

***EASTERN SEABOARD
INTERMODAL TRANSPORTATION
APPLICATIONS CENTER (ESITAC)***



2009 -2010 ANNUAL REPORT

***HAMPTON UNIVERSITY
HAMPTON, VIRGINIA, 23668***

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DIRECTOR'S MESSAGE



The Eastern Seaboard Intermodal Transportation Applications Center (ESITAC) is pleased to present its third Annual Report which provides an overview of activities conducted during June 1, 2009 through May 31, 2010. The ESITAC has had another successful year as one of the USDOT's Tier II University Transportation Center. The accomplishments of the Center were possible through dedicated efforts of University administrators, team members, students, and our partners.

Our research efforts continue to concentrate on the Center's themes related to safety, infrastructure renewal, and environmental stewardship. During the past year, we completed three RITA funded projects and solicited yet another call for proposals, which resulted in three newly funded research proposals for 2010. The educational activities include organization of transportation lectures for students and faculty, developing a concentration in Transportation Management curriculum, and offering research and internship opportunities for students.

Technology Transfer has been a priority at the local, regional, and national levels. The Center has sponsored on-campus lectures and participated in conferences. Our research results have been presented at professional gatherings. Apart from faculty members, a Chemical Engineering student also made a research presentation at a professional meeting. This student was selected Student of the Year at the 2010 TRB Meeting for contribution towards the Center's environmental research project.

We have strengthened our industry partnership through regular meetings and on-site visits. A day-long course on National Environmental Policy Act (NEPA) was conducted at our campus by Parsons-Brinckerhoff (PB). The topics covered during the course included the NEPA, Environmental Impact Statements, and how to design context sensitive transportation solutions within the bound of this policy act. The study on *public bus driver distraction problems* at Hampton Roads Transit (HRT) has yielded interesting preliminary results.

I am looking forward to another challenging year as we continue to focus on pressing transportation issues related to safety, pollution, and infrastructure. For more updated information, I encourage you to visit our website. We are always seeking collaborations, and would welcome your comments and suggestions.

Kelwyn D'Souza, Ph.D.
Director, ESITAC

ESITAC THEME AND LOCATION

The theme of ESITAC is *to enhance regional intermodal transportation systems by improving safety and efficiency while minimizing environmental impacts*. The theme contributes to the overall goal of the USDOT which seeks to advance U.S. technology and expertise in transportation that will provide safe, secure, efficient, and interconnected transportation systems.

Hampton University is located at the center of Hampton Roads which is geographically situated in the Southeastern sector of Virginia. Historically, the harbor was the key to the Hampton Roads region's growth. Currently, with a population of around 1.7 million, the region faces increasing transportation challenges as it has become largely urbanized, with additional traffic needs.



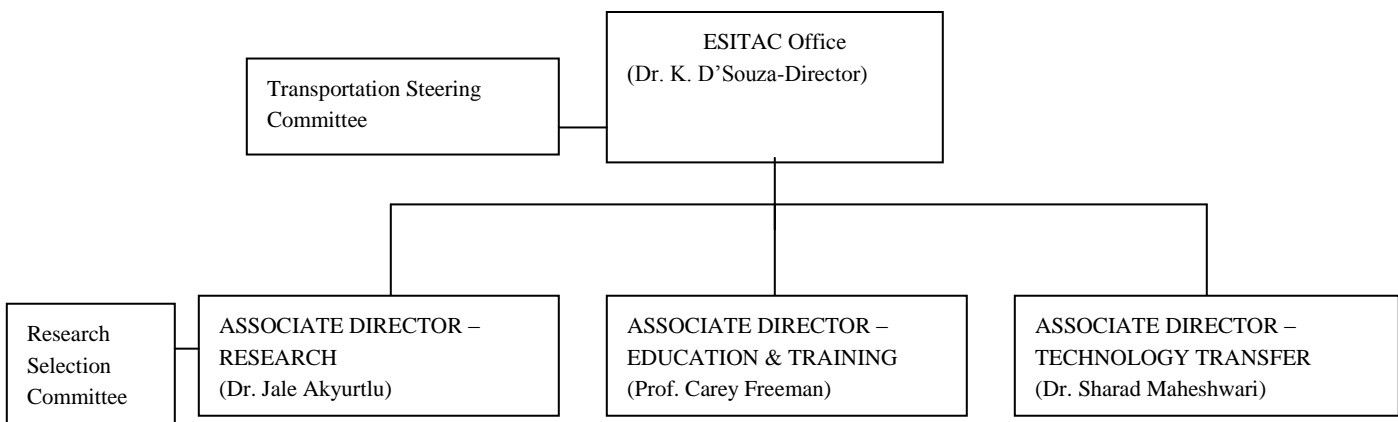
The regional transportation system hosts the major modes of transportation: air, rail, maritime, and roadway. Hampton Roads region's unique geography and abundance of waterways create multiple chokepoints for surface transportation modes, as expensive bridges and tunnels are necessary to traverse these waterways.

The ESITAC operates in the Hampton Roads region as one of USDOT's Tier II University Transportation Center. Growth in the region's interstate highways, international airports, marine ports, and railroads poses a challenge to improve safety and infrastructure, and control air pollution. The Center has responded to these challenges through a balanced combination of transportation research, education, and technology transfer

activities. Research projects continue to focus on intersection safety, non-destructive testing of bridges with acoustic emission sensor technology, and investigation of nitrogen oxide emissions from a major roadway and air quality models to study vehicle emissions and toxic pollutants.

ESITAC MANAGEMENT STRUCTURE AND PRINCIPAL STAFF

The ESITAC is staffed by an interdisciplinary team drawn from the School of Business and School of Engineering and Technology. The organization chart shows elements under each of the main components of research, education, and technology transfer. The Center Director and three Associate Directors administer the Center's day-to-day functions. The Transportation Steering and Research Selection committees serve as advisory bodies.



ESITAC Organizational Chart

COMMITTEES

The **Transportation Steering Committee** serves as an advisory body to govern the ESITAC. The Committee provides advice relative to project goals, implementation, coordinating partnership activities and funding.

The **Research Selection Committee** assists and advises the ESITAC on selection of research projects that fit the theme, expertise of the University, and the regional needs. The Center's Associate Director (Research) serves as Chairperson of the Committee.

Transportation Steering Committee

Member	Title/Organization
Dr. Moges Ayele	Senior Liaison for Higher Education, FHWA, USDOT..
Mr. Michael Chapman	Assistant Deputy Director for Aerospace Testing, NASA Langley.
Dr. Sid Credle	Dean, School of Business, Hampton University.
Dr. Michael Demetsky	Professor and Chair, Civil & Environmental Engineering, University of Virginia.
Dr. Kelwyn D’Souza	ESITAC Director, Hampton University.
Mr. David Gehr	Senior Vice President, Parsons Brinkerhoff.
Dr. Asad J. Khattak	Frank Batten Endowed Chair Professor, Civil & Environmental Engineering Department, Old Dominion University.
Dr. Eric Sheppard	Dean, School of Engineering and Technology, Hampton University.
Mr. Everett Skipper	Director, Department of Engineering, City of Newport News.
Mr. Michael Sprinkel	Associate Director, Virginia Transportation Research Council, VDOT.
Dr. Roger Stough	NOVA Endowed Chair, Professor of Public Policy, President, Intellectual Property and VP for Research and Economic Development, George Mason University.
Mr. Bill Thomas	Associate Vice President, Governmental Relations, Hampton University.

Research Selection Committee

Member	Title/Organization
Dr. Guzin Akan	City Transportation Engineer, City of Norfolk, Division of Transportation.
Dr. Jale Akyurtlu	Associate Director (Research), ESITAC, Hampton University.
Mr. Lynn Allsbrook	Traffic Engineer and Operations Manager, City of Hampton, Dept of Public Works.
Mr. Thomas Ballou	Director, Data Analysis and Planning, Virginia Department of Environmental Quality (VDEQ).
Mr. Lorenzo Casanova	Programs and Technology Engineer, FHWA, Virginia District Office.
Ms. Lisa Colbert	FTA, Head Office, Washington D. C.
Mr. Stephany Hanshaw	Regional Traffic Operations Manager, VDOT Eastern Region.
Mr. Jim Ponticello	Air Quality Program Manager, VDOT.
Dr. Camelia Ravanbakht	Deputy Executive Director, Hampton Roads’ MPO.
Dr. Stephen Sharp	Research Scientist, Virginia Transportation Research Council, VDOT.
Dr. John Sokolowski	Executive Director, Virginia Modeling and Simulation Center (VMASC), Old Dominion University.

ESITAC PRINCIPAL STAFF

The ESITAC principal staff is comprised of director, associate directors, faculty investigators, and budget executive. The director is responsible for overall administration of the Center. The associate directors are appointed in the areas of Research, Education, and Technology Transfer. They coordinate and implement activities listed in the Strategic Plan and work with the Center Director to develop research agendas, education curriculum, and technology transfer initiatives. The Budget Executive authorizes expenditure for activities proposed in the approved Strategic Plan.



Dr. Ates Akyurtlu is a Faculty Investigator for Environmental Modeling.



Dr. Jale Akyurtlu is the Associate Director (Research) and Faculty Investigator for Environmental Modeling.



Dr. Sid Credle is the Dean, School of Business and ESITAC Budget Executive.



Professor Carey Freeman is the Associate Director (Education).



Dr. Sharad Maheshwari is the Associate Director (Technology Transfer) and Faculty Investigator for Safety.



Dr. Devendra Parmar is a Faculty Investigator for Infrastructure Renewal.

OVERVIEW OF ESITAC PROGRAMS

The following activities in research, education, and technology transfer have been implemented during the twelve month period from June 1, 2009 to May 31, 2010.

RESEARCH

Completed Research Projects

1. Modeling Traffic Accidents at Signalized Intersections in the City of Norfolk, VA.

Investigators: Drs. Sharad Maheshwari and Kelwyn D'Souza, Hampton University.

A basic regression-based statistical model has been developed based on 30 most accident prone intersections in the City of Norfolk. The factors included in the models are AADT, number of lanes, number of turn lanes, number of driveways, median, pedestrian crossings, extra hazards (line railway crossing), etc. This model has been validated at 10 other intersections in the City of Norfolk. It provides an approximately 10% lower predicted value of the actual number of intersection accidents. The t-test shows that it was a significant difference ($p=0.012$).

2. Non-Destructive Bridge Testing With Acoustic Emission (AE) Sensor Technology.

Investigator: Dr. Devendra Parmar.

In view of the changes made in the VDOT Display structure 018 – 1917, research was initiated

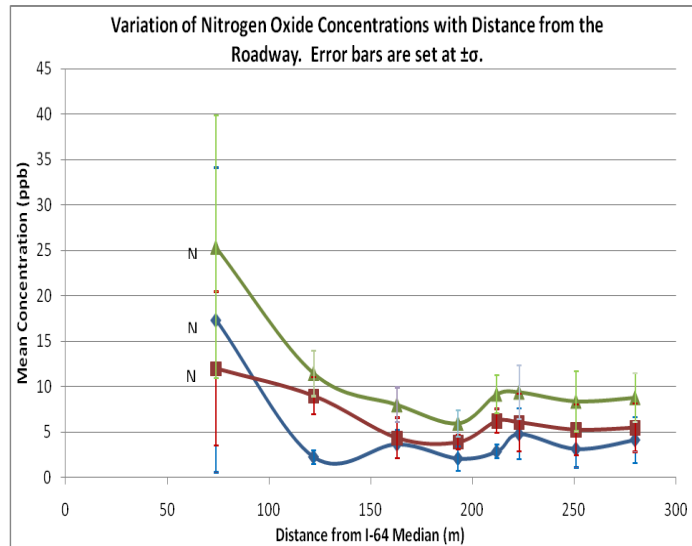


on the bridge built in 1991 on I-164 at the Coast Guard Blvd. in the City of Portsmouth. Discussions were held with the VDOT/VTRC bridge engineers to finalize a plan of action to utilize AE sensors on the potential inspection sites, both on the Suffolk bound and Norfolk bound lanes of the Interstate. According to recent data, the current average daily traffic on the bridge is 22,276 with 4% truck traffic compared to average daily traffic of 11,337 in 2004 with 4% being truck traffic. This bridge is situated near a cargo terminal. Potential test sites were identified based on the results from two AE sensors.

3. Investigation of Nitrogen Oxides Emissions from a Major Roadway.

Investigators: Drs. Ates Akyurtlu and Jale Akyurtlu.

A mobile NO and NO₂ measurement unit with the associated weather monitoring instrumentation was built for this research. Coordinated measurements of NO and NO₂ concentrations and meteorological conditions were made at varying distances from the roadway, together with the traffic volume data. CALINE4 was used to estimate the NO₂ concentrations at receptors located at the measurement points. The data obtained were analyzed to elucidate the adequacy of CALINE4 in predicting the local NO₂ concentrations near a roadway. Measurements showed that NO_x concentration decreases rapidly with the distance from the roadway and drops from 25.4 ppb to a value around 8.3 ppb, which remains fairly constant for distances greater than about 150 meters from the I-64 median.



On-Going Research Projects

1. Modeling and Predicting Traffic Accidents at Signalized Intersections in the City of Norfolk, VA.

Investigators: Drs. Sharad Maheshwari and Kelwyn D'Souza.

The objective of the research project is to develop and validate exploratory/predictive statistical models for the intersection accidents in the City of Norfolk. These models will include independent variables such as geometrical and roadside hazard factors which provide more valid explanation of the traffic accidents.

2. Investigation of NO_x and Tropospheric Ozone Transport Around a Major Roadway.

Investigators: Drs. Jale Akyurtlu and Ates Akyurtlu.

The objectives of the research project are to obtain data on the variation of ozone concentrations simultaneously with data on weather, traffic, and nitrogen oxide concentrations and model the ozone and nitrogen dioxide concentrations near major roadways using CALINE4; and to validate the model with the available data.

3. Non-Destructive Bridge Testing With Advanced Micro-II Digital AE system.

Investigator: Dr. Devendra Parmar.

The objective of the research is to monitor structural health of highway bridges to prevent spread of structural failures. Acoustic Emission (AE) sensors will be used to collect near real-time data from the selected bridge. This data will be analyzed to establish bridge inspection and monitoring procedures.

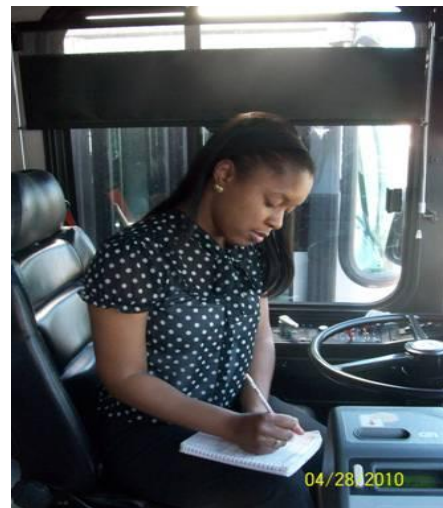
Student Research Activities

Chemical engineering students Ms. Courtney Mitchell and Ms. Dinah Holland and electrical engineering students Mr. LaMarr Hill and Mr. Tyler Hopkins assisted with the ESITAC's environmental project as undergraduate research assistants. They are involved in collecting traffic data, making environmental measurements, doing literature search, and modeling air pollution. This research provides direct and rich educational experience to students, and makes them aware of the issues involved in crafting transportation policy decisions.



Ms. Courtney Mitchell co-authored a paper and presented it at the 51st Annual Transportation Research Forum. Currently, Mr. Hill and Mr. Hopkins are making ozone and NO_x measurements, and working on MOVES software to replace MOBILE6 in our modeling computations.

Ms. Amber Griffith completed a preliminary analysis of bus accident data at Hampton Roads Transit (HRT) to identify causes due to driver distraction. Studies of driver distraction are extremely important to help in reducing the number of avoidable road accidents. According to safety experts, distraction occurs when a driver is delayed in recognizing and utilizing information needed to safely accomplish the driving task. These distractions can be due to some event, activity, object or person, within or outside the vehicle that shifts driver's attention away from the task of driving.



The HRT's 2008 accident database indicates that the most common class of preventable accidents was "class C"

where the driver used good judgment and care but could have avoided the accident by exercising a higher degree of professional skill. The second most common class of preventable accidents was “class D” where the driver used ordinary judgment and care but could have avoided the accident by using a higher degree of professional skill. The least reported preventable accidents fell into “class E” where the driver failed to use the necessary judgment and failed to use a higher degree of professional skill to prevent the accident

Four Eisenhower Transportation Student Fellows represented ESITAC at the TRB’s 89th Annual Meeting in Washington, DC, January 10-14, 2010. The students were: Mr. Troy Clegg, Mr. Michael Clarke, Mr. Roland McKay, and Mr. Andre Watkins-Clark. Mr. Roland McKay’s research project, “The Effects of the Global Positioning System”, was selected for presentation at the Eisenhower Student Showcase session on Tuesday, January 12, 2010. This is the second consecutive year that ESITAC students have been selected to present their research projects at TRB.



Mr. Roland McKay Presenting the Research Project.

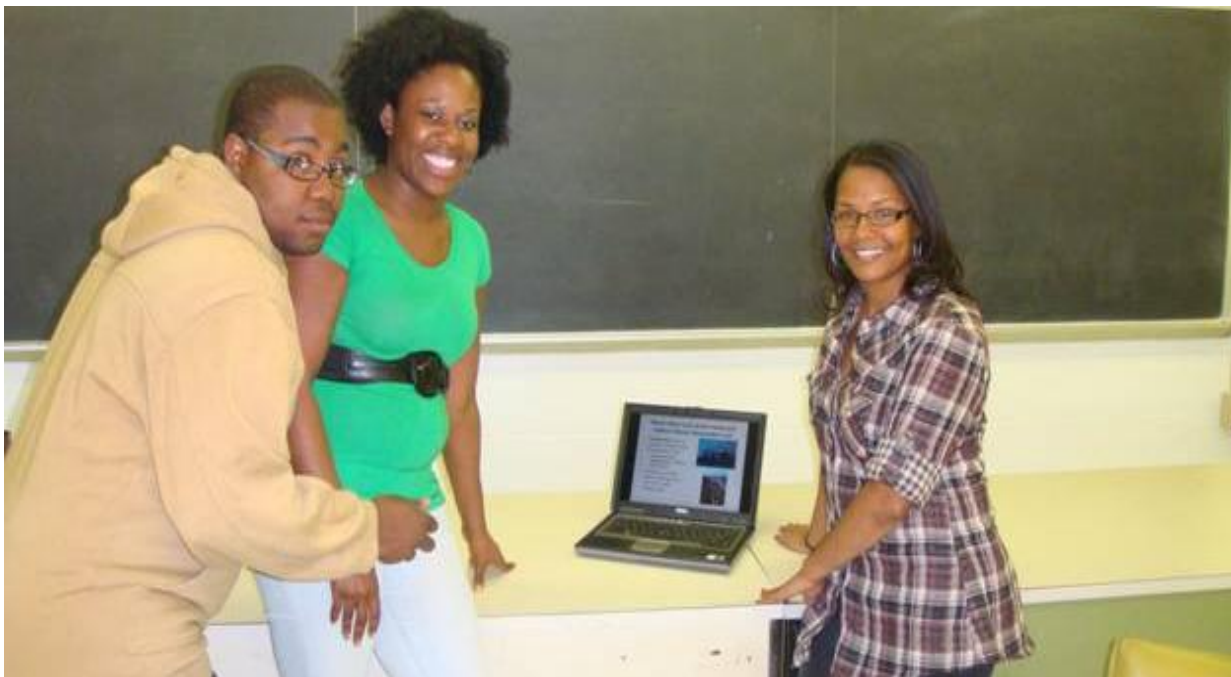
EDUCATION AND WORKFORCE DEVELOPMENT

The transportation education and workforce development programs are designed to attract and educate the next generation of transportation professionals. These are built around existing related programs offered by various departments within the University, and integrate research results into courses to produce a well-trained, effective, and efficient workforce. Partnerships with the transportation industry allow the Center to offer experiential learning through co-ops and internships.

TRANSPORTATION EDUCATION

Transportation Curriculum

During the Spring 2010 semester, the School of Business offered a Logistics and Transportation Management course at the MBA level. This course focuses on logistics and supply chain management and covers business management issues related to air, surface, and water transportation modes. The course material was delivered through case studies in logistics and transportation management including transportation applications in business. Thirteen graduate students attended this course conducted by Dr. Sharad Maheshwari, Associate Director for Technology Transfer. All of these students are members of the Institute for Supply Management (ISM), a trade organization of business procurement professionals. A selected team of students also participated in the annual ISM case competition.



Students Discussing Transportation Cost Models in Logistics and Transportation Course.

Distinguished Lecture Series

Dr. Jeremy Blum from Penn State Harrisburg delivered a lecture on *Agent-Based Optimization of Transit Route Network Design*. The Transit Route Network Design (TRND) problem model presented during the lecture seeks to optimize a set of bus routes and schedules that maximizes the utility of the bus system for passengers while minimizing operator cost. The optimization system developed by Dr. Blum was based on intelligent agent architecture. In this architecture, several existing and new meta-heuristic and heuristic search approaches are encapsulated in a single intelligent agent to find an optimal solution. The incorporation of a wide range of search approaches in one agent enables it to conduct a thorough, robust, multi-algorithmic search of the solution space. The intelligent agent approach has been successfully applied to other transportation and logistics problems.



Dr. Blum discussed application of the optimization system to a large urban transit system in New Delhi, India. To compare size and complexity of this problem, the New Delhi's transit system is orders of magnitude larger than the entire Swiss network. Previous routing plans for this system were not able to find solutions capable of accommodating all passenger demands. The intelligent agent optimization system demonstrated its scalability by producing route networks capable of satisfying all passenger demands with significantly lower travel times and lower operator cost.

The Department of Aviation invited First Officer Steve Forest, Continental Airlines, Boeing 777 and First Officer Joanne Forest, United Airlines, Airbus A-320 for a lecture presentation. Both the speakers had substantial flying experience. The main focus of their presentation was on *careers in the airline industry*. Initially, Steve and Joanne described their career paths in the airline industry. Both were graduates of college aviation programs and worked at variety of jobs in the aviation industry before joining the airlines. During the lecture, they described duties of an airline pilot while focusing on how they handled the job as a married couple with children, and flying for different airlines.



The lecture generated a lively student discussion about airline operations and policies as well as difference between company culture and work environment of the two airlines. Pilot unions, pay, commuting to work, and some of the new rule proposals currently in congress were discussed in response to student questions. The lecture was well attended by students from various majors including Electrical Engineering, Business Management,

Aviation, Psychology, Accounting, and Economics.

Concentration in Transportation Management

The proposed curriculum for concentration in Transportation Management is in its final stage of the approval process in the University. The transportation concentration curriculum will offer added opportunities for students interested in transportation careers. The concentration will consist of 18 hours of core courses in transportation management and aviation, and includes an industry internship.

Transportation Course Material

The ESITAC team is developing a transportation education course material pack for prospective students and faculty. This course material pack will include syllabi, lecture notes, and case studies for transportation related courses.

WORKFORCE DEVELOPMENT

Transit Internships

Ms. Chrystal Gaither, a Finance Major in the School of Business completed the Transit Internship Program at Hampton Roads Transit (HRT) in Fall 2009. The HRT currently serves passengers in the Hampton metropolitan area that includes service to Hampton, Norfolk, Chesapeake, Virginia Beach, Portsmouth, Suffolk, Newport News, Williamsburg, and the town of Smithfield.



Chrystal's internship project involved working with the PeopleSoft software to balance journal entries that helped understand and visualize how transactions are credited and debited in online accounting software programs. In addition, she worked with several HRT senior managers in various areas related to the Light Rail Project, FTA budgets, and other functional areas.

Summer Transportation Institute

The ESITAC played an active role in the 2009 School of Business Summer Transportation Institute (STI). Professor Carey Freeman, Associate Director Education discussed transportation opportunities with middle school students and sponsored an essay contest. The essay writing contest assignment required the students to prepare a paper on a transportation related problem. Although, the students were 7th and 8th graders, college level criteria were used to evaluate their papers.



TECHNOLOGY TRANSFER AND OUTREACH

PUBLICATIONS AND PRESENTATIONS

Akyurtlu, A., Mitchell, C. & Akyurtlu, J. *Investigation of Nitrogen Oxides Emissions from a Major Roadway*. Presented at the 51st Annual Transportation Research Forum, Arlington, VA. March 11-13, 2010.

Maheshwari, S. K. *Statistical Predictive Models for Vehicular Traffic Accidents*. Presented at the Spring International Conference of Allied Academies, New Orleans, LA. April 14-17, 2010.



Parmar, D. S. & Sharp, S. R. *Short Term Evaluation of Bridge Cables Using Acoustic Emission Sensors*. Virginia Transportation Research Council Report, VTRC-10R24. May, 2010.
http://www.virginiadot.org/vtrc/main/online_reports/pdf/10-r24.pdf

FORTHCOMING PUBLICATIONS AND PRESENTATIONS

Akyurtlu, A., Mitchell, C. & Akyurtlu, J. *Investigation of the Transport of Nitrogen Oxide Emissions from a Major Roadway, I-64*. To be presented at the Urban Environmental Pollution Conference, Boston, MA. June 20-23, 2010.

Parmar, D. S. & Sharp, S. R. *Acoustic Emission Studies for Non-destructive Evaluation (NDE) of Bridge Cables*. To be presented at The American Society for Non-Destructive Testing, NDE/NDT for Highways and Bridges: Structural Materials Technology (SMT), New York, NY. August 16-19, 2010.

Parmar, D. S. & Sharp, S. R. *Cost Benefits and Assessment for Evaluation of Bridge Cables Using Acoustic Emission Technology*. To be presented at 2010 Mid-Continent Transportation Research Forum, Madison, WI. August 19-20, 2010.

Akyurtlu, A., Mitchell, C. and Akyurtlu, J., “Investigation of Nitrogen Oxides Emissions from Roadways”, submitted to the 12th National Conference on Transportation Planning for Small and Medium Sized Communities-“Tools of the Trade”, September 22-24, 2010, Williamsburg, VA.

INDUSTRY PARTNERSHIPS



The ESITAC continues to hold monthly teleconference meetings with Parsons Brinckerhoff (PB) representatives to match its research and educational needs with available resources at PB. The ESITAC has established related partnerships between PB's technical experts and its researchers. PB conducted the NEPA course on campus in February 2010, and is a potential source of external matching funds.

Our partnership with Hampton Roads Transit (HRT) has been extended through the Transit Internship Program. The ESITAC is gaining expertise in public bus driver distraction and our student interns are gaining the research experience in different HRT departments. These skills will be useful in attracting future research and funding opportunities.



SPECIFIC ACCOMPLISHMENTS

National Environmental Policy Act (NEPA) Course

Parsons-Brinckerhoff (PB) collaborated with ESITAC to offer a short course on the NEPA process. The course was conducted at Hampton University on February 24, 2010. The NEPA has been a part of the transportation planning process since 1969. The course discussed the Policy Act, Environmental Impact Statements, and how to design context sensitive transportation solutions required by NEPA. Specifically,

- How the NEPA umbrella concept influences the transportation decision-making process,
- The roles and responsibilities of the participants in the NEPA process,
- The importance of a reasoned, collaborative process when developing and evaluating alternatives,
- How to balance an array of conflicting interests and values while making transportation project decisions, and
- The documentation requirements of the NEPA process.



Mr. Stephen Plano and Ms. Nancy Skinner, PB planners and NEPA experts, served as instructors. Around 45 participants attended the course including students, faculty, PB employees, and planners from local government agencies. This mixed group provided useful exchange of ideas, problems and concerns, and mentoring opportunities for our students.

Outstanding Student of the Year Honored at CUTC Banquet

Ms. Courtney Mitchell, an ESITAC student researcher, was awarded the Outstanding Student of the Year Award at the 13th Annual Council of University Transportation Centers (CUTC) ceremony at Washington, D.C. in January 2010. She worked with Dr. Ates Akyurtlu on analyzing NO_x emissions at high-traffic intersections and was involved in self-training of the NO_x Emission Analyzer, the CALINE4 software, and modeling of air pollution. She serves as the chapter president of the Society of Women Engineers, the chapter vice-president of the American Institute of Chemical Engineers, pre-college initiative and membership chair of the chapter of the National Society of Black Engineers, and Chemical Engineering Student Ambassador for the University.



Student Attended the Federal Aviation Administration (FAA) Conference

Mr. Joseph Wiggins, an Air Traffic Control Aviation Management major and graduating senior, was selected by the Virginia Department of Aviation to represent the State, and ESITAC at the Federal Aviation Administration Eastern Region's 33rd Annual Airports Conference held in Hersey, Pennsylvania, March 2-4, 2010. Every year, the Virginia Department of Aviation selects two students from Virginia universities to represent the state.



The conference provides the latest information on FAA programs and policies as well as discusses practical experiences by airport management, consultants, and other disciplines within the airport industry. It is designed for government officials, airport owners/management, consultants, contractors, and professionals from material testing laboratories.

The topics presented at the conference included airport planning, design, finance, management, safety, environmental issues, engineering, and field lighting. The purpose is to provide leadership in planning and developing a safe and efficient regional airport system to satisfy the needs of our aviation and transportation interests, with due consideration for economics, environmental compatibility, local property rights, and safeguarding the public investment.

HU's Business Students Participate in the ISM's Logistics Case Competition



A team of 5-Year MBA students participated in the 7th Annual Black Executive Supply Management Summit hosted by the Institute for Supply Management (ISM) from February 2-4, 2010 in San Diego, CA. The team consisted of Jameya Green, Joshua Dunn, and Devin Hairston. The Summit organized a student case competition in which the Hampton University team won fifth place. The case study title was: *Weitzen Paper Company: Optimizing*

Outbound Logistic Costs. The student teams were required to conduct research and develop a strategy for logistical cost optimization where transportation cost was a major decision variable of their solution.

Advanced Non-Destructive Testing (NDT) Laboratory

The NDT laboratory was upgraded with 8-channel acoustic emission (AE) measurement system for monitoring the test sites. The system consists of a Micro-II Digital AE system with AEWin software. It will be used in conjunction with the 2-channel AEWin control system acquired earlier.

The newly acquired 8-channel AE monitoring system is based on 12V rechargeable batteries and inverters. The DAQ, computerization and power systems are designed for their operational capability in situations where regular power is not available for instrument operation.



Advanced 8-channel Micro-II Digital AE System. Earlier 2-channel AEWin Control System.

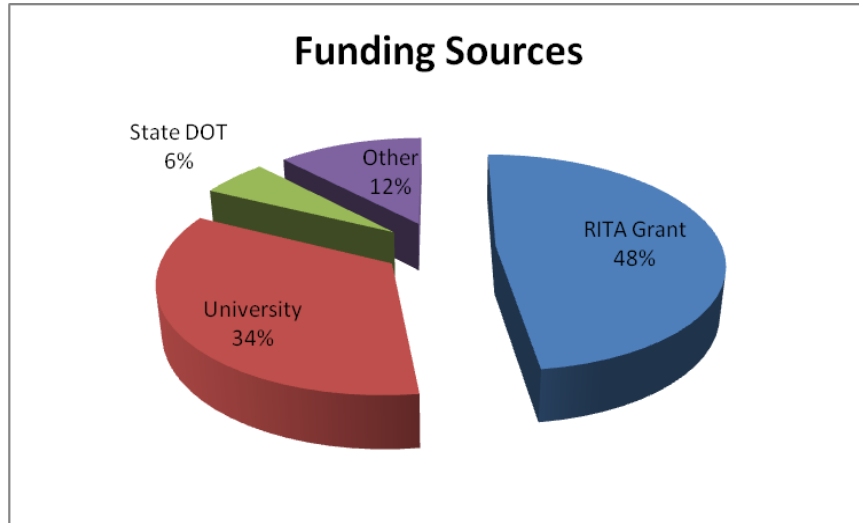
Upgraded Air Pollution Laboratory (APL)

A Thermo Scientific Model 49i analyzer, which uses UV photometric technology to measure the amount of ozone in the air from ppb levels up to 200 ppm, was installed in the APL in January 2010. It includes a dual cell photometer, a concept adopted by NIST for the national ozone standard. The following equipment are also available in the air pollution laboratory: A Thermo Scientific 42i chemiluminescence NO-NO₂-NO_x analyzer; a Climatronics Corporation's AIO compact weather station with the capability to measure temperature, relative humidity, wind speed, wind direction, and barometric pressure; a pyranometer (LI 200SA) and a light meter (LI 250A) with mounting and leveling fixture and carrying case from LI-COR Inc; and a Little Giant 3-shelf cart with writing tray. All instrument software was loaded on an existing Dell Inspiron 8100 laptop computer. All these equipment are mounted on a cart to be wheeled to locations where the measurements are to be made.

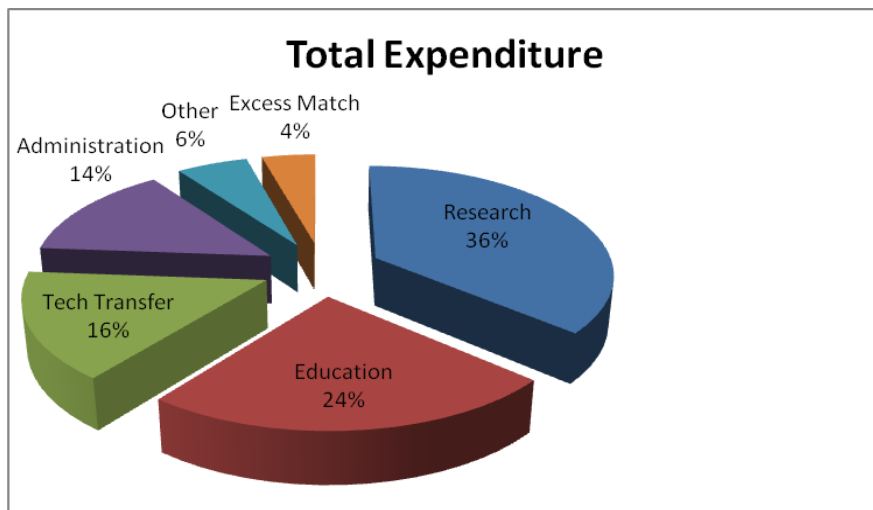


FUNDING SOURCES AND EXPENDITURES **(As of June 2010)**

The total ESITAC funding sources for 2009 - 2010 include RITA's Tier II UTC grant as well as matching funds from Hampton University, the Commonwealth of Virginia DOT, and others. The other category comprises matching funding from related private organizations and excess matching funds carried forward from the preceding year.



The total ESITAC expenditures for 2009 – 2010 on research, education, technology transfer activities, and administration are shown for the RITA grant and matching funds. The other category includes unspent funds which along with excess match will be carried forward to next year's budget for implementing future grant activities.



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