



**Program Progress Performance Report for University Transportation Centers**

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Research and Innovative Technology Administration  
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**Program Director:** Michael Hunter, Ph.D.  
Associate Professor of Civil and Environmental Engineering  
Georgia Institute of Technology  
760 Spring Street, Atlanta, Georgia 30303  
Email: michael.hunter@ce.gatech.edu  
Phone: 404-385-1243

**Program:** National Center for Transportation Systems Productivity and Management  
Georgia Tech Research Corporation  
Phone: 404-385-5135  
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**Signature of Submitting Official:**

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Michael Hunter, Ph.D.

03/08/16

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Date



## Accomplishments

### What are the major goals of the program?

The National Center for Transportation Systems Productivity and Management (NCTSPM), a Tier I University Transportation Center, was founded to facilitate, coordinate, and conduct research and educational programs toward the following goals:

- Conduct multi-disciplinary research on topics relevant to the relationship among transportation infrastructure (state-of-good-repair), economic competitiveness, and safety
- Disseminate research results and other products of the Center to the transportation community
- Promote transportation education and professional development on topics relating to Center research
- Establish a central point of contact and promotion of best practices (e.g., through a web site or list serve) for materials relating to transportation systems performance and management
- Promote diversity in the workforce through active recruitment of women and minority students into degree programs
- Act as a national resource for the debates and discussions that focus on the evolving national transportation program and future directions
- Explore international cooperative activities with research entities in selected countries where similar research interests exist

### What was accomplished under these goals?

Accomplishments for the reporting period are discussed below and organized by major center goal.

#### ***Conduct multi-disciplinary research on topics relevant to the relationship among transportation infrastructure (state-of-good-repair), economic competitiveness and safety***

NCTSPM supports multi-disciplinary research. Some projects simultaneously address infrastructure and safety; others deal with safety and infrastructure; while still others address all three of our themes. Our researchers represent a variety of disciplines: civil engineering, urban planning, economics, public health, and public policy.

A full listing of NCTSPM-funded research projects can be found at the end of this report.

#### ***Disseminate research results and other products of the Center to the transportation community***

NCTSPM posts research updates to its website on a regular basis. A Project Information Form for each project is posted on the website, as well as related documents, such as pictures, posters, reports, and

presentations. Information on NCTSPM's research is also posted to the Georgia Tech Transportation Alumni group on LinkedIn and on the Georgia Tech Civil Engineering website.

During this reporting period, NCTSPM produced a number of research reports and journal publications, and presented conference proceedings, invited presentations/lectures on research findings, workshops, seminars, and webinars on a variety of research projects. Several journal and professional publications were submitted/accepted, to a variety of publications. Our researchers and students delivered nearly 166 presentations in the form of conference proceedings, invited presentations/lectures, workshops, seminars, and webinars held on research projects.

UCF in conjunction with UT hosted the *Road Safety and Simulation 2015 (RSS2015)* conference in Orlando, Florida in October 2015. Spotlighting over 100 presentations and 85 posters, the conference also featured a special workshop on virtual and augmented reality for transportation research.

Equations developed for the research project "Evaluation of Anchor Bolt Clearance Discrepancies" will be included in the future AASHTO Standard Specifications for Structural Supports manual.

The research results from the study of the impacts of illumination levels on nighttime safety at roundabouts was chosen as one of the best papers at the Transportation Research Board's (TRB) 4<sup>th</sup> International Roundabout Conference, and were presented on a TRB national webinar that commemorated 20 years of roundabout design and was the most attended TRB webinar to date.

***Promote transportation education and professional development on topics relating to Center research***

NCTSPM actively promotes education and professional development.

During this reporting period, UCF provided training of participating graduate students and postdoctoral associate for data collection/processing, GIS techniques, and statistical analysis.

At UCF one Ph.D. on-going dissertation is focused on a commercial vehicle detection system. Also, findings from UCF NCTSPM research have been incorporated into the Bridge Engineering course.

For the third year in a row the UCF Transportation Systems Engineering program hosted Camp Connect. The week long camp in July brought 9<sup>th</sup> through 10<sup>th</sup> graders to campus, where they were presented with an overview of the engineering discipline, describing each field using real world examples. The students also learned about transportation through an interactive board game called Reservation Road Planner where they had to complete a project through the five stages of development, project inventory inclusion, funding, preconstruction, and construction.

FIU conducted a two-week summer transportation camp for 17 high school students in July 2015. The summer camp featured field trips, lectures, lab demonstration, group projects and competitions. Topics included driving simulation, traffic safety, ITS, public transportation, and bridge engineering.

A UAB student turned an internship with GHD (formerly Conestoga-Rovers & Associates) into a full-time job. As an intern he worked on forensic investigations into failure analysis.

UAB organized the annual Sustainable Smart Cities Symposium which took place October 1, 2015 at the Alumni House. More than 200 people filled the UAB Alumni House to learn from experts from

around the world on matters concerning urban sustainability and development at the 2015 Sustainable Smart Cities Symposium. The symposium, organized by the UAB Sustainable Smart Cities Research Center, is an annual event that focuses on the innovations—such as big data, renewable energy and smart mobility—being used to help make Birmingham and other cities around the world smarter, safer and more livable.

A doctoral student at UAB has been interning with Birmingham’s Regional Congestion Monitoring Project since March 2015. A joint venture between UAB and the Regional Planning Commission of Greater Birmingham, this research aims to monitor roadway performance and manage traffic congestion.

The center again supported this year’s annual *Transportation Camp South* event. The event was an “unconference”, with participant-designed sessions and discussion, which brought together professionals and laypersons with an interest in transportation. The camp was held on September 26, 2015 and provided a day of connection and creativity, facilitated by its novel approach, filled with discussions, demonstrations, and education related to transportation in the South.

More than forty researchers and students actively participated in this year’s Georgia DOT Research Expo, on September 22<sup>nd</sup>, 2015, which was jointly hosted by the Georgia Department of Transportation and the Georgia Transportation Institute. The event featured over 70 posters, highlighting research and results of GDOT-sponsored research projects.

***Establish a central point of contact and promotion of best practices (e.g., through a web site or list serve) for materials relating to transportation systems performance and management***

The NCTSPM website remains the main point of contact and promotion of best practices. In the reporting period, the website received more 7,929 web views, 4,027 unique visits, and 3,392 first time visits. Monthly page views, unique visits, and returning visits is shown in Figure 1 below.

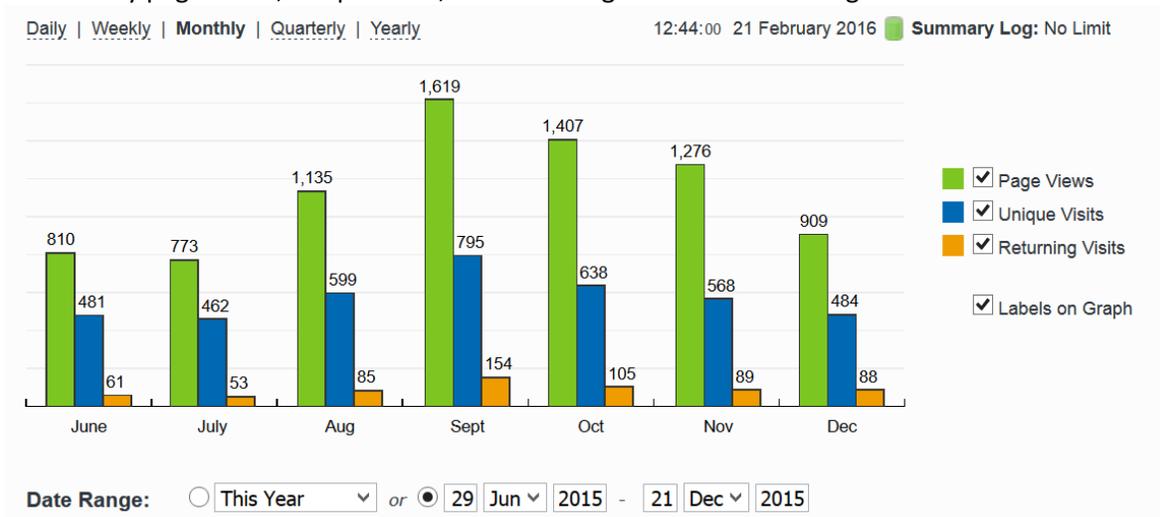
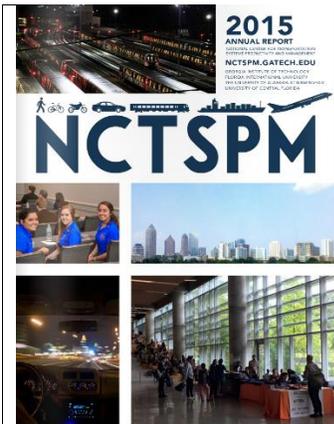


Figure 1. Web traffic during reporting period

In addition to the website, NCTSPM communicates its research efforts through publications, such as the annual report and an email newsletter.

The newsletter is sent out on a semi-annual basis, and three newsletters were created for 2015, along with the 2015 Annual Report. The newsletter for summer of 2015 included two research features, one on “Evaluation of the Cost Effectiveness of Illumination as a Safety Treatment at Rural Intersections” and one on “Freight Impacts on Small Urban and Rural Areas”. The newsletter also featured a principal investigator profile on Dr. Ram Pendyala, of the Georgia Institute of Technology, and a student profile on Chieh “Ross” Wang, also of the Georgia Institute of Technology. Additionally, the newsletter included several NCTSPM-related events and news items, such as the TransportationCamp South, an “un-conference” hosted by Georgia Tech, the 2015 Road Safety and Simulation International Conference, and a news feature on Florida International University’s Summer Transportation Camp. This newsletter reached 674 recipients, with readers from areas as far away as Belgium, France, and Turkey.



The 2015 NCTSPM Annual Report was released in January 2016. The report provided an overview of our 2015 activities, including research, education, and technology transfer. It was distributed to our university partners, the UTCs, state DOTs, the NCTSPM Board of Advisors, and at the Transportation Research Board Annual Meeting and 2016 Southeast UTC Conference.

***Promote diversity in the workforce through active recruitment of women and minority students into degree programs***

During the reporting period, each university took action to recruit women and minority students into their transportation programs and provide them with opportunities for professional development.

Activities included:

- UAB conducted the third annual Summer Enrichment program during June 2015. Six minority students participated in the program this year.
- GT funded 18 female students of which 14 were minority students, and 20 minority male students for participation in UTC activities.
- An entering female freshman undergraduate at Georgia Tech, interned with the Transportation Safety and Operation Lab (TSOL) as a part of her required Magnet Senior internship at Kennesaw Mountain High School. A female Georgia Tech doctoral student supervised her work in

completing human factors and responsible conduct of research training and in collecting data from her high school, and drafting a full-length paper. This was a pilot internship for the TSOL, an initiative expected to continue in the future.

- A female Information Technology major from FIU, interned with District Four of the Florida Department of Transportation (FDOT). She worked with intelligent transportation systems, aiding District traffic operators in monitoring roadway conditions.
- A female minority civil engineering student at FIU interned as an undergraduate assistant with FDOT, working with District Six's Intelligent Transportation Systems (ITS) department.
- UCF involved female undergraduate and graduate students in multiple transportation research projects.
- FIU provided training for 16 minority high school students in a two-week summer transportation camp.
- UAB conducted the third annual Summer Enrichment program during June 2015. Six minority students participated in the program this year.

***Act as a national resource for the debates and discussions that focus on the evolving national transportation program and future directions***

On July 27, 2015 NCTSPM sponsored a *Student Research Spotlight* at Georgia Tech with a theme on transportation innovation. The event featured twenty-nine student led posters highlighting innovative transportation research. The Student Research Spotlight was attended by a range of dignitaries, most notably Deputy U.S. Secretary of Transportation Victor Mendez and GDOT Deputy Commissioner Todd Long.

UCF and UT hosted the RSS2015 conference in Orlando, Florida in October 2015 where a special workshop on virtual and augmented reality was featured.

UCF researchers found that the Airport weather data was useful for predicting low-visibility related traffic risks. They hope that utilizing airport weather data will save considerable expenses incurred from installing weather sensors on the highway.

UAB also hosted the 2015 Sustainable Smart Cities Symposium in Birmingham in October 2015, which included presentations on sustainable transportation and development and a panel discussion with the leading experts from industry and academia.

Georgia Tech hosted eight seminars during the reporting period, bringing a variety of speakers to discuss their research and professional pursuits. Speakers and their topics included:

- Dr. Yin Hai Wang, "Big-Data-Driven Transportation Decision Making in the Smart Cities Context"
- Dr. Alex Karner, "The Convergence of Social Equity and Environmental Sustainability: Jobs-Housing Fit and Commute Distance"
- Dr. Jidong Yang, "Understanding the Varying Performance of Vehicle Detectors for Traffic Signal Control"

- Dr. Lucio Soibelman, “Design, Construction, and Management for Data Rich Advanced Infrastructure Systems”
- Dr. Steve Dickerson, "A Comprehensive Urban Transportation App"
- Dr. Aaron Steinfeld, "Crowdsourcing for Public Transit Users of All Abilities"
- Dr. Srinivas Peeta, "Modeling the Information Flow Propagation Wave under Vehicle-to-Vehicle Communications"
- Dr. Susan Tighe, “Incorporating Sustainability into Transportation Asset Management: Our Future Depends on It!”
- Dr. Christian Claudel, "Network Traffic State Estimation Using Hamilton-Jacobi Equations"

FIU hosted the following guest speaker seminars during the reporting period:

- Jill Capelli and Lisa Juan, Kimley-Horn and Associates, "What is Civil Engineering? And what is a Long Range Transportation Plan?"
- Veronica Altuve, Mobility Director, University of Miami, "Interchange Access Request"
- Jim Frazer, President, Gridaptive Technologies, "Connected Vehicles, Connected Pedestrians and Adaptive Roadway Lighting"

***Explore international cooperative activities with research entities in selected countries where similar research interests exist***

Many of our researchers are collaborating and presenting their work internationally.

UCF is currently communicating about the low-visibility issues with Korea Expressway Corporation, which manages the all the expressways in Korea. Recently 100-vehicle pile-up occurred due to severe fog on the expressway in South Korea, which prompted the need for collaboration.

UCF presented material to Turkish engineers to explore collaboration.

A UAB researcher continues to use UTC funds to leverage an ongoing NSF collaboration on B-WIM with universities in Ireland and the UK.

**What opportunities for training and professional development has the program provided?**

In the reporting period, more than 106 students participated in NCTSPM research projects, which provided them with valuable training. Some gained field experience via data collection for research projects, while many others gained experience conducting analyses and writing.

UAB also sponsored a group of eight undergraduate and graduate students who traveled to the Netherlands and Egypt during May 2015 to study sustainable transportation and development. Through a combination of tours, lab visits, seminars, and meetings with industry leaders in those countries, the students explored principles of sustainable urban engineering and developed reports for potential

implementation of these practices in Birmingham and the broader U.S. The students continued work on their research through the summer and presented final reports in November 2015.

UCF has provided the following training and professional development for graduate students and a postdoctoral associate:

- 1) Driving simulation experiments
- 2) Weather and traffic data collection and processing
- 3) Statistical analysis techniques to analyze surrogate safety measures under reduced visibility
- 4) Involvement of three Ph.D. students
- 5) Trained graduate and undergraduate students throughout the project and shared results with FDOT engineers and exchanged ideas
- 6) The graduate student researcher funded by the project has been receiving training on industry practices and construction techniques for both ultra-high performance concrete and fiber-reinforced polymers. In addition, they have received training and curricular expertise regarding numerical methods in structural analysis

### **How have the results been disseminated?**

The NCTSPM website remains the main point of contact and promotion of best practices. During the reporting period, an updated Project Information Form was posted for each research project. Related documents, such as presentations, pictures, reports, and posters, have been also been uploaded when available. Most of the presentations hosted by the center have been recorded and posted to YouTube and other social media accounts. Additionally, the semi-annual email newsletter has served to inform readers about at least two featured NCTSPM-funded projects each reporting period.

Researchers have produced a number of technical papers and presentations to disseminate their work. Our researchers delivered nearly 166 presentations in the forms of conference proceedings, invited presentations/lectures, workshops, seminars, and webinars held on research projects. Many of these presentations were conducted at conferences. Our researchers are also prolific publishers. During the reporting period, more than 97 refereed journal and professional publications were submitted/accepted, to a variety of journals such as Transportation Research Record, Accident Analysis & Prevention, Journal of Transportation Safety and Security, ASCE Journal of Composites for Construction, Journal of Civil Engineering and Architecture, Traffic Injury Prevention, etc.

### **What do you plan to do during the next reporting period to accomplish the goals?**

Research will continue on the active NCTSPM projects; project information forms posted on the website provide detailed work plans. Final reports are expected for a number of projects.

NCTSPM researchers presented work at the Transportation Research Board 95<sup>th</sup> Annual Meeting in January 2016.

The 2016 UTC Conference for the Southeastern Region will be held from March 31 to April 1 and will be hosted by the Southeastern Transportation Center UTC and the University of Tennessee, Knoxville. In the words of its organizers, "this innovative conference will bring together faculty, students, practitioners, and public agencies in the southeast to showcase recent achievements and collaborations. The program promises to be a fast-paced and engaging opportunity to share where we've been and where we're going in transportation research, education, and tech transfer".

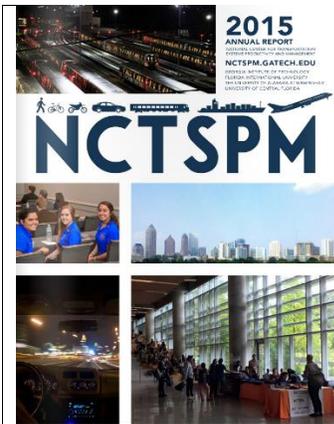
Georgia Tech will host seven seminars during the Spring 2016 semester. These events are open to Georgia Tech students, faculty, and staff, as well as alumni and general members of the public. Recording of these seminars are available on the center's YouTube channel.

At UAB Research will continue on the active NCTSPM projects. Planning is underway for the 2016 NCTSPM Summer Enrichment Program, which will bring another group of minority students to UAB to study transportation and sustainable engineering. Planning is also underway for the 2016 UAB study abroad program, in which students will spend two weeks in England and two weeks in Egypt studying sustainable transportation initiatives. Summer internships will be funded for UAB students at local transportation agencies. Finally, UAB will continue planning for the 2016 Sustainable Smart Cities Symposium to be held in Birmingham with NCTSPM sponsorship.

## Products

The center's website, <http://nctspm.gatech.edu> continues to be updated regularly with updates on research projects, educational initiatives, and news related to NCTSPM researchers.

The center produces newsletters that provide updates on research projects, educational activities, and the people behind center. The summer newsletter highlighted two research projects, a researcher profile and a student profile, recent events and upcoming events.



The 2015 NCTSPM Annual Report was released in January 2016. The report provided an overview of our 2015 activities, including research, education, and technology transfer. It was distributed to our university partners, the UTCs, state DOTs, the NCTSPM Board of Advisors, and at the Transportation Research Board Annual Meeting and 2016 Southeast UTC Conference.

Our researchers will continue to produce technical papers and deliver presentations to disseminate their work throughout the nation and internationally.

## Participants and Other Collaborating Organizations

### NCTPSM Participants at Georgia Institute of Technology

The following individuals from Georgia Tech have worked on the NCTSPM at the programmatic level.

Name	<i>Michael Hunter, Ph.D.</i>
Program/Project Role	<i>NCTSPM Director</i>
Number of hours worked during the reporting period	<i>Approximately 500 hours</i>
Contribution to Program/Project	<i>Responsible for oversight and governance of NCTSPM</i>
Funding Support	<i>UTC, GDOT</i>
Collaborated with individual in foreign country	<i>N/A</i>
Country(ies) of foreign collaborator	<i>N/A</i>
Travelled to foreign country	<i>N/A</i>
If traveled to foreign country(ies), duration of stay	<i>N/A</i>

Name	<i>Catherine Ross, Ph.D.</i>
Program/Project Role	<i>NCTSPM Deputy Director for Policy, Education and Workforce Development</i>
Number of hours worked during the reporting period	<i>Approximately 60 hrs.</i>
Contribution to Program/Project	<i>Responsible for administrative oversight and faculty coordination; liaison to NCTSPM researchers.</i>
Funding Support	<i>UTC, GDOT</i>
Collaborated with individual in foreign country	<i>N/A</i>
Country(ies) of foreign collaborator	<i>N/A</i>
Travelled to foreign country	<i>N/A</i>
If traveled to foreign country(ies), duration of stay	<i>N/A</i>

Name	<i>Michael O. Rodgers, Ph.D.</i>
Program/Project Role	<i>NCTSPM Deputy Director for Research and Technology Transfer</i>
Number of hours worked during the reporting period	<i>Approximately 350 hours</i>
Contribution to Program/Project	<i>Oversees subcontract reporting requirements and research products and is responsible for coordinating technology transfer activities of the center</i>
Funding Support	<i>UTC, GDOT, U.S. DOE,</i>
Collaborated with individual in foreign country	<i>N/A</i>
Country(ies) of foreign collaborator	<i>N/A</i>
Travelled to foreign country	<i>N/A</i>
If traveled to foreign country(ies), duration of stay	<i>N/A</i>

Name	<i>Bhargava Chilukuri</i>
Program/Project Role	<i>Research Program Coordinator</i>
Number of hours worked during the reporting period	<i>Approximately 800 hours</i>
Contribution to Program/Project	<i>Provided administrative management and assistance to Center.</i>
Funding Support	<i>UTC, GDOT</i>
Collaborated with individual in foreign country	<i>N/A</i>
Country(ies) of foreign collaborator	<i>N/A</i>
Travelled to foreign country	<i>N/A</i>
If traveled to foreign country(ies), duration of stay	<i>N/A</i>

Name	<i>Ms. Marjorie Jorgenson</i>
Program/Project Role	<i>Transportation Faculty Assistant</i>
Number of hours worked during the reporting period	<i>Approximately 250 hrs.</i>
Contribution to Program/Project	<i>Provide assistance to Director and Research Coordinator for UTC management</i>
Funding Support	<i>GT</i>
Collaborated with individual in foreign country	<i>N/A</i>
Country(ies) of foreign collaborator	<i>N/A</i>
Travelled to foreign country	<i>N/A</i>
If traveled to foreign country(ies), duration of stay	<i>N/A</i>

### **NCTSPM University Partner Representatives**

These individuals have served as liaisons between NCTSPM and their institutions to organize joint efforts related to research, education, technology transfer, and workforce development. These met with the NCTSPM Director and Deputy Director, via teleconference, in an initial kick-off meeting in order to establish governing parameters for the management and coordination of the center’s research and activities. They also coordinated submissions of proposals and cost sharing from their respective institutions and were members of the proposal selection committee. Subsequently, these individuals served to facilitate the subcontracting process within their institutions.

#### **University of Alabama, Birmingham**

Fouad H. Fouad, Professor and Chair, Department of Civil Construction and Environmental Engineering  
Email: [ffouad@uab.edu](mailto:ffouad@uab.edu)

Name	<i>Fouad H. Fouad, Ph.D.</i>
Program/Project Role	<i>NCTSPM Partner Representative/University of Alabama, Birmingham</i>
Number of hours worked during the reporting period	<i>Approximately 15 hours</i>
Contribution to Program/Project	<i>Liaison between UTC and the University of Alabama, Birmingham</i>
Funding Support	<i>UTC, ADOT, UAB</i>

Collaborated with individual in foreign country	N/A
Country(ies) of foreign collaborator	N/A
Travelled to foreign country	N/A
If traveled to foreign country(ies), duration of stay	N/A

**Florida International University**

Dr. Albert Gan, Email: [gana@fiu.edu](mailto:gana@fiu.edu)

Name	<i>Albert Gan, Ph.D.</i>
Program/Project Role	<i>NCTSPM Partner Representative / Florida International University</i>
Number of hours worked during the reporting period	<i>200 hours on (1) development, coordination, administration, and teaching of a two-week Summer Transportation Camp; (2) recruitment and administration of student internship program.</i>
Contribution to Program/Project	<i>Liaison between UTC and Florida International University</i>
Funding Support	<i>UTC, FDOT, FIU</i>
Collaborated with individual in foreign country	N/A
Country(ies) of foreign collaborator	N/A
Travelled to foreign country	N/A
If traveled to foreign country(ies), duration of stay	N/A

**University of Central Florida**

Dr. Essam Radwan, Executive Director, Center for Advanced Transportation Systems Simulation

Email: [Ahmed.Radwan@ucf.edu](mailto:Ahmed.Radwan@ucf.edu)

Name	<i>Essam Radwan, Ph.D.</i>
Program/Project Role	<i>NCTSPM Partner Representative/University of Central Florida</i>

Number of hours worked during the reporting period	<i>Completed approximately 40 hours in activities related to research, education, and administration activities.</i>
Contribution to Program/Project	<i>Liaison between UTC and the University of Central Florida</i>
Funding Support	<i>UTC, FDOT, UCF</i>
Collaborated with individual in foreign country	<i>N/A</i>
Country(ies) of foreign collaborator	<i>N/A</i>
Travelled to foreign country	<i>N/A</i>
If traveled to foreign country(ies), duration of stay	<i>N/A</i>

### **Advisory Board and Other Collaborators**

#### **The following are members of the NCTSPM Advisory Board:**

F.T. "Tread" Davis, Jr. – Senior Counsel, McKenna Long & Aldridge, LLP (Board Chair) and Board Member, Atlanta Regional Commission

Harry L. Anderson - Senior Vice President, Global Business and Technology Services, The Coca-Cola Company

James Balloun – Financial Investor and Former CEO (Past Chair)

Harold Barley – Executive Director, MetroPlan Orlando

Mark Bartlett – FHWA Division Administrator, Alabama

Jeffrey W. Brown – Alabama DOT Bureau Chief, Research and Development

Mike Dover – GDOT Deputy Commissioner

Bill Johnson – Director, Port of Miami

Michelle Livingstone – Vice President for Transportation Distribution, The Home Depot

Todd Long – Chief Operating Officer, Fulton County

Russell McMurry – GDOT Commissioner

George Overstreet – Executive Board Member and Vice President of Operations, Alabama Trucking Association

G. P. "Bud" Peterson – President, Georgia Tech, Ex Officio

Jay Roberts – GDOT Division of Planning

Daniel L. Rodgers – President, Dunn Investment Company

Randy Stashick – Global Vice President of Engineering, UPS

Yvette Taylor – Regional Administrator, FTA

Dave Williams – Vice President of Infrastructure and Government Affairs, Metro Atlanta Chamber of Commerce

#### **Other Partnering Organizations:**

Georgia Department of Transportation (GDOT)  
Florida Department of Transportation (FDOT)

Alabama Department of Transportation (ADOT)

**Other Collaborators:**

Morehead State University

Saint Louis University

Georgia State University

Georgia Southern University

Kennesaw State University

## Impact

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

Our research is producing results that contribute to the body of knowledge on transportation safety, economic competitiveness, and state-of-good-repair. Research results are disseminated through publications and presentations, with the potential to impact transportation practitioners well beyond the Southeast region.

Our researchers also collaborate with state DOTs, regional planning commissions, and other transportation agencies, informing work that is being done at these agencies. For instance, researchers investigating “Bringing Freight Components into Statewide and Regional Travel Demand Forecasting” are working with their regional planning commissions, which may improve their in-house modeling. Likewise, many of our researchers are collaborating with their state DOTs, which may enhance DOT work; for instance, researchers at FIU are working closely with FDOT to develop a tool to enable DOT district offices to easily utilize the Highway Safety Manual. Researchers are also conducting research to help their DOT’s evaluate and maintain the health of vital infrastructure, such as bridges, signage and pavement. These studies may help eliminate the types of structural failures that DOTs have experienced in the past. NCTSPM partner NCTSPM institutions are becoming recognized as leaders in the use of advanced materials for repair and retrofit of nation’s infrastructure.

At UCF research is being conducted into the impact of reducing travel time on society, sustainability, and transportation economics. The research for “ Automated Data Collection for Origin/Destination Studies of Freight Movement” will produce an inexpensive and powerful approach for collecting data about travel destinations of commercial vehicles. Additional research provides a comparative analysis of using the conventional bridge girders and FIBs that can and will be considered on major projects such as I-4 Ultimate. This document can provide valuable data for modeling, analysis, rating of such bridges. UCF and partner NCTSPM institutions are becoming recognized as leaders in the use of advanced materials for repair and retrofit of nation’s infrastructure.

At FIU Ph.D. students are breaking new ground. One Ph.D. student is developing materials that will allow for increased load-bearing on existing bridges and extended service lives. Other is examining the Value of Travel Time Reliability for Freight Transportation to Support Freight Planning and Decision-making.

At Georgia Tech a Ph.D. student is researching the “inevitable” impact of autonomous vehicles, in order to develop modeling and performance measurement tools, and to demonstrate how these tools can be applied to high-volume freight corridors in Georgia. Another Ph.D. is focusing on the measurement of transportation system users' performance.

Meanwhile, at UAB, three outstanding graduate researchers and a postdoctoral researcher are impacting the civil engineering field in unique ways.

- A Ph.D. student and his advisor are evaluating anchor bolt clearance discrepancies and their research findings will be included in the future AASHTO Standard Specifications for Structural Supports manual.
- A master's student is contributing to a collaborative effort between UAB, FIU, and UCF, attempting to determine if a new type of decking system for bridges can help to speed up repair times for failing bridges.
- A Ph.D. student is working to determine optimal designs for highway signs to minimize fatigue caused by wind gusts.
- A postdoctoral research assistant is investigating the impacts of increasing vehicle loading on existing infrastructure to create bridge retrofit, management, and network maintenance tools for use by the bridge engineering community as a whole.

At the UCF, a master's student analyzed and assessed the behavior and performance of taxicab drivers in large cities. A Ph.D. student is focusing on understand the impact that environmental and traffic conditions have in causing car crashes. A master's student is working on the factors that affect driver behavior and safety at toll plazas.

Researchers at UAB worked closely with the Regional Planning Commission of Greater Birmingham (RPCGB) to evaluate the new tour based model. The RPCGB is interested in continuing development of this model and improving freight forecasting for the region. UAB is currently negotiating additional projects with the RPCGB related to the freight model.

The results of the Digital Billboards project are likely to influence the future Alabama DOT guidelines for their placement and characteristics.

The researchers of the Anchor Bolts study have developed analysis procedures and design methods for computing the stress distribution for anchor bolts with excessive and uneven standoff distances, something that was not available earlier. They also developed a procedure to identify structures that are susceptible to damage resulting from this condition, which will help the Alabama DOT eliminate the types of structural failures that has experienced in the past.

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

The interdisciplinary nature of NCTSPM's work impacts disciplines beyond transportation engineering. Our work spans public policy, public health, and economics.

For instance, several projects focus on freight movement; these studies not only inform the discipline of transportation engineering, but also the disciplines of supply chain management and regional economics. “Optimizing EMS Through the Use of Intelligent Transportation Systems (ITS) Technologies” impacts the discipline of health; “Reducing Service Interruptions in Linear Infrastructure Systems

(Transportation and Water/Sewer) by Synchronizing Schedules for Selected Maintenance Activities” deals with environmental engineering. These researchers are publishing in non-transportation-centered publications and presenting at non-transportation-focused conferences. The UTC funding is a critical part of producing this multidisciplinary work.

The results of the Visibility Project supplemented with quick and accurate weather prediction will be essential for providing timely and adequate preemptive countermeasures to avoid traffic crashes.

## **What is the impact on transportation workforce development?**

NCTSPM places a heavy emphasis on workforce development. Each partner university engages in a variety of activities to support this work.

During the reporting period, over 200 students were involved in our research projects, providing them with valuable experience in transportation research and over 31 of those students received degrees.

The transportation graduate program at UCF has produced graduates receiving both MS and Ph.D. degrees and engineering consulting firms, academia, and public agencies employed their recipients. Specifically, the Florida Department of Transportation, the Florida Turnpike Enterprises, and the City of Orlando are the three public agencies that hired the majority of our MS graduates. Other Ph.D. graduates were hired in academic institutions in Australia, China, and the US. The program was also able to obtain a computational tool in their research group which can be used for educational and research purposes.

At UAB during the reporting period, two Ph.D. candidates and four MSCE candidates associated with the center were awarded degrees. The following dissertations and theses were accepted based on NCTSPM research:

### Ph.D. Dissertations

1. Rahul Kalyanker: “Simulation of Bridge Responses to Heavy Vehicles”
2. Adel A Elfayoumy: “Impacts and Solutions for Doubling Heavy Vehicles”

### M.S. Theses

1. Emad Badiie: “Bridge Rail Design Procedure”
2. Adel Badiie: “Dynamic Simulation of Bridge Rails”
3. Ahmed Hattib: “Drive-By Damage Detection”
4. Md. Mozahidul Islam: “A Comprehensive Assessment of Possible Links between Digital Advertising Billboards and Traffic Safety”

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

Nothing new to report.

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

Technology transfer is an important component of our program. Many of our research projects have a focus on being applied, so that transportation agencies can readily apply them to their own work.

The main vehicle for technology transfer is presentations and publications delivered by our researchers. During the reporting period, our researchers delivered over 166 presentations in the forms of conference proceedings, invited presentations/lectures, workshops, seminars, and webinars held on research projects.

UAB projects have been presented at conferences and in technical journals (see previous sections). UAB is also working to transfer the Birmingham freight model to the Birmingham Regional Planning Commission to improve regional modeling efforts.

Collaborative project between two states (FL and AL) engages the State DOTs directly and addresses broader concerns that may lead to immediate deployment of some of the solutions. There are plans to engage the AL DOT in the next reporting period to gauge interest and ascertain feasibility of deploying a test hybrid bridge deck.

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

We expect several projects will have impacts beyond science/engineering professions.

“Bringing Freight Components into Statewide and Regional Travel Demand Forecasting” has already demonstrated improvements over traditional freight models and we will continue to pursue implementation of the tour based model in Birmingham. This could lead to better freight facilities for private carriers. Goods movement will also be impacted by the results of “Automated Data Collection for Origin/Destination Studies of Freight Movement,” as it has the potential to reduce the cost of transporting goods.

“Impact and Feasibility Study of Solutions for Doubling Heavy Vehicles” will, in the end, impact the trucking and commercial freight industries.

“Digital Advertising Billboards and Driver Distraction” may ultimately have impacts to both State DOT’s as well as the advertising industry.

The results of the Visibility Project, will save many precious lives from traffic crashes due to reduced visibility.

The outcomes of the Commercial Vehicles O-D Project are expected to reduction of emissions, travel time, cost of goods transport and increase the capacity of the national highway system to move freight.

The joint FIU/UCF project addresses major national need: deteriorating infrastructure and increasing demands on the existing infrastructure. Therefore, potential for extending service life of bridges through deck replacement (most common cause of deficient or functionally obsolete bridges) has major economic and social impacts.

The UCF project, “Automated Data Collection for Origin/Destination Studies of Freight Movement”, will help reduce emissions, reduce travel time, decrease the cost to transport goods, and increase the capacity of the national highway system to move freight.

## Changes/Problems

**Changes in approach and reasons for change:** Nothing to Report

**Changes that have a significant impact on expenditures:** Nothing to Report

**Significant changes in use or care of human subjects, vertebrate animals and/or biohazards:** Nothing to Report

**Change of primary performance site location from that originally proposed:** Nothing to Report

## Special Reporting Requirements

### Specific Requirements

**Website:** Created and operational in 2013; continues to be updated regularly as new information becomes available

**Directory of Key Personnel:** Information available on the program website and updated as needed

**Financial and Annual Share Reports:** The SF425 requirements will be met by separate report.

**FFATA Subaward and Executive Compensation Report:** Will be met by separate submission

**Research Project Descriptions:** Available on program website. The projects selected and funded by the center are provided below.

## Projects Selected for Funding by NCTSPM

Project Title	Lead Uniy	Principal Investigator
Integrating Safety in Developing a Variable Speed Limit System	UCF	Mohamed Abdel-Aty
Reducing Service Interruptions in Linear Infrastructure Systems (Transportation and Water/Sewer) by Synchronizing Schedules for Selected Maintenance Activities	FIU	Berrin Tansel
Performance Measurements of Transportation Systems based on Fine-Grained Data Collected by AVI and AVL Systems	FIU	Mohammed Hadi
Full-Scale Wall of Wind Testing of Variable Message Signs (VMS) Structures to Develop Drag Coefficients for AASHTO Supports Specifications	FIU	Arindam Chowdhury
Information Services in Social Networked Transportation	GT	Hans Klein
Traffic Management Centers: Challenges, Best Practices, and Future Plans	FIU	Xia Jin
Digital Advertising Billboards and Driver Distraction	UAB	Virginia Sisiopiku
Impact and Feasibility Study of Solutions for Doubling Heavy Vehicles	UAB	Nasim Uddin
Optimizing EMS Through The Use of Intelligent Transportation Systems (ITS) Technologies	UAB	Andrew Sullivan
Efficient Utilization of the Existing Its System and the Viability of a Proactive Traffic Management System for the Orlando-Orange County Expressway Authority System	UCF	Mohamed Abdel-Aty
Development of a Prototype Evidence-Based Database and Planning Tool: Applying Performance Management Principles in Asset Management Program Development	GT	Adjo Amekudzi
Bringing Freight Components into Statewide and Regional Travel Demand Forecasting	GT	David Lee
Development of Risk Management Strategies for State DOTs to Effectively Deal with Volatile Prices of Transportation Construction Materials	GT	Baabak Ashuri
Freight Movement and Economic Competitiveness from the Megaregion Perspective	GT	Catherine Ross
Economic Development and Workforce Impacts of State DOT Expenditures	GT	Danny Boston

Factors Influencing Visual Search in Complex Driving Environments	GT	Mike Hunter
Next-Generation Wireless Bridge Weigh-in-Motion (WIM) System Incorporated with Nondestructive Evaluation (NDE) Capability for Transportation Infrastructure Safety	GT	Yang Wang
Micro-Dynamics of Business Location and Growth and its Effects on the Transportation Network and Congestion in Georgia and the Southeast Region	GT	Frank Southworth
Automated Data Collection for Origin/Destination Studies of Freight Movement	UCF	Amr A. Oloufa
Enhanced Role of Activity Center Transportation Organizations in Regional Mobility	GT	Angshuman Guin
Georgia SPLOST Database and Clearinghouse for Transportation Finance	GT	Catherine Ross
GRTA/GDOT Real-Time Tracking and Choice Data	GT	Randall Guensler
Evaluation of Signage Alternatives for Express Lane Facilities	FIU	Albert Gan
Innovative Modular High Performance Lightweight Decks for Accelerated Bridge Construction	FIU	Amir Mirmiran
Field Validation of a Drive-By Bridge Inspection System with Wireless BWIM + NDE Devices	GT	Yang Wang
Development of a Web-based Decision Making Tool for the Highway Safety Manual Implementation	FIU	Priyanka Alluri
A Data Driven Approach to State Transportation Investment Decisions: a Transportation Project Investment and Evaluation Resource (T-Pier)	GT	Timothy F. Welch
Freight impacts on Small Urban and Rural Areas	GT	Catherine Ross
HOV to HOT Conversion Impacts on Carpooling	GT	Yanzhi "Ann" Xu
Consumer Response to Road Pricing: Macro and Micro Modeling Tools for Socioeconomic Evaluation and Pricing of Managed Lanes	GT	Randall Guensler
Evaluation of the Cost Effectiveness of Illumination as a Safety Treatment at Rural Intersections	GT	Angshuman Guin
Assessment of High Early Strength Limestone Blended Cement for Next Generation Transportation Structures	GT	Kimberly Kurtis
Managing Transportation System Health: Setting Performance Targets and Policies in Non-Uniform Regions and Jurisdictions to Achieve Uniform Statewide and National Objectives	GT	Adjo Amekudzi
Extending HYRISK to Predict Scour Risk as a Function of Soil Erodibility Characteristics	GT	Laurie Garrow
Cooperative Vehicle-Highway Automation (CVHA) Technology: Simulation of Benefits and Operational Issues	GT	Michael Rodgers
Next Generation Crack Sealing Planning Tool for Pavement Preservation	GT	James Tsai
Estimating the Monetary Benefits of Reducing Delays on Heavily Trafficked Truck Freight Corridors in Georgia	GT	Frank Southworth
A Comprehensive Investigation of Visibility Problems on Highways: Developing Real Time Monitoring and Prediction System for Reduced Visibility and Understanding Traffic and Human Factors Implications	UCF	Mohamed Abdel-Aty
Evaluating the Impact of Real-time Transit Passenger Information on Ridership and Mode Share	GT	Kari Watkins
Bridge Rail Design Procedures	UAB	Dean Sicking
Evaluation of Anchor Bolt Clearance Discrepancies	UAB	Ian Hosch
Examining the Value of Travel Time Reliability for Freight Transportation to Support Freight Planning and Decision-Making	FIU	Xia Jin