



ESITAC

**Safety, Infrastructure
Renewal, and Environmental
Stewardship**

Eastern Seaboard Intermodal Transportation Applications Center E-Newsletter

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Message from the Director



The past few months have been an exciting and challenging period for the ESITAC. We were pleased to host our first RITA site visit on November 03, 2009. The site visit team spent the day with Center members and with senior university administrators, discussing progress of the UTC program at Hampton University.

We completed the RITA funded research projects on safety, infrastructure renewal, and environmental stewardship, and are in the process of developing new project proposals.

This newsletter highlights completed and planned activities in research, education, and technology transfer. Our new research projects will continue to concentrate on the Center's theme as it relates to safety, infrastructure renewal, and environmental stewardship. In addition to proposals prepared by Center's current research team members, we are also soliciting new proposals from the faculty across the campus. The educational activities during this period include the organization of transportation lectures for students and faculty, offering a minor in Aviation, and creation of research opportunities for students.

We continue to strengthen our partnership with industry through monthly meetings and on-site visits. Parsons-Brinckerhoff (PB), a leader in planning, engineering, and program and construction management services has proposed to offer a short course on the NEPA process. I visited Hampton Roads Transit (HRT) to discuss the potential for study of safety and driver distraction problems on public transit systems.

On my return from sabbatical leave during the Spring 2009 semester, I see added opportunities for the ESITAC in the areas of transportation research and education. These are being explored nationally and internationally.

I encourage you to review the articles presented in this newsletter, and welcome your suggestions in any area. Please visit our website for updated information on ESITAC's activities.

Kelwyn D'Souza, Ph.D.
Director, ESITAC, School of Business
Hampton University, Hampton, VA 23668



RITA Conducts ESITAC's 1st Site Visit

The ESITAC was pleased to welcome USDOT's RITA site visit team consisting of Lydia Mercado (RITA), Moges Ayele (FHWA), Jarrett Stoltzfus (FTA), Denise Dunn (RITA), and Felicia Young (FHWA). They visited Hampton University on November 3, 2009. It was a productive visit that included presentations of the Center's activities, demonstration of laboratory experiments, and interaction with faculty, students, and administrators. In the morning session, Dr. Kelwyn D'Souza, ESITAC Director, along with other team members summarized past accomplishments and future plans in research, education, and technology transfer. A cross section of industry partners made brief presentations on ESITAC projects and their usefulness for the Region. Presentations by students on safety research and transit internships provided an insight on the importance of student involvement in the Center's activities. During the afternoon session, tours were conducted of the laboratory facilities used for the Center's research projects. These included the acoustic emission and pollution monitoring laboratories where the RITA's site visit team could observe equipment used in the research. Discussions with senior administrators focused on the business operations and financial reporting systems. The site visit team shared their expertise and feedback with faculty and administrators.

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RITA Site Visit Team from Right: Ms. Lydia Mercado (RITA Grant Administrator); Dr. Moges Ayele (FHWA Senior Liaison for Higher Education); Mr. Jarrett Stoltzfus (FTA Transportation Program Specialist); Ms. Denise Dunn (RITA Program Analyst).



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Ms. Denise Dunn of RITA Observing the Pollution Monitoring Equipment.

Acoustic Emission Testing Laboratory



ESITAC Researcher Dr. Devendra Parmar Explaining Stress Test on a Concrete Slab to Ms. Lydia Mercado, RITA Grant Administrator.



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The goal of establishing a pollution monitoring laboratory is to measure level of various pollutants in air caused by the vehicular transportation. These measurements can be compared with the results from existing air pollution models, to determine adequacy of these models to predict the pollution levels from transportation.

The following equipment were purchased for this purpose using ESITAC funding: a Thermo Scientific 42i chemiluminescence NO-NO₂-NO_x analyzer; a Climatronics Corp. 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. Instrument software was loaded on an existing Dell Inspiron 8100 laptop computer, and the weather station and the NO_x analyzer were mounted on the cart.

A Thermo Scientific Model 49i analyzer, which uses UV photometric technology to measure the amount of ozone in the air from one ppb level up to 200 ppm, was ordered with matching funds from Norfolk Southern Corporation. It contains a dual cell photometer, a concept adopted by NIST for the national ozone standard. All these equipment are housed in OLIN Engineering Building.



Dr. Ates Akyurtlu and Student Intern Ms. Courtney Mitchell Working on the NO_x Analyzer in the Air Pollution Lab.



Completed Research Projects

Dr. Jale Akyurtlu, Associate Director (Research) coordinated with the investigators of the research projects at sites across Hampton Roads. A summary for each of the completed research project follows:

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

Objective:

Develop statistical predictive models for vehicular traffic accidents at signalized intersections in the City of Norfolk, VA.

Partner:

Transportation Division, City of Norfolk.

PIs for the Project:

Drs. Sharad Maheshwari and Kelwyn D'Souza.

Project Results:

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. The following regression model explained about 61% of the variations (R=.78).

$$ACCAVG = -6.4 + 0.574 * LANE + 3.06 * TURN + 0.001 * AADT + 0.122 * DRWY - 0.654 * MEDN + 15.368 * HZRD$$

Variable	Definition
ACCAVG	Total Number of Accidents from 2001-2004 with 250' of a Given Intersection
AADT	Annual Average Daily Traffic ('000) at The Intersection
LANE	Total Number of Lanes at The Intersection
TURN	Total Number of Turn Lanes at The Intersection
MEDN	Total Number of Physical Median at The Intersection (MEDN1+MEDN2+MEDN3+MEDN4)
PEDN	Total Number of Pedestrian Crossing at The Intersection (PEDN1+PEDN2+PEDN3+PEDN4)
DRWY	Total Number of Driveways at The Intersection
HZRD	Number of Legs with Extra Hazards at the Intersection.

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 in the City of Norfolk. The t-test shows that it was a significant difference (p=0.012).

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

Objective:

Monitor structural health of highway bridges to prevent spread of structural failures.

Partners:

Virginia Department of Transportation (VDOT), District Structures and Bridge Engineering Department and Virginia Transportation Research Council (VTRC).

PI for the Project:

Dr. Devendra Parmar.

Project Results:

The objective of this research is to investigate bridge structure element active defects during periods of low and/or no traffic, and peak and/or heavy traffic in short areas of the AE sensors. Hence, the study focused on areas with higher potential of damage.



Bridge on I-164 at the Coast Guard Blvd. in the City of Portsmouth.

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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. The following activities were conducted:



Potential Locations for AE Sensor Installation on the Bridge And the Back Wall.

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- Potential sites for monitoring and for analyzing AE were identified.
- An 8 sensor system for monitoring the test sites has been designed.
- The newly designed 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.
- The designed equipment is under fabrication through ESITAC funds.
- Studies on Virginia bridges using the newly designed AE system will continue.
- AE monitoring during the investigation involves metal and non-metal (e.g. concrete) bridge structural components.
- An inspection procedure and methodology is to be established based on the studies during quiet/low and peak traffic periods.
- The role of thermal factors needs to be investigated and incorporated in the inspection procedure.
- The AE data need to be monitored, recorded and analyzed on a real time basis from a remote location such as from the office of the bridge engineer/inspector.



Project 3: Investigation of Nitrogen Oxides Emissions from a Major Roadway

Objective:

Develop a model to predict pollutant concentrations near major roadways and to validate the model with real-time pollutant concentration, traffic and meteorological data. This will be realized by obtaining NO_x and ozone measurements with a higher time (in minutes) and spatial resolutions (within 200 meters of the roadway.) The data will be used in conjunction with real time traffic and weather data, and MOBILE6 emission factor estimations to validate CALINE4 predictions.

Partners:

Virginia Department of Transportation (VDOT) and Virginia Department of Environmental Quality (VDEQ).

PIs for the Project:

Drs. Ates Akyurtlu and Jale Akyurtlu.

Project Results:

1. Built a mobile NO and NO₂ measurement unit with the associated weather monitoring instrumentation.
2. Obtained coordinated measurements of NO and NO₂ concentrations and meteorological conditions at varying distances from the roadway, together with the traffic volume data.
3. Used CALINE4 to estimate the NO₂ concentrations at receptors located at the measurement points.
4. Analyzed the data obtained to elucidate the adequacy of CALINE4 in predicting the local NO₂ concentrations near roadways.

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 m from the I-64 median. The reason for this decrease is atmospheric dispersion and conversion of NO_x to other nitrogen containing compounds. Close to the roadway (less than about 100 m from the I-64 median), the majority of NO_x is NO, which converts to NO₂ and other nitrogen compounds and falls from 17.3 ppb to about 3.4 ppb at distances greater than 150 m from the median.

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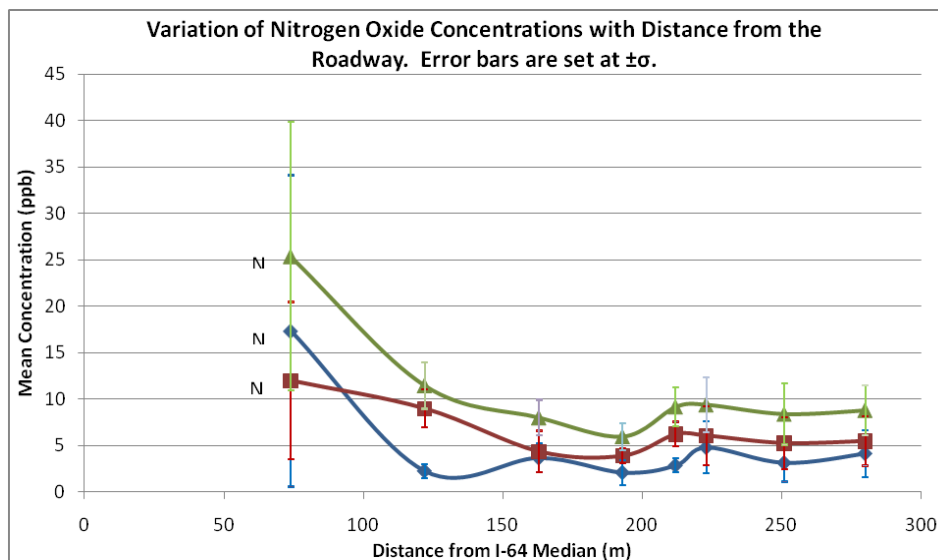
Project 3: Investigation of Nitrogen Oxides ...Cont.

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The decrease in nitrogen dioxide (NO₂) concentration is not as much and falls from about 12 ppb at 74 m to about 5.5 ppb beyond 150 m. This seems to indicate conversion of some NO to NO₂ possibly through its reaction with ozone. Close to the roadway, there was significant variation in the measured NO and NO_x concentrations due to the effects of emissions coming from individual vehicles passing close to the analyzer intake. This effect became less significant at larger distances from the roadway.

The NO_x concentrations at the receptor locations were predicted using CALINE4, which can provide estimates with a sensitivity of ± 5 ppb. Since the specified background NO_x concentration was 8 ppb, it was expected that CALINE4 would predict 0.010 ppm NO_x at each receptor location except the one at 74 m from I-64 median. CALINE4 predicted a concentration of 0.01 ppm at all receptor locations. This is an under prediction at the first receptor at 74 m from I-64 median, where the measured value was 0.025 ppm. The predictions obtained using CALINE4 indicates that the current data cannot provide an adequate evaluation of the program. To obtain a reasonable evaluation, data are needed during the rush hour traffic and closer to the roadway, which may give higher NO_x concentrations.

Since the measured NO_x levels are lower than the 24-hr EEGL (emergency exposure guidance levels) value of 0.04 ppm for NO₂, they do not by themselves represent a significant health risk. But since the main health effects of nitrogen oxides are through their role in the formation of ground level ozone (smog) and nitrogen containing particulates, it is imperative that ozone and particulates are also measured.





Transportation Education and Training

Distinguished Lecture Series

The speakers were First Officer Steve Forest, Continental Airlines, Boeing 777 and First Officer Joanne Forest, United Airlines, Airbus A-320. Both speakers had substantial flying experience.

The main focus of their presentation was “careers in the airlines” industry. Initially, Steve and Joanne described their career path in the airlines. Both were graduates of college aviation programs and worked at variety of jobs in the aviation industry before joining the airlines. Later in the lecture, they described life 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.



First Officers Steve Forest and Joanne Forest Speak During ESITAC's Distinguished Lecture Series.

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National Environmental Policy Act (NEPA) Process Course Proposed for Spring 2010 Semester

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Parsons-Brinckerhoff (PB), a leader in planning, engineering, and program and construction management services will collaborate with ESITAC to offer a short course on the NEPA process. The course, to be conducted on Hampton University campus in Spring 2010, will discuss the Policy Act, Environmental Impact Statements, and how to design context sensitive solutions required by NEPA.

This one-day course will be conducted by Mr. Stephen Plano, PB planner, in between late February and March, 2010. The participants will include University students, PB employees, and planners from local government agencies. This mixed group should provide for interesting perspective and mentoring opportunities for the students.

NEPA became federal law in 1970 and established a basis for the national environmental policy. NEPA was the first major environmental law in the United States and is often called the "Magna Carta" of the federal laws related to the environment. New construction or any other activity that "disturbs the earth" falls under NEPA guidelines.

Concentration in Transportation Management

ESITAC completed the first step in establishing a concentration in Transportation Management at Hampton University. The proposed curriculum has been approved by the deans of the School of Business and School of Engineering and Technology. The proposal needs to be approved by the University's curriculum related committees before it is included the University Catalog. The transportation concentration is designed to prepare students for careers in the transportation industry. It consists of the following 18 credit-hours:

Proposed concentration curriculum

Required courses:

AVN 304	Air Transportation
AVN 305	Aviation Management
MGT 215/MBA 202	Statistical Analysis/ Management Engineering
MGT 370	Transportation Management
MGT 402	Production/Operations Management
MKT 360/AVN 400	Cooperative Education/internship



Minor in Aviation

Aviation Minor Approved

Students majoring in other fields of study are offered an opportunity to earn a minor in Aviation. A bachelors' degree with a minor in Aviation will prepare students to work in aviation which is a large and growing segment of intermodal transportation, especially in the expanding global trade/economy. Emphasis is on the aviation safety and legislation courses to ensure safe operations of the civil aviation fleet. The course requirements for a minor in Aviation are shown in the following Table:

Course Requirements for a Minor in Aviation

Course	Title	Credit Hours
AVN 201	Aviation Foundation I	3
AVN 202	Aviation Foundation II	3
AVN 301	Flight Safety	3
AVN 302	Aviation Legislation	3
AVN 304	Air Transportation	3
AVN 325	Tower Operation I	3
	Total Hours	18

Transportation Graduate School Information

The Associate Director of Education is in the process of compiling and organizing Transportation Graduate School information. This organized information on advanced transportation related programs will be made available in the Department of Aviation. This will be useful for any student planning to pursue an advanced degree in the transportation or related fields.

The Department of Aviation has established a long-standing relationship with the Texas Southern Transportation Graduate Program. It is working to build other relationships with other in-state and out-of-state schools.



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The ESITAC played an active role in the 2009 School of Business Summer Training Institute (STI). Professor Carey Freeman, Associate Director Education discussed transportation opportunities with middle school students and sponsored an essay contest. The essay contest writing 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. The ESITAC awarded prizes in the amounts of: 1st Place--\$150; 2nd place--\$100; 3rd place --\$50; and honorable mention -- certificate.



STI Banquet.





Hampton University 2009-10 Eisenhower Fellows

The TRB Annual Meeting covers all modes of transportation, with more than 3,000 presentations in nearly 600 sessions addressing topics of interest to all attendees.

Four Eisenhower Transportation Fellows will represent HU at the Transportation Research Board 89th annual meeting in Washington, DC, January 10-14, 2010. The students are: 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" will be presented at the Eisenhower Student Showcase on Tuesday, 12 January, 2010. This is the second consecutive year that HU students have been selected to present their research projects at TRB.



ESITAC's Mr. Roland McKay.

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Transit Internship Program (TIP)

Chrystal Gaither, a Finance Major in the School of Business completed the TIP at Hampton Roads Transit (HRT) in Fall 2009. HRT currently serves passengers in the Hampton metropolitan area that include service to Hampton, Norfolk, Chesapeake, Virginia Beach, Portsmouth, Suffolk, Newport News, Williamsburg, and the town of Smithfield. Chrystal's internship project involved working with 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.



Ms. Chrystal Gaither Making a Presentation at RITA Site Visit Meeting.

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HU's Business Students Participating in Institute for Supply Management (ISM) Case Competition

A team of graduate and undergraduate students will be participating in the Seventh Annual Black Executive Supply Management Summit hosted by the Institute for Supply Management (ISM) from Feb 2-4, 2010 in San Diego, CA. The team will consist of Jameya Green (undergraduate student), Devin Hairston (undergraduate student), and Joshua Dunn (graduate student). The summit also includes a student case competition related to transportation cost optimization in a paper production company. The Hampton University team is currently working on the solution to the case problem and creating a transportation and distributing model for the company. Dr. Sharad Maheshwari is the faculty advisor for this competition.



Highlights

Research Presentations and Publications

Papers submitted for presentation

- 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.
- Akyurtlu, A., Mitchell, C. and Akyurtlu, J., “Investigation of Nitrogen Oxides Emissions from I-64”, accepted for presentation at the 51st Annual Transportation Research Forum, March 11-13, 2010, Washington, D.C.

Acquisition of an Ozone Analyzer by Funding From Norfolk-Southern Corporation

Dr. Ates Akyurtlu and Dr. Jale Akyurtlu have been working on a research project to collect real-time simultaneous NO-NO₂-NO_x concentrations, traffic and meteorological data, and to validate existing models to predict pollutant concentrations near I-64 using those data. They use a Chemiluminescent NO-NO₂-NO_x analyzer, a compact weather station and light measurement equipment to collect the data. The next step is to acquire an ozone analyzer because of the interaction of nitrogen oxides and ozone.

Ground-level ozone is formed from pollutants from vehicles and power plants, like nitrogen oxides and volatile organic compounds (from particulate emissions especially from diesel vehicles) under light; therefore, its concentrations fluctuate depending on the time of day and the season. Ozone is transported long distances and causes adverse health effects, like respiratory problems, etc. Through matching funds provided by Norfolk Southern Corporation, an ozone analyzer has been ordered. This analyzer uses UV photometric technology to measure the amount of ozone in the air from one ppb level up to 200 ppm. It contains a dual cell photometer, a concept adopted by NIST for the national ozone standard. Undergraduate engineering students working with the research team are introduced to transportation applications.

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Outstanding Student of the Year Nominated for the Council of University Transportation Centers Award

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Courtney Mitchell has worked as a student researcher with the ESITAC for the past year. She has been working directly with Dr. Ates Akyurtlu on analyzing NO_x emissions at high-traffic intersections. She has been involved in self-training of the NO_x Emission Analyzer, the CALINE4 software and modeling of data collection techniques. She will represent Hampton University at the 13th Annual Council of University Transportation Centers (CUTC). Outstanding Student of the Year Award ceremony at Washington, D.C. in January 2010.

Courtney Mitchell is very active at her school and in the community. At the University, 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 University chapter of the National Society of Black Engineers, and Chemical Engineering Student Ambassador for the University. In her spare time, she enjoys dancing and is the dance team leader at her church.



2009 ESITAC Student of the Year Ms. Courtney Mitchell, Junior, Chemical Engineering Major.



Undergraduate Research in Transit Driver Distraction

Driver distraction is currently the subject of discussion at the highest levels of government. The U.S. Transportation Secretary has recently highlighted the dangers of distracted driving and pledged to take action at the federal level to mitigate this problem.

The ESITAC is employing Miss Amber Griffith, a student researcher in Spring 2010 to conduct preliminary analysis of bus accident data collected by Hampton Roads Transit (HRT). The research will identify causes of accident due to distractions that drivers are exposed to while driving buses, what can be done to minimize driver exposure to them, and their potential impact on driver performance and safety.



Ms. Amber Griffith, Intern at HRT for Driver Distraction Data Analysis.

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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 following is a list of Transportation Steering Committee members.

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, UVA.
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 Trans Research Council, VDOT.
Dr. Roger Stough	Associate Dean for Research, Dev, and External Relations, GMU.
Mr. Bill Thomas	Associate Vice President, Gov. Relations, Hampton University.

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. The following is a list of Research Selection Committee members.

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	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	Research Professor and Director of Research, Virginia Modeling and Simulation Center, ODU.



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Dr. Sid Credle	Budget Executive	Credle	757-727-5472
Dr. Kelwyn D'Souza	Center Director	Dsouza	757-727-5037
Mr. Carey Freeman	Associate Director	Freeman	757-727-5519
Dr. Sharad Maheshwari	Associate Director	Mahesh	757-727-5605
Dr. Devendra Parmar	Researcher	Parmar	757-344-3648

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