

## Program Progress Performance Report for University Transportation Centers

**Federal Agency and Organization Element to Which Report is Submitted:**

U.S. Department of Transportation  
Research and Innovative Technology Administration

**Federal Grant or Other Identifying Number Assigned by Agency:** DTRT12-G-UTC14

**Project Title:** National Center for Intermodal Transportation for Economic Competitiveness (NCITEC)

**Program Director (PD) Name, Title and Contact Information (e-mail address and phone number):**

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**Recipient Organization (Name and Address):** U.S. Department of Transportation  
Research and Innovative Technology Administration  
(Denise Dunn, UTC Grant Administrator)  
1200 New Jersey Ave, S.E.  
Washington, DC 20590

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**Signature of Submitting Official:**



## 1. Accomplishments

As indicated in our grant application, NCITEC's major goals are to directly address the economic competitiveness and safety of the national intermodal transportation system. Economic competitiveness and safety are two of the five strategic goals that U.S. Department of Transportation (USDOT) has identified. The next section provides more specific goals of NCITEC.

### 1.1. What are the major goals and objectives of the program?

- Develop, implement and maintain a comprehensive research program that addresses the economic competitiveness and safety of the national intermodal transportation center.
- Develop educational programs in intermodal transportation that incorporate the multidisciplinary nature of intermodal transportation by drawing upon the resources of each university.
- Utilize modern educational technologies, and develop effective professionals in intermodal transportation.
- Enhance the public awareness, understanding, and appreciation of intermodalism and its role in the modern world, including career opportunities in the field.
- Offer interdisciplinary programs and experiential training in intermodal transportation operations to provide a steady source of transportation professionals to public and private organizations.
- Ensure the availability of research results to potential users in a form that can be directly implemented, utilized, or otherwise applied.
- Strengthen the collaboration between NCITEC consortium members as well as between federal, state, and local agencies.
- Develop ties with other University Transportation Centers (UTCs) and USDOT's research clusters to create opportunities for collaborative activities.

### 1.2. What was accomplished under these goals?

- *Develop, implement and maintain a comprehensive research program that addresses the economic competitiveness and safety of the national intermodal transportation center:* NCITEC has funded 23 projects which are currently ongoing. There are 5 more projects which went through our review process and were selected for funding. They are currently pending budget approvals.
- *Develop educational programs in intermodal transportation that incorporate the multidisciplinary nature of intermodal transportation by drawing upon the resources of each university:* One of the ongoing projects is about introducing K-12 students to intermodal transportation concepts. A summer program is under development for K-12 teachers to be on the MSU campus for a 2-3 day camp. Another ongoing project is about developing a new Logistics curriculum. A two-day workshop took place in Hattiesburg, MS. Two pilot school district teachers, along with one school principal attended. In addition to new information on Intermodal Transportation presented, a resource book with accompanying CD was produced for classroom use.

- *Utilize modern educational technologies, and develop effective professionals in intermodal transportation:* One of the ongoing NCITEC projects is about educating the next generation of transportation professionals through well-designed education and Work Force Development (WFD) programs. Two student interns collected transportation course information across campus. They also assisted with the organization of the National Conference on Intermodal Transportation (NCIT) and development of the conference proceedings.
- *Enhance the public awareness, understanding, and appreciation of intermodalism and its role in the modern world, including career opportunities in the field:* Nothing to report.
- *Offer interdisciplinary programs and experiential training in intermodal transportation operations to provide a steady source of transportation professionals to public and private organizations:* Nothing to report.
- *Ensure the availability of research results to potential users in a form that can be directly implemented, utilized, or otherwise applied:* Nothing to report.
- *Strengthen the collaboration between NCITEC consortium members as well as between federal, state, and local agencies:* We are in close collaborations with state DOTs. The Mississippi (MDOT), Louisiana (LADOTD), Colorado (CDOT), and Virginia (VDOT) Departments of Transportation have all served as reviewers on some of our proposals.
- *Develop ties with other University Transportation Centers (UTCs) and USDOT's research clusters to create opportunities for collaborative activities:* We are in discussions with the Regional UTC at the University of Florida, the Tier 1 UTC at Georgia Tech, and the Transit oriented UTC at the University of South Florida to organize a regional conference.

### **1.3. How have the results been disseminated? If so, in what way/s?**

Although all NCITEC projects are still ongoing, some NCITEC researchers have presented preliminary results:

- On October 11-12, 2012, Hampton University hosted the 1<sup>st</sup> National Conference on Intermodal Transportation (NCIT): Problems, Practices, and Policies. More than 130 participants including students, faculty members, city planners, and transportation professionals from all over the world participated in the conference. Around 34 technical papers were presented and 14 other topics were discussed at the various plenary sessions. The conference incorporated a wide range of transportation topics that included transportation policy, safety, security, environment, infrastructure, simulation education and workforce development.
- Dr. Altınakar presented a Keynote Lecture at the 10th International Congress on Advances in Civil Engineering, which was held in Ankara, Turkey, October 17-19, 2012.
- Dr. Altınakar presented project overview and NCCHE flood modeling capabilities to Professors João Virgílio Merighi and Rita Moura Fortes, CAIT Transportation Modeling Lab, Oxford, Mississippi, November 16, 2012. (Both visiting professors were Dr. Uddin's guests from Mackenzie University, São Paulo, Brazil. Both our universities have a long standing cooperative agreement).
- Dr. Uddin submitted a paper to *Management and Production Engineering Review* that includes value engineering application for innovative sheet pile protection of levees and road infrastructure. The paper has been accepted for publication after editorial revisions, March 2013.

- Dr. Uddin incorporated value engineering applications for preservation of transport infrastructure in one chapter submitted to McGraw-Hill for his 2013 book on *Public Infrastructure Asset Management*.
- Dr. Uddin attended and presented an invited paper and panel presentation at the NCIT 2012, National Conference on Intermodal Transportation: Problems, Practices, and Policies, Hampton University, Hampton, Virginia, October 11-12, 2012.
- Dr. Uddin participated and made presentation at a workshop, co-organized by Dr. Patrick Sherry of DU's National Center for Intermodal Transportation and Mineta Transportation Institute, San Jose State University, October 25, 2012. Workshop was on "Policy Options for Increased Use of Urban Intermodal and Transit Oriented Development to Reduce Energy Consumption and GHG Emissions."
- Dr. Uddin and Graduate student Carrissa Beasley made a presentation to DOT's Keith Moore, November 14, 2012. The presentation included project overview and geospatial maps of freight data handled at top 50 ports in the U.S.
- Dr. Lemond Irvin is maintaining a website (<http://mslogistics.wordpress.com/>) to disseminate information and results of his transportation education program.
- Dr. El-adaway published the following abstracts:  
*El-adaway, Islam, Eric Vechan, and Marwa Hassan, "Sustainability of Transportation Systems using Dynamic Social Network Analysis", 2013 Engineering Sustainability: Innovation and the Triple Bottom Line*, Mascaro Center for Sustainable Innovation at the University of Pittsburgh and the Steinbrenner Institute for Environmental Education and Research at Carnegie Mellon University, Pennsylvania, United States.  
*El-adaway, Islam, Eric Vechan, and Marwa Hassan, "Transportation Congestions: A Dynamic Social Network Analysis Framework for Sustainability", 2013 International Workshop on Computing in Civil Engineering*, American Society of Civil Engineers, California, United States.
- An MS student on one of the NCITEC projects presented at the 2012 Reliability and Maintainability (RAM) Workshop sponsored by Society of Reliability Engineers on October 17.
- Dr. Greenwood published the following extended abstracts:  
Jannat, S. and Greenwood, A. G., "Estimating Parameters of the Triangular Distribution Using Non-Standard Information," *Winter Simulation Conference*, December 2012, Berlin, Germany (extended abstract and poster).  
Hales, H. and Greenwood, A. G., "General Simulation Model to Improve the Design and Operation of Cross-Docking Systems," *Winter Simulation Conference*, December 2012, Berlin, Germany (extended abstract and poster).

#### **1.4. What do you plan to do during the next reporting period to accomplish the goals and objectives?**

As indicated in our previous report we are in discussions with the Regional UTC at the University of Florida, the Tier 1 UTC at Georgia Tech, and the Transit oriented UTC at the University of South Florida to organize a regional conference. We have developed a program for this conference which will take place on April 4-5, 2013 at the Rosen Plaza Hotel in Orlando, FL. Here are some of the other activities that will take place:

- NCITEC will select new projects in 2013 using the FY12 funds. The request for proposals (RFP) is already out on our website. This RFP has also been distributed to researchers at all five member institutions.

- Dr. Uddin discussed with Chair of Civil Engineering and Dean of Engineering for organizing a mini symposium with presentations by all UM NCITEC project PIs. The symposium will be held on February 7, 2013 at the University of Mississippi, sponsored by School of Engineering. The e-mail announcement of the symposium was circulated university wide with the help of Dean's office and UM ORSP in early December 2012.
- Dr. Uddin will be producing project related short videos for posting on YouTube channel of *infrastructureglobal*. This will include highlights of NCITEC intermodal integration theme, global supply chain examples for YouTube posting and sharing.
- Dr. Uddin will continue following several global supply chain and logistics associations on Twitter and will tweet about the project progress. Dr. Uddin's *InfrastructureGlobal* blog will be updated with a post on this project. <http://infrastructureglobal.com/>

Some of the activities for ongoing projects include:

- Centrality analysis will be performed. Monte Carlo Simulation will be undertaken during the next reporting period if centrality analysis progresses to the point where uncertainty of changes can be evaluated.
- Continue to refine the guidelines for lesson plans, and activities with the teachers during the week they will be on the MSU campus.
- Conduct a review of a recent (January 2013) initiative to introduce aluminum catamarans for coastal application by a former major Jones Act shipping executive. Summarizing these studies will be the main goal of the next period along with an initial assessment of the second task regarding definition of trade routes and respective ship systems, and compiling data on traffic volumes and rates. We also intend to either meet or interview over the phone (Skype) knowledgeable individuals from governmental agencies (MarAd, Coast Guard), port authorities, shipping lines, truck lines, railroads, naval architects, ship brokers, and major shippers.

## 2. Products

### 2.1. Publications, conference papers, and presentations:

- Altinakar, M.S., McGrath, M.Z., Ramalingam, V.P., Singh, J., Ding, Y., and Inman, M.(2012). Advances in 2D Flood Modeling and Mapping Technology for Dam and Levee Safety. *The 10th International Congress on Advances in Civil Engineering*, 17-19 October 2012 , Middle East Technical University, Ankara, Turkey.
- Uddin, W. "Value Engineering Applications for Deploying Sustainable Intermodal Transportation Infrastructure Strategies." *Proceedings, First National Conference on Intermodal Transportation: Problems, Practices, and Policies*, Hampton, Virginia, October 11-12, 1202. *Invited Paper Presentation*.
- Uddin, W. "Research needs not being met in the Infrastructure and Remote Sensing Areas." Panel Presentation, High Payoff Intermodal Research Areas: Vision and Identification, *First National Conference on Intermodal Transportation*, Hampton, Virginia, October 11-12, 1202. *Invited Presentation*
- Uddin, W. "Models of Freight Transportation and Emission Costs." Presentation at DU's NCIT and MTI Workshop Policy Options for Increased Use of Urban Intermodal and

Transit Oriented Development to Reduce Energy Consumption and GHG Emissions, San Jose State University, October 25, 2012.

- Uddin, W. "Value Engineering Applications for Managing Sustainable Intermodal Transportation Infrastructure Assets," *Production Engineering Review*, Vol. 4, No. 1, March 2013.
- Adams-Price, C., Turner, J., Warren, S., & Wilmoth, J. (November, 2012). Activity participation in black and white Mississippians from urban, Micropolitan, and rural contexts. Symposium title: Contexts of aging: Exploring the intersections of geography and well-being among older adults. Symposium to be presented at the Annual Meeting of the Gerontological Society of America, San Diego, CA.
- *El-adaway, Islam*, Eric Vechan, and Marwa Hassan, "Sustainability of Transportation Systems using Dynamic Social Network Analysis", *2013 Engineering Sustainability: Innovation and the Triple Bottom Line*, Mascaro Center for Sustainable Innovation at the University of Pittsburgh and the Steinbrenner Institute for Environmental Education and Research at Carnegie Mellon University, Pennsylvania, United States.
- *El-adaway, Islam*, Eric Vechan, and Marwa Hassan, "Transportation Congestions: A Dynamic Social Network Analysis Framework for Sustainability", *2013 International Workshop on Computing in Civil Engineering*, American Society of Civil Engineers, California, United States.
- Jannat, S. and Greenwood, A. G., "Estimating Parameters of the Triangular Distribution Using Non-Standard Information," *Winter Simulation Conference*, December 2012, Berlin, Germany (extended abstract and poster).
- Hales, H. and Greenwood, A. G., "General Simulation Model to Improve the Design and Operation of Cross-Docking Systems," *Winter Simulation Conference*, December 2012, Berlin, Germany (extended abstract and poster).
- Steven B. Worley and Elizabeth K. Ervin, "A Comparison of Structural Health Indicators," RAM Workshop, Society of Reliability Engineers, Huntsville, AL, October 16-17, 2012. *Presented by Worley on Oct 17; second place student presentation.*
- *National Summer Transportation Institute Program: Role of Educators and Mentors in the Post-Secondary Achievement of Participants.* Sonja Pollard-Mitchell, Shontae Taylor and Margaret Dismond Martin. NCIT, Hampton University, Hampton, VA, October 11 – 12, 2012.
- *Impact Of Education And Awareness Programs On The Usage And Attitude Towards Texting While Driving Among Young Drivers.* Sharad K. Maheshwari and Kelwyn A. D'Souza. NCIT, Hampton University, Hampton, VA, October 11 – 12, 2012.
- *A Conceptual Analysis of Cognitive Distraction for Transit Bus Drivers.* Kelwyn D'Souza, Hampton University; Denise Siegfeldt, Florida Institute of Technology; and Alexa Hollinshead. NCIT, Hampton University, Hampton, VA, October 11 – 12, 2012.
- *Research Framework for Studying Transit Bus Driver Distraction in the Commonwealth of Virginia.* Kelwyn D'Souza and Sharad Maheshwari. NCIT, Hampton University, Hampton, VA, October 11 – 12, 2012.
- *Modeling and Analysis of Transit Bus Driver Distraction.* Kelwyn D'Souza and Sharad Maheshwari. 20<sup>th</sup> National Conference for Rural Public and Intercity Bus Transportation, Salt Lake City, Utah. October 14 – 17, 2012.

## **2.2. Website(s) or other Internet site(s):**

All products will be published on NCITEC's web site ([www.ncitec.msstate.edu](http://www.ncitec.msstate.edu)).

UM CAIT web page: <http://www.olemiss.edu/projects/cait/ncitec/>

Twitter: <https://twitter.com/drwaheeduddin>

Blog: <http://infrastructureglobal.com/>

Project website: <http://mslogistics.wordpress.com/>

### **2.3. Technologies or techniques:**

- The new integrated inspection technique is expected to be more efficient, more cost effective, and more accurate than traditional techniques. With appropriate adjustments in data processing algorithms, the techniques herein will be applicable to any bridge; however, the scope is limited to overall health so that subsequent local inspection may be indicated. Thus, Dr. Mullen's team will examine potential technology transfer means, such as code considerations and inspection workshops.
- Developed a means to use distribution moments and percentiles in place of, or in conjunction with, location parameters to specify the triangular distribution. This allows modelers to use the best information they have available in order to specify the distribution. The technique also facilitates the experimentation process, e.g. the technique allows desired changes in moments between scenarios to be translated to the distribution specifications used by simulation software.

### **2.4. Inventions, patent applications, and/or licenses:**

Nothing to report.

### **2.5. Other products, such as data or databases, physical collections, audio or video products, software or NetWare, models, educational aids or curricula, instruments, or equipment**

Nothing to report.

## **3. Participants & Other Collaborating Organizations**

### **3.1. What other organizations have been involved as partners?**

- MDOT is providing matching funds for two of the NCITEC funded projects.
- IAVO Research & Scientific, Durham, North Carolina: IAVO has offered a new version of the GeoGenesis® geospatial software for CAIT Transportation and Remote Sensing Labs. The value of the software for each computer seat will be used as in-kind cost share for this project. Their help will be sought to identify imagery specifications and training data for CAIT students.
- Contacts have been established with the following agencies: US Army ERDC Hydraulics Lab, Vicksburg, Mississippi (Dr. Kenneth Ned Mitchell)
- Organization Name: University of Southern Mississippi's Center for Logistics, Trade and Transportation (CLTT)  
Location of Organization: Hattiesburg, MS  
Partner's contribution to the project: Collaborative research
- Organization Name: Mississippi Department of Education  
Location of Organization: Jackson, MS  
Partner's contribution to the project: Financial support and Collaborative research
- Organization Name: Desoto County School District  
Location of Organization: Desoto County, MS  
Partner's contribution to the project: Collaborative research

- Organization Name: Jackson Public School District  
Location of Organization: Jackson, MS  
Partner's contribution to the project: Collaborative research
- Organization Name: Parsons Brinckerhoff (PB)  
Location of Organization: Norfolk, Virginia.  
Partner's contribution to the project: The ITEWDM team has monthly teleconference meetings with PB representatives to plan educational conferences and seminars on campus.  
Financial support: None.  
In-kind support: Time and effort of PB representatives and NCIT conference lunch sponsorship on October 12, 2012 are provided as matching funds.  
Facilities: None.  
Collaborative research: None.  
Personnel exchanges: Mr. Joseph Curtis of PB conducts monthly conference calls and organizes PB seminars at HU.
- Organization Name: Hampton Roads Transit (HRT)  
Location of Organization: Hampton, Virginia.  
Partner's contribution to the project: Provides internship positions and mentoring for students.  
Financial support: None.  
In-kind support: None.  
Facilities: On-site internships for students.  
Collaborative research: Transit Bus Driver Distraction.  
Personnel exchanges: None.

- Organization Name: Flexsteel  
Location of Organization: Starkville, MS  
Partner's contribution to the project: In-kind support (labor); collaborative research.
- Organization Name: Nissan North America  
Location of Organization: Canton, MS  
Partner's contribution to the project: In-kind support (labor); collaborative research.
- Organization Name: FlexSim  
Location of Organization: Orem, UT  
Partner's contribution to the project: In-kind support (software).
- Organization Name: Department of Transportation and Development  
Location of Organization: Baton Rouge, Louisiana  
Partner's contribution to the project: Collaborative research

### 3.2. Have other collaborators or contacts been involved?

- We have been in contact with the Regional UTC at the University of Florida, the Tier 1 UTC at Georgia Tech, and the transit-oriented UTC at the University of South Florida.
- Mississippi Automated Resource Information System (MARIS): This is a statewide resource agency in Mississippi for no-cost Landsat imagery and DEM data sources of selected counties in Mississippi. <http://www.maris.state.ms.us/>
- Intermap Technologies, Inc: Intermap has been contacted for their archived remote sensing IFsar stereo synthetic aperture radar imagery and 1-m digital elevation contour data for one or more candidate sites. Dr. Uddin has several collaborative efforts with executives of Intermap in the past.
- The project collaborator IAVO has been approached to identify other sources of overlapping imagery scenes for the selected pilot site to extract 3D features including built infrastructure.
- Kentucky Transportation Center, University of Kentucky (Mr. John Ripy and Mr. Ted Grossardt). First contact was made at the National Conference on Intermodal Transportation, organized by Hampton University, October 11-12, 2012 at Hampton University campus, Virginia.
- Maritime Information Systems, Inc., Warren, Rhode Island (Mr. Karl Y. Petrow). They contacted us to access their extensive online data related to vessel movements. This company operates a large scale AIS network to track vessel movements in all Navigable North American Waterways. This system has been operational since around 2007 and all historical data has been saved for future analysis. The database could be used to enhance economic impact studies.
- While organizing the NCIT, the ITEWDM team visited Virginia Port Authority (VPA) to identify speakers and sponsorship. Jeff Keever, Senior Deputy Executive Director, Virginia Port Authority provided the inaugural address for the NCIT conference entitled: *Maintaining Transportation Connections Through Effective Partnerships*. VPA sponsored the NCIT lunch on October 11, 2012 and have offered to organize guest lectures and student internships.
- American Society for Transportation and Logistics – provided input for the new curriculum.
- Gerontological Society of America (GSA) Interest Groups, Rural Aging Interest group.
- Organization Name: Atlantic Track and Turnout  
Location of Organization: Memphis, TN; home office in New Jersey.  
Partner's contribution to the project: In-kind support. Jeff Grissom, Director of Engineering and Manufacturing, and Pat Reilly, Manager of Railroad Products, donated the following rail

materials: 16 tie plates, 2 splice plates, 32 e-clips, 50 screw spikes, 32 feet of new cross tie, 20 feet of used cross tie, and two 10-foot rail sections.

- A collaboration is being developed between Mississippi State University's (MSU) Industrial and Systems Engineering (ISE) Department and the Industrial Engineering program and GSCOP Laboratory at Grenoble Institute of Technology (GIT). The general area of collaboration is logistics research, with a focus on the design and operation of cross-docking systems. The primary members of the inter- university working group are: Professor Allen Greenwood and masters student Halston Hales from MSU and Professor Gulgun Alpan-Gaujaj and Ph.D. student (also teacher and researcher) Anne-Laure Ladier from GIT. Mr. Hales is studying at GIT during the 2012-2013 academic year; he expects to receive a masters degree from both institutions (MSU and GIT) in 2013. His research involves the analysis of cross-docking systems using simulation. Ms. Ladier will be a visiting scholar at MSU during the Spring 2013 semester and during a part of the Fall semester. Her research involves the development of optimization models to improve cross-dock scheduling. Our working group is applying simulation and optimization to improve cross-docking system performance in terms of operations planning and scheduling. MSU's simulation models will be used to test the robustness of GIT's optimization approaches when they are applied to real-world problems that contain partial information and other uncertainties.

#### 4. Impact

##### 4.1. What is the impact on the development of the principal discipline(s) of the program?

- New graduate and UG student workers will be trained for 2D GIS and 3D geospatial analysis and visualization applications in infrastructure, transportation, and environmental areas. It is expected that the research accomplishments will be incorporated in the existing CE 570 – Infrastructure Management course (3 credit hours) in the department of Civil engineering, which will be offered again by Dr. Uddin in Fall 2013 to UG seniors and graduate students. The new textbook for this course will be 2013 McGraw-Hill book *Public Infrastructure Asset Management* (Uddin, Hudson, Haas).
- The sampling technique developed should enable Nested Sampling with MCMC to produce accurate results in terms of the model evidence.
- The Logistics program curriculum will prepare individuals to manage and coordinate all logistical functions in an enterprise, ranging from acquisitions to receiving and handling, through internal allocation of resources to operations units, to the handling and delivery of output. The curriculum includes instruction in acquisitions and purchasing, inventory control, storage and handling, just-in-time manufacturing, logistics planning, shipping and delivery management, transportation, quality control, resource estimation and allocation, and budgeting. It also includes instruction in transportation systems and technologies; multi- and intermodal-transportation systems; transportation planning and finance; demand analysis and forecasting; carrier management; behavioral issues; transportation policy and law; intelligent systems; and applications to aviation, maritime, rail, and highway facilities and systems.
- Teachers participated in a 2-day knowledge building workshop at the University of Southern Mississippi's Center for Logistics, Trade and Transportation (CLTT). The workshop is preparing Logistics secondary instructors to dissipate relevant and practical knowledge on logistics concepts, transportation, and intermodal facility to K-12 students. The workshop provided six lecture modules designed to provide fundamental understanding of basic concepts of intermodalism, impact of intermodalism in transportation and economy, and future

perspectives of intermodal transportation professionals. The workshop provided resources and best practice examples to strengthen such curriculum for K-12 students. The participants are developing a sample lesson plan focusing on overview of intermodal transportation, logistics and supply chain activities, and career development opportunities that can be used in the K-12 classroom.

- **Transportation Education:** Nine existing transportation management and related courses offered across campus have been identified and stored in a database. These and the AVN Management courses are being updated to offer an interdisciplinary education curriculum with emphasis in intermodal transportation. Totally, 57 undergraduate students are currently pursuing a Minor in Aviation Management and Concentration in Transportation Management. Totally, 28 MBA students and 46 Management undergraduate students completed transportation-related business courses and 53 students are enrolled in Aviation Management courses.
- **Transportation Training:** One graduate and one undergraduate student participated in the internship program. Seven guest lectures were organized on campus. The NCIT conference was used as platform to disseminate research, educational and workforce development programs nationally and internationally. Proceedings are available on the [web](#) for wide access.
- Both the structural health monitoring and non-destructive inspection communities will be affected by this work. Structural health is addressed by researchers in such fields as computer science, civil engineering, mechanical engineering, reliability engineering, statistics, and electrical engineering. The determination of any damage threshold is an actively pursued research topic; no solutions or even hypotheses have been suggested for civil infrastructure. Thus, this project will increase the base of knowledge for low frequency structures.
- The further development of laser rail techniques and their adaptation to infrastructure has the potential to transform inspection techniques, maintenance schemes, and disaster response. The developed method will apply to broad classifications of structures and will significantly improve current infrastructure management. This forensic analysis methodology will apply to the high value targets of both railroad and highway bridges (both passenger and freight). The eventual goal is to provide condition-based maintenance via a cost-effective product that will ride along any bridge and identify an overall change in its stiffness, indicating that localized inspection is required before a bridge collapse, for instance.
- It is anticipated that the project will aid in the performance of the following traffic congestion functions: (1) describe social network dynamics through visualization; (2) develop what-if-scenarios of varying organization settings through analytical methods rather than heuristics; (3) know the driving forces behind network dynamics; (4) understand the evolution of actors attributes over time; (5) predict network performance; and (6) lead network toward desired directions. This results in answers for important management decisions questions pertaining to ways to overcome drawbacks of traditional planning and control methods through explicitly presenting implications of organizational settings. This is very important within the context of evaluating potential strategies for infrastructure transportation projects. The literature review supports these anticipated results. Modeling during the next reporting period has the potential to validate the anticipated results.
- This project is likely to make an impact on the base of knowledge on how state agencies, especially DOTs, can encourage local growth management policy development through

incentives, technical assistance, and provision of a toolkit for municipalities, parishes, and regions in Louisiana. This project will also advance the state of research on growth management and transportation planning in rural communities and in a southern context, with applicability to other states. The project will demonstrate effective, politically palatable tools for developing and achieving livability, sustainability, and economic goals in a context where traditional growth management strategies have failed to take hold. The findings of the research will be used to extend time geography theory, which has been used for explaining other perspectives of passenger travel behaviors and patterns but has not been used for passenger intermodal transportation.

#### **4.2. What is the impact on other disciplines?**

- It is expected that research accomplishments from this project will be introduced in the computational hydroscience graduate program courses.
- Close interaction has been established with UM's Department of Public Policy Leadership through Dr. Jody Holland's participation in the UM project team. Dr. Holland is preparing the content of a new transportation related course in his department.
- The developed sample generating method can enrich the research in Bayesian inference with MCMC, and has impact in data analysis in general where model selection and parameter estimation are major tasks.
- Undergraduates from other disciplines are attracted to transportation. An undergraduate from Psychology major has been selected as a transportation research intern. Undergraduates from other majors from Architecture, Engineering, Psychology, Biology, Computer Science and others had enrolled in the Production/Operations Management and Aviation Management Minor courses.
- The findings of this project will be applicable not only to transportation planners, but to local governments, real estate developers, community advocates, and public works providers.

#### **4.3. What is the impact on the development of transportation workforce development?**

- The project has provided opportunities to UG students, graduate students, post-doctoral fellows for research and teaching in flood disaster assessment, transportation infrastructure evaluation for disaster risk vulnerability, emergency management, and related disciplines.
- *Education Outreach for Intermodal Transportation – Moving minds at the speed of time* will educate secondary teachers about intermodal transportation and how it complements Mississippi's Career and Technical Education Logistics curricula, as well as prepare them to be ambassadors of intermodal transportation in the K-12 education environment. A statewide curriculum will be implemented to prepare secondary teachers to teach the concepts of logistics and intermodal transportation. Students will be introduced to statewide transportation issues, different modes of transportation, federal and state requirements, and many other transportation- and logistics-related strategies. The primary purpose is to introduce high school students to logistics and intermodal transportation and to develop a sustainable pipeline to work in this field. Participating teachers will prepare lesson plans for implementation of intermodal-transportation experiences into the Logistics curricula. The RCU will also design and produce marketing and training materials, such as brochures and curriculum guides, for the teachers to take back to the classroom. These materials will be excellent resources for the teachers to use in educating their students about intermodal transportation.

- Transportation information has been infused into Psychology of Aging course.
- Offering graduate and undergraduate students updated courses in intermodal transportation and experiential learning that reflect real-world applications.
- Improving transportation skills of minority and women students through research and in-company internships that will increase access to transportation related professions.
- Offering internships and scholarships that will encourage students to pursue transportation education modules offered by ITEWDM.
- The potential outcomes are more pointed inspections and condition-based maintenance rather than time-based maintenance. The identification of internal non-visible defects will be an entirely new idea of which FHWA and DOT management will need to be convinced. Once the new technique is finalized, DOT inspectors will need training in quantitative structural deterioration measurements. Note that the ease of use is a major consideration in this project for just this purpose.
- Educational impacts will transpire during this project; this work will improve the quality of research and industrial training for both graduate and undergraduate students. This project has already reached four graduate students and is currently funding one of them. At least two additional students will be funded in 2013. This project has also created ENGR693 “Structural Health Monitoring” offered by Dr. Ervin. Public education is not warranted at this time.
- Providing exposure and an educational resource on growth management for local and state transportation planners and policy makers.
- Improving technical skills in effective transportation planning and design for transportation practitioners throughout the state.
- Improving public access to and awareness of new transportation policy tools, especially in rural communities.
- The PI offered a split-level course titled “Transportation and Society” for the first time in Spring 2012. The syllabus of this course can be found at <http://guangqingchi.sociology.msstate.edu/teaching.html>. Passenger travels and intermodal transportation systems are two of the main components. Students are enthusiastic about the two topics, as they are relevant to their daily lives. Three students used the 2009 NHTS data for their term papers; they are encouraged to participate in the poster presentation of the Transportation Working Group to be held in Spring 2013.

#### **4.4. What is the impact on physical, institutional, and information resources at the university or other partner institutions?**

The project will impact on enhancing current capabilities and research infrastructure at both CAIT and NCCHE units of the University of Mississippi, including:

- Physical infrastructure resources: computing facilities, geospatial laboratory, geospatial and flood simulation software;
- Institutional resources: involving Student Chapter of Institute of transportation Engineers (ITE) in project activities and developing a workshop model; or
- Information resources and electronic means: web pages, news interviews by journalism students, You Tube video production, and scientific papers.

The ITEWDM project has made the following impact on HU and its partner institution:

- The BUC 208 classroom has been dedicated for conducting ITEWDM modules through state-of-the-art Smart Board technology. This reflects on the importance that the University places on transportation education and workforce development.
- The newly installed Driver Simulator at the HUARC provides opportunities for students and faculty to conduct advanced research on texting while driving and driving distraction whose results could be possibly used in education and workforce development.
- The driver distraction research conducted at HRT and Potomac and Rappahannock Transit Commission (PRTC) will improve performance of the transit agencies and provide a framework for undertaking driver distraction studies at any transit agency in the Commonwealth of Virginia.
- Provides partnering transportation organizations a pool of future potential employees.
- Co-PI Chambers has already provided new laboratory space that expands the Department of Civil Engineering's research capabilities. Access to existing machine shop facilities greatly expands the PI's vibration research abilities. This would not have been possible without the collaboration on this project.
- Note that the expensive LDV instrument was already possessed by NCPA. However, the use of Dr. Lu's soil tester to create a rail test stand is innovative. This creates exchange between the soils and structures areas.
- As a part of the related ENGR693 course, the health algorithms are being applied to captured data from the student steel bridge of the American Society of Civil Engineers. Flaws may be identifiable before next spring's competition.

#### **4.5. What is the impact on technology transfer?**

The ITEWDM's education and workforce development modules have been communicated to the larger transportation community through the NCIT conference to increase the support from industry and other UTCs. Research findings resulting from partnerships with the city, state, public and private transportation organizations, and other institutes were disseminated at the HBCU meeting held at Virginia State University in April, 2012 and the NCIT conference in October 2012. The NCIT identified transportation problems facing this region, and brought academicians, professionals, legislators, governmental representatives, and related constituent groups together in order to seek potential solutions. Selected results from current ITEWDM projects were presented at the NCIT conference and published in the proceedings.

#### **4.6. What is the impact on society beyond science and technology?**

Through a multidisciplinary program of course work and experiential learning the ITEWDM project has attracted and educated students through well-designed transportation education and workforce development programs to produce a trained, effective, and efficient future workforce. This fulfills the USDOT's goal of advancing U. S. technology and expertise in transportation that will provide safe, secure, efficient, and interconnected transportation systems.

### **5. Changes/Problems**

#### **5.1. Changes in approach and reasons for change:**

There have yet to be significant changes in approach, but the PI foresees that LDV measurements at a given velocity cannot be processed at this time. The project is using 250,000 samples over five-seconds of measurement at static points on any structure. Ervin's programming as well as new literature have revealed that health algorithms are not well suited for moving measurements, which introduce too much uncertainty to develop damage criteria. The moving measurements will still be captured for the rail, but their direct use appears to be beyond the scope of this project. This item may be a future Ph.D. dissertation for a follow-on project.

**5.2. Actual or anticipated problems or delays and actions or plans to resolve them:**

- Problems are anticipated in the *Intermodal Transportation Infrastructure Interactions: Utilizing Acoustic Emission and Other Non-Destructive Evaluation Technologies* – Dr. Devendra Parmar, PI for this project is no longer with HU. Preliminary work has completed and the bridges for NDT evaluation were selected. HU's Sponsored Program Office and the HU Executive Committee member submitted a request for PI change. NCITEC director reviewed the request and approved the PI as well co-PI changes. We anticipate some delay in completing this project but it is underway.
- The two-day teacher workshop was conducted in Fall 2012 rather than Summer 2012 because of when the funding was received.
- Site visits will stretch out into the spring to accommodate teaching schedules and site schedules.
- Lockheed Martin, industry partner, has elected to serve in an advisory capacity only. A replacement industry for a site visit is being sought.
- Williams Sonoma, industry partner, has elected not to participate in the project. A replacement industry for a site visit is being sought.
- The PI and co-PIs have identified some potential problems on the full-scale field test, and they are working to address them in advance. Preliminary cooperation has been retained from the city of Oxford. Dr. Mullen contacted the Director of Facilities Planning at the University of Mississippi regarding possible use of the East Gate Bridge. No problems are anticipated regarding access. Height and safety equipment may be borrowed from the Center for Manufacturing Excellence.

**5.3. Changes that have a significant impact on expenditures:**

Nothing to report.

**5.4. Significant changes in use or care of animals, human subjects, and/or biohazards:**

Nothing to report.

**6. Special Reporting Requirements**

No additional award-specific reporting requirements.