



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

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## Overview

The SAFER-Sim has funded 42 research and educational projects, and has engaged in many education and outreach activities. Three rounds of competitive research and educational proposals have been received and selected for funding; 11 in the first round, 14 in the second and 17 in the third. Collaborative projects comprise 42% of our funded projects. Recently completed projects have reported results that provide guidance on traffic operations, traffic management strategies, toll booth placement and design, roadway markings, highway clear zones, and improving simulation as a tool. SAFER-Sim researchers and students have submitted 25 journal articles and conference papers, 4 technical papers and a TRB workshop related to their work on SAFER-Sim projects. The general public has been provided with transportation safety information through media outlets such as Consumer Affairs, Iowa Public Radio, New York Magazine, Yahoo Parenting, and MedicalXPress.

An advisory board meeting was held in February 2016. Board members were updated on the range of SAFER-Sim projects, SAFER-Simposium plans, and were provided input topics for SAFER-Sim to focus on in the future. The Outstanding Student of the Year award was presented to University of Central Florida student Kali Carroll. We held our third SAFER-Simposium hosted by the University of Central Florida. The SAFER-Simposium brought together local traffic safety professionals, faculty and students from all the consortium schools for a research and technology exchange. A fourth SAFER-Simposium is planned and will be hosted by the University of Wisconsin – Madison in June 2016. We also participated in many outreach events including STEM tours, K-12 curriculum development, and college course curriculum development related to road safety. Over 1430 K-12 students and their families, 26 teachers, and 50 college students have participated in these events.

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. Six projects have completed and final reports are available. As projects continue to complete, final reports will be made available to the public 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 will be added to the resources tab, a new tab. These summaries focus on recommended practices for transportation professionals providing easier access to key information than the full project report.

A call for proposals for projects using FY15 money was issued in December 2015. The RFP received 20 project proposals. The proposals were reviewed and rated for funding by the SAFER-Sim advisory board and directors. A total of 17 projects were approved for funding.

Collaboration continues to be strong within our consortium. Two across-site collaborative projects and five interdisciplinary projects were among those funded, comprising 41% of projects funded under this RFP.

Table 1. Research projects selected for funding with FY15 money.

Project Title	Project Type	Institution (s)	PI Co-PI	PI Departments
<b>A field and simulator evaluation of all-red clearance intervals for use in left turn applications</b>				
	Collaborative	UMass UW	Knodler Noyce	Civil Eng. Civil Eng.
<b>Phase III: Operational and safety-based analyses of varied toll lane configurations</b>				
	Collaborative	UMass UPRM	Knodler Valdes	Civil Eng. Civil Eng.
<b>Agent-based simulation for investigating the safety concerns of electric vehicles in the United States</b>				
	Individual	UCF	Tatari	Civil Eng.
Enhancing non-motorized safety by simulating non-motorized exposure using a transportation planning approach				
	Individual	UCF	Eluru	Civil Eng.
A driving simulator investigation of road safety risk mitigation under reduce visibility				
	Individual	UCF	Park Abdel-Aty	Eng. & Comp. Science Civil Eng.
<b>Distributed simulation to support driving safety research</b>				
	Individual	UI	Schwarz	NADS
<b>Automating transportation design model conversion for use in driving simulation</b>				
	Individual	UI	Allen Horosewski	NADS NADS
<b>Do prohibitive warnings improve road-crossing safety for texting pedestrians?</b>				
	Interdisciplinary	UI	Kearney Plumert	Comp. Sci. Psychology
Driving after distal radius fractures				
	Interdisciplinary	UI	Caldwell Brown	Orthopedics NADS
<b>Drugged driving: effects of pain and anxiety medications on driver performance in a simulator</b>				
	Interdisciplinary	UI	Gaffney Brown	Psychiatry NADS
Global road safety, online course development (Education)				
	Individual	UI	Hamann	Occ. & Env. Health
<b>Advanced Vehicle Technology Simulation and Research Outreach to STEM Programs (Education)</b>				
	Individual	UI	McGehee McDonald	Public Policy Public Policy
<b>Examining distracted drivers' underestimation of time and overestimation of speed</b>				
	Interdisciplinary	UMass	Samuel Knodler	Ind. Eng. Civil Eng.

<b>Speeding on curves &amp; potential countermeasures: A driving simulator assessment</b>			
Interdisciplinary	UMass	Samuel Knodler	Ind. Eng. Civil Eng.
<b>Perception of time influences on driver speed selection</b>			
Individual	UMass	Chrisofa Knodler	Civil Eng. Civil Eng.
<b>Safety evaluation of urban freight deliveries using microsimulation and surrogate safety measures</b>			
Individual	UMass	Gonzales	Civil Eng.

**2. Leadership Development.** The third symposium presented by SAFER-Sim was hosted by the **University of Central Florida** on October 5 & 6, 2015, with attendance of more than 70, in conjunction with the 2015 Road Safety and Simulation (RSS) International Conference in Orlando, Florida. The organizational planning and student preparation took place during the previous reporting period with the symposium and conference within the first week of this reporting period. Attendees included students involved in SAFER-Sim projects, faculty, and the five site directors. As part of the symposium, there was a networking dinner attended by more than 40 students. Transportation professionals who were former students at the University of Central Florida presented perspectives on careers in government, industry and academia to symposium attendees. SAFER-Sim students presented more than 20 posters highlighting their work on SAFER-Sim projects in a session the morning of the first day of the RSS International Conference. This poster session was attended by students, faculty, and conference attendees.

The fourth symposium will take place June 2-4, 2016 and will be hosted by the **University of Wisconsin-Madison**. Preparations are underway and presentations on SAFER-Sim research will focus on work from this reporting period. The event boasts lunch speakers, overviews of each institution's work, a strategic goals breakout session held by staff and students, a simulator tour and bus tour of the campus and Madison, student poster sessions, and presentations, evening social events, and individual project meetings. Attendees will also have the opportunity to visit a farmer's market in the area.

The **University of Iowa** has begun preparations for the fifth symposium to take place in November 2016. It is worth noting that the Iowa Lieutenant Governor, Kim Reynolds, is expected to attend and be a keynote speaker. Other state and university officials are expected to attend as well. Events currently being planned include a career and research fair presented by SAFER-Sim students to high school students, panel discussions, an open house at the National Advanced Driving Simulator (NADS), a business etiquette dinner, project presentations, and a number of tours of simulators on campus.

In addition to symposiums, SAFER-Sim has and will continue to sponsor a webinar series based on completed SAFER-Sim projects. In March 2016, Joe Kearney and Jodie Plumert of the **University of Iowa** presented their work focused on pedestrian and bicyclist road crossings and the use of connected vehicle technology to deliver timely safety warnings to pedestrians. Research was conducted at the Hank Virtual Environments Lab on campus. The first webinar had 78 registrants, 50 from academia, 15 from government, and 13 from

industry. It was also posted to YouTube and had roughly 60 views as of the end of the reporting period (the number continues to grow and was 82 views as of April 23<sup>rd</sup>). Webinars will continue to be scheduled each month featuring the results of a SAFER-Sim project. Upcoming topics include:

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

Kali Carroll of the **University of Central Florida** received the SAFER-Sim Outstanding Student of the Year Award, presented during the Council of University Transportation Centers (CUTC) awards banquet at the 2016 Transportation Research Board (TRB) 95<sup>th</sup> Annual Meeting and Exposition.

*Invited presentations*

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

- ASCE Transportation Conference, Ames, IA
- Safety Summit of USDOT University Transportation Centers
- Wisconsin Senior Driving Summit, Madison College, WI
- Korea Research Institute of Human Settlement (KRIHS)
- Mid-Continent Transportation Research Symposium, Ames, IA.
- V/AR & Transportation: Examples from Academia, Pre-Conference Workshop on Virtual Reality (VR) and Augmented Reality (AR) for Transportation Research, RSS International Conference, Orlando, FL
- Panel Discussion: Potential Transportation Research using Virtual/Augmented Reality, Pre-Conference Workshop on Virtual Reality (VR) and Augmented Reality (AR) for Transportation Research, RSS International Conference, Orlando, FL
- Virtual and Augmented Reality in Transportation: Examples from Academia, Iowa State University, Ames, IA
- Using Connected Vehicle Technology to Deliver Timely Warnings to Pedestrians, SAFER-Sim Webinar, Iowa City, IA
- Panel: Affordances in Immersive and Mixed Virtual Reality: Design Importance and Open Questions, Institute of Electrical and Electronics Engineers (IEEE) Virtual Reality Conference, Greenville, SC
- TRB Human Factors Workshop and Panel entitled “Cross Modal Distributed Simulation”, 95<sup>th</sup> Transportation Research Board Annual Meeting, Washington, D.C.
- 2016 Innovation and Tech Transfer Exchange Conference, Worchester, MA

### *Student conference papers accepted*

SAFER-Sim students have had 31 journal articles, conference papers, and posters accepted. This includes the following conferences and publications:

- 9<sup>th</sup> Biennial Meeting of the Cognitive Development Society, Columbus, OH
- 95<sup>th</sup> TRB Annual Meeting, Washington, D.C.
- Third SAFER-Sim Symposium, Orlando, FL
- RSS International Conference, Orlando, FL
- 21<sup>st</sup> ACM Symposium on Virtual Reality Software and Technology, Beijing China. (2<sup>nd</sup> best paper award)
- IEEE Virtual Reality Conference, Greenville, SC
- Journal of Child Psychology and Psychiatry
- Journal of Pediatric Psychology
- Accident Analysis and Prevention
- Congress of Engineering and Surveying and Related Disciplines
- Advances in Transportation Studies, an International Journal RSS2015 Special Issue
- XIX Pan-American Conference of Traffic, Transportation Engineering and Logistics
- LACCEI International Multi-Conference for Engineering, Education, and Technology
- Northeastern District ITE Meeting
  - 7 UMass students presented posters, two awarded 2<sup>nd</sup> and 3<sup>rd</sup> place in competition
- UMass Tech Day event
  - 8 students presented posters, one awarded “People’s Choice Award” for best poster
- IEEE Transactions on Visualization and Computer Graphics (submitted)
- 2016 ACM Symposium on Applied Perception, Anaheim, CA (submitted)

In addition, the **University of Massachusetts-Amherst** reports that three new journal publications and twelve new conference papers have been submitted for review.

### *Advisory committees/panels*

SAFER-Sim faculty currently serve on 3 advisory committees for national and local organizations and have led workshops organized by these committees:

- Strategic Highway Safety Plan Safety Summit
- State Transportation Innovation Council
- Member of Standing Committee on Transportation Safety Management (ANB10) of TRB

### *Journal editing and reviewing activity*

Many SAFER-Sim faculty at each site have served as reviewers for at least 6 journals, conferences, and committees covering a wide range of scientific areas.

- Dr. Jaeyoung Lee, Dr. Qi Shi, and Ling Wang of the University of Central Florida are actively reviewing papers from multiple journals
- Editor-in-Chief of Accident Analysis and Prevention
- Journal of Experimental Psychology: Applied, Editorial Board
- Journal of Experimental Child Psychology, Editorial Board

- National Science Foundation, Developmental & Learning Sciences, College of Reviewers
- National Science Foundation, review panel

*Leadership positions of students and faculty in professional organizations*

SAFER-Sim students hold leadership roles in several professional organizations in a wide range of safety and health fields.

*Students*

- Director of Activities of ITE University of Puerto Rico-Mayaguez Student Chapter
- President of Institute of Civil Engineers Student Chapter
- Secretary of ITE University of Puerto Rico-Mayaguez Student Chapter
- Vice President of Vehicular Technology Society Student Chapter

*Placement of students*

Three students originally funded from this UTC from the **University of Massachusetts-Amherst** received full time employment. One took a traffic engineering position with VHB in Virginia. An MSc student working on a **University of Massachusetts-Amherst** SAFER-Sim project chose to pursue a Ph.D. at the **University of Massachusetts-Amherst**.

*Shared resources*

- UPRM simulation procedures used at three universities (UMass, UCF, Madison)
- UPRM data analysis techniques used at two universities (UMass, Madison)

- 3. Education and Workforce Development.** The SAFER-Sim consortium members organized and participated in several education events and made plans for future collaborative efforts in education and workforce development. Overall, more than 1300 students have been reached by these activities.

*K-12 student events*

The **University of Puerto Rico-Mayaguez** engaged with high school and college students by giving an educational presentation about the driving simulator. Students learned how the driving simulator operates and the benefits of performing research with this equipment to improve highway safety. The outreach activities gave the students a driving simulation experience, a presentation of the output and the analysis process, and an opportunity for the exchange of ideas. The event impacted more than 100 high school and college students from all over Puerto Rico. The **University of Massachusetts-Amherst** participated in a Science Night for more than 60 middle school students that involved hands-on demonstrations that utilized a SAFER-Sim project, 3 project students, and the project PI. The **University of Massachusetts-Amherst** also presented at the Summer Engineering Institute (SENGI) for more than 40 high school students who were part of the month-long program.

The **University of Iowa** has been very active in K-12 engagement in a variety of forums:

- 2015 STEM Institute for Young Scientists on November 23-24
  - 150 students aged 12-13 from Northwest Junior High, West Branch, and Iowa Valley

- Teacher Professional Development – Explore the Science of Driving Curriculum on December 12
  - 6 high school teachers
- Lone Tree High School Tour of NADS on January 28
  - Approximately 15 Students
- 2016 Cedar Rapids STEM Festival on February 23
  - 800 individuals (pre-kindergarten-12<sup>th</sup> grade and parents)
- University of Iowa Admitted Students Day on both February 26 and March 4
  - 50 individuals (students and parents)
- Bettendorf Middle School Visit on March 1
  - 145 students from 8<sup>th</sup> grade
- Lab demonstrations at 4<sup>th</sup> Annual Junior Science and Humanities Symposium (JSHS) in Iowa City, IA in March 2016
  - The JSHS program promotes and publicly recognizes students for outstanding achievement in original research and experimentation in STEM fields at the high school level. By connecting talented students, their teachers, and research professionals, JSHS aims to widen the pool of students prepared to conduct vital research.
- DMACC Visit in West Des Moines, IA on March 7-8
  - 50 people
- Mock interviews at Elizabeth Tate High School in Iowa City on March 23
  - 3 students
- Mount Pleasant Career Day on March 24
  - 85 students
- Simulation Curriculum Prototype Day on April 11
  - 20 Pre-Service Teachers, partnership between UI College of Education and NADS
- Solon 7<sup>th</sup> Grade Tour of NADS on April 20
  - 24 students

#### *School and career fair visits*

The portable simulator at the **University of Iowa** is available for travel to eastern Iowa middle schools and high schools. The simulator can be used for a Texting-and-Driving Demonstration on the effects of distraction while driving and is available for the “Exploring the Science of Driving” curriculum modules for graphing and friction for middle and high school students. Students use the portable driving simulator in their school to collect driving performance data and then analyze that data to explore STEM concepts. Dr. Brown visited Bettendorf Middle School to provide curriculum support with approximately 145 students reached. He is working with five other schools to set up sessions and coordinating a return to the initial school to reach additional classrooms. One of these other schools will be in the Norwalk Community School District. A visit date has been planned for May 4<sup>th</sup> and the details are being finalized.

On November 23-24, 2015, SAFER-Sim and NADS researchers presented at the STEM Institute for Young Scientists. Dawn Marshall, Tim Brown, and Jacob Heiden gave presentations to ten groups of local 7<sup>th</sup> grade students from Northwest Junior High, West



Branch, and Iowa Valley. They described how NADS uses simulation to improve safety. They also collaborated with the students by brainstorming traffic safety hazards and ways simulation can solve them. A few students from each group drove the SAFER-Sim Texting-and-Driving Demo at the end of every presentation. This hands-on simulator experience displayed the dangers of texting and driving to the 12- and 13-year-old students while also encouraging them to explore a STEM career. The SAFER-Sim presentations reached approximately 150 students throughout the two days. Jacob Heiden displayed the texting and driving simulator at the Cedar Rapids STEM Festival on February 23, 2016. Over 800 individuals attended this evening event. Attendees included children from pre-kindergarten to 12th grade and their families. Eighty people drove the Texting-and-Driving Demo while many more gathered and watched the devastating consequences of distracted driving. On March 7 and 8, 2016, the texting and driving simulator was exhibited at the DMACC campus in West Des Moines, IA. Over 50 people had the chance to drive the simulator and see the consequences of distracted driving. On March 23, 2016, Dr. John Gaspar of NADS participated in a training event at Elizabeth Tate High School in Iowa City. He performed mock interviews with 3 students to assist in their transition from high school to adult life. Alec LaVelle and Jacob Heiden of NADS, three Master's students in Secondary Science Education, and UI professor Leslie Flynn also participated in a career fair at Mount Pleasant Middle School with 85 students reached. They shared their experiences working in a STEM career and exhibited the texting and driving simulator.

In April, as part of a SAFER-Sim education project, the UI College of Education and NADS 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 throughout. Twenty-four students from a 7th grade class at Solon Middle School visited NADS and learned about the exciting transportation research taking place throughout the University and had a chance to drive the miniSim™.

Spring 2016 semester, Dr. Brown is bringing simulation and simulators as examples to an UI Ergonomics class, specific examples include workplace design, hazard identification remediation, and controls. The class will tour the NADS facility in April 2016 to gain hands-on experience with principles covered in the class in a research facility and simulator environment.

The **University of Massachusetts-Amherst** led five new tours of their driving simulator facilities. They also used one of their projects as part of a STEM Lecture (Science Saturdays) in January 2016 and used another project as part of a STEM activity on campus.

#### *Videos, Animations, and Activities*

SAFER-Sim researchers at the **University of Wisconsin-Madison** developed a series of video lessons in a playlist called "Simulator Scenario Creation". This resource provides valuable insight for anyone, student or professional, into the process of scenario creation for a driving simulator. There are currently 10 videos posted on YouTube that are available to the public (<https://www.youtube.com/playlist?list=PLQcoZ3uITZkjBfa0bA41fsKfVJJj338ln>). As of this reporting period, the series had 97 views.

The **University of Massachusetts-Amherst** led a new hands-on microsimulation activity for first year engineering students at the University. In addition, the **University of Massachusetts-Amherst** participated in two workshops for undergraduate students. Students involved with SAFER-Sim projects taught 2-hr workshops on VISSIM and AIMSUN to fellow graduate students. In addition, one student participated as an instructor for AIMSUN in a Women in Transportation Seminar (WTS) UMass Chapter event.

#### *Workforce*

The **University of Massachusetts-Amherst** is discussing the possibility of developing results from SAFER-Sim projects into Local Technical Assistance Program (LTAP) workshops. The **University of Iowa** was an exhibitor at the Pearson Health and Safety Fair on January 14<sup>th</sup>. Pearson employees learned about the important work being done by SAFER-Sim in conjunction with NADS to further motor vehicle and driver safety. Over 100 employees viewed the exhibit and 30 individuals gained hands-on experience in the dangers of texting and driving through the use of the simulator. SAFER-Sim researchers also served as judges at the **University of Iowa's** 14<sup>th</sup> Annual College of Engineering Research Open House held April 7<sup>th</sup> (one week after this reporting period). The event had over 100 student posters showcasing innovative research conducted at the university.

#### *Curriculum modules and courses developed*

The Global Road Safety course developed by Drs. Cara Hamman and Corinne Peek-Asa at the **University of Iowa** was again offered in the Spring 2016 semester. The course trains undergraduate and graduate students on the field of simulation research and how to develop scenarios, including lecture, hands-on activities, and a field trips to see simulators in operation. The full curriculum has been created for an in-person class and plans are to offer the course again in Spring 2016. Drs. Hamann and Peek-Asa will further develop this course into an online version during the summer of 2016 that could 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** has developed 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.

The same simulator is available for a Texting-and-Driving demonstration on the effects of distraction while driving at the **University of Iowa**. The initial phase of the demonstration includes a short drive where students are asked to read a text message during the drive. The simulator then displays driving performance measures while distracted compared to non-distracted. Students have been very receptive to this demonstration and highly enjoy taking part. The Texting-and-Driving Demo has been presented at multiple events geared toward teen drivers, happening in places such as Des Moines, West Liberty, and West Burlington, Iowa. This geographic area ranges from the center of the state to the eastern border. This demonstration is also used during tours of the NADS facility for both future and current drivers. The desktop simulator is available for future use in safety-related events, middle schools, and high schools in Iowa.

- 4. Technology Transfer.** The **University of Puerto Rico-Mayaguez** programmed and implemented two major technology transfer and outreach activities: Vehicular Technology Society Student Chapter Info Session and Exposition and an outreach activity with K-12 students. The first technology transfer activity was performed with the collaboration of the University of Puerto Rico-Mayaguez Vehicular Technology Society Student Chapter and consisted of two interventions. First, there was an info session where the Co-PIs of the SAFER-Sim project offered a technical presentation to a multidisciplinary audience of undergraduate students. Second, there was a week-long exposition where students and faculty from several disciplines had the opportunity to drive the simulator along various scenarios. The second technology transfer activity was geared toward K-12 students coming from a local public school. The outreach activities served to motivate young students to pursue a career in transportation and create safety awareness. The University of Puerto Rico-Mayaguez SAFER-Sim team engaged more than 150 students and engineering professionals in safety issues using the driving simulator.

The SAFER-Sim lecture series has become a webinar series and continues to connect researchers by providing a venue for sharing work in support of a collaborative atmosphere. Videos of the webinars are available on our website and on our YouTube channel shortly after each date. Joe Kearney and Jodie Plumert of the **University of Iowa's** Hank Virtual Environments Lab presented the webinar "Using Connected Vehicle Technology To Deliver Timely Warnings To Pedestrians" in March. As of the end of the reporting period, it had 60 views on YouTube (currently 88 views).

In addition to the webinars, we have created a SAFER-Sim UTC YouTube channel to host instructional videos. Currently, the 10-video "Simulator Scenario Creation" YouTube playlist created by the **University of Wisconsin-Madison** is hosted on Kelvin Santiago's personal channel. Late in this reporting period, in addition to the YouTube channel, SAFER-Sim became active on Facebook and on Twitter in an attempt to reach a broader audience. The Facebook page features posts with descriptions and pictures of how simulation is used for research projects and education and workforce development activities. The Twitter account features tweets with similar themes. These tweets have been seen by over 1200 Twitter users and include retweets and likes from USDOT Research and other University Transportation Centers. SAFER-Sim will continue these social media accounts to improve our online presence and educate our stakeholders about the benefits of simulation in

transportation research. SAFER-Sim also works to bring visiting scholars for lectures. In February, Alexandra Kondyli presented “Safety-Related Analysis of 3D Driver Body Posture Using Naturalistic Data” at the NADS facility. Approximately 20 individuals from multiple departments at the **University of Iowa** attended this event. This was made possible via networking efforts at conferences such as TRB.

The reorganization and redesign of the SAFER-Sim website, hosted by the **University of Iowa**, to support all users and potential users of simulators - students, faculty, and transportation professionals - has completed, with additional modifications occurring as needed. This project was taken on by research assistant Jacob Heiden, who took on the effort while working as an undergraduate student and was subsequently hired to continue his efforts after graduation. Jacob was supported by NADS Systems Administrator and Web Programmer, Stephen Cable. This effort is critical to supporting technical transfer and other activities, including accurate reporting of SAFER-Sim projects. A major addition was online reporting forms for SAFER-Sim researchers and site directors at both the individual project and site levels. We have received feedback on these online forms and plan to make changes based on the feedback. A “Resources” tab is still being planned that will contain two-page project summaries focused on best practices and key results for transportation professionals, as well as additional resources for transportation professionals. This will include information on the uses of simulation and how to use simulators, valuable existing materials such as the Driving Simulation Handbook, and SAFER-Sim created instructional videos aimed at students and professionals to help them use and understand simulation as a tool. This tab will also include the curriculum materials for download by teachers.

Significant planning and redesign of supporting databases on the website has completed. The underlying website structure allows automatic updates to the SAFER-Sim website for news events submitted by researchers across the consortium sites. The “Research tab” was reorganized to make finding individual projects easier and links to project reports, conference presentations, and journal articles are added to both the “Research” and “Reports” tab. This allows visitors to the website to easily find information about ongoing projects and quickly locate reports, papers, and presentations supporting the transfer of technology and information. The news feature was redesigned to indicate the most recent updates to the website to allow visitors to easily and quickly see the range of educational and professional activities engaged in by SAFER-Sim members as they happen.

During this reporting period, SAFER-Sim projects have resulted in several journal articles and conference presentations in addition to the presentations at the symposium in Orlando, FL and invited presentations listed above. These are authored by both SAFER-Sim researchers and students. An honor’s research abstract was submitted by a student at the **University of Massachusetts-Amherst** for consideration at an annual event held in April. It was selected for podium presentation.

University of Central Florida	1 submitted journal article, 3 conference presentations
University of Iowa	12 submitted journal articles and conference presentations, 1 abstract + symposium presentation
University of Massachusetts	3 submitted journal articles, 6 conference presentations
University of Puerto Rico	4 technical papers including 1 special issue
University of Wisconsin	1 conference presentation and 1 TRB workshop

David Noyce of the **University of Wisconsin-Madison** presented at the Wisconsin Senior Driving Summit on October 2 at Madison College. It was hosted by WisDOT, AAA-Wisconsin, and Madison College. Nationally recognized experts from around the country made initial presentations, and then a panel of experts from Wisconsin carried the discussion forward. Their fields of expertise included how aging affects driving, how law enforcement can help, the driver’s license renewal process, driver evaluation by occupational therapists, transportation alternatives, traffic engineering, and traffic engineering research. The focus was on how to help older people stay mobile and stay connected to their communities in a safe way. Presenters and attendees explored many topics, considered how teamwork can be further improved, and looked ahead to further planning and preparation for what’s on the horizon.

*Media requests*

The **University of Massachusetts-Amherst** had two media requests and the **University of Wisconsin-Madison** contributed to Wisconsin's Traffic Safety Reporter on Older Driver Safety Issues (<http://wisconsindot.gov/Documents/about-wisdot/newsroom/newsletters/safety/tsr-vol18no4.pdf>). The Hank Virtual Environments Lab at the **University of Iowa** had several media appearances and press releases. Jodie Plumert was an invited guest on World Canvass for a program entitled “Research to Real Life” (<http://international.uiowa.edu/news/worldcanvass-recap-research-real-life>). Work by Nikolas, Elmore, Franzen, O’Neal, Kearney, & Plumert from their 2016 “Risky bicycling behavior among youth with and without attention-deficit hyperactivity disorder” publication has been highlighted in numerous media outlets (<https://www.consumeraffairs.com/news/making-bicycling-safer-for-kids-with-adhd-121815.html>, <http://www.sciencenewsline.com/news/2015121701430050.html>, <http://www.healthcentral.com/adhd/c/1443/179464/keeping-children-adhd-safe-bikes/>). Work by O’Neal, Plumert, & Peterson from the 2016 publication “Parent-child injury prevention conversations following a trip to the emergency department” has been featured on Iowa Public Radio, in New York Magazine (<http://nymag.com/scienceofus/2015/10/girls-boys-get-different-talks-after-accidents.html#>), and on Yahoo Parenting (<https://www.yahoo.com/parenting/saying-be-careful-to-kids-actually-makes-a-201243853.html>). The 2016 publication by O’Neal, Plumert, McClure, & Schwebel “The role of body mass index in child pedestrian injury risk” was featured in MedicalXpress (<http://medicalxpress.com/news/2016-03-kids-high-body-mass-index.html>).

*Facility tours*

The **University of Massachusetts-Amherst** gave five new tours of the simulator facilities, one of which included demonstrating project scenarios. Dr. Brown of the **University of**

Iowa's NADS supported two tours in addition to the education and workplace development tours listed above. The Hank Virtual Environment Lab gave four tours, including demonstrations for university classes, visitors from the automotive industry, representatives from Iowa and US DOT, and groups of K-12 students visiting campus.

#### *License agreements*

Shawn Allen sought a license agreement between Presagis and the **University of Iowa** to permit re-distribution of OpenFlight API python files.

Drs. Chris Schwarz and Tim Brown, Dawn Marshall, and Gerene Denning from the **University of Iowa** have been participating in STEM Innovator Community Partnership. The University of Iowa's STEM Innovator program offers professional development for teachers and administrators who want to infuse innovation and entrepreneurship into their schools by working with business and industry community partners. STEM Innovator prepares teachers to have their students work in teams employing an entrepreneurial mindset and innovative thinking to solve authentic, community-driven, real-world problems. STEM Innovator students gain skills to thrive in a 21st Century global economy. For example, STEM Innovator students have partnered with The University of Iowa's National Advanced Driving Simulator and Department of Emergency Medicine to address the problem of ATV Safety; including identifying what the problem is, verifying and validating the problem and solution through customer discovery, and implementing the solution.

Additionally, STEM events through Workplace Learning Connection ([www.workplace-learning.org](http://www.workplace-learning.org)) reach K-12 students through day-long learning institutes where students participate in short workshops with professionals in STEM fields. Tours for high school students of various facilities also highlight STEM related career paths. Mock interviews provide high school students with professional skills.

**Collaboration.** A main focus of the SAFER-Sim UTC is collaboration within consortium sites, and across disciplines. To date, 8 multiple site collaborative another 10 interdisciplinary projects have been funded, 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. 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 new webinar format allows for greater engagement and a broader exchange of ideas. SAFER-Sim also has a biweekly news digest that is emailed to almost 200 individuals holding academic, government, and transportation industry positions. The email's content currently includes SAFER-Sim news and webinars, recent reports and journal articles, and automotive technology and safety news. The goal for the next reporting period is to include all SAFER-Sim project final reports.

The **University of Central Florida** had four members attend the SAFER-Sim symposium in October: Professor Dr. Mohamed Abdel-Aty, Dr. Jaeyoung Lee, Dr. Qi Shi, and Ling Wang. Dawn Marshall, Joe Kearney, and four graduate students from the **University of Iowa** also attended. Joe Kearney gave a presentation of academic research using A/VR in the transportation area and participated in a panel discussion at a workshop co-sponsored by

the SAFER-Sim UTC. Elizabeth O'Neal presented a poster on child pedestrian road crossing based on an experiment conducted in the pedestrian simulator at the SAFER-Sim poster session. Pooya Rahimian gave a talk focused on the design of the pedestrian simulator. The **University of Massachusetts-Amherst** attended and presented a project as well.

The **University of Central Florida** and the **University of Puerto Rico-Mayaguez** continue exchanging ideas associated with the analysis of independent variables using the driving simulator. Two ongoing research projects involving freeway simulation using the Phase One and Phase Two toll plaza scenarios have been developed in collaboration with the **University of Massachusetts-Amherst** and the **University of Wisconsin-Madison**. Two published papers resulted from this collaborative effort with the **University of Massachusetts-Amherst**: a faculty, graduate, and undergraduate collaboration for a submission to *Advances in Transportation Studies*, an International Journal RSS2015 Special Issue and a submission for *Transportation Research Record*.

The **University of Massachusetts-Amherst** is engaged in one collaborative research project. They are also working to link a different project with a Roundabout Project that is currently funded by the New England UTC. The NEUTC project is tasked with modeling the emissions impact from various roundabout configurations.

The **University of Wisconsin-Madison** collaborated with Shawn Allen of the **University of Iowa** in understanding workflow involved in scenario creation for the NADS miniSim™. Dr. John Gaspar is heading a collaborative research effort between the **University of Wisconsin-Madison** and the **University of Iowa**. Using the model developed by Shawn Allen and the **University of Wisconsin-Madison**, NADS will collect and analyze data from the rural SHRP-2 curves in the NADS-1 simulator. Iowa State University was also brought in for access to the SHRP-2 NDS data. A collaboration with the **University of Wisconsin-Madison's** Mechanical Engineering and Electrical/Computer Engineering is developing a proposal for NSF on networking driving simulators. Also within the **University of Wisconsin-Madison** is collaboration on a SAFER-Sim project among the Medical School, Department of Radiology, and Department of Kinesiology. The **University of Wisconsin-Madison** is also building collaboration with University of Wisconsin-Milwaukee on bike-pedestrian safety issues, as well as working with the City of Madison, WI to prepare for evaluation of a novel pedestrian warning sign at intersections with permissive left turn operations using flashing yellow arrows.

Jodie Plumert and Joe Kearney of the **University of Iowa** have one collaborative project with another UTC (Peter Hancock, University of Central Florida), and two funded SAFER-Sim collaborative projects. Two SAFER-Sim collaborative projects were submitted in the last call for proposals (1 was funded). Four graduate students are seeking advanced degrees while working on projects related to SAFER-Sim: Pooya Rahimian, Ph.D. student in Computer Science; Elizabeth O'Neal, Ph.D. student in Psychological and Brain Sciences; Yuanyuan Jiang, Ph.D. student in Computer Science; and Junghum Paul Yon, M.S. student in Computer Science.

5. **Program Efficacy.** The activities of the SAFER-Sim UTC are advancing traffic safety through the use of simulation and developments in simulation. With 64 proposals for education and research projects have been received in response to our three calls for proposals resulting in 43 funded projects. These projects have are providing advancements in safety for all roadway users as well as developments in simulator technology. A few examples:
- **Integration of Microscopic Big Traffic Data in Simulation-Based Safety Analysis** aids professionals' understanding of traffic operation and safety and subsequently assists in the creation of more proactive traffic management strategies. Additionally, the use of real-time traffic data in simulation helps to better reflect traffic conditions for the simulated environment to support identification of countermeasures for the investigated issue.
  - **Dynamic Simulation Models for Road Safety and Its Sustainability Implications** provides insight into reducing worldwide greenhouse gas emissions, decreases in fatality rate, and improving the vehicle safety index (by means of increased safety technologies).
  - **Evaluation of Real-World Toll Plazas Using Driving Simulation** contributed recommendations to the developments of national toll plaza design guidelines, location of a toll plazas and signage
  - **Examination of driver behavior in response to bicyclist behaviors** provided guidance for shared lane arrow markings and passing separation distances.
  - **Driving Simulator Use in the Roadway Design and Planning Process** involved the science of simulation through development of algorithms that allow for more reliable import of third party sourced models in terms of simulator model quality for safety-centered road designs and evaluations that rely on human-in-the-loop simulation.
  - **The Effect of Roadside Vegetation and Clear Zone Design on Driver Behavior** provided guidance for traffic engineers on clear zones on highways.

The journal articles and conference papers coming from SAFER-Sim projects provide resources for traffic safety professionals and researchers. The redesign of the SAFER-Sim website also provides easier access to resources both produced by SAFER-Sim activities and existing expertise in the field of simulation. Some of the requested changes came directly from transportation professionals, illustrating that they will access resources provided in this manner.

SAFER-Sim relationships with STEM and workforce development organizations , such as STEM Innovator and Workplace Learning Connection as well as development and distribution of educational materials and demonstrations that will be available to hundreds of students in 2016.

The center continues to hold regular teleconferences among the consortium members to share information, track progress on collaborative research projects, share outreach ideas, and plan future activities. These regular phone calls have proven to support the collaborative nature of our center. The bi-weekly digest of news items related to safety and simulation is distributed via email to over 200 people. The newsletter has provided subscribers with a total of 596 links to abstracts, conferences and events and reports.



An Advisory board meeting was held in February 2016. The Advisory Board consists of nine individuals from academia, business, federal and state government with involvement and expertise in transportation safety. The meeting was attended by eight of the nine board members and all of the SAFER-Sim directors. The agenda for the meeting included:

#### **Highlights of Recent Activities**

- SAFER-Sim Symposium in Orlando, Fl.
- UTC Student Award Recipient - Kali Carroll from University of Central Florida
- Project Summary

#### **Feedback from advisory board on SAFER-Sim performance**

- Distribution of SAFER-Sim materials and getting the word out about our activities
- Review of proposals received in response to most recent RFP
  - Topics of interest and priority for decisions on funding proposals
- Revision of SAFER-Sim thrusts and themes based on changing research needs
  - More focus on pedestrians, bicycles, connected and automated vehicles
- Simulation workshop in collaboration with TRB Simulation committee

#### **Next SAFER-Simposium June 2-4, 2016 in Madison Wisconsin**

Dawn Marshall attended the Council of University Transportation Center meetings at TRB in January of 2016. Through these meetings connections were made with other UTC directors and administrators. Ms. Marshall also represented SAFER-Sim at the UTC Safety Summit in Washington, D.C. in March 2016. There she gave an overview of SAFER-Sim activities and suggested future avenues for the advancement of simulation as a safety research too. Dawn Marshall , Jacob Heiden and Kathy Holeton will attend the CUTC summer meeting in June 2016.

#### *Proposals to other funding agencies*

“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).

“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, \$99,965 in total costs.

- 6. Diversity.** SAFER-Sim Research projects are providing funding for several students from minority groups. The minority groups represented include various people of color, Asian and Hispanic ethnic origins, and women. Some projects have had more than one minority student employed sequentially that are counted here. SAFER-Sim is also proud of the diversity of the professional backgrounds of individuals involved: Engineering, Public Health, Psychology, Psychological & Brain Sciences, Computer Science, Emergency Medicine, Science Education, and more. The **University of Massachusetts-Amherst** reported that three new SAFER-Sim students were placed into full-time employment at graduation. Five of

their projects involved at least one student from an underrepresented group. Dr. Plumert at the **University of Iowa** reports two female graduate students (one in Computer Science and one in Psychological & Brain Sciences) and three female undergraduate students (all in Psychological & Brain Sciences) who are working on SAFER-Sim projects. The **University of Puerto Rico-Mayaguez** had two students apply to the transportation option of the Master of Science in Civil Engineering (MSCE) program and have three undergraduate STEM students who will continue to work on SAFER-Sim research. Two graduate students worked on a previous project phase and will work on the current phases of SAFER-Sim research. In addition, two major diversity activities were designed for participation of diverse students at the University of Puerto Rico-Mayaguez. Two major recruitment events were programmed using their driving simulator: The Vehicular Technology Society Driving Simulation Info Session and K-12 outreach demonstration. All recruitment events included primarily students from the Hispanic ethnic group from the Latin American and Caribbean countries.

	Number of Minority Students
University of Central Florida	2
University of Iowa	6
University of Massachusetts	5
University of Puerto Rico	5
University of Wisconsin	0

## 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. The relationships that have been built will also produce more activity in education and outreach. Planned activities are:

- Fourth SAFER-Symposium at the University of Wisconsin – Madison Spring/Summer 2016
- Planning for the fifth SAFER-Symposium at the University of Iowa in Fall of 2016
- Continue to schedule events with the Texting & Driving demonstration on the portable simulator in middle and high schools
- Contact educators about the Exploring the Science of Driving curriculum and schedule events in middle and high schools
- Reports and two-page summaries from completed projects will become available on the SAFER-Sim website
- Continue work on videos on how to use simulation aimed at students and professionals
- Monthly webinar series presenting results of SAFER-Sim projects
- Continued participation in STEM outreach and educational events
- Summer internships
- CUTC Summer meeting June 2016

## b. Products

Project reports and two-page summaries are available through the SAFER-Sim website. The webinar series provides more interaction with transportation professionals and researchers than the UI

based lecture series. 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 is currently being offered for a second semester. Creation of the online version of the course 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 is taking place 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 Wisconsin participation in the Wisconsin Senior Driving Summit hosted by WisDOT, AAA-Wisconsin, and Madison College. These events bring professionals from many fields together to discuss, learn and plan how to better serve transportation needs.

### d. Impact

The development and implementation of two curricula using simulation; Global Road Safety and Exploring the Science of driving have impacted the development of the transportation workforce by increasing student knowledge and training in these areas and also introducing them to the field, which may lead some to continue their training and pursuit of careers in transportation safety. Education and outreach activities have reached over 1430 students and their families.

SAFER-Sim researchers and students have submitted 25 journal articles and conference papers, 4 technical papers, and a TRB workshop related to their work on SAFER-Sim projects. These contributions support transportation professionals and researchers by providing insight and guidance on traffic operations, traffic management strategies, toll booth placement and design, roadway markings, highway clear zones, and improving simulation as a tool for safety research.

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 media outlets such as Consumer Affairs, Iowa Public Radio, New York Magazine, Yahoo Parenting, and MedicalXPress.

#### e. Changes/Problems

Some projects have experienced delays that were outside the control of the principal investigators. One was due to the hospitalization of a PI and two were due to delays in leveraged non-SAFER-Sim projects. All are projects on track to successfully complete on updated timelines.