic, the location of incidents (events that impede the flow of traffic), and the likely number of lanes blocked. The system was tested in a microscopic traffic simulation with freeway networks in Spartanburg, S.C., and Baltimore, Md., used as the study sites. As the traffic volume was increased in the simulated environment, the Morgan-Clemson model continuously outperformed the existing traffic surveillance system. If used in the real world, the prototype would translate into faster response to emergency situations on highways, reducing congestion, and increasing the safety and mobility of roadways for everyone.

This project originated at Clemson University. Dr. Ronnie Chowdhury, the principal investigator at Clemson, invited Dr. Anthony Saka to join him on the project based on previous work that they had done together, as well as Morgan's expertise in traffic flow. Technical papers from this project will be presented and published at the Transportation Research Board's annual conference in 2009.

ONGOING PROJECTS

- **The Influence of Custodial Care of Children Among Elderly African Americans on Their Travel Behavior and Transportation Needs**
  Principal Investigators: Dr. Robert Smith and Dr. Stella Hargett
  Contract/Grant #: 0608-002
  Sponsoring Organization: NTC

  This project studies the travel behavior and needs of elderly African Americans who are the partial or primary guardians of children under the age of eighteen, a group that typically relies on public transportation or the transportation assistance of others. In addition, the projects seeks to obtain a more detailed understanding of how "second parenthoods" affect travel behavior, and the transportation technologies that may be necessary to meet these special transportation needs.

- **Estimation of Traffic Recovery Time for Different Flow Regimes on Freeways**
  Principal Investigator: Dr. Anthony Saka
  Sponsoring Organization: SHA and NTC

  Traffic managers are very familiar with the high financial, environmental, and social costs associated with traffic delays caused by nonrecurring incidents

that impede the flow of traffic (ie., lane blockage from construction activities, accidents, disabled vehicles, or natural phenomena).

This project seeks to:

* develop, calibrate, and validate a microscopic simulation model capable of reasonably depicting the prevailing traffic-flow conditions on selected segments of freeways with known design and operational parameters;
* develop incident scenarios involving different durations and traffic intensities, and capture the resulting traffic recovery times;
* and develop and document mathematical and/or graphical relationships between incident duration and traffic recovery time for different values of traffic intensity (i.e., volume-capacity ratio).

The results of this study will help the SHA develop measures to deal with recovery time after incidents. This will enhance the SHA's ability to mitigate the impact of congestion and delay on Maryland's highway network.

- **Implementation of the Concrete Maturity Meter for Maryland**
  Principal Investigator: Robert Johnson
  Contract/Grant #: SP708B4K
  Sponsoring Organizations: SHA and NTC

The study "Use of Maturity Meters in Concrete Acceptance" evaluates different types of maturity technologies and the ability of lab-developed correlation curves to predict the strength of the same concrete mix on subsequent projects. The preliminary results have shown that the maturity concept is viable, and correlation curves can accurately estimate in-place concrete strength.

The objective of this study is to develop a specification that allows the use of the Maturity Meter method in Maryland.

Angelica Daniel's interest in transportation began with a sophomore-year internship with the National Transportation Safety Board. She worked as an accident research assistant and gathered information on various vehicular laws across the country.

"I was also fortunate enough to accompany actual highway safety investigators on crash sites to help them determine the causes of different accidents," Daniel said. "It was an eye-opening experience."

The experience also gave her the skills necessary to work with Dr. Jeihani on "Trip Generation Studies for Special Generators."

"My primary role was to gather information on retirement housing facilities and malls/town centers in Maryland. These sites were used for traffic count data collection," said Daniel, who is now enrolled in Transportation and Urban Infrastructure Studies graduate program.

"The most exciting thing I experienced was developing a questionnaire for individuals visiting malls and a questionnaire for individuals using public transportation to visit malls," she continued. "Just being able to develop something that would be utilized in soliciting data that would then be used for analysis in a report was very rewarding."

NTC by the Numbers

Quantitative achievements for the 2007-08 grant year

RESEARCH SELECTION

Number of transportation research projects selected for funding using the NTC's grant funding: 4

Number of those projects that are:
basic research: 2
advanced research: 2
applied research: 2

Total budget for the projects listed above: $545,019

RESEARCH PERFORMANCE

Number of transportation research papers presented at academic/professional meetings that resulted from projects funded by the NTC: 2

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: 6

HUMAN RESOURCES

Number of students enrolled in transportation-related advanced degree programs: 178 master's level, 47 doctoral

Number of students who received transportation-related degrees: 33 master's level, 1 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: 216

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THE NATIONAL TRANSPORTATION CENTER

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National Transportation Center at Morgan State University
Montebello D-206
1700 E. Cold Spring Lane
Baltimore, MD 21251