

Semiannual Program Progress Performance Report for  
**Southeastern Transportation Center (STC)**  
US DOT Regional University Transportation Center



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# STC Program Progress Performance Report #5

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## 1. Accomplishments

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

The following document summarizes the many activities and initiative of the Southeastern Transportation Center (STC) that were completed or underway during the past six months. STC is USDOT's Regional UTC representing the eight southeastern states, and is led by the University of Tennessee, Knoxville (UT). We are a strong consortium of exceptional universities striving to fulfill the mission of the University Transportation Center Program in Region 4, with a special emphasis on our programmatic theme: comprehensive transportation safety. In this current UTC grant reporting period, we have continued on-going activities and initiated key new activities in each of our four program areas: research, education, work force development, and technology transfer. We are especially proud of our new O&E Project initiative targeting the safety aspects of emerging advanced transportation technologies, including CAVs and CI.

We get that SAFETY of all users is paramount in the conception, planning, design, building, operation, and maintenance of every transportation mode and facility. We BELIEVE that innovative research and effective technology transfer are the keys to address current and emerging safety issues and challenges. To accomplish our GOAL of comprehensive transportation safety in our region, STC researchers strive to better understand the region's safety culture; to gather, curate, and effectively use the vast amount of safety-related data available; to integrate and optimize the human interface with our current and future transportation infrastructure and vehicles; and to enhance and more effectively use safety tools like the Highway Safety Manual. As you read on, you will see how we have incorporated these efforts into our MAJOR RESEARCH INITIATIVES.

STC also gets that the future of transportation in this county is about PEOPLE. STC fully embraces its role in developing and expanding the transportation workforce—tomorrow's problem solvers and implementers. We continue to attract the best and brightest students in our region to careers in transportation, and providing these students the knowledge and tools to be tomorrow's leaders. We are effectively reaching out to teachers, to high school and younger students, and to the private sector to expand and improve the transportation workforce PIPELINE for both the present and the future.

The STC is a "mover" and we MOVE! We move our States, our region, and our nation toward safer and more efficient transportation. And we MOVE our faculties, staffs, and students toward their lifetime contributions to the transportation profession.



**b. What was accomplished under these goals? What opportunities for training and professional development have the program provided?**

## **Research Accomplished under Program Goals**

### **Reg Souleyrette, Director, University of Kentucky**

The STC research program includes two primary components: **Major Research Initiatives** (MRIs) and **Opportunity and Exploratory Grants** (O&E projects). The past six months have seen considerable activity and accomplishments in both of these research components, which are reported and discussed in the following sections. In addition, we have included for the first time a section on **Other Research Activities** to capture research-related accomplishments not directly associated with one of the two primary STC research components. If we receive favorable feedback, we will include this “Other Research Activities” section in future PPPRs.

### **Major Research Initiatives (MRI)**

STC has four active MRIs, all of which are multi-year, multi-university major research projects. Each MRI is led by a Coordinator or Co-coordinators, with assigned Principal Investigators (one per campus) overseeing the work performed by each university partner. STC’s Research Director, Dr. Reg Souleyrette, routinely works with the MRI Coordinators and PIs to review, assess, and provide oversight for individual MRIs, and to provide constructive feedback to the STC Director and Co-Director on the overall MRI component.

During the current PPPR reporting period, Dr. Souleyrette reviewed the 2015 quarterly MRI research progress status reports, and presented his findings and recommendations to the STC Directors. A critique and reassessment of the MRI research program structure was completed by the STC Management Team, including a comprehensive assessment of output metrics, interim research results and summaries of progress, and anticipated research benefits. After assessing alternative investment scenarios, the STC Management Team determined and implemented project funding for Program Years Two and Three.

The MRI oversight and management activity included the following specific tasks during this PPPR reporting period:

- Assessment of MRI performance via required quarterly reporting.
- Preparation of an overall MRI status report which includes output metrics, interim research results and summaries of progress, anticipated benefits, and listings of research products generated to date.
- Continued administrative support for MRI Coordinators/Co-Coordinators.
- Consultation among the STC Management Team to determine future MRI direction and project funding.



Following are progress and accomplishment summaries for each of the four ongoing MRIs during this reporting period. These summaries, where appropriate, indicate reported activities by university partners.

## Summary of MRI Project Activities and Accomplishments

### MRI1: Crash Modification Factors and the Highway Safety Manual Raghavan Srinivasan, Highway Safety Research Center, Coordinator

*Pls - HSRC: Raghavan Srinivasan, Bo Lan, Daniel Carter  
UA: Steven Jones, Luana Ozelim, Randy Smith (UA Center for Advanced Public Safety)  
UK: Mei Chen, Jerry Pigman, Eric Green  
UT: Asad Khattak, Lee Han*

With the publication of the Highway Safety Manual (HSM), there is now a formal document that can be used to link roadway design with safety consequences. Part C of the HSM provides prediction models that can be used for project level analysis to assess the safety impacts of alternative designs. Crash modification factors (CMFs), which provide an estimate of the safety effectiveness of specific treatments, are available for selected treatments from Part D of the HSM. However, there are many treatments for which reliable CMFs are not available. One of the principal thrusts of MRI 1 is developing CMFs for high priority engineering treatments (stop to signal conversion and two-way to multiway stop conversion). This thrust complements NCHRP Project 17-63 (also being conducted by STC team members) that is developing guidelines for the development of crash modification functions. In addition, research is focusing on work zone procedures in the HSM, verification of previously developed Safety Performance Functions, and performance comparison of four calibration methodologies for SPFs focused on two-lane rural roads.

#### **HSRC**

HSRC is part of Major Research Initiative 1: Crash Modification Factors and the Highway Safety Manual. The intent of the HSRC effort is to estimate crash modification functions for two to three engineering treatments for which data on treatment and reference sites are readily available. This effort is being coordinated with ongoing NCHRP Project 17-63 (Guidance for the Development and Application of Crash Modification Factors) that is developing guidelines for developing crash modification functions. The draft final report from the Year 1 effort was completed during this period.

#### **UK**

During this reporting period, UK's objective for MRI 1 was to develop Kentucky specific data for Crash Modification Factors, and verify previously developed Safety Performance Functions (SPFs). To accomplish this, we coordinated research to maximize SPF/CMF development; analyzed the influence of socio-economic factors on crash predictability initiated; and tested two SPFs statistical significance factors. We prepared the final draft of a summary report of year 1

findings. Accomplishments for this reporting period include 1) crash frequency prediction for single- and multi-vehicle crash using different travel time reliability parameters; and 2) real-time crash analysis for multi-vehicle crash risk given a crash occurrence using a travel time reliability indicator. We also provided data collection and analysis statistical model building training and professional development for a Ph.D. student.

## **MRI 2. Integrated Simulation and Safety**

**Essam Radwan, University of Central Florida & Nikiforos Stamatiadis, University of Kentucky, Co-Coordinator**

*PIs UK: Nikiforos Stamatiadis, Adam Kirk  
UCF: Essam Radwan, Hatem Abou-Senna, Mohammad Abdel-Aty  
UT: Asad Khattak, Lee Han*

Simulation has evolved into a productive tool for predicting and evaluating safety on roadways and street networks. Simulation aptly defines human actions, addresses the effectiveness of roadway design and traffic operations on transportation safety, and helps to develop surrogate safety measures. Judicious and creative implementation of simulation tools holds great promise for enhancing HSM methodologies and approaches. Projects within this initiative evaluate the use of simulation in assessing and possibly predicting safety levels for roadway environments for pedestrian and bicycle conflicts with vehicular traffic; review of commonly used simulation tools and their capability to model incidents, accidents, and traffic operation under large-scale incidents requiring evacuations; and are developing vehicle-to-vehicle crash prediction models for intersections. Projects have resulted in an interim draft report being completed, papers and abstracts have been submitted and student theses have been initiated and one completed.

### **UCF**

The research team collected and summarized extensive conflict information from eight signalized intersections in the Orlando area from real-time digital video surveillance camera data available for these intersections. This information included pedestrian crossing characteristics, vehicle traffic characteristics, pedestrian-vehicle conflict data, and overall intersection operational data.

Then, the previously calibrated and validated VISSIM model was used to generate pedestrian-vehicle conflict estimates for these study intersections, and SSAM software was used to extract these conflicts by processing the vehicle trajectory file from the VISSIM model. The results showed that there was a best goodness-of-fit between simulated conflicts and observed conflicts when the maximum TTC threshold was set to be 2.7, and the maximum PET threshold was set to be 8. A linear regression model was developed to study the relationship between simulated conflicts from the micro-simulation and the observed conflicts from the field. The results indicated that there was a high correlation between the simulated conflicts and the observed conflicts, supporting the utility of the simulation tool developed in this research effort.

Additionally, during this reporting period, work began on developing a driver simulation tool to further assess potential intersection pedestrian/vehicle intersection conflicts, to complement and expand upon the VISSIM micro-simulation modelling. Selected hazard scenarios that involved both pedestrians and vehicles factors were created for the driver simulator study. Several potential factors, such as time of day, road/intersection type, with/without crosswalk markings, and pedestrian attire (i.e., color of clothing) are included as variables in the driving simulator study experiment design. The simulator experiment designed and implemented during this reporting period is currently underway.

## **UK**

UK's task for MRI 2 is titled *Develop Vehicular Crash Models for Intersections and Interchanges*. During this period, we evaluated preliminary models based on initial simulation, and completed the STC report for year 1. Products include development of nomographs that provide a decision-tool for safety-based left turn phase selection. Coordinating their use with the capacity-based nomographs is under way to complete the decision for left turn phase selection.

A paper has been developed and accepted for publication in Transportation Research Part C; a paper was submitted for the RSS 2015; a second paper is under development for submittal in 15Q3 to Accident Analysis and Prevention; and a paper is under development for submittal to TRB. Graduate student Tate Sallee completed a Master's report on the safety implications on left-turn phasing selection. Alexander Flores is working on a Master's report on the potential use of hourly traffic counts for crash prediction and left-turn phasing changes.

## **MRI 3. Exploring Socio-Demographic Characteristics and Culture Factors in Differential Safety Performance across Geography** **Shashi Nambisan, University of Tennessee & Steve Polzin, University of South Florida; Co-Coordinator**

*PIs*      *USF: Steve Polzin, Xuehao Chu, Jodi Godfrey*  
              *UT: Shashi Nambisan, Chris Cherry*  
              *UA: Steven Jones, Luana Ozelim, Randy Smith (UA Center for Advanced Public Safety)*

The southeastern US has the highest roadway incident and injury rates in the country. While this disparity in roadway safety has been explored numerous times, these studies most often investigate the physical design characteristics of the transportation infrastructure. Some studies focus on the weather, government policies (e.g., speed limits, seat belt law), and the role of human factors in designing the infrastructure or vehicles. When socio-demographic characteristics are considered, they are typically limited to gender, age, and race or ethnicity. The results have not provided a comprehensive picture or convincing explanation for regional safety performance differences. The research effort underway with this initiative expands this limited set of characteristics to include socio-demographic characteristics, risk-taking and health characteristics, land use patterns, and other measures that consider the culture and values of the population as potential explanatory factors. Specific projects now underway

include the determination of the extent to which population characteristics might explain differential safety performance (dataset development and comprehensive analysis). Research work includes a special focus on motorcycles and heavy vehicle safety. Multiple papers are in various stages of submission and review that includes publication in a major peer reviewed journal.

## **USF**

As part of MRI 3, we explored differential safety performance across states and regions in several ways during this period:

We examined the differential safety performance between the Southeastern region and other regions as well as how this difference varies over time and across travel conditions and socio-demographic groups. Socio-demographic groups were defined by person age, gender, and race and ethnicity. Travel conditions include the day of week and time of day for crashes and the functional classification of roadways. Safety performance was measured in terms of fatalities per person hour traveled for examining differences across socio-demographic groups and time periods for a single year of 2009 because of the need of using the 2009 NHTS for exposure measurement but in terms of fatalities per VMT for examining differences across functional class for the period from 1994 to 2013. The time-based fatality rate in 2009 was higher in the Southeastern region than other regions as a whole for each gender-age group, each day of week and time of day combination, and every combination of gender and race-ethnicity. Again, the VMT-based fatality rate throughout the 1994-2013 period was consistently higher in the Southeastern region than in other regions for various functional classes, particularly in rural areas.

Instead of comparing traffic mortality rates (fatalities per capita) or traffic fatality rates (fatalities per unit of exposure), further insights may be gained from decomposing these rates and comparing each component. Specifically:

Mortality rate = product of fatality rate (=fatalities per VMT) and per capita VMT (=VMT per person)

Fatality rate = product of

- involvement risk (=injury crashes per VMT)
- injury risk (=injuries per injury crash)
- death risk (=fatalities per injury of any severity)

This decomposition approach was applied to individual states as well as the Southeastern region versus other regions for the combined 3-year period of 2007 to 2009. The results from the regional analysis showed that Southeastern Region's higher mortality rate during the 2007-2009 period resulted from its 21% higher per capita exposure and 31% higher fatality rate than



other regions and that Southeastern Region's higher fatality rate resulted from its 23% higher involvement risk, 7% higher injury risk, and 1% lower risk of death.

We developed a mathematical relationship to attribute the overall difference in the fatality rate between the Southeastern region and other regions to each of the travel segments defined by one or two variables. This analysis was applied to 2009 data with exposure measured from the 2009 NHTS for the socio-demographic factors and travel conditions used in earlier analyses. This analysis was also applied to the 20-year period from 1994 through 2013 with one result indicating that almost 80% of the overall elevation in VMT-based fatality rate for the Southeastern Region over other regions can be attributed to non-limited-access facilities in rural areas.

Using the combined data for the 2007-2009 period, we expanded the limited regression analysis in the completed thesis during the previous reporting period to include a broader set of control variables (e.g., population density, traffic density, weather, economic conditions, exposure to visitors, etc.), additional variables on general risk-taking a behavior (e.g., per-capita crimes), separate analyses of fatality rates (e.g., involvement risk, injury risk, and death risk), and the use of a dummy variable for the Southeastern region. In addition to the set of general risk-taking behavioral factors, the other explanatory variables were grouped into several categories: land use and system conditions, weather, and socio-demographics. When each category was added separately, the coefficient for the Southeastern dummy stayed significant both in its magnitude and its statistical significance when system features or weather features were controlled. The coefficient for the Southeastern dummy, however, essentially disappeared when either the socio-demographic factors or the general risk-taking behavioral variables were controlled.

## **UT**

The southeastern US has the highest roadway incident and injury rates in the country. While this disparity in roadway safety has been explored numerous times, these studies most often investigate the physical design characteristics of the transportation infrastructure. Some studies focus on the weather, government policies (e.g., speed limits, seat belt law), and the role of human factors in designing the infrastructure or vehicles. When socio-demographic characteristics are considered, they are typically limited to gender, age, and race or ethnicity. The results have not provided a comprehensive picture or convincing explanation for regional safety performance differences.

The research effort underway with this MRI 3 expands this limited set of characteristics to include socio-demographic characteristics, risk-taking and health characteristics, land use patterns, and other measures that consider the culture and values of the population as potential explanatory factors. Specific projects now underway include the determination of the extent to which population characteristics might explain differential safety performance (dataset development and comprehensive analysis). Research work includes a special focus on motorcycles and heavy vehicle safety.



## **MRI 4. Big Data for Safety Monitoring, Assessment, and Improvement** **Asad Khattak, University of Tennessee, Coordinator**

*PIs UT: Asad Khattak, Lee Han, Shashi Nambisan*

*UA: Steven Jones, Luana Ozelim, Randy Smith (UA Center for Advanced Public Safety)*

*UK: Mei Chen, Reg Souleyrette, Brian Gibson*

Emerging sensor and communication technologies have made traffic, mobility, safety, and other information available ubiquitously and in real-time with appreciable temporal resolution and spatial accuracy. Some of the real time and dynamic data come from infrastructural investments by government agencies for traditional traffic monitoring (e.g., in-road loops and RTMS sensors), some come from private enterprises for logistical operations (e.g., RFID), and still other data come from crowd-sourced personal electronics (e.g., smartphone and Bluetooth equipped units). All these and other increasingly available data can be collected, fused, and mined to help monitor, assess, and improve transportation safety in real-time as well as after the fact. Along with the potential benefits of big data come issues related to large data volumes, high data velocities, varied data types and formats, and the veracity of the data's accuracy and reliability, thus making big data and the proactive applications that rely upon it vulnerable to interruption, overload, and misuse. Projects within this initiative are: assessing/ investigating data sources and scenarios for how different data types can contribute to improving safety; macroscopic safety analysis and real-time crash risk analysis (including pedestrians); analyzed real-time travel time data quality collected from license plate readers, Bluetooth readers, probe vehicles, INRIX database, NAVTEQ, Remote Traffic Microwave Sensors (RTMS). Projects have already resulted in several research papers and presentations at the Transportation Research Board Annual meeting in Washington, D.C.

UT's task in MRI 4 is to develop innovative programs to monitor, assess and improve safety using big data. To achieve this, we will provide a framework to plan, design, operate and maintain data intensive safety systems that can enhance safety by using historical and real-time data from several sources. Our current objective is to inventory and assess the expanding array of safety-related data and sources, and investigate scenarios for how different types of data can contribute to improving transportation safety. Activities during this period included developing integration methods for Big Data with traditional data, and developing a method to identify vulnerable/hotspots.

Within MRI 4, UK's task is developing an integrated framework for safety and mobility analysis; during this reporting period, the work has focused on developing methods to integrate Big Data with traditional data sources. Continuous traffic monitoring data from fixed location sensors have been obtained along with the incident log. The team is using a program to retrieve a live stream of the sensor data at two-minute increment. Data quality screening criteria are being reviewed and tested. Preliminary analysis has demonstrated how to use the data to quantify the impact of incidents through cumulative density function of corridor travel time. The team also started to develop and test methods to fuse data from various sources.

## Opportunity and Exploratory (O&E) Grants

O&E grants provide individuals or small groups of faculty and students the opportunity to engage in relevant safety-related research within their areas of interest and expertise. O&E Grants are designed to provide seed-funding to explore new and emerging concepts, technologies, and methods with promising safety enhancement applications. All O&E Grants are competitively awarded, and typically each grant will be performed at one university with single-source or in-kind matching funds.

### 2014 O&E Projects

Final reports for the 2014 O&E projects have been submitted during this reporting period. Links to each project's description and final reports are online at [http://stc.utk.edu/STCresearch/oe\\_research.html](http://stc.utk.edu/STCresearch/oe_research.html).

The 2014 O&E Project titles and PIs are:

Automated Traffic Surveillance from an Aerial Camera Array	Clemson	Wayne Sarasua
Intervention Strategies for Unsafe Cell Phone Usage Among Teen Drivers	NCA&T	Maranda McBride
Evaluating the Wrong-Way Driving Incidents Problem on the Florida's Turnpike Enterprise Roadway System	UCF	Haitham Al-Deek
Development and Evaluation of Coordinated Traffic Signal Emergency Preemption System	UK	Adam Kirk
Promoting Safe Transportation Among Older Drivers: Risk Assessment via Driving Simulator Technology	USF	Jerri D. Edwards
New technologies and bicycle safety	UT	Chris Cherry
Utilizing Assistive Technology to Remove Communication Barriers in the Public Transportation System for Passengers with Disabilities	UT	Rupy Sawhney

### 2016 O&E Projects

During this reporting period, a competitive RFP solicitation for new O&E grants was completed. This solicitation specifically targeted projects addressing the safety implications of CAVs, CI and other advanced technologies, as well as projects addressing transportation security needs and deficient areas. A review of Proposals, involving both internal and external reviewer was completed in February, and in March, the new O&E projects selected for 2016 were announced. These projects, along with the university and P.I.(s) performing the research, are listed below:

1. Connected and Automated Vehicles: What are the implications of partial adoption?  
University of Tennessee, Asad Khattak
2. Evaluating the potential of connected vehicles in combating wrong-way driving  
University of Central Florida, Haitham Al-Deek
3. Big Data Analytics for connected vehicle data infrastructure resilience  
Clemson University, Mashrur Chowdhury
4. Development of safety performance indices in a connected vehicle environment  
University of Kentucky, Adam Kirk
5. Development of a security platform for vehicle to infrastructure network  
Clemson University, Mashrur Chowdhury

Task-orders for performing these new projects were generated and are in various stages of execution. The first of these projects, at UT, is already underway, and a description of this project is included below.

### **UT 2016 O&E: Connected and Automated vehicles: What are the implications of partial adoption?**

With increasing attention focused on connected and automated vehicles (CAVs), this study will explore the opportunities and challenges associated with the adoption and use of such systems. CAVs represent the opportunity to greatly enhance safety, and reduce both congestion and emissions. Adoption of new technologies is often messy, even if they follow the familiar S-shaped adoption curve. Among the challenges is how will partial adoption of automated technologies, characterized by levels 0 to 5, work in a transportation network? We will develop simulations to help us understand the impacts of CAVs in transportation networks. Specifically, our research will focus on developing network simulations and algorithms to understand how variations in driving control will impact safety and congestion. Specifically, this exploratory study will use novel tools to understand the implications of partial automation on the traffic network performance. This problem is made complex by the unpredictable nature of partial automation, where humans have different levels of involvement. The study will account for traveler behavior under various automation scenarios and model the traffic flows at nodes in a network (merging facilities and intersections). In particular, the study will develop simulations and algorithms to better understand how variations in driving control will impact safety and congestion.

### **Other STC/UTC-Supported Research**

For this PPPR, one of our consortium members (UAB) reported on the academic-based research activities of some of their students who receive STC/UTC Grant funding support, even though the students' research is not directly linked to an STC-funded project. As is the case with many student research activities, they probably would go "unreported" and "uncredited" as a significant contribution made possible by the UTC Grant Program. So, beginning with this PPPR, the STC will begin reporting on as many of these activities, which go on every semester at most, if not all, of our member universities, as we can identify. This first group of student



research activities were all at UAB, and we credit our UAB colleagues for “jump-starting a no-brainer” great idea!

Catherine Ritchey Fecanin has focused on the development of a new approach to crash energy management. The new method is based on the concept that every crash energy management problem has a characteristic period that determines the minimum duration of an impact that must be obtained if the safety device is to provide measurable reductions in risks. The overall objective of this research is to demonstrate the importance of the characteristic duration in the design of safety devices and to develop a method for its calculation in any given impact scenario. Successful completion of this study will allow developers to rapidly zero in on energy management systems that can provide protection for humans. The study will verify characteristic periods for highway safety features and demonstrate methods for calculating this parameter. Ultimately this research will lead to development better performing highway safety products that cost less than conventional systems.

Joseph Swertz is focusing on the evaluation of crash cushion and guardrail terminal systems that can provide both improved safety performance and reduced restoration costs. The study is focused on correlating crash test safety performance with on road crash experience. If successful, the study will help highway engineers determine the expected repair costs and safety performance of roadside features based upon crash test results.

Andrew Dameron has been attempting to develop a retrofit for UAB’s drop tower test system that will allow its use in the development of highway safety products. The study will identify creative methods for scaling energy management systems for evaluating full-scale performance using low cost models. This study should help control the high costs of energy management systems.

## **Education & Workforce Development Accomplished under Program Goals**

### **DeAnna Flinchum & Shashi Nambisan, Co-Directors University of Tennessee, Knoxville**

STC supports students and student enrichment activities at all nine member universities. We also have developed and support a number of innovative workforce development initiatives, some of which are led by UT as the STC lead university, and others are led by various STC member universities. The following section presents a summary of STC education and workforce development activities and accomplishments during the current reporting period.

#### ***STC Education/Workforce Development Philosophy***

The high value of STC’s education program is achieved through experiential learning, student research opportunities, and inspired teaching. One result is the great number of gifted graduates who make significant contributions to the regional and national transportation workforce.



Another result of STC's extensive continuing education, outreach, and continuing education activities is a more safety-conscious transportation workforce.

From middle school students to seasoned professionals, STC develops and executes programs for graduate and undergraduate education, workforce development, and continuing education. STC supports courses offered by the Traffic Signal Academy, Tennessee Academy of Transportation Engineering, and Tennessee Transportation Assistance Program.

We help the transportation sector improve its existing workforce while we develop the next generation of educators, professionals, technical specialists, and practitioners who will create and sustain our nation's safe transportation systems.

### ***The STC Student Spotlight Event***

Since 2008, former and current students, faculty, researchers, and friends of the Southeastern Transportation Center have gathered at TRB to acknowledge and celebrate our students. This year's TRB Student Spotlight Event was held on the Sunday evening at the beginning of TRB week. It featured the 3-Minute Thesis Competition (3MT), an engaging, rapid-fire display of student research and presentation skills. 3MT challenges participants to present their research in just 180 seconds and with one slide, in a way that can be understood by an audience with no background in the research area. This exercise develops presentation, research, and academic communication skills and develops a student's capacity to explain his or her work effectively.

STC judges had the difficult task of choosing a winning thesis presentation from among an outstanding group of presenters. Ultimately, NCAT's Kierra McCall won first place for *Creating a Product Delivery Contingency Plan to Ensure Business Continuity*.

The 2016 Student Spotlight was also a forum to recognize notable student accomplishments in 2015, and announce those preparing to make presentations at the 2016 TRB Annual Meeting. An important highlight was the presentation of the 2015 Outstanding Student of the Year, Daniel Oldham of North Carolina A&T State University. The Student Spotlight Event Program is included as an Exhibit to this PPPR. It includes the impressive listing of student honorees. This year's edition of the STC Student Spotlight Event was attended by over 80 students, faculty and staff representing all 9 STC schools, as well as several former STC students and "friends of the STC."

The Student Spotlight Event is the one time of the year that the entire STC family – faculty, researchers, undergraduate and graduate students, post-docs and staff - gather to get re-acquainted and to share the special opportunities and experiences made possible by the STC/UTC Grant. Most (and hopefully all) of the attendees leave this event with the appreciation that they are part of something very special, and part of something much larger than the transportation program at their individual universities!

## ***Summary of Activities and Accomplishments***

As noted previously, all nine STC schools receive education funding support on an annual basis, and many are directly involved in STC work force development initiatives as well. Below are some of the education/work force development highlights for this reporting period. You will note that we encourage flexibility and diversity in how STC education/work force development funds are used. The highlights are presented and discussed by university; however, we can brag that they are all STC activities, made possible and/or made better by the STC!

### ***UT***

With support from the STC, a course on intelligent transportation systems covering safety aspects of connected and automated vehicles was offered by Dr. Khattak during Fall 2015, with 10 graduate students. A total of 4 courses were offered in Spring 2016 as part of the transportation curriculum in Civil & Environmental Engineering, with special safety content developed through the STC that included the safety aspects of planning, design, and operations.

The STC teamed with the UT Civil & Environmental Engineering Department to jointly sponsored speaker series and webinars during the reporting period of 2016. Among the speakers was Dr. C. Michael Walton, Member National Academies, who spoke about connected and automated vehicles.

Six UT graduate students received STC stipends during the reporting period. In addition, nine new students were recruited successfully for Fall 2015, with the help of STC faculty and researchers. The existing students and the newly recruited students are performing well and their activities, along with activities of other graduate students, are documented in the UT Institute of Transportation Engineers (ITE) student chapter annual report, available online. It should be noted that the STC regularly provides student travel support and program content for the UT ITE Student Chapter. The partnership between the STC and ITE student chapters (and other student organizations) at all of our member universities is very beneficial for all parties involved.

Substantial effort was devoted to preparing and presenting research papers at the 2016 Transportation Research Board Annual meeting. UT students and faculty presented 18 technical papers, with about 12 focusing on transportation safety issues with STC support.

Dr. Shashi Nambisan is partnering with the Office of Diversity Programs, College of Engineering to conduct eVol9, a weeklong program for 9th Grade Students, as part of the 2016 Summer Pre-College Program. The STC is a major partner in this initiative. The program is titled “Experiments in Transportation: Speed, Distance, Volume, Mass, Acceleration, Braking - So What?” Two UT graduate students are providing support. In addition, Dr. Nambisan is organizing Transportation Systems STEM Summer Academy for Teachers. This program will have participation of more than a dozen selected school teachers in Eastern Tennessee. The program will include a brief “in-class” overviews of transportation systems, logistics and supply chain management, followed by “Site” or “Field” visits to a variety of real-life settings. Our



educations activities with the National Science Foundation funded CURENT (Center for Ultra-Wide-Area Resilient Electric Energy Transmission Network) center are also continuing.

STC sponsored travel for 32 UT students and scholars to attend and present technical papers at the 2016 TRB annual meeting in Washington, D.C. The following UT students won awards during this reporting period:

- Kwaku Boyake: Lifesavers Conference Traffic Safety Scholarship Award
- Behram Wali: President of Pakistan Gold Medal Award for Outstanding Graduate
- Bumjoon Bae: ITSTN Student Scholarship 2015 and the Frank Richter AARS Scholarship
- Jianjiang Yang: Transportation Research Forum Best Paper (Int'l)
- Ebony Lemmons: Engineering VOLunteers for Ninth Graders (eVOL9) Recognition Award
- Kwaku Boakye, Kristina King, Ziwen Ling, Hunter McCracken, Luis Taboada: Tennessee Section Institute of Transportation Engineers (TSITE) Scholarships 2015
- Kristina King: 2015 TSITE Undergraduate Scholarship
- Jun Liu, Jianjiang Yang, Hyeonsup Lim: Tennessee Section Institute of Transportation Engineers (TSITE) Student Paper Awards 2015
- Ziwen Ling: Helene M. Overly Memorial Scholarship by Women's Transportation Seminar Central Virginia Chapter
- Ziwen Ling: 2016 Chancellor's Award for Professional Promise
- Alexandra Boggs, Hyeonsup Lim: University of Tennessee Chancellor Fellowship
- UT Traffic Bowl Team: 1st Place in TSITE Traffic Bowl

### **HSRC**

Between October 1, 2015, and March 31, 2016, HSRC held meetings with a team of instructional designers to make updates to the Road Safety 101 course modules that are being developed with invited STC input and partial funding support. These recommended updates were based upon a course assessment conducted during the prior period by Reify Media, and the same consultant team began working with HSRC team members to develop revised course material. In addition to revisions to PowerPoint slides and other lecture materials, the team developed activities and exercises to reinforce course concepts. On March 2, a news release was circulated to the HSRC mailing list to recruit students for the upcoming course. A total of 46 applications were received within 10 days, and 20 of these were selected by the HSRC team to be enrolled in the course.

### **NCAT**

During this period, NCAT completed the application process for the STC Education Award for the 2016-17 academic year. The successful applicants will receive research mentorship, internship opportunities, and opportunities to engage in experiential learning activities such as





the Transportation Research Board Meeting. Additionally, two students have been selected to participate in the TRB Minority Student Transportation Research program. They are Lacy Evans, a Transportation and Supply Chain major, and Daniel Folley, a Civil Engineering major. These students will write a transportation research paper over the summer on the topic of their choosing, which will be presented at the 2017 TRB meeting. Each student will be mentored by a faculty member throughout the writing process. Those faculty members are Dr. Laquanda Leaven, Assistant Professor of Transportation and Supply Chain, and Dr. Elli Fini, Associate Professor of Civil Engineering.

NCAT students participated in the 2016 TRB meeting and the STC Student Spotlight Event held at the TRB meeting. Daniel Oldham, an NCAT student and graduate, was selected to be the STC Outstanding Student of the Year for the Region 4 UTC, and Kierra McCall won the 3 Minute Thesis Competition. Other NCA&T students were cited for Noteworthy Student Accomplishments and Student TRB Presenters. Additionally, students attended the 2016 UTC Spring Research Conference hosted by the STC in Knoxville, TN.

## UA

This year, UA's STC funding was supplemented by National Summer Transportation Institute (NSTI) funding from USDOT. The Institute's purpose is to introduce high school students to careers in transportation, and strengthen their competency in STEM subjects. Topics and activities include:

- Transportation safety in Alabama
- Field trips to a lock and dam, a barge towing company, the UA transit system, a rock quarry, an asphalt manufacturing plant, and a regional airport
- Making concrete cylinders
- Speakers concerning careers in water, air, highway, and transit transportation programs
- Free-flow speed measurement using radar guns
- Computer bridge design
- University life
- 3-D printing lab tour
- Culminating banquet (with families)

## UK

UK devotes its STC education funding to select, engage, and support graduate students in safety research, and to support outreach to undergraduate and high school teachers and students, with the goal of attracting more bright students into transportation career paths. During this reporting period, we selected three graduate students to work on STC research projects. In addition, we have graduate students and one high school student engaged in supporting other safety research, which is integrated with our STC safety research projects



## Technology Transfer Accomplished under Program Goals

### Steven Jones, Director, University of Alabama

The STC accomplishes technology transfer through a number of mechanisms and approaches. All of our research activities – MRIs and O/E projects – have a planned technology transfer component built into the activity from the onset. T2 products are required in each case including journal article submission, technical reports, patents/copy-rights, implementation plans, etc., as appropriate. The STC also participates/host regional, national and even international conferences which promote technology transfer. One such conference, on a major international scale, was held this reporting period, as discussed below. STC universities have also moved research results into practice through partnerships with state DOTs, local governments, private enterprise, and non-profits. These partnerships have led to improved pedestrian, bicycle, and motorcycle safety; the creation of safety coalitions across sectors; and improved nighttime road visibility. Results of research have helped lawmakers and stakeholders create transportation policies, guidelines, standards, and specifications.

Highlights of particular STC T2 activities during the current reporting period are presented below.

#### *Conferences*

On October 6–8, 2015, the STC, UCF and UT hosted the 2015 Road Safety & Simulation International Conference. Under an umbrella arrangement facilitated by the STC, three world-class research centers supported the conference: Center for Advanced Transportation Systems Simulation, and the Institute for Simulation and Training at UCF; and UT’s Center for Transportation Research.

The STC also organized and hosted the 2016 UTC Conference for the Southeastern Region, March 31-April 1, 2016 in Knoxville, Tennessee. The conference theme was Safety, Mobility & Sustainability. This innovative conference brought together faculty, students, practitioners, and public agencies in the southeast to showcase recent achievements and collaborations. The program was a fast-paced and engaging opportunity to share where we've been and where we're going in transportation research, education, and tech transfer. STC students made several podium and poster presentations.

Conference speakers included TDOT Commissioner John Schroer; Paul Trombino III, AASHTO President and Iowa DOT Director; Peter Kelle of LSU, who gave the Cross-Cutting Session, Performance Measurement and Simulation of Intermodal Freight Transportation. Jurek Grabowski, Director of Research for the AAA Foundation, delivered the final keynote address about older driver safety and the impending “Silver Tsunami” that is currently hitting our roads. During the conference, STC demonstrated its “Seatbelt Convincer” program while Dr. S. Chakraborty displayed and discussed his instrumented Hummer used for driving data acquisition.

## Partnerships

One way that the STC has advanced technology transfer is through the support and facilitation of partnerships. Two great examples of such partnerships, that were active during the current reporting period are identified and discussed below:

A partnership, facilitated with STC research funding, between USF's CUTR and Florida DOT has resulted in the Advanced Lighting Measurement Systems, used to measure street lighting levels for more than 300 centerline miles, improving nighttime safety for road users. The research results and findings from the "Landscaping of Highway Medians at Intersections" were used by FDOT to revise the Florida Standard Index 546 – Sight Distance at Intersections, and provide training.

NCAT's Dr. Laquanda Leaven continues to work with the Knox County, Tennessee School System and the University of Tennessee, Knoxville on the Garrett A. Morgan Technology and Transportation Education Program Clearinghouse. She has completed "When will I ever use this" stories for high school students in math and science courses that relate to supply chain and transportation. These stories show how the math and science concepts learned in high school can be applied in supply chain and transportation careers. Dr. Leaven is also researching school websites for the 50 states to determine what transportation and supply chain courses are required for high school students. This research will include phone interviews with the 50 state directors for the Career and Technical Education (CTE) transportation/supply chain cluster.

### **c. Have the results been disseminated? If so, in what way(s)?**

STC helps researchers identify transferable products as outcomes of every research project. To showcase research results, we employ

- peer reviewed journals and academic publications;
- technical papers, posters, and conference presentations;
- information exchanges, blogs, and social media campaigns;
- intellectual property and patent applications;
- distance learning, webinars, and annual conferences; and
- research-based technical assistance to transportation professionals.

An example of our technology transfer success is the STC-funded project at Clemson that recently produced three patents: Speed Sentinel: Real-Time Crash Risk and Citation Probability Display System; Real-Time, Revealed-Risk Insurance Pricing; and Computer Vision Algorithm to Monitor Highway Traffic. A similar example is STC-funded research at UCF which generated three products currently under patent review by the university's Technology Transfer Office: Pedestrian Safety Prioritization Tool (PSPT); Decision Support System for Flashing Yellow Arrow Signals (FYA DSS); and Microscopic Transportation Emissions Model (Micro-TEM).



NCAT has presented the results from the Teen Texting While Driving O&E project at several conferences during this reporting period:

- Exploring Protection Motivation Theory in the Public Sector: Should Government Agencies Develop Personalized Highway Safety Campaigns? 2015 Pre-ICIS Workshop on Public Sector Information Systems: Service, Governance, and Citizen Engagement Challenges, Fort Worth, Texas, Dec 13-16, 2015.
- Distracted driving: How individual differences influence youth texting while driving behavior. Transportation Research Board (TRB) 2016 Annual Meeting, Washington, DC, Jan 10-14, 2016.
- *Psychosocial factors related to distracted driving among teens: New and emerging trends.* 2016 University Transportation Center (UTC) Conference for the Southeast Region, Knoxville, Tennessee, Mar 31-Apr 1, 2016.
- Texting while driving among teens: Exploring user perceptions to identify policy recommendations. Digital Government Society (dg.o 2016) Conference, Jun 8-10, 2016, Shanghai, China.

Another conference paper, *Teen texting while driving: Factors influencing this epidemic behavior*, has been accepted by the Human Factors and Ergonomic Society 2016 Annual Meeting committee and is scheduled to be presented on September 21, 2016. In addition, a journal article titled *Integrating the Theory of Planned Behavior and Psychosocial Factors to Explore Texting among Adolescent Drivers in the US* was submitted to the Journal of the Association for Information Systems and is currently under review.

STC universities provide continuing education and technical assistance to transportation practitioners through on-site technical assistance, training courses and workshops, and certification programs. Topics range from Work Zone Safety to Writing Skills for Transportation Professionals. For example, UK's Traffic and Safety Academy and Horizontal Curve Alignment training courses are freely available to all local governments. UK has also operated the Safety Circuit Rider Program (SCRCP) funded by the Kentucky Division of the Federal Highway Administration. SCRCP offers safety-related information, training, and support to agencies tasked with overseeing local roadway safety. UK identifies locations with high crash rates and helps local governments identify and implement economical safety improvements. SCRCP helps communities across Kentucky to save lives.

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

The STC has a comprehensive slate of activities and initiatives already in place and underway that will continue, as outlined in our approved plan. There will be no significant changes to the agency-approved plan. Individual STC partner schools will further their established goals and objectives in the following ways:

## **UT**

### ***Research:***

The transportation faculty will continue to work on the STC MRIs research initiatives that relate to the Highway Safety Manual, safety simulations, big data/connected & automated vehicle applications in safety, new technologies, pedestrian and bicycle issues and the role of socio-demographics in safety. We will also focus our work in the next period on safety implications of connected and automated vehicles, through the start-up of new O/E projects targeting this area.

### ***Education:***

Transportation faculty in Civil & Environmental Engineering have worked with STC to recruit nine exceptional students who have strong interests in safety to the UT program; we will mentor these students in the coming months and work with them to present research results at TRB and other conferences. Transportation faculty at UT will continue the transportation seminar series, with speaker presentations available online. A dedicated transportation safety course will be offered in Fall 2016.

Dr. Shashi Nambisan, Department of Civil and Environmental Engineering, will continue his efforts with the College of Engineering's Office of Diversity Programs. Dr. Nambisan will also continue his partnership with Dr. Jennifer Richards (Education and Curriculum Development specialist) on STEM teaching training and curriculum development efforts.

### ***Outreach:***

In line with USDOT priorities, the UT faculty will continue to work on safety aspects of connected and automated vehicles, and pedestrian and bicycle transportation issues, focusing on technical safety issues. We will coordinate our efforts with consortium partners and seek new partners and sponsors.

International links will be further strengthened with universities in Asia, Europe, and Australia.

The Transportation Engineering & Science Program website will continue to provide up-to-date information about research, education, and outreach activities of the UT faculty.

The faculty at University of Tennessee will work to further strengthen the Journal of Safety and Security. It has already seen very good growth in technical paper submissions and a special issue on railroad grade crossing safety is nearly complete. Our aim is to have the journal listed in the Science Citation Index.

## **HSRC**

### **Research:**

HSRC plans to continue work in the area of crash modification factors and functions in MRI 1. The goal of the Year 2 effort is to compare the performance of cross-sectional regression models that make use of propensity scores with the results from before-after studies. The goal is to use data sets that allow both methods to be applied and compared.

### **Education:**

During the next reporting period (April 1 – September 30), HSRC and Reify will finalize all course materials and begin delivering the course. Road Safety 101 will consist of seven instructor-led web sessions, beginning on May 12 and concluding on June 23. Student progress and feedback will be tracked during the course, and a summary of the course will be prepared. HSRC staff plan to present the course outcomes to the TRB Highway Safety Workforce Development Committee during that group's mid-year meeting on August 15.

## **NCAT**

### **Research:**

These are the conferences and journals targeted for the next reporting period to disseminate the TWD study results.

- Human Factors and Ergonomics Conference (presentation and paper)
- Transportation Research – Part F (paper)
- Human Factors Journal (paper)

### **Workforce Development and Outreach:**

The STI program will run from June 29<sup>th</sup> to August 5<sup>th</sup>. Participants will engage in various activities including lectures in transportation-related topics, site visits to transportation companies or organizations, and transportation projects.

## **UCF**

### **Research:**

The next step for MRI 2 is to conduct the experiment in the driving simulator; the goal is to analyze the driving simulator data and find out if potential factors are related to pedestrian safety. There will be no change to the agency-approved plan for MRI4. In the next reporting period, one objective will be accomplished: Real-time safety evaluation for various crash types. The O&E draft final report was submitted to STC in March.

## **UK**

### **Research:**

In management of the Major Research Initiatives, UK will work with MRI Coordinators to assess progress on Year 2/3 work plans for all MRI sub-projects; assist with MRI strategy and research project investments for future years; and coordinate all MRI-1 Crash Modification Factors sub-projects.

For MRI-1 Crash Modification Factors, we will issue STC report for year 1 work and participate in technology transfer activities; initiate expanded activity on year 2/3 work plan; and continue investigation of non-engineering factors that may have an effect on crash occurrences.

For MRI-2 Simulation, we will initiate activity on year 2/3 work plan; continue to evaluate/revise preliminary models based on initial simulations and crash data; and continue to develop papers and presentations based on research findings.

For MRI-4 Big Data, we will initiate activity on year 2/3 work plan; continue to review data sources; simulate connected vehicle operating data; and continue to develop papers and presentations based on research findings.

We will initiate the research activity on the O&E project, Framework for High Crash Risk Locations in a Connected Vehicle Environment

### **Education:**

We will identify and select graduate students to support with partial funding to work on safety research projects (for second/third year of STC funding), and continue to mentor graduate students interested in highway safety issues.

## **USF**

For MRI 3, we plan to develop a panel dataset of individual states over the 14-year period of 2001-2014 for a number of data crash outcomes (e.g., fatalities by person type, fatal crashes), a range of potential general risk-taking behavioral factors, and several sets of potential explanatory variables as control. These potential explanatory variables would greatly expand what were used in the exploratory regression analyses described earlier, including availability of medical facilities (community hospitals), traffic laws, composition of the vehicle fleet (e.g., share of light trucks), distribution of population density, roadway lane miles by functional class, traffic density by functional class, roadway width by functional class, lane width by functional class, mental health, etc. We then plan to conduct panel data regression analysis to isolate the role of the general risk-taking behavioral factors in the differential safety performance between the Southeastern region and other regions. This panel-data approach has several advantages over a single cross section approach, including a much larger sample size and the ability to control for state-specific features that are constant over time but are not explicitly measured by the available variables.



The subsequent period will include the production of a technical memorandum that will provide material for subsequent journal articles and professional presentations.

## **2. Products: What has the program produced?**

### **a. Publications, conference papers, and presentations**

During this reporting period, STC produced 48 publications, conference papers, and presentations based on our research. A listing of these publications, by university, is presented below:

#### **UT**

Technical papers presented at conferences during reporting period:

- Khattak A., *The Role of Connected and Automated Vehicles: How can urban areas use the data they create?* Seminar presentation at National Center for Transportation Systems Productivity and Management, Civil Engineering Department, Georgia Institute of Technology, March 2016.
- What Role Do Pre-Crash Driver Actions Play in Work Zone Crashes? Application of Hierarchical Models to Crash Data - 16-1587 by Jun Liu, Asad Khattak, Meng Zhang.
- Migrating Toward Using Electric Vehicle on Campus-Proposed Method for Fleet Optimization - 16-1703, Taekwan Yoon, Christopher Cherry, Megan Ryerson, John Bell.
- Modeling Traffic Incident Duration Using Quantile Regression - 16-4235, Asad Khattak, Jun Liu, Behram Wali, Xiaobing Li, ManWo Ng.
- A Spatial-Temporal Approach for High Resolution Traffic Flow Imputation - 16-1404, JJ Yang, Lee Han, Shih-Miao Chin, Ho-Ling Hwang.
- Modeling Route Choice of Bikeshare Users with GPS Data - 16-6150, Ranjit Khatri, Christopher Cherry, Shashi Nambisan, Lee Han.
- An Overview and Preliminary Assessment of a Summer Transportation Experiential Learning Program for Ninth Graders - 16-3597, Shashi Nambisan, Kwaku Boakye, Ebony Lemons
- Impacts of HOV Violations: Simulation-Based Study in Tennessee - 16-0398, JJ Yang, Lee Han, Stephanie Hargrove.
- Empirical Study of the Evaluation of Travel Speed Data Accuracy - 16-6786, Stephanie Hargrove, Hyeonsup Lim, Philip Freeze, Lee Han.
- Structuring and Integrating Data in Metropolitan Regions to Explore Multilevel Links Between Driving Volatility and Correlates - 16-0194, Jun Liu, Asad Khattak, Meng Zhang.
- Enhancement to Self-Learning License Plate Matching Algorithm: Derived Association Matrixes - 16-1587, Stephanie Hargrove, Hyeonsup Lim, Lee Han.
- The Impact of Narrow Lane on Safety of the Arterial Roads - 16-6703, Hyeonsup Lim, Lee Han, Asad Khattak.

- Exploring Multiple Eco-routing Guidance Strategies in a Commuting Corridor - 16-0033, Jorge Bandeira, Paulo Fernandes, Tania Fontes, Sergio Pereira, Asad Khattak, Margarida Coelho.
- Modifiable Temporal Unit Problem in Crash- Frequency Modeling - 16-6533, Bumjoon Bae, Changju Lee, Tae- Young Pak, Asad Khattak.
- Effects of Car-Truck Mix on Occurrences of Truck- Related Crashes - 16-1287, Chunjiao Dong, Mark Burton, Shashi Nambisan, Jian Sun.
- How On-Road Fuel Economy Varies with Vehicle Cumulative Mileage and Daily Use - 16-1586, David Greene, Jun Liu, Asad Khattak.
- A comparative study of passenger satisfaction with Bus Rapid Transit with and without awareness of travel information - 16-2895, Dan Wan, Camille Kamga, Jun Liu, Aaron Sugiura, Eric Beaton.
- Delivering Improved Alerts, Warnings, and Control Assistance Using Basic Safety Messages Transmitted Between Connected Vehicles - 16-0195. Jun Liu, Asad Khattak.
- Is There Evidence for a Gap Between On-road and Test-Cycle Fuel Economy? - 16-1579, David Greene, Asad Khattak, Jun Liu, Xin Wang, Janet Hopson, Richard Goeltz.

### HSRC

The following research reports were completed and submitted:

- Srinivasan, R. & Lan, B. (2016). *Estimation of Crash Modification Functions for Using Site Level Information from Results of Empirical Bayes Before-After Evaluations*, Draft Final Report, Submitted to Southeastern Transportation Center, January 2016.
- Smith, S. (2015). *Synthesis of countermeasure service life and crash severity costs user guide*. Washington, D.C.: Federal Highway Administration.  
[http://www.cmfclearinghouse.org/resources\\_servlifecrashcostguide.cfm](http://www.cmfclearinghouse.org/resources_servlifecrashcostguide.cfm)

### NCAT

The following conference papers were published during the reporting period:

- McBride, M., and Carter, L. (in press). "Teen texting while driving: Factors influencing this epidemic behavior." Proceedings of the Human Factors and Ergonomics Society 2016 International Annual Meeting.
- Carter, L., and McBride, M. (2016). "Texting while driving among teens: Exploring user perceptions to identify policy recommendations." Digital Government Society (dg.o 2016) Conference Proceedings.
- McBride, M. and Carter, L. (2016). "Distracted driving: How individual differences influence youth texting while driving behavior." Transportation Research Board (TRB) 2016 Annual Meeting Compendium.

The following conference presentations were made during the reporting period:

- "Exploring Protection Motivation Theory in the Public Sector: Should Government Agencies Develop Personalized Highway Safety Campaigns?" 2015 Pre-ICIS Workshop

on Public Sector Information Systems: Service, Governance, and Citizen Engagement Challenges, Fort Worth, Texas, Dec 13-16, 2015.

- “Distracted driving: How individual differences influence youth texting while driving behavior.” Transportation Research Board (TRB) 2016 Annual Meeting, Washington, DC, Jan 10-14, 2016.
- “Psychosocial factors related to distracted driving among teens: New and emerging trends.” 2016 University Transportation Center (UTC) Conference for the Southeast Region, Knoxville, Tennessee, Mar 31-Apr 1, 2016.
- “Texting while driving among teens: Exploring user perceptions to identify policy recommendations.” Digital Government Society (dg.o 2016) Conference, Jun 8-10, 2016, Shanghai, China.

## UA

The following conference papers were /presented/published during the reporting period:

- Lindly, J.K., “Transportation Institute for Underrepresented High School Students,” presented at the 2016 UTC Conference for the Southeastern Region, Knoxville, TN, March 31, 2016.

## UCF

The following conference papers were presented/published during the reporting period:

- Wu, J., Abou-Senna, H., Radwan, E., & Darius, B. (2015). Micro-simulation Application to Pedestrian Safety at Mid-Block Crossing. 2015 Road Safety & Simulation International Conference, Oct 6-8, 2015.
- Wu, J., Radwan, E. & Abou-Senna, H. (2016). Pedestrian-vehicle Conflict Analysis at Signalized Intersections Using Micro-simulation. 2016 UTC conference for the Southeastern Region, Mar 31 – April 1, 2016.
- Wu, J., Radwan, E. & Abou-Senna, H. (2016). Pedestrian-vehicle Conflict Analysis at Signalized Intersections Using Micro-simulation. Road Safety on Five Continents scheduled, May 17 – 19, 2016.

## UK

The following reports/conference papers were presented/prepared during the reporting period:

- Two papers were presented and published: Evaluation and Implementation of Highway Safety Manual Methodologies Using Benefit-Cost Analyses; Development of a Methodology to Improve the Identification of Median Crossover Crashes
- Two state program/project reports have been completed on HSM methodologies for Kentucky data

In addition to these reports, UK also completed the following documentation of other STC-funded research underway at UK, shown by funding category:

#### MRI 2 Integrated Simulation & Safety Research:

- Paper published -- Transportation Research Part C (Vol 55, pp486-495)
- RSS2015 Special Issue Article – Left Turn Guidance Based on Crossing Conflict Analysis
- Paper published –Advances in Transportation Studies (Vol. 2 pp 17-26; 2016)
- Paper published – Transport Research Arena Conference (Warsaw, 4/18-21/16)
- Master’s report (safety-based model development) and a master’s thesis (capacity-based model development) was completed
- STC report – Integrated Simulation and Safety: Signalized Left Turn Evaluation

#### MRI 4 Big Data Research:

- Three papers presented/published: Determining Reference Speed for Urban Arterials Using GPS-based Speed Data (TRB); An Effective Data Fusion Algorithm for Travel Time Reliability Applications; Feasibility of Using Crowdsourced Probe Vehicle Data for Urban Arterial Performance Monitoring
- STC report – Developing an Integrated Framework for Safety Mobility Analysis (Year 1 Final Report)

#### O&E Project Coordinated Emergency Vehicle Pre-emption Research:

- TRB paper published
- PTV Users Group presentation and paper
- STC report

#### **b. Journal publications:**

During this reporting period, STC produced 22 journal publications based on our research:

#### *UT*

- Liu J. & A. Khattak. Delivering improved alerts, warnings, and control assistance using basic safety messages transmitted between connected vehicles, Transportation Research, Part C, Volume 68, pp. 83–100, 2016.
- Khattak A., J. Liu, B. Wali, X. Li, & M. Ng, Modeling traffic incident duration using quantile regression, Transportation Research Record: Journal of the Transportation Research Board, 2554, Transportation Research Board, National Academies, Washington, D.C., 2016. DOI: 10.3141/2554-15.
- Liu J. B. Bartnick, S. Richards, & A. Khattak, Driver behavior at railway-highway grade crossings with passive traffic controls: A driving simulator study, Journal of Transportation Safety and Security, Volume 8, Supplement 1, 2016, pp. 37-55.
- Liu J., A. Khattak, & M. Zhang, What role do pre-crash driver actions play in work zone crashes? Application of hierarchical models to crash data, Transportation Research

Record: Journal of the Transportation Research Board, 2555, National Academies, Washington, D.C., pp. 1–11, 2016.

- Liu J., X. Wang, A. Khattak, J. Hu, J. Cui, J. Ma, How big data serves for freight safety management at highway-rail grade crossings? A spatial approach fused with path analysis, *Neurocomputing*, DOI: 10.1016/j.neucom.2015.08.098.
- Liu J., X. Wang, & A. Khattak, Customizing driving cycles to support vehicle purchase and use decisions: Fuel economy estimation for alternative fuel vehicle users, *Transportation Research, Part C*, Vol. 67, 2016, pp. 280–298.
- Bandeira J., D. Carvalho, A. Khattak, N. Roupail, P. Fernandes, T. Fontes, S. Pereira, & M. Coelho, Empirical assessment of route choice impact on emissions over different road types, traffic demands, and driving scenarios. *International Journal of Sustainable Transportation*, 10:3, 2016, pp. 271-283.
- Wang X., A. Khattak, J. Liu, & D. Clarke, Non-crossing rail-trespassing crashes in the past decade: a spatial approach to analysis of injury severity, *Safety Science*, Volume 82, February 2016, Pages 44–55.
- Liu, J., A. Khattak, S. Richards, & S. Nambisan, What are the differences in driver injury outcomes at highway-rail grade crossings? Untangling the role of pre-crash behaviors, *Accident Analysis & Prevention*, Volume 85, December 2015, pp. 157–169.
- Wang X., A. Khattak, J. Liu, G. Amoli, & S. Son, What is the level of volatility in instantaneous driving decisions? *Transportation Research Part C*, Volume 58, Part B, September 2015, pp. 413-427.
- Liu J., A. Khattak, X. Wang, The role of alternative fuel vehicles: Using behavioral and sensor data to model hierarchies in travel, *Transportation Research Part C*, 55, 2015, pp. 379-392.
- Khatri, R., C. Cherry, S. Nambisan, L. Han (2016) *Modeling route choice of bikeshare users with GPS data*. *Transportation Research Record: Journal of the Transportation Research Board*. 2587. 10.3141/2587-17.
- Ling, Z. C. Cherry, Y. Ni, K. Li (2015) *Pedestrian Level of Service at Signalized Intersections in China*. *Transportation Research Record: Journal of the Transportation Research Board*. 2519 pg 75-81. Doi: 10.3141/2519-09
- Fishman, E., C. Cherry (2015) *E-bikes in the mainstream: Reviewing a decade of research*. *Transport Reviews* doi: 10.1080/01441647.2015.1069907
- Langford, B.C., Chen, J.C. Cherry (2015) Risky riding: naturalistic methods comparing safety behavior from conventional bicycle riders and electric bike riders. *Accident Analysis and Prevention*, 82, 220-226.

## NCAT

- McBride, M., Carter, L., and Phillips, B. “Integrating the Theory of Planned Behavior and Psychosocial Factors to Explore Texting among Adolescent Drivers in the US.” Under review by the *Journal of the Association for Information Systems*.

## UCF

- Shi, Q., & Abdel-Aty, M., 2016. Evaluation of the Impact of Travel Time Reliability on Urban Expressway Traffic Safety. Accepted by Transportation Research Record: Journal of the Transportation Research Board, Accepted.
- Modeling the Risk of Wrong-Way Driving on Freeways and Toll Roads. Authors: John H. Rogers P.E., Haitham Al-Deek, Ph.D., P.E., Ahmad Alomari, Nizam Uddin, Ph.D., Eric Gordin, and Grady Carrick, Ph.D., accepted for publication in the Transportation Research Record: Journal of the Transportation Research Board, February 2016.
- A paper titled “Pedestrian-vehicle conflict analysis at signalized intersections using micro-simulation” has been submitted to the Accident Analysis and Prevention Journal, April, 2016.

## UK

- Paper published in Transportation Research Part C (Vol 55, pp486-495)
- RSS2015 Special Issue Article, *Left Turn Guidance Based on Crossing Conflict Analysis*
- Paper published in Advances in Transportation Studies (Vol. 2 pp 17-26; 2016)

### c. Books or other non-periodical, one-time publications

During this reporting period, STC produced three publications in this category based on our research:

## UT

- Ranjit Khatri, Master of Science, Modeling Route Choice of Utilitarian Bikeshare Users from GPS Data.
- Hunter McCracken, Master of Science, The Economic Implications of Evolving Aviation Funding Policy in Tennessee
- Luis Taboada, Master of Science, Non-residential Pedestrian Access to Transit Systems: A GIS Modeling Application.

### d. Other publications, conference papers, and presentations

During this reporting period, STC produced 11 publications, conference papers, and presentations based on our research:

## HSRC

- Hummer, J., Cunningham, C., Srinivasan, R., Warchol, S., Claros, B., Edara, P., & Sun, C. (2016, January). Safety evaluation of seven of the earliest diverging diamond interchanges Installed in the US. Presented to the 95th Annual Meeting of the Transportation Research Board, Washington, D.C.

- Srinivasan, R., Carter, D., & Lan, B. (2016, January). Interaction between horizontal and vertical alignment on rural two lane roads. Presented to the 95th Annual Meeting of the Transportation Research Board, Washington, D.C.
- Srinivasan, R., Carter, D., & Lan, B. (2016, March). Use of data from the SHRP2 naturalistic driving study to investigate driver performance in different horizontal and vertical curve combinations. Presented to the 2016 UTC Conference for the Southeastern Region, Knoxville, TN.
- Srinivasan, R., Colety, M., Bahar, G., Crowther, B., & Farmen, M. (2016, January). Estimation of calibration functions for predicting crashes on rural two lane roads in Arizona. Presented to the 95th Annual Meeting of the Transportation Research Board, Washington, DC.
- Srinivasan, R. & Lan, B. (2016, March). Development of Crash Modification Functions using data from empirical Bayes before-after studies. Presented to the 2016 UTC Conference for the Southeastern Region, Knoxville, TN.

### UCF

- Modeling the Risk of Wrong-Way Driving on Freeways and Toll Roads. Authors: John H. Rogers P.E., Haitham Al-Deek, Ph.D., P.E., Ahmad Alomari, Nizam Uddin, Ph.D., Eric Gordin, and Grady Carrick, Ph.D., presented at the Transportation Research Board, January 2016.
- Wrong Way Driving Multifactor Risk-Based Analysis for Florida Limited Access and Toll Facilities. Authors: John H. Rogers P.E., Adrian Sandt, Haitham Al-Deek, Ph.D., P.E., Ahmad Alomari, Nizam Uddin, Ph.D., Eric Gordin, P.E., Cristina Dos Santos, and Grady Carrick, Ph.D., presented at the Transportation Research Board, January 2015. This won the best paper award in freeway operations for the 2015.
- Modeling Driver Responses to Wrong-Way Driving Countermeasures through a Driver Survey and Countermeasure Implementation in Florida. Authors: Adrian Sandt, Haitham Al-Deek, Ph.D., P.E., John Rogers, P.E., Presented at the Transportation Research Board in January 2016.

### UK

- Transport Research Arena Conference (Warsaw, 4/18-21/16)
- Evaluation and Implementation of Highway Safety Manual Methodologies Using Benefit-Cost Analyses
- Development of a Methodology to Improve the Identification of Median Crossover Crashes

#### **e. Websites or other Internet sites**

STC's web address is <http://stc.utk.edu/>. No new websites were established during this period.

#### **f. Technologies or techniques**



Nothing to report.

### **g. Inventions, patent applications, or licenses**

UT has a patent application under review: “Device for level bicycle at-grade crossing of rail tracks.”

Clemson was recently awarded three patents: Speed Sentinel: Real-Time Crash Risk and Citation Probability Display System; Real-Time, Revealed-Risk Insurance Pricing; and Computer Vision Algorithm to Monitor Highway Traffic.

UCF has three products currently under patent review by the university’s Technology Transfer Office: Pedestrian Safety Prioritization Tool (PSPT); Decision Support System for Flashing Yellow Arrow Signals (FYA DSS); and Microscopic Transportation Emissions Model (Micro-TEM).

### **h. Other products**

UT faculty purchased in-vehicle, mobile, and roadside units for field testing in Connected and Automated Vehicles from ARADA Technologies. Traffic and incident data from INRIX and TDOT are being obtained. The CAV units were successfully tested.

UT faculty have obtained funding for transportation laboratory software and hardware for research and education projects. With this funding they purchased equipment to display traffic data in real-time, and created a well-functioning transportation laboratory. The lab has modeling and simulation capabilities that include: capability to display and archive incoming operations feeds from Tennessee Department of Transportation, a driving simulator, and software for accident reconstruction and modeling.

### 3. Participants and other collaborating organizations

#### a. Table of collaborating organizations

Organization Name	Location of the Organization	*Partner's Contribution to the Project	Name (First and Last)	University
KY Trans. Cabinet-DOH	Frankfort, KY	In-Kind support Collaborative support Financial support	Jason Siwula	UK
National Cooperative Highway Research Program	Washington, D.C.	Collaborative support & matching funds from NCHRP Project 17-63	Raghavan Srinivasan	HSRC
UT Dept Civil & Environmental Engineering	Knoxville TN	Collaborative support	Shashi Nambisan	USF
Conference of Minority Transportation Officials (COMTO)	Washington, DC	Collaborative Support-Garett Morgan Youth Symposium	Mioshi Moses, President/CEO of COMTO	NCAT
NC Department of Transportation	Raleigh, NC	In-kind and financial support	Ashley Goolsby	NCAT
NC FHWA Division	Raleigh, NC	In-kind and collaborative support	Lynise DeVance,	NCAT
Knox County School System	Knoxville, TN	Collaborative Support	Jamie Wilson, Meiko Thompson	NCAT
UT	Knoxville, TN	Collaborative Support	Jerry Everett	NCAT
Institute for Transp. Research & Education (ITRE)	Raleigh, NC	Financial, collaborative, and research support	James Martin	NCAT
FDOT	Florida	Data		UCF
Central Florida Expressway Authority	Florida	Data		UCF
Florida Turnpike Enterprise	Florida	Mile Post 263, Suite 5315, Ocoee, FL 34761	Eric Gordin, P.E.	UCF
City of Orlando	Florida	Pedestrian data	Charles Ramdatt	UCF
USDOT	Washington, DC	Financial Support		UA
Alabama DOT West Central Region	Tuscaloosa, AL	Collaborative support		UA
Center for Advanced Public Safety	Tuscaloosa, AL	Collaborative Support	Randy Smith	UA
iRAP	London, UK	Access to iRAP training modules, QA support, roadway star-rating software	James Bradford	Clemson
Marko Sevrovich	Croatia	FPZ Software Access, Technical support, QA	Marko Sevrovic Bojan Jovanovic	Clemson
WTS International	Washington, DC	Support for development of student chapter	Tiffany Jackson	Clemson

\*Choices are: In-kind support, financial support, personnel exchanges, collaborative support, Facilities, other

## b. Additional collaborators

Organization Name	Location of the Organization	*Partner's Contribution to the Project	Name (First and Last)	University
UT Center for Transportation Research	Knoxville, TN	Collaborative support	Airton Kohls	UK
NURail--UTC	Champaign Urbana, IL	Collaborative Support	Ahmed Shabana	UK
NCHRP Project 17-63 team		Collaborative support on MRI 1	Bhagwant Persaud, Ryerson University; James Bonneson, Kittelson and Associates; Ezra Hauer, University of Toronto, Retired	HSRC
Cambridge Systematics & Alabama DOT	Atlanta GA	Collaborative Support	Danena L. Gaines	UA

## 4. Impact

### a. What is the impact on development of the principal disciplines of the program?

Work accomplished by STC this period has directly affected the program's principal disciplines in the areas addressed by our Major Research Initiatives. The multi-disciplinary research activities are creating the knowledge-base and foundation needed for innovations in safety countermeasures, and making methodological advances in safety modeling, simulation, and visualization. The impact of safety research will be felt in multiple modes of transportation and by multiple stakeholders.

Below are a few examples of how STC research is affecting the development of the principal disciplines.

#### *UT*

The work undertaken at UT enhances safety through research on the Highway Safety Manual, safety simulations, big data applications, and the role of socio-demographics in safety. As an example, findings from MRI 4 Big Data are creating new metrics of driving volatility. These can be used in real-time to support instantaneous driving decisions. This work is providing new analytics (driving volatility) using big data coming in from sensors to enhance safety. The information on driving volatility can be used, for example, in high-schools to reward students who show "calm" driving patterns rather than volatile driving patterns. The idea of driving volatility appealed to the National Science Foundation, which awarded UT a three year, \$400,000 research grant titled "Study of Driving Volatility in Connected and Cooperative Vehicle Systems."



The e-HM Initiative Consortium led by the University of Tennessee and STC aims to develop and demonstrate a proof-of-concept for an electronic Hazardous Materials (e-HM) system. Our partners in the consortium include Label Master, Blue Dot Solutions, American Trucking Associations, CHEMTREC, Commercial Vehicle Safety Alliance, Eastman Chemical Company, FedEx, International Association of Fire Chiefs, Pilot Flying J, National Tank Truck Carriers, OmniTracs, ORNL, UPS. We have started with developing mock-ups of the envisioned system. The next step is to develop a prototype system, and eventually conduct pilot tests to demonstrate how software, cloud computing, and communications hardware interact. We were invited to present our efforts and their outcomes at the 2016 TRB Annual Meeting and also at a US DOT OHMS Research and Development Forum.

Several outreach activities were conducted at UT and locations in Knox County and Blount County using “The Seatbelt Convincer.” These events attracted hundreds of individuals, and at each event at least 50 people experienced a ride in the Convincer. The Convincer dramatically demonstrates the importance of wearing seatbelts as occupants of motor vehicles.

### **HSRC**

Most of the crash modification factors in the Highway Safety Manual, the CMF Clearinghouse, and other sources are just single factors implying that the safety effect of a treatment does not depend on the characteristics of a site. The MRI<sub>1</sub> effort from HSRC will develop crash modification functions that will provide insight into how the safety effect of a treatment may vary depending on the characteristics of a site.

### **NCAT**

The data from both of the texting while driving (TWD) surveys is still being analyzed. Our preliminary analyses indicate evidence of individual differences that impact teenager TWD behavior. Once the analyses have been completed, the results will be used to identify the most salient factors associated with teenage drivers’ decisions to TWD. These individual differences and decision factors will be the basis upon which customized driver training protocols will be developed. These protocols will be designed to be more effective when it comes to discouraging teenage TWD behaviors and will, in turn, enhance transportation safety.

### **UCF**

MRI 2 research provides an added dimension for using microscopic simulation and traffic conflicts as safety tool and surrogate measure, respectively. The lack of pedestrian safety data has been a major hurdle for researchers to better quantify pedestrian crash rates. This research will assist with this goal.

The MRI 4 research study proves that there are differences between the impacts of travel time reliability on single-vehicle and that on multi-vehicle crashes from both aspects of crash frequency and real-time safety analysis. It was found that travel time reliability more significantly affects multi-vehicle crashes than single-vehicle crashes.

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

The transportation field is multi-disciplinary and applied. As such, transportation research produces domain knowledge that helps improve mobility and transportation safety. STC research benefits business, psychology, education, information sciences, decision sciences, and many others. Here are a few examples of STC impact on other disciplines.

### ***UT***

UT's comprehensive view of safety impacts other disciplines. In this light, engineering faculty at UT are collaborating with the the Haslam College of Business faculty on educational efforts to raise awareness of young adults about wearing seatbelts, leveraging the CDC grant awarded to the Center for Transportation Research.

### ***NCAT***

The TWD study is multidisciplinary in nature since it incorporates concepts from psychology, information technology, transportation, and decision sciences. Even though the study was focused on transportation safety, the methods employed in the study can be applied to research investigating industrial safety concerns and general risk taking behaviors that impact individuals, businesses, and other organizations. The protocols that will be developed as a result of the findings of the TWD study also have the potential to impact policy as it pertains to driver education.

### ***UCF***

Based on our work on MRI 4, future technologies, such as dynamic message signs, variable speed limit signs, ramp metering, and others can be used to enhance travel time reliability, and then decrease multi-vehicle crash risk. Given the high percentage of multi-vehicle crashes on expressways, reduction in multi-vehicle crashes would remarkably improve traffic safety on expressways.

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

STC affects transportation workforce development at all levels of learning: K–12 student programs and teacher training, undergraduate and graduate education, and continuing education for both professionals and field personnel.

Each consortium school offers one or more programs in these areas; below are several examples of STC's impact on the workforce.

### ***UT***

The transportation engineering and science program at UT has 22 students working toward their graduate degrees during the reporting period. There are also 304 undergraduate students



in Civil & Environmental Engineering that will be exposed to transportation safety through their required undergraduate transportation course. The following graduate courses were offered during Spring 2016:

- CE 550 - Transportation Seminar
- CE 552 - Traffic Engineering: Operations
- CE 553 - Geometric Design
- CE 558 - Planning and Transportation
- CE 651 - Analysis Techniques for Transportation Systems

### ***Clemson***

The SCLTAP Program offered the following workshops and safety training programs in the last period. In addition, SCLTAP answers requests for resources from their extensive libraries and expert opinions on field issues.

- MPO/COG Planning Conference
- SC Highway Engineers Conference
- Work Zone Safety
- Basic Surveying
- Tractor Mower Operations Safety
- Winter Weather Planning & Maintenance
- Chainsaw Safety
- Writing Skills for Transportation Professionals
- Dealing with Difficult People
- Improving Public Relations
- Asset Management

### ***HSRC***

We expect that the Road Safety 101 course that we plan to offer will provide basic skills to practitioners in the traffic safety area, and encourage them to make better holistic decisions.

### ***NCAT***

#### ***Research***

A graduate student assisted in part of the data analysis of the TWD study. Although this student was majoring in Human Resource Management, she became very interested in the study as she



analyzed the data. Dr. McBride used this opportunity to introduce her to the various careers in the transportation industry.

### ***Education***

The Knox County Garrett Morgan project will increase the availability of transportation curriculum information for K-12 educators through its clearinghouse. The clearinghouse will give teachers access to other educators and transportation professionals as well as training and other resources to help them incorporate transportation subject matter into their classes. By educating K-12 teachers, a larger number of students have the potential to be exposed to transportation subject matter and more of these students are likely to pursue careers in transportation in the near future.

The STC provides education awards (scholarships) to our supply chain and civil engineering students to incentivize them to excel in their academics. In addition, we provide opportunities for students to apply for transportation internships and permanent job placement with Fortune 500 companies who seek students with high GPAs in the supply chain and civil engineering disciplines. STC Award recipients Kierra McCall, Fready Mills, Ryan Yeargin and De'Andre Melvin have accepted positions with Boeing, Abbott Labs, the US Air Force Logistics, and Wells Fargo, respectively.

### ***Workforce Development/Outreach***

The Summer High School Transportation Institute (STI) has served as a recruitment tool to expose students to the academic opportunities in transportation at the university. Each year two to three STI program alumni enroll in the supply chain or civil engineering programs. Upon graduation, they typically enter the transportation industry. STI engages them through career exploration in the transportation industry.

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

The UTC grant has allowed STC to leverage resources in the form of new laboratories, equipment, and space. UT offers excellent physical, institutional, and information resources that have a positive impact on the mission of STC. UT's Civil & Environmental Engineering Department in the new John D. Tickle building has ample space for transportation labs, and houses the UT driving simulator used for safety studies.

UCF shares their experiences in collecting and processing data for safety analysis, and building safety models, with colleagues at our university.

USF uses STC education resources to support graduate students and expose them to transportation safety issues. The combination of STC support with the high profile attention to transportation safety in Florida (due to the high fatality rates for bicycles, pedestrians and





motorcyclists) have given these young professionals a strong appreciation for the importance of safety in all aspects of transportation planning and engineering.

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

During this period, STC has organized research conferences, informed decisions made at state agencies, affected driver training practices, and provided concepts and materials for K–12 curricula. The following highlights examples at several STC partner schools:

##### ***UT***

On October 6–8, 2015, UCF and UT hosted the 2015 Road Safety & Simulation International Conference. Under the auspices of the Southeastern Transportation Center, three world-class research centers supported the conference: Center for Advanced Transportation Systems Simulation, and the Institute for Simulation and Training at UCF; and UT’s Center for Transportation Research.

STC hosted the 2016 UTC Conference for the Southeastern Region, March 31–April 1, 2016 in Knoxville, Tennessee. The conference theme was Safety, Mobility & Sustainability. This innovative conference brought together faculty, students, practitioners, and public agencies in the southeast to showcase recent achievements and collaborations.

##### ***HSRC***

The crash modification functions resulting from the MRI1 effort is on track to provide valuable information to state agencies as they make decisions about identifying appropriate treatments based on site characteristics.

##### ***NCAT***

The TWD study will impact current driver training practices. Once data analyses are complete, psychosocial profiles of young drivers will be identified based on their TWD behaviors, and customized training protocols will be developed. These protocols are expected to be more effective at deterring young drivers from texting while driving. The training protocols will be used to develop training modules that can be implemented in driver training classes.

The results of the Garret Morgan project will provide K-12 teachers with the educational resources they need to effectively incorporate transportation subject matter into their classes. This is expected to lead to the development of curriculum material designed specifically to teach transportation concepts.

##### ***UK***

Impacts are beginning to accrue from MRI-1 Crash Modification Factors research work, specifically in the prioritization of safety countermeasures. Strategic site specific future roadway

safety improvement investments will tend to reduce crashes and their severity. This will be a major anticipated research benefit.

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

STC efforts directly contribute to the development of methods and applied knowledge in safety by training a skilled workforce, forming and expanding social networks that stimulate safety research while raising public awareness of transportation issues, and creating new problem solving approaches that enhance safety.

At NCAT, the training modules that will be developed as a result of the TWD project are expected to encourage safer driving behaviors. The papers and presentations resulting from this project will inform the public of some of the factors that influence TWD behaviors. By bringing awareness to the problem along with potential solutions, roads will be safer for all users. Also, the “When will I use this” stories developed for the Garrett Morgan project during this reporting period by Dr. Leaven will help students relate the transportation material to the classes they are taking or situations with which they are familiar.

Dr. Steve Polzin’s (USF) blog on Planetizen popularizes issues such as “Public Transportation Ridership: Three Steps Forward, Two Steps Back?” “So Much for Peak VMT” and “All I Want for Christmas is a Driverless Car.”

A UCF research project is evaluating the effectiveness of the Road Ranger Program using Big Data approaches. Road Ranger is an FDOT service to assist drivers stuck on Florida roadways due to vehicle maintenance issues. UCF researchers are examining responses on twitter and Facebook from road users who were helped by the program to evaluate the public perception of the service.

### **5. Changes or problems**

#### **a. Changes in approach and reasons for change**

Nothing to report.

#### **b. Actual or anticipated problems or delays and actions or plans to resolve them**

USF’s fundamental approach has remained the same; however, the detailed specification of the research methodology has been shaped by data availability. The appropriately high standards of research rigor for safety analysis have created a significant challenge in assembling adequate data sets for the terrorists in this effort. The project team is comfortable we have assembled a methodology and data set up to the high standards appropriate.

#### **c. Changes that have a significant impact on expenditures**

Nothing to report.

**d. Significant changes in use or care of human subjects, vertebrate animals, or biohazards**

Nothing to report.

**e. Change of primary performance site location from the originally proposed**

Nothing to report.

**Additional information regarding Products and Impacts**

***Outputs:***

UT faculty have purchased in-vehicle, mobile and roadside units from ARADA Technologies; these are being field tested as part of our Connected and Automated Vehicles initiatives. Traffic and incident data from INRIX and TDOT as well as other sources, along with simulators and other lab equipment are providing the building blocks needed for production of research products, creating innovative transportation safety strategies and new algorithms or software products that enhance safety. STC affiliated faculty and staff worked on several papers submitted to various conferences, including those sponsored by STC (e.g., the RSS conference in Orlando).

Shi, Q., & Abdel-Aty, M., 2016. Evaluation of the Impact of Travel Time Reliability on Urban Expressway Traffic Safety. Accepted by Transportation Research Record: Journal of the Transportation Research Board.

***Outcomes:***

Nothing to report.

***Impacts:***

The work undertaken by faculty at University of Tennessee is enhancing safety through research, education and outreach. The multi-disciplinary research efforts include focused projects on Highway Safety Manual, safety simulations, big data applications, and the role of socio-demographics in safety. Their impacts are reflected in several refereed journal papers, conference presentations, and products that improve safety. The impact of safety research will be felt in multiple modes of transportation and by multiple stakeholders. Several examples have been provided. Our educational efforts are focused on the production of a technology savvy workforce through teaching of transportation courses (some focusing exclusively on safety) at the graduate level, and having safety content in other graduate and undergraduate courses. More broadly our workforce development efforts span across course delivery, student involvement in research activities and their participation in professional conferences. Several outreach activities are also underway, including reaching out to practitioners, conducting



conferences, and raising awareness of safety at the state, county and city levels. Overall, our program at UT is well-rounded and comprehensively addresses the UTC mission and goals.



# Student Spotlight Event

January 10, 2016 • 5:00 until 7:00 pm • Smith & Wollensky Skylight Ballroom



Welcome & Introductions

3 Minute Thesis Competition (3MT)

Recognition of Student Accomplishments and 2016 TRB Student Presenters

STC Outstanding Student Award • 3MT Competition Awards

2016 UTC Spring Research Conference, hosted by STC



## STC Outstanding Student

***Daniel Oldham, North Carolina A&T State University***



### 3 Minute Thesis Competition

*Kwaku Boakye, University of Tennessee*

*Jenner Barry Darius, University of Central Florida*

*Afshin Famili, Clemson University*

*Sakib Khan, Clemson University*

*Kierra McCall, North Carolina A&T State University*

*John Rogers, University of Central Florida*

*Behram Wali, University of Tennessee*

*Xu Zhang, University of Kentucky*

## Student TRB Presenters

### *University of Tennessee*

Jun Liu, Jianjiang Yang, Stephanie Hargrove, Hyeonsup Lim, Ranjit Khatri, Berham Wali, Xiaobing Li, Meng Zhang, Bumjoon Bae, Kwaku Boakye, Weimin Song, Yongjie Ding, Wei Hu, Hongren Gong, Xueqin Chen

### *North Carolina A&T State University*

Ahmed Lamarre, Daniel Oldham, Kierra McCall, Abdou Yaya

### *University of Alabama*

Samwel Zephaniah, Abhor Lidbe

### *University of Central Florida*

Adrian Sandt, John Rogers, Ahmad Alomari

### *University of Kentucky*

Xu Zhang

### *Clemson University*

Andrew Stokes, Kweku Brown, Adika Mammadrahimli, Jie Lu, Yongxi Huang, Xi Zhao, Mizanur Rahman, Kakan Dey, Melissa Gende, Joshua Mitchell, Sababa Islam, Fei Xie

## Noteworthy Student Accomplishments

### *University of Tennessee*

#### ***Tennessee Institute of Transportation Engineers named UT a 2015 Outstanding Student Chapter***

Kristina King, ASCE John Harper Memorial Scholarship  
Jun Liu (1st Place), Jianjiang Yang (2nd Place), Hyeonsup Lim (3rd Place), TSITE Student Paper Competition  
Jun Liu, Chinese Government Fellowship for Outstanding Students Abroad  
Kwaku Boakye, Kristina King, Ziwen Ling, Luis Taboada, Hunter McCracken, TSITE Student Scholarship  
Bumjoon Bae, ITS Tennessee Student Scholarship, AARS Frank J. Richter Scholarship  
Alexandra Boggs, UT Chancellor's Fellowship  
Jianjiang Yang, Transportation Research Forum Best Paper (International)

### *Clemson University*

Andrew Stokes, SDITE Best Student Paper Award  
Melissa Gende, NSF Fellowship Recipient

### *University of Alabama*

Samwel Zephaniah, International Road Federation 2015 Road Scholar Program Fellowship, ITE student chapter president, Chi-Epsilon president

### *University of Central Florida*

John Rogers, Adrian Sandt, Ahmad Alomari, coauthored TRB's Best Freeway Operations Paper of 2015  
Adrian Sandt, UCF Board of Trustees Fellowship  
Jiawei Wu, 2015 ITS Florida Award, 2016 Fellowship for the International Road Federation

### *University of Kentucky*

Xu Zhang, ITE Student Chapter President, Dean Fellowship Award Recipient

### *North Carolina A&T State University*

James Brown (Parliamentarian), Deandre Melvin (Secretary), Devarta Monroe (Executive Vice President), Council of Supply Chain Management Professionals Student Chapter  
Charles Chisley, Jasmin Kirby, Fready Mills, Devarta Monroe, Theodore Stevens, Girik Vadehra, Diamond Womack, Six Sigma Green Belt Certification  
Cameron Johnson, Jacob Smith, Abdou Salami Yaya, 2016 TRB Minority Student Research Fellows  
Ahmed Lamarre, Zachery McLaughlin, Fready Mills, 2015–16 Eisenhower Transportation Fellows  
Ahmed Lamarre, ITE Student Chapter Outreach and Community Engagement Officer  
Kierra McCall, Zachery McLaughlin, Girik Vadehra, Ryan Yeargin, Golden Key International Honor Society  
Kierra McCall, Fready Mills, Alpha Kappa Mu Honor Society, Beta Gamma Sigma Honor Society  
Zachery McLaughlin, NSF I-Blend Award, Industry Cluster Scholarship  
Devarta Monroe (1st Place), Mia Steele (3rd Place), 2015 Shell Supply Chain Case Competition  
Devarta Monroe, Vice President of Administration, Pi Sigma Epsilon Fraternity  
Jacob Smith, Triad Chapter APICS Scholarship Award, Martin Luther King Oratory Scholarship Contest Winner, Wells Fargo Innovation Challenge Runner Up  
Mia Steele, Beta Gamma Sigma Honor Society  
Theodore Stevens, William Vaughn NCLTL Lifetime Achievement Scholarship, Conference of Minority Transportation Officials (COMTO) Scholarship  
Ryan Yeargin, ITE Student Chapter President, ASCE Student Chapter Recording Secretary, ASEE 2nd Place Senior Design Project Award