



**PROGRAM PROGRESS PERFORMANCE REPORT FOR
UNIVERSITY TRANSPORTATION CENTERS**

Submitted to: US Department of Transportation,
Research and Innovative Technology Administration

Federal Grant No: DTRT13-G-UTC53

Project Title: Safety Research Using Simulation (SAFER-SIM)

Program Director: Dawn Marshall, M.S.
Project Director/Research Manager
National Advanced Driving Simulator
2401 Oakdale Blvd
Iowa City, IA 52242
Phone: 319-335-4774
Fax: 319-335-4658
Email: dawn-marshall@uiowa.edu

Submitting Official: Same as Program Director

DUNS and EIN Nos.: UI DUNS 062761671; EIN 42-6004813

Submission Date: October 31, 2016

Recipient Organization: The University of Iowa
5 Gilmore Hall
Iowa City, IA 52242

Recipient Identifying Grant Program No.: 15311500

Project/Grant Period: 10/21/13 – 9/30/2018

Reporting Period End Date: 09/30/2016

Report Term or Frequency: Semi-annual

Signature of Submitting Official:

Overview

Progress continues on the 38 individual projects and 7 multi-site collaborative projects funded by SAFER-SIM. Projects are beginning to wrap on with 9 reports available on the SAFER-SIM website and the federal database. Twenty-four additional reports will become available within the calendar year.

The monthly webinar series that replaced the recorded lecture series is very successful with 487 total registrations and 492 views of the videos posted on the SAFER-SIM YouTube channel. Webinars will continue to be scheduled at least once monthly until all funded projects have presented. Additionally, SAFER-SIM website pages have received 5668 total views; there have been 4585 impressions from Facebook, 20,779 impressions on Twitter.

Students involved with SAFER-SIM projects have prepared 52 presentations, posters and papers. SAFER-SIM faculty continue to be active on 6 advisory committees and panels and have given 24 invited presentations since our consortium was formed. Faculty and students are reviewers for 25 journals and conferences. SAFER-SIMposium at the University of Wisconsin – Madison 46 attendees, 26 of them being students. Students presented 15 posters and gave five lectern presentations of their SAFER-SIM projects. Transportation professionals from the Wisconsin DOT and the City of Madison also spoke to the group regarding current and future transportation issues in the rapidly changing transportation system. The fifth SAFER-SIMposium at the University of Iowa is planned for October 9-11, 2016 in Iowa City, IA.

Thirty-five students from under-represented groups are involved in SAFER-SIM projects. Fifteen students associated with SAFER-SIM have graduated and entered the workforce or continued their studies in graduate programs. Education and outreach events have provided transportation safety experiences for over 37,000 individuals. These events include STEM festivals, career fairs, school visits, state fairs, lab tours, and an exhibit in a mobile museum.

A copy of this report can be found on the SAFER-SIM website under the “Reports” tab (<http://safersim.nads-sc.uiowa.edu/reports.php>).

1. Accomplishments

a. Goals and objectives of the program

The goal of the SAFER-SIM UTC is to use simulation techniques to address the safety issues prioritized by the US DOT. Specifically, our center has identified seven areas of activity:

- 1. Conduct safety research using simulation techniques.** Progress continues on all previously funded projects. Nine projects have completed and final reports are available. As projects continue to complete, final reports will be available on the SAFER-SIM website under the research tab for each project (<http://safersim.nads-sc.uiowa.edu/research.php>). Additionally, two-page summaries of each project are available for a quick overview of the project. These summaries focus on recommended practices for transportation professionals providing easier access to key information than the full project report.

Three RFPs issued during the first three years of this grant that resulted in 56 proposals resulting in thirty-six individual site research projects and two education projects. Additionally, seven collaborative projects were funded that represent 14 projects at

consortium sites. Nine projects are complete and technical reports are available on the SAFER-SIM website as well as the federal database.

Table 1. Research projects complete and reports

Project Title	Project Type	Institution (s)	PI Co-PI	Project on OST-R Database
Examination of Driver Behavior in Response to Bicyclist Behaviors				
	Individual	UI	Hamann	1530187
		UI	Schwarz	
Cross-Platform Driving Simulator Scenarios to Use in the Roadway Design and Planning Process				
	Collaborative	UI	Allen	1530185
		UW	Noyce	
The Effect of Roadside Vegetation and Clear Zone Design on Driver Behavior				
		UMass	Knodler	1530318
		UMass	Don Fisher	
Integration of Microscopic Big Traffic Data in Simulation-Based Safety Analysis				
	Individual	UCF	Abdel-Aty	1530180
		UCF	Wang	
		UCF	Wu	
Dynamic Simulation Models for Road Safety and its Sustainability Implications				
	Individual	UCF	Tatari	1530179
Phase I: Evaluation of Real World Toll Plazas Using Driving Simulators				
	Collaborative	UMass	Knodler	1530317
		UMass	Fisher	
		UCF	Abdel-Aty	
		UPR	Valdes	
		UPR	Rios	
Transfer from Highly Automated to Manual Control Performance Trust				
	Individual	UI	Brown	1556647
		UI	Schwarz	
Utilizing Micro Simulation to Evaluate the Safety and Efficiency of the Expressway System				
	Individual	UCF	M. Abdel-Aty	1556637
An Investigation of Peer Influences on Risky Child and Adolescent Pedestrian Road Crossing				
	Collaborative	UI	Plumert	1556672
		UI	Kearney	
		UCF	Hancock	

An additional three projects have completed and submitted final reports that will be posted within the next few weeks. The remaining 24 projects are currently scheduled to complete and submit technical reports within the calendar year. As reports are submitted, as in the past, they will be reviewed by a technical editor and revised by the principal investigators prior to submission to the federal database and the SAFER-SIM website. Collaborative projects will submit a technical report from each consortium site involved in the project and since timelines at each site may differ delivery of final reports will vary.

Table 2: Projects in Progress

Project Type	Institution(s)	Project Title
Collaborative	UMass UCF UPR	Phase I: Evaluation of Real World Toll Plazas Using Driving Simulators
Collaborative	UMass UCF UPR	Phase II: Operational and Safety-Based Analyses of Varied Toll Lane Configurations
Collaborative	UI UW	Using Naturalistic Driving Data to Develop Simulator Scenarios
Collaborative	UMass UW	A Field and Simulator Evaluation of All-Red Clearance Intervals for use in Left Turn Applications
Collaborative	UMass UW	A Driving Simulator Evaluation of Red Arrows and Flashing Yellow Arrows in Right Turn Applications
Individual	UCF	Enhancing Non-Motorized Safety by Simulating Non-Motorized Exposure using a Transportation Planning Approach
Individual	UCF	Agent-Based Simulation for Investigating the Safety Concerns of Electric Vehicles in the US
Individual	UCF	A Driving Simulator Investigation of Road Safety Risk Mitigation under Reduced Visibility
Individual	UI	Identifying Postural Control and Thresholds of Instability Utilizing a Motion-Based ATV Simulator
Individual	UI	Using Driver Simulators to Assess Instructional Format Efficacy on Older and Younger Drivers' Understanding of Adaptive Cruise Control
Individual	UI	Exploring the Science of Driving (Education)
Individual	UI	Automating the Transportation Design to Simulator Model Process
Individual	UI	Drugged Driving: Effects of Pain and Anxiety Medications on Driving Performance in a Simulator
Individual	UI	Driving After Distal Radius Fractures
Individual	UI	Do Prohibitive Warnings Improve Road-crossing Safety for Texting and Non-texting Pedestrians?
Individual	UI	Distributed Simulation to Support Driving Safety Research
Individual	UI	Community-Based Education and Public Awareness for All-Terrain Vehicle and Side-by-Side Safety to Reduce Roadway Deaths and Injuries
Individual	UI	Advanced Vehicle Technology Simulation and Research Outreach to STEM Programs (Education)
Individual	UI	Global Road Safety Online Course Development (Education)
Individual	UMass	Development and Evaluation of Infrastructure Strategies for Safer Cycling
Individual	UMass	Impact of Deflection Angle on Roundabout Driver Behavior

Individual	UMass	The Impact of Vehicle Automation on the Safety of Vulnerable Road Users (Pedestrians and Bicyclists)
Individual	UMass	Analysis of Driver Behavior and Operations Intersection Short Lanes
Individual	UMass	Visually Impaired Pedestrian Safety at Roundabout and Midblock Crossings
Individual	UMass	Safety Evaluation of Urban Freight Deliveries using Microsimulation and Surrogate Safety Measures
Individual	UMass	Perception of Time Influences on Driver Speed Selection
Individual	UMass	Speeding on Curves & Potential Countermeasures: A Driving Simulator Assessment
Individual	UMass	Examining Distracted Drivers' Underestimation of Time and Overestimation of Speed
Individual	UW	Effectiveness of In-Vehicle Virtual Traffic Control Devices
Individual	UW	Driving Simulators for Virtual Road Safety Audits
Individual	UW	Using Naturalistic Driving Data to Develop Simulator Scenarios
Individual	UW	Neural Correlates of Older Driver Performance
Individual	UW	Driving Simulator Evaluation of Countermeasures to Improve Pedestrian and Bicycle Safety
Individual	UPR	Phase III: Operational and Safety-Based Analyses of Varied Toll Lane Configurations

2. Leadership Development

The **University of Wisconsin – Madison** hosted the 4th SAFER-SIM Symposium on June 2 - 4, 2016. This event took place in Madison, Wisconsin on the University's beautiful campus. Students, faculty, and all the site directors from each SAFER-SIM consortium site attended the symposium. 46 individuals attended the conference, 26 of them being students. The students gained valuable experience throughout the entire event. 15 students created a poster and shared their SAFER-SIM research to other attendees. Another 5 students (1 from each consortium site) presented their work in front of a room full of researchers. They also participated in a question and answer session after their presentations, which helped them learn how to react and respond to questions about their work. Along with the presentations, students were able to network with faculty and student from other sites, leading to thought-provoking conversations and greater networking experience. Transportation professionals from the Wisconsin DOT and the City of Madison also spoke to the group regarding current and future transportation issues in the rapidly-changing transportation system. The 46 symposium attendees, faculty and students alike, gained professional experience and developed skills that they will be able to use throughout the rest of their careers.

The 5th Symposium is planned for October 9-11, 2016 at the **University of Iowa** in Iowa City. University of Iowa researchers have been planning and organizing the symposium during

this reporting period. The event will feature activities and experiences for students and faculty to further develop leadership skills:

- Business Etiquette Dinner – Dr. Patricia Tice, author of *Agri Manners – Essential Etiquette for Professional Success*, will lead attendees through a formal dinner. Students and researchers will learn table manners and business etiquette for professional meals they will attend at future conferences and events.
- Facility Tours – Students will guide attendees throughout their labs (e.g. National Advanced Driving Simulator, Hank Virtual Environments Lab, ATV Simulator). Each lab will have students present posters about their SAFER-SIM project. Students will enhance ability to communicate their research through the tours and poster sessions.
- Student Panel Presentations – Students from each site will present their research to a room full of attendees in a 15-minute talk. Attendees will ask questions after presentations to test students’ critical thinking skills. They will receive feedback on presentations from fellow researchers after gaining experience speaking to a crowd.
- Innovation, Entrepreneurship, and Intellectual Property – Attendees will listen to presentations about innovation, entrepreneurship, and intellectual property which will relate back to engineering and research. Speakers will be from the University of Iowa, U.S. Patent and Trademark Office, and Iowa City Area Development Group. Students will increase knowledge and hear new ideas they can use after the symposium.

SAFER-SIM continues sponsoring a monthly webinar series relating to SAFER-SIM projects. These webinars showcase the expertise of consortium researchers to everyone that views the webinars, such as researchers from other consortium sites and universities, government employees within the Department of Transportation, and individuals from the transportation industry. Presenters gain experience sharing their research findings to an audience. The webinars are recorded and uploaded onto the SAFER-SIM YouTube channel so they can be viewed and shared anytime. SAFER-SIM sponsored 6 webinars during this reporting period and has scheduled future webinars for next period. The webinars from this period are listed below:

Date	Topic
4/12/2016	The Effect of Roadside Vegetation and Clear Zone Design on Driver Behavior
5/10/2016	Cross-Platform Driving Simulator Scenarios to Use in the Roadway Design and Planning Process
6/14/2016	Dynamic Simulation Models for Road Safety and its Sustainability Implications
7/12/2016	Integration of Microscopic Big Traffic Data in Driving Simulation-Based Safety Analysis
8/9/2016	Examination of Driver Behavior in Response to Bicyclist Behaviors
9/13/2016	Development & Evaluation of Infrastructure Strategies for Safer Cycling

Invited Presentations

SAFER-SIM faculty and students have given invited presentations at 24 different symposia, workshops, panel discussions, and meetings. These include U.S. and international gatherings:

- 4th SAFER-SIM Symposium – Madison, WI
- 19th Meeting of the EURO Working Group on Transportation – Istanbul, Turkey
- Mid-Continent Transportation Research Symposium – Ames, IA
- XIX Pan-American Conference of Traffic, Transportation Engineering and Logistics – Mexico City, Mexico
- LACCEI International Multi-Conference for Engineering, Education, and Technology – San Jose, Costa Rica
- 2016 Northeast Transportation Safety Conference – Worcester, MA
- 2016 ITE Northeastern District Annual Meeting – Portsmouth, NH
- 5th International Conference on Roundabouts – Green Bay, WI
- 46th Annual Meeting of the Jean Piaget Society – Chicago, IL
- Legislators in the Lab, ATV Simulator – Iowa City, IA
- To Cross or Not to Cross: The Influence of Mobile Device Alerts on Road Crossing for Texting Pedestrians – J.K. Kearney; Amherst, MA
- STEM + Humanities + Arts – J.K. Kearney; Iowa City Iowa
- Grinnell Mutual Insurance Annual Meeting – Grinnell, IA
- Safety 2016 World Conference – Tampere, Finland
- Lifesavers Conference – Long Beach, CA
- Governor’s Highway Traffic Safety Conference – Okoboji, IA
- State Traffic Records Central Committee Meeting – Iowa City, IA
- Society of Academic Emergency Medicine – Iowa City, IA
- 2016 National Governor’s Association Summer Meeting – Des Moines, IA
- The Effect of Roadside Vegetation and Clear Zone Design on Driver Behavior, SAFER-SIM Webinar – Iowa City, IA
- Cross-Platform Driving Simulator Scenarios to Use in the Roadway Design and Planning Process, SAFER-SIM Webinar – Iowa City, IA
- Dynamic Simulation Models for Road Safety and its Sustainability Implications, SAFER-SIM Webinar – Iowa City, IA
- Integration of Microscopic Big Traffic Data in Driving Simulation-Based Safety Analysis, SAFER-SIM Webinar – Iowa City, IA
- Examination of Driver Behavior in Response to Bicyclist Behaviors, SAFER-SIM Webinar – Iowa City, IA
- Development & Evaluation of Infrastructure Strategies for Safer Cycling, SAFER-SIM Webinar – Iowa City, IA

Student Conference Papers

SAFER-SIM students have been active in preparing presentations, posters, and papers. 52 total have been submitted, accepted, or presented at conferences, workshops, panels, and meetings. Below are some highlights:

- 4th SAFER-SIM Symposium
 - 15 posters
 - 5 presentations

- 5th SAFER-SIM Symposium
 - 10 posters (accepted)
 - 10 presentations (accepted)
- 96th TRB Annual Meeting – Washington D.C.
 - *Microscopic safety evaluation and prediction for freeway-to-freeway interchange ramps* (accepted)
 - *Bicycle Infrastructure from the Driver's Seat: Evaluating Bicycle Infrastructure Using a Driving Simulator* (accepted)
 - *Analysis of Driving Behavior at Expressway Toll Plazas Using Driving Simulator* (submitted)
 - *Analysis and Comparison of Safety Models Using AADT, Hourly, and Microscopic Traffic* (submitted)
 - *Implementation of Active Traffic Management Strategies for Safety of a Congested Expressway Weaving Segment* (submitted)
- Journal of Child Psychology and Psychiatry
 - *Risky bicycling behavior among youth with and without attention-deficit hyperactivity disorder*
- ACM Symposium on Applied Perception
 - *Action coordination with agents: crossing roads with a computer-generated character in a virtual environment*
 - *Acting together: Joint pedestrian road crossing in an immersive virtual environment*
- IEEE Transactions on Visualization and Computer Graphics
 - *Optimal camera placement for motion capture systems* (submitted)
- Journal of Experimental Psychology: Human Perception and Performance
 - *Changes in perception-action tuning over long time scales: How children and adults perceive and act on dynamic affordances when crossing roads* (submitted)
- Special Issue of the Journal of Safety
 - 2 papers accepted

Advisory Committees/Panels

SAFER-SIM faculty serve on 6 advisory committees or panels. Their insights and ideas help drive transportation safety forward. The committees are for national and local organizations:

- Committee on Highway Safety Performance
- Committee on User Information Systems
- Committee on Transportation Safety Management
- Strategic Highway Safety Plan Safety Summit
- State Transportation Innovation Council
- Committee on Traffic Signal Systems

Journal Editing and Reviewing Activity

SAFER-SIM faculty and students have edited and reviewed work for 25 journals, conferences, and committees. They have reviewed reports covering a wide variety of scientific areas, which shows the range of expertise within SAFER-SIM. Examples of journal reviewing include:

- Elsevier – Dr. Mohamed Abdel-Aty, Editor-in-Chief
- Accident Analysis and Prevention – Dr. Mohamed Abdel-Aty, Editor-in-Chief
- Accident Analysis and Prevention – Dr. Jaeyoung Lee, Reviewer
- Accident Analysis and Prevention – Dr. Ling Wang, Reviewer
- Accident Analysis and Prevention – Dr. Eric Gonzales, Reviewer
- Accident Analysis and Prevention – Dr. Eleni Christofa, Reviewer
- Transportation Research Record – Dr. Eleni Christofa, Reviewer
- IEEE Intelligent Transportation Systems Magazine – Dr. Jaeyoung Lee, Reviewer
- Journal of Experimental Psychology: Applied – Jodie Plumert, Editorial Board
- Journal of Experimental Child Psychology – Jodie Plumert, Editorial Board
- National Science Foundation, Developmental & Learning Sciences – Jodie Plumert, College of Reviewers
- ACM Symposium on Spatial User Interaction (SUI) – Joe Kearney, Reviewer
- IEEE Transactions on Human-Machine Systems – Joe Kearney, Reviewer
- Transportation Research Board

Leadership Positions of Students and Faculty in Professional Organizations

SAFER-SIM students and faculty hold leadership roles in 11 professional organizations focusing on a variety of engineering, safety, and health topics:

- Vice President, ITE UPRM Student Chapter
- Director of Activities, ITE UPRM Student Chapter
- Fellow, American Society of Civil Engineers
- American National Standards Institute
- International Organization for Standardization
- American Society of Civil Engineers
- American Society for Engineering Education
- Society for Experimental Engineering
- American Academy of Pediatrics
- American College of Emergency Physicians
- Society for Academic Emergency Medicine
- Society for Advancement of Violence and Injury Research
- International Society for Agricultural Safety and Health

Placement of Students

Fifteen students associated with SAFER-SIM have either found full-time employment or graduated and advanced to a higher level of education during this period. They received useful experience and skills through their SAFER-SIM work that will make them successful in their future endeavors. The connections they made with mentors and students grow the transportation safety network and lead to innovative ideas and collaborations. Examples of employment and education include:

- 1 Masters student from **University of Central Florida** graduated and works at Wantman Group Inc.
- 1 student from **University of Iowa** graduated and is currently a Research Analyst at University of Pennsylvania
- 1 student from the **University of Iowa** found employment at Facebook
- 2 students from **University of Iowa** were accepted in M.A. programs at Columbia University and University of Illinois
- 3 students from the **University of Wisconsin** graduated with degrees in transportation disciplines
- 6 undergraduate students from **University of Puerto Rico – Mayaguez** are enrolled in engineering courses and plan to continue their education in a transportation field
- 1 student from **University of Massachusetts – Amherst** is writing his thesis to complete his degree in a transportation discipline

Shared Resources

- **University of Puerto Rico – Mayaguez** simulation procedures used at 3 universities (UMass, UCF, UW)
- **University of Puerto Rico – Mayaguez** data analysis techniques used at 2 universities (UMass, UW)

3. Education and Workforce Development

SAFER-SIM consortium members organized and participated in events focusing on students and members of the workforce. Overall, more than 37,139 individuals of all ages have been reached by these activities.

K-12 Student Events

University of Puerto Rico – Mayaguez gave three educational presentations to high school students about driving simulators. The students received a hands-on driving simulation experience. They also discussed how simulation is used to perform driving research, how to analyze findings, and how the findings can lead to safer roadways for all users. These events reached almost 100 students. **University of Massachusetts – Amherst** student Nick Fournier presented to high school students at the UMass Summer Transportation Institute. The institute is designed to create awareness and stimulate interest in transportation. He discussed the history of bikes and bicycle infrastructure treatments with students. The **University of Central Florida** hosted Camp Connect. About 100 students from 8th grade – 10th grade participated in this week-long experience that took students into the realm of an

engineer. **University of Wisconsin – Madison** participated in several outreach events and connected with 60 students.

The **University of Iowa** continues to be very active in K-12 engagement in a variety of forums:

- National Advanced Driving Simulator Tour – Solon Middle School
 - 24 students from 7th grade toured the facility
- Driving Curriculum Class Visit – Norwalk Middle School
 - 232 students from 8th grade science classes used simulation to discuss graphs, friction, and distracted driving
- National Advanced Driving Simulator Tour – Iowa City West High School
 - 90 students from the high school toured the facility
- Hank Virtual Environments Lab Tour
 - 60 students toured the facility
- STEM Innovator – ATV Safety
 - 5 high school students were mentored by researchers from the ATV lab
- Southeast Iowa STEM Festival
 - 800 students experienced the dangers of texting and driving on a simulator
- Iowa State Fair
 - Over 3000 individuals saw the distracted driving scenario on the simulator
- Driving Simulator Exhibit on the Mobile Museum
 - 30,942 people interacted with the museum at 84 separate events across the state

College Events

SAFER-SIM sites also interacted with college students at their own university and at other colleges. These interactions help increase collaborations across campuses and promote traffic safety to young adults. A few examples of college outreach events are as follows:

- **University of Puerto Rico - Mayaguez** exhibited their mobile driving simulator at the center stage of the Puerto Rico Convention Center at the 2016 Mega Civil Friday Annual Conference. This activity gathers students and multidisciplinary professional engineers to promote highway safety awareness. 1000 students participated in this event. Other UPRM students attended the Puerto Rico Summer Transportation Institute to discuss transportation safety.
- **University of Central Florida** held a Transportation Safety Seminar with engineering students from the school.
- **University of Wisconsin – Madison** led visitors from Chalmers University through their lab and discussed transportation safety concerns.
- The **University of Iowa** helped judge the College of Engineering Research Open House. Over 100 student posters were showcased. As part of a SAFER-SIM project, the University of Iowa College of Education and the National Advanced Driving Simulator partnered to develop a science-based curriculum using a driving simulator. The students involved with this project demonstrated their ideas in class to 20 pre-service teachers while collecting feedback and data. The National Advanced Driving Simulator hosted tours for an Ergonomics class, the Institute of

Industrial Engineers, for visiting scholars from Japan, and for a University-wide Open House. 88 college students and staff attended these tours. Jacob Heiden exhibited SAFER-SIM's portable simulator to over 200 students at the DMACC campus in Boone, IA. He displayed the texting and driving demonstration to show the students the dangers of distracted driving. The students enjoyed the hands-on experience, and some teachers even incorporated it into their class.

- The **University of Massachusetts – Amherst** hosted 20 students for a presentation from Joseph Kearney of the University of Iowa. He discussed the results of SAFER-SIM experiments examining how texting pedestrians cross streams of traffic and compared two different approaches of Vehicle-to-Pedestrian communication technologies.

Workforce

The **University of Iowa** organized "Science Thursday" for University employees to eat lunch outside and experience a scientific demonstration. SAFER-SIM researchers exhibited the texting and driving demonstration on the miniSim. Over 100 individuals were able to see the devastating effects of distracted driving in a simulated and safe environment. 10 educators from Project Lead the Way visited the University of Iowa. These teachers from across Iowa took part in rigorous professional development sessions, which will help empower and excite their students about STEM education. The teachers' work and dedication to STEM will help change the standard classroom into a unique, innovative work space where students are given the tools to succeed. Researchers from the University of Iowa also attended the 2016 Hawkeye Safety Conference. This one-day conference provided current information on health and safety topics. Dan McGehee, the director of the National Advanced Driving Simulator, led a discussion about advanced safety features in cars during a breakout session. Other researchers exhibited displays including information about new safety technologies, a texting and driving demonstration, and views of the Volvo XC90 research vehicle. Over 500 individuals attended the conference with almost 100 individuals participating in our events. Researchers from the ATV Lab at Iowa met with Iowa Legislators to discuss safety issues and laws. The **University of Wisconsin - Madison** hosted a Women in Transportation group and guided them throughout their facility. Researchers in Wisconsin also have continued contact with Trek Bicycle Corporation and MSA Professional Services.

Curriculum Modules and Courses Developed

The Global Road Safety course developed by Drs. Cara Hamman and Corinne Peek-Asa at the **University of Iowa** completed in the Spring 2016 semester. The course trained undergraduate and graduate students on the field of simulation research and how to develop scenarios, including lectures, hands-on activities, and field trips to see simulators in operation. Drs. Hamann and Peek-Asa have further developed this course into an online version during the summer of 2016 that can be taken by a wider array of students both within and beyond Iowa. Interest has been expressed by SAFER-SIM members at the University of Massachusetts in utilizing the course material.

“Exploring the Science of Driving” at the **University of Iowa** was developed as a driving-based curriculum for STEM education in middle and high schools that can be used by teachers in their classroom. Drs. Timothy Brown, Leslie Flynn, and Chris Schwarz developed two curriculum modules for graphing and friction. These included stand-alone curriculum support for graphing and friction combined with public safety messaging on distracted driving. This curriculum is augmented by a “teach the teacher” program where teachers can be brought in to learn the curriculum material so that it can be implemented in their class. This curriculum will increase interest in transportation projects in K-12 students who receive it. Student teachers involved in curriculum development established a new excitement for transportation that they can take to the classroom. Teachers who participate cultivate an increased appreciation for the transportation field that they can share with their students. Students use a portable driving simulator in their school to collect driving performance data and then analyze that data to explore STEM concepts. Data sets are also available. A highly portable desktop miniSim™ driving simulator is available for loan to teachers wishing to utilize this curriculum in their schools.

4. Technology Transfer

Nine final reports and their corresponding summaries have been completed this reporting period. These products will lead to future transportation safety research and can aid professionals in making the best decisions possible when it comes to transportation safety. SAFER-SIM continues hosting tours for schools (listed above), organizations, and businesses. Consortium researchers also tour different labs to share ideas and discuss future collaborations.

Final Research Reports and Summaries

Project Title	Institution
Dynamic Simulation Models for Road Safety and its Sustainability Implications	UCF
Integration of Microscopic Big Traffic Data in Simulation-Based Safety Analysis	UCF
Utilizing Micro Simulation to Evaluate the Safety and Efficiency of the Expressway System	UCF
Examination of Driver Behavior in Response to Bicyclist Behaviors	UI
Transfer from Highly Automated to Manual Control Performance Trust	UI
Cross-Platform Driving Simulator Scenarios to Use in Roadway Design and Planning Process	UI
An Investigation of Peer Influences on Risky Child and Adolescent Pedestrian Road Crossing	UI
The Effect of Roadside Vegetation and Clear Zone Design on Driver Behavior	UMass
Phase 1: Evaluation of Real World Toll Plazas Using Driving Simulators	UCF, UMass, UPRM

Tours of SAFER-SIM facilities

- National Highway Traffic Safety Administration
- National Scholars Institute

- National Association of Counties
- Toyota Motor Engineering & Manufacturing North America
- Trek Bicycle Corporation
- Fairbank Highway Research Center

Tours of other facilities

- Trek Bicycle Corporation – Waterloo, WI
- Volpe National Transportation Systems Center – Cambridge, MA

SAFER-SIM research and facilities have been featured in 10 news postings. The work and labs have received attention from local media to promote different safety issues. They have also been featured in university magazines and in U.S. Transportation Secretary Anthony Foxx’s online blog. A few highlights include:

Media

- “Safer Cars & Safer Highways Through Safer Simulation”. Iowa Engineer Magazine. Byline: Gary Galluzzo. Link: <http://www.pageturnpro.com/University-of-Iowa-College-of-Engineering/73203-Iowa-Engineer-Magazine,-2016-No-2/index.html#6>
- “Protecting Pedestrians with Connected Vehicle Technology”. Fast Lane. Byline: Transportation Secretary Anthony Foxx. Link: <https://www.transportation.gov/fastlane/protecting-pedestrians-connected-vehicle-technology>
- “UI College of Engineering hopes ATV simulator will make riding safer”. KCRG-TV-9 News. Byline: Brady Smith. Link: <http://www.kcrg.com/content/news/UI-College-of-Engineering-hopes-ATV-simulator-will-make-riding-safer-384038731.html>
- “ATV simulator aims to reduce real vehicle crashes”. KWWL-Channel 7. Byline: Hillary Maglin. Link: <http://www.kwwl.com/story/32285827/2016/06/22/atv-simulator-aims-to-reduce-real-vehicle-crashes>

Online Presence

- Webinars – SAFER-SIM has hosted 6 webinars over the course of this reporting period. The themes of the webinars relate to vulnerable road users, simulation techniques, and traffic control devices. Researchers and industry professionals from the United States and other countries have attended. The recorded webinars are uploaded onto the SAFER-SIM YouTube channel and have been viewed another 226 times.
- Website – The website for SAFER-SIM is used to host research final reports and summaries and also used to share recent news and progress. 1129 different users have

visited the webpage. These users have accumulated 6162 page views, and over 1500 of those page views have been related to SAFER-SIM research and reports.

- Social Media – SAFER-SIM is active on Twitter, Facebook, and YouTube. These accounts help followers keep up to date with the most recent webinars, final reports, and other news. Social media allows the UTC to reach a larger audience. SAFER-SIM has interacted with the USDOT, NHTSA, and various organizations and individuals within the transportation industry through these different platforms, which has led to 25,564 impressions.
- News Digest – Another method SAFER-SIM uses to reach more individuals is through a news digest. 290 subscribers receive content featuring SAFER-SIM news, webinars, final reports, and other automotive and safety news. The news digest is emailed two times per month and has been sent out 12 times during this reporting period.

License agreements

A SAFER-SIM research project at the **University of Iowa** resulted in a refinement of the NADS software that can be used in the NADS-1 and supplied to NADS miniSim customers. “Autodriver” software is being integrated into future miniSim releases for customers around the world. The software is being expanded to allow customers to provide all vehicles inputs from their own software/hardware (ex: Simulink, Python)

5. Collaboration

A main focus of the SAFER-SIM UTC is collaboration within consortium sites and across disciplines. 8 multiple-site collaborative projects and 10 interdisciplinary projects have been funded, making up 42% of SAFER-SIM projects. Consortium members engage in regular web conferencing, teleconferences, and email communications, as well as face-to-face interactions via site visits and time set aside during symposia. Site directors participate in a conference call once a month to share information about the progress at each university. Regular updates to the SAFER-SIM website and social media accounts allow for up-to-date project information and outreach activities to spur ideas across sites. The webinar format builds greater engagement and a broader exchange of ideas among students, faculty, and industry professionals. SAFER-SIM also emails a biweekly news digest to 290 individuals holding academic, government, and transportation industry positions. The email’s content includes SAFER-SIM final reports, news, webinars, and automotive technology and safety news. Researchers and students stay connected with each other through various platforms to conduct research and to share ideas.

Another unique aspect of collaboration within SAFER-SIM is the symposium. These gatherings bring researchers and students together in-person to exchange study findings and to learn more about each other. The collaboration within SAFER-SIM and across engineering and social sciences fields will build relationships that will drive future improvements in simulation research and road user safety. The **University of Wisconsin – Madison** successfully held the 4th SAFER-SIM Symposium in June of 2016. This conference featured multiple collaborative activities for the 46 attendees:

- Networking Lunch and Dinner – Researchers and students met each other face-to-face, and they discussed many topics including SAFER-SIM research, future work, and other interests.
- Project Meetings – The symposium set aside a block of time for each collaborative project to meet in-person to plan and converse about their research. In some cases, the symposia are the only times when Principal Investigators on collaborative projects can work together in the same room.
- Student Team-Building Exercise – 26 students were split into 5 groups. Each group had to choose a transportation problem and brainstorm ideas to solve the problem. This collaboration led to interesting discussions and showed the students the importance of teamwork.

The **University of Iowa** organized the next SAFER-SIM Symposium set to occur in October 2016. They expect excellent collaboration at this event, similar to the previous symposia. Although the entire symposium is a collaborative experience, some highlights will include:

- Early Morning Fun Run/Walk – Attendees can start their day with a 5K run or a 2K walk to showcase the University of Iowa campus and network with members from other sites.
- Facility Tours – Attendees will tour the premium simulation labs at the University of Iowa while students and researchers present posters. Individuals will be able to discuss different projects, ideas, future work, and more as they move through the tours.
- SAFER-SIM Webinar – The final activity planned is a live webinar examining the collaborative research project *Evaluation of Real World Toll Plazas using Driving Simulators*. Michael Knodler of **University of Massachusetts – Amherst**, Mohamed Abdel-Aty of **University of Central Florida**, and Didier Valdes of **University of Puerto Rico – Mayaguez** will present their work.

SAFER-SIM researchers have a diverse range of professional backgrounds that span across many colleges throughout the universities. The variety of expertise within the consortium creates a collaborative environment to address safety issues from different perspectives. Some backgrounds include:

- Engineering
- Public Health
- Psychology
- Psychological & Brain Sciences
- Computer Science
- Emergency Medicine
- Science Education

6. Program Efficacy

SAFER-SIM finished the final round of RFPs last reporting period. The UTC has demonstrated a high level of research productivity resulting from an impressive 38 total projects funded. Researchers and students will complete all the funded projects throughout the remainder of the current UTC grant. These projects have supported 49 students this reporting period. 9

final reports and summaries were submitted this reporting period and have also been uploaded to RITA for other professionals to access. The completed and current SAFER-SIM projects have led to 15 additional proposals to other funding agencies. Below are some highlights:

- *“Supplement: Children’s Use of Visual Information to Guide Selection and Timing of Motor Behaviors”* Jodie M. Plumert (P.I.), Joseph K. Kearney (C.I.), & James F. Cremer (C.I.), National Science Foundation, \$75,000 in total costs. Awarded
- *“Safety Benefits of Adaptive Headlight Systems for Drivers, Pedestrians, and Bicyclists”* Chris Schwarz (PI), Joseph K. Kearney (Co-I), Jodie M. Plumert (Co-I), Toyota Motor Company (\$653,535). Awarded
- *“Safety Research Using Simulation (SAFER-SIM)”* Dawn Marshall (PI), Joseph K. Kearney (Co-I), & Jodie M. Plumert (Co-I), US Department of Transportation, (\$1,500,000). Pending
- *“The Emergence of Risky Behavior in Dyads with Typically- and Atypically-Developing Youth”* Jodie M. Plumert (P.I.), Molly Nikolas (P.I.), & Joseph Kearney (P.I.). National Institute of Child Health and Human Development, \$1,958,914 in total costs (R01-HD086033). Pending

7. Diversity

SAFER-SIM impacts underserved and underinvested populations by bringing more minority students into the transportation sector. The minority groups represented include various people of color, Asian and Hispanic ethnic origins, and women. Thirty-five minority students, both undergraduate and graduate, have been involved in SAFER-SIM projects this period. One of our consortium members, the **University of Puerto Rico – Mayaguez** is a minority serving institution. In addition, minority students make up one third of the student population at the **University of Central Florida**. SAFER-SIM is dedicated to educating the next generation of safety professionals, building the transportation workforce for tomorrow, and fostering a vibrant community of simulation researchers.

	Number of Minority Students
University of Central Florida	12
University of Iowa	8
University of Massachusetts	3
University of Puerto Rico	8
University of Wisconsin	4

The different locations of each SAFER-SIM site help the research represent a diverse portion of the population. The **University of Iowa** and the **University of Wisconsin – Madison** are able to recruit individuals from a more-rural background. They are also able to share transportation safety findings at outreach events in rural communities, which are often times overlooked. **University of Massachusetts – Amherst** and **University of Central Florida** are located in urban environments. Researchers at these sites examine driving habits specifically associated with metropolitan transportation. The **University of Puerto Rico – Mayaguez** is able to research the driving habits of predominately Hispanic individuals. The

different locations of the SAFER-SIM sites help produce research that depicts the diverse range of driving behaviors from a diverse set of participants, which will lead to a better overall understanding of the way people drive.

Plan for Next Reporting Period

As projects funded by the center continue to report results, the next reporting period will bring more activity in dissemination of information and technology transfer. Relationships with STEM programs will continue to produce significant activity in education and outreach. Planned activities are:

- Advisory Board meeting December 2016
- Sixth SAFER-SIMposium – location TBD - Spring/Summer 2017
- Continue to schedule events with the Texting & Driving demonstration on the portable simulator in middle and high schools
- Continue to schedule classroom visits for the simulator and the Exploring the Science of Driving curriculum and schedule events in middle and high schools
- Reports and two-page summaries from completed projects continue to be become available on the SAFER-Sim website
- Monthly webinar series presenting results of SAFER-Sim projects with videos posted on SAFER-SIM YouTube channel
- Continued participation in STEM outreach and educational events
- CUTC Winter meeting January 2017

b. Products

Project reports and two-page summaries are available through the SAFER-Sim website. The webinar series continues to provide interaction between transportation professionals in government and industry and researchers. The webinars are recorded for later viewing by those who wish to revisit the presented material or were not able to attend the original presentation. The SAFER-Sim YouTube channel provides access to recorded webinars and informational and instructional videos produced by the SAFER-Sim consortium members.

The SAFER-Sim News Digest is available by subscription at our website. This email digest gathers news stories, program announcements, and conference information from around the world in the areas of safety and simulation. (<http://safersim.nads-sc.uiowa.edu/>) The website also hosts videos from the SAFER-Sim lecture series.

Development of the Global Road Safety course curriculum has been offered for two semesters. Creation of the online version of the course is in progress and will expand the availability to non-traditional students and others interested in the course content.

The Exploring the Science of Driving curriculum is available to the public, and the Texting & Driving demonstration will be available to schools and other organizations.

c. Participants & collaborating organizations

Significant collaboration continues across departments and institutions within SAFER-Sim and with other partners. The symposia held by SAFER-Sim have provided transportation students and faculty with valuable networking and collaboration opportunities. The relationship forged during these events branch out into the transportation workforce as students involved in SAFER-Sim projects join the workforce or pursue additional education at other institutions.

Consortium institutions collaborate with state DOTs and other organizations on events that focus on transportation safety and mobility. One example from this reporting period is the University of Iowa project on Automating the Transportation Design to Simulator Model Process is collaborating with 23 other laboratories on models.

d. Impact

Nine technical reports and at least 27 journal articles and conference papers have been produced as a result of SAFER-SIM funded research projects. Education and outreach activities have reached over 35,000 students and their families. Webinars have attracted 487 registrations 492 views on YouTube. Exploring the Science of driving have impacted the development of the transportation workforce by increasing teacher interaction with transportation safety as a teaching tool as well as introducing students to the field.

Media requests provide the public with valuable information about transportation safety and mobility topics. SAFER-Sim researchers have responded to multiple media requests and their work has been highlighted in university magazines and in U.S. Transportation Secretary Anthony Foxx's online blog.

e. Changes/Problems

No changes or problems to report.