ANNUAL REPORT
2007 – 2008

EASTERN SEABOARD INTERMODAL TRANSPORTATION APPLICATIONS CENTER (ESITAC)

Safety, Infrastructure Renewal, and Environmental Stewardship

Hampton University
Hampton, Virginia 23668
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On behalf of Hampton University’s Eastern Seaboard Intermodal Transportation Applications Center (ESITAC) staff, faculty, students, committee members, and external partners, I am glad to present our first Annual Report. The span for the first grant year was set to be June 2006 to May 2008 covering a period of 24 months. This Annual Report documents all activities conducted during the 24 month period of June 1, 2006 through May 31, 2008.

Our Strategic Plan was approved in December 2007. Thereafter, the Center has been engaged mainly with planning and organizing activities that were proposed in the approved Plan. The Transportation Steering Committee was formulated to serve as an advisory body to govern activities of the Center, and the Research Selection Committee was formulated to assist and advise the Center on selecting research projects that fit the theme, expertise of the University, and the regional needs. Both these committees consist of University representatives and transportation experts from federal, state and city governments, and transportation industries. We are thankful for the encouraging responses received from the committee members.

The ESITAC is located in the Hampton Roads Region, which is at the crossroad of air, rail, road, and water modes providing intermodal transportation systems for passengers and freight. The recent growth in these modes of transportation has added pressure on our highways and environment, resulting in traffic congestion and air pollution. The Center is addressing these challenges through a combination of research, education, and technology transfer programs. Our current research attempts to address FHWA's and FTA's corresponding strategies outlined in the U.S. DOT, Transportation Research, Development and Technology Strategic Plan 2006 - 2010. The research proposals discussed later in this report are focused on safety, infrastructure renewal, and environmental stewardship.

Although often overlooked, education and training of future professionals is critical in view of the nationwide shortage of skills to meet transportation’s increasing needs. The overall goal of the Center is to attract and educate the next generation of transportation professionals through well-designed education, training, and workforce development programs. We have implemented transportation curriculum that include classroom and experiential learning in intermodal transportation operations. These programs provide our bright young students opportunities to enhance their understanding of transportation, thereby building potential talent for the transportation industry.

I am extremely pleased with ESITAC’s progress during the initial stages of operation. We are beginning to disseminate our preliminary research results to local, national, and international audiences. For more updated information, I encourage you to visit our website. We would like to hear from you, so please contact me or any of the associate directors if you need more information.

Kelwyn D'Souza, Ph.D.
ESITAC THEME

The theme of ESITAC is to enhance regional intermodal transportation systems by improving safety and efficiency while minimizing environmental impacts. This theme was finalized after intense discussions within the University and among our external partners. It recognizes the different modes of transportation serving the Hampton Roads Region and proposes an interdisciplinary approach to address the needs of motor carriers, railroads, water carriers, and air carriers.

The ESITAC’s region is served by a combination of interstate highways, international airports, marine ports, and railroads. The rapid growth in these, poses a challenge to improve safety and infrastructure, and control air pollution. To address these challenges, the Center has proposed research projects related to intersection safety, non-destructive bridge testing with acoustic emission sensor technology, and investigation of nitrogen oxides emissions from major roadways and air quality models to study vehicle emissions and toxic pollutants. The research programs are integrated with the University’s existing transportation curricula to offer students from varied disciplines an interdisciplinary transportation education. The preliminary research results produced by the Center are disseminated within the Region and nationwide to users and decision makers involved with the design of safe and environmentally clean transportation systems.
MANAGEMENT STRUCTURE AND PRINCIPAL ESITAC STAFF

The ESITAC is funded by USDOT’s Research and Innovative Technology Administration (RITA) as one of the nation’s Tier II UTC. It is housed in the School of Business and operated according to the organizational chart shown in Figure 1. This chart shows elements under each of the main components of research, education, and technology transfer. These elements constitute avenues for administrators, faculty, students, and external partners to interact with the Center.

Figure 1. ESITAC Organizational Chart

CENTER DIRECTOR

Dr. Kelwyn D’Souza is the ESITAC Director.
COMMITTEES

Transportation Steering Committee: serves as an advisory body to govern the ESITAC. The Committee provides advice relative to project goals, implementation, and coordinating partnership activities and funding. The Committee is made up of the following leaders representing federal, state, city, academics, and private organizations whose expertise contributes positively to the theme and goals of ESITAC.

- Dr. Moges Ayele, Senior Liaison for Higher Education, FHWA, USDOT.
- Mr. Michael Chapman, Assistant Deputy Director for Aerospace Testing, NASA Langley Research Center
- 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, Associate Dean for Research, Development, and External Relations, George Mason University
- Mr. Bill Thomas, Associate Vice President, Governmental Relations, Hampton University
Research Selection Committee: assists and advises the Center on selecting research projects that fit the theme, expertise of the University, and the regional needs. The Committee is made up of the following transportation experts representing federal, state, city, academics, and private organizations.

- 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 Engineering and Operations Manager, City of Hampton, Department of Public Works
- Mr. Tom Ballou, 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. Jim Ponticello, Air Quality Program Manager, VDOT
- Dr. Camelia Ravanbakht, Principal Transportation Engineer, Hampton Roads Planning District Commission (HRPDC)
- Dr. Stephen Sharp, Research Scientist, Virginia Transportation Research Council, VDOT
- Dr. John Sokolowski, Research Professor and Director of Research, Virginia Modeling and Simulation Center, ODU
ESITAC PRINCIPAL STAFF

The ESITAC principal staff is comprised of associate directors, faculty investigators, and budget executive. 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 described in the approved Strategic Plan.

<table>
<thead>
<tr>
<th>Dr. Ates Akyurtlu is a Faculty Investigator for Environmental Modeling.</th>
<th>Dr. Ates Akyurtlu is the Associate Director (Research) and Faculty Investigator for Environmental Modeling.</th>
<th>Dr. Sid Credle is the Dean, School of Business and ESITAC Budget Executive.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor Carey Freeman is the Associate Director (Education).</td>
<td>Dr. Sharad Maheshwari is the Associate Director (Technology Transfer) and Faculty Investigator for Safety.</td>
<td>Dr. Devendra Parmar is a Faculty Investigator for Infrastructure Renewal.</td>
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</table>
OVERVIEW OF ESITAC PROGRAMS

After approval of the Strategic Plan on December 17, 2007, our staff started planning to implement the Research, Education, and Transfer Technology activities. During the following five month period from January to May 2008, it was possible to implement a modest level of activities in research, education, and technology transfer.

RESEARCH

The ESITAC outreached towards its partners to identify research areas that support the national strategy for surface transportation research related to safety, infrastructure renewal, and environmental stewardship. Our research team visited city transportation divisions in the Region, VDOT, and VDEQ to identify potential research areas that fit our theme and needs of the Region. Three research proposals were developed by the Center and submitted to the Research Selection Committee. Dr. Jale Akyurlu, Associate Director for Research and the other research team members are finalizing the following proposals based on the inputs received from the Research Selection Committee members.

Proposed Research

Safety: Drs. Sharad Maheshwari and Kelwyn D’Souza

The objective of this proposed research is to develop statistical predictive models for vehicular traffic accidents at signalized intersections in the City of Norfolk, VA. The current studies show that traffic accidents are largely caused due to traffic volume and driver actions. However, the reviewed literature indicates that intersection topography/design factors and traffic management rules may also contribute significantly to traffic accidents. A pilot study
conducted in the City by ESITAC in 2005-2006 showed that these factors may be contributing to the traffic accidents at signalized intersections. Hence, there is a need to conduct further investigation of these controllable factors that cause traffic accidents at the intersections. The proposed research will expand upon the work completed in the pilot study, and delineate significant controllable factors contributing to traffic accidents at signalized intersections in the City.

The major deliverables from the proposed research will include the following:
- A list of signalized intersection topographical/design and traffic management factors which show significant correlation with the traffic accidents in the City.
- A predictive statistical model for the traffic accident rate which would include the significant topographical/design and traffic management factors.

Infrastructure Renewal: Dr. Devendra Parmar

The objective of this proposed research is to utilize Non-Destructive Testing Technologies (NDT) for monitoring the structural health of two bridges in the Region. 1. A bridge on I-164 at the Coast Guard Blvd. in Portsmouth, VA. It is located in an area of heavy cargo transportation. In 2004, the average daily traffic on the bridge was 11,337 with 4% truck traffic. 2. A bridge in the city of Williamsburg handling an average daily traffic of 2,230 vehicles with 5% daily average of truck traffic according to 2004 data. The study will involve monitoring the health of metal and non-metal (e.g. concrete) bridge structural components using NDT of Acoustic Emission (AE).

The major deliverables from the proposed research will include the following:
- Establish inspection procedures and methodology based on the studies during lean and peak traffic intervals. Investigate the role of thermal factors and incorporate them in the inspection procedures.
- Provide analysis and research procedures including simple bridge health grading criteria.
- Simplify the AE technology application for VDOT data review and decision making such that if problems are identified with AE, a dedicated system could be put into place for online monitoring.

Environmental Stewardship: Drs. Ates Akyurtlu and Jale Akyurtlu

The proposed project will measure and estimate through the use of models, the NOx concentrations over the area adjacent to a major roadway. The NOx emissions that will be monitored and predicted are expected to be higher than the values measured by the stationary monitoring stations. These results will be highly useful in determining the possible health and environmental effects of these emissions and will help in determining possible land use restrictions in areas adjacent to major roadways, and prediction of the effects of transportation policies on the air pollution that may affect the health of sensitive populations who are living in close proximity to roadways.
The major deliverables from the proposed research will include the following:

- A mobile NO and NO₂ measurement unit with the associated weather monitoring instrumentation.
- Coordinated measurements of NO and NO₂ concentrations and meteorological conditions at varying distances from the roadway, together with the traffic volume and vehicle type data.
- CALINE4 results to estimate the NO₂ concentrations at receptors located at the measurement points.
- Analysis of data obtained to elucidate the adequacy of CALINE4 in predicting the local NO₂ concentrations near roadways and perform a sensitivity analysis to suggest possible improvements.

**Student Research**

**Modeling Transportation Pollutants: Drs. Ates and Jale Akyurtlu**

Mr. Christopher Santiago, a chemical engineering sophomore works with ESITAC researchers, Drs. Ates and Jale Akyurtlu, on modeling of the dispersion of transportation pollutants on I-64. In Spring 2008, he did research on air pollution modeling and the equipment needed to measure pollutants. Mr. Santiago will be involved in collecting traffic data, making environmental measurements, and doing a literature search. This will help implementation of research into education and increase awareness of issues involved in making transportation policy decisions.

*Mr. Christopher Santiago, a Chemical Engineering Sophomore making a Presentation on Air Pollution Modeling.*
EDUCATION

The overall goal of the Center is to attract and educate the next generation of transportation professionals through well-designed education and job training programs. The transportation education program builds upon existing related programs offered by various departments within the University and integrates research results into courses to produce a well-trained, effective, and efficient workforce. The partnerships with the transportation industry allow the Center to offer experiential learning through co-ops and internships.

Transportation Curriculum

Logistics and Transportation Management Course: Dr. Sharad Maheshwari

The School of Business at Hampton University offers transportation technology and management curriculum through existing course work and co-ops/internships in transportation organizations. During the spring 2008 semester, the School offered a Logistics and Transportation Management course at the MBA level. This course focused on logistics and supply chain management applicable to air, surface, and water transportation modes. The course used business settings to explain transportation models. The course material was delivered mainly through case studies in logistics and transportation management. Twenty-nine graduate students attended this course conducted by Dr. Sharad Maheshwari, Associate Director for Technology Transfer. The School has recently received funding from Prudential Financial to enhance its computer technology in the electronic classroom and computer laboratory used in the conduct of graduate transportation courses and research projects.

Graduate Students in the Logistics and Transportation Management Course making Case Presentations.
Transportation Training

Transit Interns: Dr. Kelwyn D’Souza

Training a student to be successful in the transportation field cannot be accomplished by classroom lectures alone. On-site experience-based learning is an essential component of the training process, and co-op/internship has proven to be an effective method to achieve this goal. Recognizing the importance of on-site experience-based learning and with a focus on increasing transit ridership, the Center developed a transit internship program in collaboration with Hampton Roads Transit (HRT). The objective of the internship is to supplement student classroom knowledge through independent projects conducted under the guidance of HRT mentors. Two students from the School of Business participated in the transit internship program at HRT in spring 2008. One of the students interned in HRT’s Accounts and Finance Department concentrating on grants and fund management projects. The other student interned in HRT’s Organizational Development Department in the area of statistical reporting. Both students acquired transit work experience and an opportunity to use state-of-the-art software programs.

Spring 2008 Transit Interns: Mr. Devin Jones (left) and Mr. Richard Nelson (right) at HRT Hampton location.
TECHNOLOGY TRANSFER

The ESITAC’s research proposals presented earlier needs to be communicated to the larger transportation community in order to put the results into practice and increase the likelihood of implementation. The research team visited our partners and made brief presentations to related audiences. In addition, conference and journal papers have been published on the basis of preliminary research results.

Presentations to ESITAC Partners

Investigation of Nitrogen Oxides Emissions From A Major Roadway. Drs. Ates Akyurtlu and Jale Akyurtlu presented plans for pollution modeling to environmental staff from the Virginia Department of Environmental Quality (VDEQ) and VDOT, Richmond, VA, April 18, 2008.

Modeling Signalized Intersection Traffic Accidents: A Pilot Study Conducted in City Of Norfolk, Virginia, U. S. A. Drs. Sharad Maheshwari and Kelwyn D’Souza presented research results from the pilot study to transportation engineers at the City of Norfolk, Division of Transportation, March 06, 2008.

Hampton University’s Transportation Research and Training Expertise. Dr. Kelwyn D’Souza presented an overview of ESITAC to Mr. Charles W (Wick) Moorman, President and CEO, Norfolk Southern Corporation, Hampton University, January 16, 2008.
Presentations at Conferences and Meetings


Publications in Journals and Proceedings


SPECIFIC ACCOMPLISHMENTS

RESEARCH


The purpose of this General Vehicle Usage Policy is to provide use, maintenance, and replacement guidelines for all vehicles owned by the Research Operations, Maintenance, and Engineering (ROME) Group that provides building and other general maintenance service to NASA, Langley. Drs. Sharad Maheshwari and Sid Credle conducted a comprehensive analysis of existing vehicle data which included vehicle make, model and type, the age of vehicles, the years placed in service, type of use, and assignment of vehicle. The financial data available for the vehicle were purchase price, book value, and the accounting depreciation schedule. The maintenance data on each vehicle comprised of type and annual cost of maintenance. All this information and data were used to prepare a Fleet maintenance policy.

The results from the data analysis are highlighted as follows:

- Approximately 22 of the 107 vehicles are out of commission and not in use. These vehicles have little value to ROME’s current or future Fleet operations and should be disposed or sold. The proceeds from the sale or disposal should be reinvested in new or used vehicles. It appears that the first priority is replacement of the Fleet vans.

- It is recommended that all vehicles purchased before 1989 be replaced since they incur high maintenance and repairs costs.

- An analysis of the Fleet age indicates that possibly two additional vehicles will be out of commission in the near future.

- It is recommended that in addition to the replacement of Fleet vans which are used for maintenance of most NASA facilities (since they have relatively large spare parts storage capacity), ROME should also consider the replacement of out-of-commission vehicles with energy efficient “Golf Carts” for routine minor repairs.
Evaluation of Highway Bridge Cables: Dr. Devendra Parmar

In the first year of operation, ESITAC took a lead in the assessment and monitoring of the Region’s highway bridges by contracting with the Virginia Transportation Research Council (VTRC) to conduct a study on the Short term Evaluation of Bridge Cables Using Acoustic Emission Sensors. This contract, fully funded by VTRC is being implemented by Dr. Devendra Parmar. The on-going study focuses on the Varina-Enon Cable Stay Bridge in Virginia to determine corrosion on single stay cables and evaluation of signature sounds from cables. The Acoustic Emission (AE) technique is being used on the bridge to investigate fatigue, corrosion, initiation of cracks and imperfections.

Varina- Enon Cable Stay Bridge.

87th Annual TRB Conference: Professor Carey Freeman

Professor Carey Freeman encouraged Ms. Whitney Blackburn, a senior Aviation Management major to participate in the 87th annual TRB Conference in Washington D.C. on January 13-17, 2008. Whitney presented her research at an afternoon poster session focusing on the increased usage and congestion at airports. Her research project illustrated the importance for airports to grow and expand as their usage increases.

Whitney Blackburn with the Research Poster at the TRB Conference
EDUCATION AND WORKFORCE DEVELOPMENT

Leadership Education and Development (LEAD): The Business of Engineering 2007: Dr. Eric Sheppard, Dean of School of Engineering and Technology

This one-week academic enrichment program hosted in August 2007 by the College of Engineering and Technology, provided 18 high school students from across the U. S. A. the opportunity to explore and learn more about the world of engineering. This project was supported by the Department of Energy and executed by Dr. Eric Sheppard, Dean, School of Engineering and Technology. The students were grouped into the following four teams.

Team 1: Commuters.

Team 2: Environmentalists

Team 3: Shipping

Team 4: Tourism

Each team was assigned a case study addressing Hampton Roads traffic problems and was required to suggest the most appropriate solution to solve or at least lessen Hampton Roads metropolitan area traffic problems.

High School Students Participating in the LEAD Program.
Workforce Development: Professor Carey Freeman

As a leading Historically Black College and University (HBCU), Hampton University has been designated to establish a Dwight D. Eisenhower Transportation Fellowship Program to advance transportation workforce development. The Department of Aviation and Department of Management students have participated in the Dwight D. Eisenhower Transportation Fellowship Program since the early 1990’s. The purpose of this fellowship is to provide students with additional opportunities to enter careers in transportation. Our Dwight D. Eisenhower Transportation Fellowship graduates are employed at various levels in the transportation industry, from Airport Management and Air Traffic Control, to FHWA Regional Offices. The ESITAC assisted the Aviation Department in identifying and selecting students for this fellowship program. The following table shows the number and amount of fellowships that have been awarded during the past three years.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Number of Fellowships</th>
<th>Amount of Fellowships</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008-2009</td>
<td>3</td>
<td>$22,500</td>
</tr>
<tr>
<td>2007-2008</td>
<td>4</td>
<td>$20,000</td>
</tr>
<tr>
<td>2006-2007</td>
<td>3</td>
<td>$45,000</td>
</tr>
</tbody>
</table>
FUNDING AND EXPENDITURES

The total ESITAC funding sources include RITA’s Tier II UTC grant as well as matching funds from Hampton University and the Virginia Transportation Research Council (VTRC), VDOT. The “other” category includes sources from related private organizations. The ESITAC conducted some of the initial research, education, and technology activities at no cost to the RITA grant because of matching fund support from the University, VTRC, and other sources. The expenditures are shown for the initial RITA funding of $150,000 spent largely on preparing the Strategic Plan, and planning and organizing the research, education, and technology transfer activities to date.
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