



**SEMI-ANNUAL PROGRESS REPORT FOR
UNIVERSITY TRANSPORTATION CENTERS**

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

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Signature of Submitting Official: 

1. Accomplishments

1.1 What are the major goals of the program?

1.1.1 Research

Safety Research Using Simulation (SAFER-SIM) is a Tier 1 University Transportation Center (UTC) with a research priority of promoting safety. The UTC includes five institutions: University of Iowa (lead), University of Wisconsin Madison, University of Massachusetts Amherst, University of Central Florida, and University of Puerto Rico Mayaguez. SAFER-SIM leverages research from a range of disciplines to study how road users, roadway infrastructure, and new vehicle technologies interact and interface with each other. The center uses microsimulation and state-of-the-art human in the loop driving, bicycling, pedestrian simulators to develop solutions for safer transportation in the US and globally.

SAFER-SIM works to promote safety by addressing these research topic areas:

- Automated Vehicles Technology
- Connected Vehicles Technology
- Vulnerable Road Users
- Roadway Infrastructure Design
- Distributed Simulation Technology

1.1.2 Leadership Development

SAFER-SIM sites are recognized nationally and internationally as leaders in transportation safety research with a distinction in applying simulation to safety problems. Developing the next generation of leaders in safety research and simulation is a key function of our work. Our center will accomplish this using seminars, symposia, web-based discussions, and other opportunities to share our expertise.

1.1.3 Education and Workforce Development

SAFER-SIM will educate the next generation of safety professionals, building the transportation workforce for tomorrow, and fostering a vibrant community of researchers.

1.1.4 Technology Transfer

SAFER-SIM will establish and promote opportunities for research collaboration with industry, state and local governments, and other organizations with an interest in transportation safety. The center will promote commercialization activities and will provide highly trained scientists for the industrial workforce

1.1.5 Collaboration

Strong collaboration efforts will take place across consortium sites, within consortium sites, and with government agencies and industry partners. Collaboration plays an important role in reaching goals in all areas at our center.

1.1.6 Diversity

SAFER-SIM is committed to promoting diversity through student involvement on research projects and to reaching underrepresented populations in community outreach.

1.2 What was accomplished under these goals?

1.2.1 Research

The center has funded ninety-seven (97) projects under the FAST Act – seventy-six (94) research and two (3) outreach. Thirty-six (36) projects remain active and sixty-one (66) projects are complete. We have changed the way we count collaborative projects. In the past collaborative projects were counted as a single project, yet since the institutions involved sometimes used different timelines and submitted separate deliverables, such as data sets, multi-institution collaborative projects are now counted separately for each institution. This change came about as different institutions experienced differing lengths of delays from COVID-19 and allows records to accurately reflect project completion for each consortium institution. Collaborative projects will still submit a single final report and result in a single TRID submission. All project information can be found on the research tab of the [SAFER-SIM website](#). Active projects are listed on the Transportation Research Board’s [Research in Progress \(RIP\) Database](#).

SAFER-SIM directors discussed plans for Year 6 projects this period. Additional projects are still being identified following the finalization of the collaborative projects with the AAA Foundation for Traffic Safety (described in section 1.2.5). The center decided to forgo the annual Request for Proposals process last period in favor of each site determining the optimal project(s) to fund in the final year of the UTC with the end of the performance period approaching in September 2023. Project selection was focused on advancing the findings of previously funded projects and providing project level funding to promising previously completed pilot projects. Most project decisions have been made with many projects already active. New projects funded will be posted on [Research in Progress \(RIP\) Database](#):

| Year | Funded/Inactive | Projects Active | Projects Complete | Total Projects |
|-------|-----------------|-----------------|-------------------|----------------|
| Y1 | 0 | 0 | 14 | 14 |
| Y2 | 0 | 0 | 16 | 16 |
| Y3 | 0 | 2 | 17 | 19 |
| Y4 | 0 | 2 | 18 | 20 |
| Y5 | 0 | 21 | 1 | 22 |
| Y6 | 0 | 6 | 0 | 6 to date |
| Total | 0 | 31 | 66 | 97 |

SAFER-SIM completed five (5) research projects this period listed below. These projects are finalizing revisions to reports and datasets, and final submission to TRID will happen early next period. The delays due to COVID created a backlog of work on the research and administrative sides, yet our center is working diligently through these delays to return to normal operating procedures. More description is available in [Section 6.1](#).

| Projects Completed this Period | TRID |
|---|-------------|
| Enhancing School Zone and School Bus Safety | In Progress |
| Using Simulation to Study Communication between Autonomous Vehicles and Vulnerable Road Users | In Progress |

| | |
|--|-------------|
| Understanding Bicyclists' Behaviors Through Learning from Big Trip Data | In Progress |
| A Co-Simulation Study to Assess the Impacts of Connected and Autonomous Vehicles on Traffic Flow Stability during Hurricane Evacuation | In Progress |
| Using Augmented Reality to Help Older Adults Make Safe Road-Crossing Decisions | In Progress |

SAFER-SIM and the AAA Foundation for Traffic Safety continue collaboration with the funding of two additional research projects.

Identifying outcome measures to evaluate effectiveness of consumer education and training for vehicle automation (AAAFS Year 4) – University of Massachusetts, Lead This project has the primary objective to identify outcome measures that can be used to assess effectiveness of training and education for advanced vehicle technologies. This research will be focused on understanding drivers' knowledge in the context of vehicle technologies that are currently deployed and available (Level 1 & 2 as per SAE J3016 (SAE, 2018) definitions). Specifically, adaptive cruise control (ACC) and lane keeping assist (LKA) or lane centering technologies will be considered, whether they function independently or in combination. A secondary objective of this proposed research is a discussion of the implications of these identified outcome measures in the context of higher levels of automation.

Mapping comprehension of ADAS across different driving and road user populations (AAAFS Year 4) – University of Iowa, Lead This project will survey drivers and other road users regarding their knowledge of different vehicle technologies, providing significant insight into how understanding varies across populations, defined by age, gender and individual differences. This research will also identify those groups of individuals who are lacking the necessary understanding but who feel confident, nonetheless. The outcomes of this research will (1) inform the development of education and training approaches for specific populations, and (2) characterize those individuals with miscalibrated confidence in their understanding of advanced vehicle technologies.

Below is a summary of research performance metrics for the current performance period. Full list can be found [here](#).

| Performance Metric | Result |
|--|--------|
| Peer-reviewed journal publications (published) | 16 |
| Book chapters | 0 |
| Edited books | 0 |
| Conference papers, posters, and symposia | 12 |
| Paper/poster awards | 1 |
| External grants related to SAFER-SIM | 6 |

1.2.2 Leadership Development

Researchers and students gained and shared valuable experience through SAFER-SIM work this period.

SAFER-SIM researchers continued representing the center at professional meetings through invited

presentations. This work shows the combined expertise of our center along with the wide range of stakeholders interested in our research including state departments and tech companies. Some invited presentation highlights include:

1. Shannon Roberts gave a presentation called “What’s going on with this car?: How drivers respond to unexpected events in driving automation systems” for the Purdue University Human Factors and Ergonomics Society Technical Talks on April 11, 2022.
2. Taveras, Y. Uso de los simuladores de conducción para educación e investigación (Use of driving simulators for education and research). Conferencia de Seguridad Vial. Manta, Ecuador, September 16, 2022.
3. Figueroa, A., Chamorro, A., Cardona, N., and Badillo, J. June 16/22, 2022. Demonstrations of the UPRM Pedestrian Virtual Reality Simulator and the UPRM Driver Simulators. UPRM Pre-Engineering Summer Camp. R2-DEEP and the UPRM School of Engineering.
4. Christofa, E. 2022. Embracing Diversity, Equity, and Inclusion in Engineering. Department of Civil Engineering, The University of Memphis, 18 April.

SAFER-SIM contributed to the advancement of simulation and road safety through other leadership development activities this period. Researchers actively participated on grant review panels, advisory committees, professional organizations, and other scholarly endeavors. SAFER-SIM researchers were honored by an array of awards for impactful achievements in transportation. Some exemplary awards were given to our Co-Directors and are listed below:

1. IPRC pilot grant proposal reviewer – (Reyes) – University of Iowa –
2. Alberto Figueroa-Medina. Member of Oversight Panel for NCHRP project 07-29: Development of the 8th edition of the AASHTO's A Policy on Geometric Design of Highways and Streets (Green Book). National Cooperative Highway Research Program, Transportation Research Board.
3. Shannon Roberts served on an NSF proposal review panel.
4. Shannon Roberts served on an NIH proposal review panel for HCMF (Human Complex Mental Function).
5. Shannon Roberts continues to serve on a BTSCR panel for BTS-01: Guidance for Employer-Based Behavioral Traffic Safety Programs for Drivers in the Workplace. For the panel, she provided guidance for the contractor in terms of how drivers will respond to traffic safety programs.
6. Anuj K. Pradhan – BTSCR - Determining the State of Knowledge, Opportunities for Outreach, and Data-driven Tools for Consumer Education of ADAS.

Below is a summary of leadership development performance metrics. Full list can be found [here](#).

| Leadership Development Performance Metric | Result |
|--|---------------|
| Invited presentations | 4 |
| Invited papers | 0 |
| Invited workshops | 1 |
| Grant review panels | 6 |
| Advisory committees | 20 |
| Journal editing | 42 |
| Leadership positions in professional organizations | 14 |
| SAFER-SIM webinars (see section 1.1.4) | 0 |

1.2.3 Education and Workforce Development

Consortium members continued engaging students of all levels this period in transportation, safety, and STEM (science, technology, engineering, and math).

The University of Iowa actively engaged K-12 students this period through tours, events, and classroom visits with 725 students participating. The UI team focused on visiting school districts with high percentages of minority students and established relationships with new school districts while continuing existing relationships. School classroom visits present STEM concepts and provide students with information on transportation careers and present science topics supporting physics, math, psychology, and health curricula. Two in-class mini research activities are offered, distracted driving and stopping distance based on the coefficient of friction of different road conditions. Additionally, UI researchers are again involved in the organizing committee for the [Iowa National Transportation Summer Institute \(INTSI\)](#). The INTSI is a STEM Camp for 7-9 grade students focusing on STEM education, careers in transportation, and leadership. The program provided 20 students with challenges with two weeks of introduction to careers in aviation, maritime, and surface transportation.

K-12 activities include:

- Linn County STEM Festival – 60 students
- Jefferson County STEAM Festival – 250 students
- Liberty High School Robotics Team Tour - 10 students
- Perry Research Scholars Institute Tour – 18 students
- Iowa National Summer Transportation Institute Tour – 20 students
- Liberty High School Classroom visit – 210 students
- Postville Middle School Classroom visit – 83 students

Activities with collage-age students include:

- STEM Pre-Service Teacher Conference Tour – 30 students
- Kirkwood Community College Tour – 36 students
- International Students Tour – 8 students

SAFER-SIM developed an [online resource](#) in 2019 for Boy Scouts of America to earn the Traffic Safety merit badge. The goal of the resource is to create greater visibility and access to the merit badge. The Traffic Safety merit badge “gives Scouts crucial tools to stay safer when driving a car on a highway, riding a bike across town, or jogging across a busy street.” By completing the Traffic Safety merit badge, Scouts learn about transportation safety, careers, and research at an opportune time. The online resource continued making nationwide impacts this period with students this period. An additional 61 scouts started the resource this period with 59 more scouts successfully completing all requirements. In total 1081 scouts have used this resource and 712 have completed all requirements.

In 2020, SAFER-SIM developed a similar [online tool](#) for the Engineering Merit Badge. Whether it is improving personal electronics, developing health care solutions, creating automated vehicles, protecting

the environment or sending people to Mars, engineers are using math and science to create a better tomorrow. Earning the Engineering Merit Badge gives Scouts a better understanding of how engineers work and how to apply the engineering process to daily problems. An additional 18 scouts started the resource this period with 13 more scouts successfully completing all requirements. In total 331 scouts have used this resource and 155168 have completed all requirements.

Below is a summary of education and workforce development performance metrics. Full list can be found [here](#).

| Education and Workforce Development Performance Metric | Result |
|---|---------------------------------|
| Peer-reviewed journal publications w/ student authors | 6 |
| Book chapters w/ student authors | 0 |
| Conference posters and papers w/ student authors | 6 |
| Paper/poster awards w/ student authors | 1 |
| Graduate students working on and supported by SAFER-SIM related projects | 26 |
| Undergraduate students working on and supported by SAFER-SIM related projects | 16 |
| Student attendance and presentations at the SAFER-SIMposium | na |
| Transportation-related M.A. and PhD theses | 4 |
| Curriculum modules developed | 3 |
| Student Internships | 2 |
| Presentations to student groups or classes | 10 presentations 84 students |
| # Schools visited and # students present | 2 schools 293 students |
| # Career fairs visited and # of attendees | 2 career fairs 310 attendees |
| Summer institutes and programs and # of students participating | 2 programs 38 attendees |

1.2.4 Technology Transfer

SAFER-SIM-funded projects work toward technology transfer goals from the beginning through completion. State DOTs, industry partners, and other agencies work with researchers by using their expertise or findings to inform decisions that guide future research and projects.

A main aspect of our technology transfer activities involves webinars. Research projects are required to present webinars about their results which are shared with contacts in academia, industry, and government. The presentations focus on findings, recommendations, specifications, and guidelines. During this reporting period SAFER-SIM leadership chose to change our approach to webinars from individual project webinars to online symposia where projects are grouped by subject matter to allow parties interested in specific topics to interact with several researchers and projects in a single session. Attendance at presentations will remain open to all transportation professionals and the public, recorded,

and posted on the SAFER-SIM YouTube channel so they are available to anyone who was not able to attend or would like to review. The first project symposium is being planned for December 2022.

Our center has been successful at receiving media attention from our work. Some highlights of SAFER-SIM sites in the media this period include:

- Shannon Roberts gave an interview for WWLP's Mass Appeal program for National Women in Engineering Day on June 23, 2022.. The 5 minute segment aired on local television.
- Samiul Hasan was interviewed on Fox Weather to discuss evacuation challenges during Hurricane Ian in September 2022.
- "John McGivern's Main Streets" filmed and episode on Iowa City and a behind the scenes segment on the National Advanced Driving Simulator (<https://mainstreets.tv/>)

Lab tours included government representatives and their staff, professionals in the transportation industry, corporations, local interest groups, Our center offered 18 facility tours:

- 4/1/22: Justin Wood- Indiana University- 3 people
- 9/30/22: Professor Karen Adolph (NYU)
- STEM Pre-Service Teacher Conference toured the National Advanced Driving Simulator on April 9, 2022
- Reid Willis, Legislative Assistant with Senator Chuck Grassley's Office toured the National Advanced Driving Simulator at the University of Iowa on April 12, 2022
- Liberty High School Robotics Team toured the National Advanced Driving Simulator on April 18, 2022
- Dr. Tara Lovestead from the National Institute of Standards and Technology visited the UI as an invited speaker to the College of Pharmacy and toured the National Advanced Driving Simulator on April 26, 2022
- Iowa Department of Transportation visited the National Advanced Driving Simulator on May 5, 2022
- FTA Region 7 Administrator visited the National Advanced Driving Simulator on May 6, 2022
- P.E.O. women's education group visited the National Advanced Driving Simulator on May 13, 2022
- Iowa City Porsche Club hosted a car show and tours of the National Advanced Driving Simulator on May 21, 2022
- Representative Mariannette Miller-Meeke visited and toured the National Advanced Driving Simulator on June 6, 2022
- Aisin visited the National Advanced Driving Simulator on June 17, 2022
- Iowa National Summer Transportation Institute (INSTI) participants toured the National Advanced Driving Simulator on June 21, 2022
- Kirkwood Community College students toured the National Advanced Driving Simulator on June 27, 2022
- International Students hosted by Gideon Zamba toured the National Advanced Driving Simulator on July 2, 2022
- Representatives from OPM and SAMHSA/DFWP visited and toured the National Advanced Driving Simulator on July 14, 2022

- Students participating in the Perry Research Scholars Institute toured the National Advanced Driving Simulator on July 19, 2022
- Iowa Technology Institute conference attendees toured the National Advanced Driving Simulator on August 31, 2022
- UI Center for Advancement hosted a tour for 30 alumni of the National Advanced Driving Simulator on September 9, 2022
- Rep. Best to the Iowa House of Representatives and two staffers visited and toured the National Advanced Driving Simulator on September 19, 2022

Below is a summary of our technology transfer plan performance metrics with the full list accessible [here](#) and more detail provided in [Section 3](#) below.

| Technology Transfer Performance Metric | Result |
|--|---|
| SAFER-SIM webinars | na |
| Registrations for webinars | na |
| Views of archived webinar content | 0 |
| Press releases for SAFER-SIM related research | 2 |
| Media requests | 3 |
| Tours of facilities | 20 |
| Website traffic | 2,770 users 3,248 sessions 6,247 page views |
| Patents filed | 0 |
| DOT requests for presentations or proposals related to SAFER-SIM | 0 |
| Practitioner attendance at events | na |
| Number of improved or new simulation technologies, software, methods, or processes | 1 |

1.2.5 Collaboration

Collaboration drives our consortium in all aspects of our work. Our collaboration is described further in [Section 2](#) of this report.

SAFER-SIM and the AAA Foundation for Traffic Safety continue collaboration for the fourth year. Two additional research projects were created and funded this year. Researchers from AAAFTS, the University of Massachusetts-Amherst, and the University of Iowa are collaborating to further understanding of advanced vehicle technologies.

Identifying outcome measures to evaluate effectiveness of consumer education and training for vehicle automation (AAAFTS Year 4) – University of Massachusetts, Lead This project has the primary objective to identify outcome measures that can be used to assess effectiveness of training and education for advanced vehicle technologies. This research will be focused on understanding drivers’ knowledge in the context of vehicle technologies that are currently deployed and available (Level 1 & 2

as per SAE J3016 (SAE, 2018) definitions). Specifically, adaptive cruise control (ACC) and lane keeping assist (LKA) or lane centering technologies will be considered, whether they function independently or in combination. A secondary objective of this proposed research is a discussion of the implications of these identified outcome measures in the context of higher levels of automation.

Mapping comprehension of ADAS across different driving and road user populations (AAAFTS Year 4) – University of Iowa, Lead This project will survey drivers and other road users regarding their knowledge of different vehicle technologies, providing significant insight into how understanding varies across populations, defined by age, gender and individual differences. This research will also identify those groups of individuals who are lacking the necessary understanding but who feel confident, nonetheless. The outcomes of this research will (1) inform the development of education and training approaches for specific populations, and (2) characterize those individuals with miscalibrated confidence in their understanding of advanced vehicle technologies.

Below is a summary of collaboration performance metrics. Full list can be found [here](#).

| Collaboration Performance Metric | Result |
|---|--------|
| Attendance at the SAFER-SIMposium | na |
| Interdisciplinary research projects within and across sites | 7 |
| Collaborative research projects across SAFER-SIM or other UTC sites | 8 |
| Collaborations with industry partners and government agencies | 19 |
| Collaborative peer-reviewed journal publications | 0 |
| Collaborative book chapters | 0 |
| Student exchanges with other SAFER-SIM sites | 0 |
| Students pursuing advanced degrees at other SAFER-SIM sites | 0 |
| Programs involving community colleges | 1 |
| Graduates hired at other SAFER-SIM or UTC sites | 0 |

1.2.6 Diversity

Diversity continues to play an important part in our research and outreach. The University of Puerto Rico Mayaguez and University of Central Florida are minority serving institutions. Eighteen (18) students from historically excluded groups were involved in twenty (22) SAFER-SIM projects this period. Individuals from historically excluded groups contribute to SAFER-SIM at all levels including the directors, advisory board, principal investigators, and student"ts.

Dr. Christofa gave a presentation titled “Embracing Diversity, Equity, and Inclusion in Engineering” to the Department of Civil Engineering at The University of Memphis, 18 April 2022.

Three students from underrepresented or minority groups graduated this period.

- Lakshmi Devi Subramanian, Assistant Professor, Department of Computer Science and Technology, Kean University, Union, New Jersey.
- Jah’inaya Parker is now a PhD student in Industrial Engineering at the University of Wisconsin

Madison.

- Beatrice Ojuri is now a research coordinator/assistant at Kennedy Krieger Institute.

Below is a summary of diversity performance metrics. Full list can be found [here](#).

| Diversity Performance Metric | Result |
|---|--------|
| # SAFER-SIM projects involving underrepresented/minority (U/M) students | 22 |
| # U/M events attended | 3 |
| # U/M students at attended events | 1536 |
| Graduating U/M student placement | 3 |

1.3 What opportunities for training and professional development have been provided?

SAFER-SIM provides opportunities for training and professional development in numerous ways. Students gain direct training from faculty and research staff from involvement in research projects. Researchers and students are encouraged to attend conferences to share their work and continually develop their professional skills and share their knowledge with others in the transportation industry.

1.4 How have the results been disseminated?

Final reports and datasets are posted on all required repositories after completion. Additionally, research projects are required to submit two-page summaries and prepare online webinar presentations about their results which are shared with contacts in academia, industry, and government. Researchers and students also share their work at meetings, conferences, and with the public.

1.5 What do you plan to do next reporting period to accomplish these goals?

SAFER-SIM funded an additional 5 projects this period with additional projects still being determined. The center will continue progressing toward final reports from projects. Sites and administration teams have been working through a backlog of delays due to COVID-19, and the center will see many delayed projects complete next period. Project symposia and online outreach will continue as normal. Education and outreach activities, both in-person and virtual, have returned to normal with additional efforts to visit additional school districts in the coming reporting period.

2. Participants & Collaborating Organizations

2.1 What organizations have been involved as partners?

The following organizations have been involved as SAFER-SIM partners:

| <i>Organization Name</i> | <i>Location</i> | <i>Contribution</i> |
|--|--------------------|---|
| UI Injury Prevention Research Center and the Iowa Initiative for Artificial Intelligence | University of Iowa | Financial support In-kind support Facilities Collaborative research Personnel Exchange |

| | | |
|--|--|--|
| Recreative Association of Sport Buenaventura | Mayagüez, Puerto Rico | Provided facilities at low cost to perform data collection activities for the project. |
| Mayagüez Bureau of Highway Patrol | Mayagüez, Puerto Rico | The Mayaguez Bureau of Highway Patrol provided Equipment and experienced police officers to measure BAC during the project data collection. |
| Puerto Rico Local Technical Assistance Program (PR-LTAP) | Department of Civil Engineering and Surveying, University of Puerto Rico at Mayaguez | The PR-LTAP Center provided access to their HTC Vive Eye Pro Virtual Reality equipment for its use by the SAFER-SIM researchers during this project. |
| AAA Foundation for Traffic Safety | Washington D.C. | Financial support Collaborative research |

2.2 Have other collaborators or contacts been involved?

A main focus of SAFER-SIM UTC is collaboration, both within consortium sites and across disciplines. 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.

SAFER-SIM researchers have a diverse range of backgrounds that span many colleges throughout the universities. The variety of expertise within the consortium creates a collaborative environment to take a wholistic approach on safety issues. The backgrounds of our researchers include:

- Civil, Environmental, & Construction Engineering
- Mechanical & Industrial Engineering
- Industrial & Systems Engineering
- Computer Science
- Psychology & Brain Sciences
- Public Health
- Management Sciences
- Urban and Regional Planning

Our advisory board currently includes 10 individuals from industry, government, and academia.

| | |
|------------------|--------------------------------------|
| William Horrey | AAA Foundation for Traffic Safety |
| Patrick Hoye | Iowa Governors Traffic Safety Bureau |
| Rich Romano | University of Leeds |
| Lisa Schletzbaum | Massachusetts DOT |
| Gary Huttman | MetroPlan Orlando |
| Chuck Green | Industry consultant (formerly GM) |
| Elizabeth Pulver | State Farm |
| Don Fisher | Volpe |
| John Corbin | USDOT |
| Linda Boyle | University of Washington |
| Rebecca Burkel | Wisconsin DOT |

3. Outputs

Below is a summary of our technology transfer plan output performance metrics. Further description can be found in [Section 1.2.4](#) Technology Transfer Accomplishments with the full list accessible [here](#).

During this reporting period SAFER-SIM leadership chose to change our approach to webinars from individual project webinars to online symposia where projects are grouped by subject matter to allow parties interested in specific topics to interact with several researchers and projects in a single session. Attendance at presentations will remain open to all transportation professionals and the public, recorded, and posted on the SAFER-SIM YouTube channel so they are available to anyone who was not able to attend or would like to review. The first project symposium is being planned for December 2022.

| Performance Metric | Target | Result | Target Next Period |
|---|--|---|--|
| SAFER-SIM webinars (changing to symposia next period) | 10 | 0 | 1 |
| Registrations for webinars (changing to symposia next period) | 200 | 0 | 100 |
| Views of archived webinar content | 200 | 0 | 200 |
| Press releases related to SAFER-SIM | 1 | 2 | 1 |
| Media requests | 10 | 3 | 5 |
| Tours of facilities | 5 | 20 | 15 |
| Website traffic | 3,000 users 5,000 sessions 8,500 pageviews | 2,770 users 2,100 sessions 6,247 page views | 3,000 users 3,000 sessions 7,000 pageviews |
| Patents filed | 1 | 0 | 1 |
| DOT requests for presentations or | 1 per year | 0 | 1 per year |

| | | | |
|--|-----|---|-----|
| proposals related to SAFER-SIM | | | |
| Practitioner attendance at events | 100 | 0 | 100 |
| Number of improved or new simulation technologies, software, methods, or processes | 5 | 1 | 5 |

3.1 Publications, conference papers, and presentations

Journal Publications

1. McGehee, D., Roe, C., Kasarla, P., & Wang, C. (2022). Quantifying and recommending seat belt reminder timing using naturalistic driving video data. *Journal of Safety Research*, 80:399-407.
2. A. Fallahdizchah and C. Wang, "Profile monitoring based on transfer learning of multi-profile with incomplete samples," *IISE Transactions*, 2022, 54(7): 643-658.
3. Carney, C., Gaspar, J. & Horrey, W. (accepted), Longer-Term Exposure vs. Training: Their Effect on Drivers' Mental Models of ADAS Technology, *Transportation Research Part F*.
4. O'Neal, E. E., Wendt, L., Hamann, C., Reyes, M.L., Yang, J., and Peek-Asa, C. (Submitted). Rates and Predictors of Teen Driver Crash Culpability. *Journal of Safety Research*.
5. Malik, J., Kim, N.Y., Di Napoli Parr, M., Kearney, J.K., Plumert, J.M., & Rector, K. (2022). Do simulated augmented reality overlays influence street-crossing decisions for non-mobility-impaired older and younger adult pedestrians? Submitted to *Human Factors*.
6. Di Napoli Parr, M., O'Neal, E.E., Zhou, S., Williams, B., Butler, K.M., Kearney, J.K., & Plumert, J.M. (2022). How children judge affordances when walking and bicycling across virtual roads: Does mode of locomotion matter? Submitted to *Developmental Psychology*.
7. O'Neal, E. E., Wendt, L., Hamann, C., Reyes, M., Peek-Asa, C. (under review). Rates and predictors of teen crash culpability.
8. Gonzales, E., Roberts, S. C., & Mehrotra, S. (accepted). Curb Management Policy Insights and Recommendations for Communities of All Sizes. In *Proceedings of the Transportation Research Board 101st Annual Meeting 2022*.
9. Christofa, E., Ai, C., Deliali, A., Tainter, F., Cesic, L., Hannon, T., and Kostopoulou, E. 2022.
10. Bicyclist and Motorist Behavior at Bike Boxes. *Transportation Research Record: Journal of the Transportation Research Board*. [accepted]
11. Deliali, A., Fournier, N., Christofa, E., and Knodler, M. 2022. Investigating the Safety Impact of Segment and Intersection-levels Bicycle Treatments on Bicycle-Motorized Vehicle Crashes. *Transportation Research Record: Journal of the Transportation Research Board*.
12. DOI: 010.1177/03611981221112670.
13. Han, Z., Gonzales, E., Christofa, E., and Oke, J. 2022. Modeling System-Wide Urban Rail Transit Energy Consumption: A Case Study of Boston. *Transportation Research Record: Journal of the Transportation Research Board*. DOI: 10.1177/03611981221096442.

Conference papers and presentations

1. Kearney, J.K., The Effectiveness of Smartphone Warnings and Alerts on Pedestrian Road

- Crossing. Presentation at the Rice University Workshop on Improving Mobility with Low Vision. Rice University, Houston Tx, July 29, 2022.
2. Kim, N. Y., O'Neal, E., Noferesti, I., Wang, J., Flathau, J., Tang, H. Kearney, J. K., & Plumert, J. M. (April, 2021). A parent-based intervention program for training prospective control skills in children. Poster presented at the 2022 biennial meeting of the Cognitive Development Society, Madison, WI.
 3. O'Neal, E.E., Noonan, M.F., Tang, H., & Plumert, J.M. (April, 2022). How do mothers and fathers socialize safety values in sons and daughters? Poster presented at the 2022 biennial meeting of the Cognitive Development Society, Madison, WI.
 4. Kim, A., O'Neal, E.E., Flathau, J., Tang, H., Kearney, J.K., & Plumert, J.M. (April, 2022). A parent-based intervention program for training prospective control skills in children. Poster presented at the 2022 Biennial Meeting of the Society for Research in Child Development, Virtual Conference.
 5. O'Neal, E.E., Peek-Asa, C., Wendt, L., Hamann, C., Reyes, M., & Yang, J. (March, 2022). Factors associated with teens' crash culpability. Oral presentation given at the 2022 annual meeting of the Society for Violence and Injury Research, Washington D.C.
 6. O'Neal, E.E., Plumert, J.M., & Peek-Asa, C. (March, 2022). A method for evaluating parent-teen conversations about potential roadway hazards. Oral presentation given at the 2022 annual meeting of the Society for Violence and Injury Research, Washington D.C.
 7. Roberts, S. C., Ebadi, Y., Talreja, N., Knodler, M. K., & Fisher, D. L. (2022). Designing and Evaluating an Informative Interface for Transfer of Control in a Level 2 Automated Driving System. 14th International Conference on Automotive User Interfaces and Interactive Vehicular Applications, Seoul, South Korea, 253-262.
 8. Figueroa-Medina, D. Valdés, B. Colucci, N. Cardona & A. Chamorro. 2022. Pedestrian Walking Speeds and Success Rates on Mid-Block Crossings using Virtual Reality Simulation. Paper presented at the Road Safety and Simulation Conference (RSS 2022), Athens, Greece. June 8-10, 2022.
 9. Deliali, A., Christofa, E., Ai, C., Tainter, F., Cesic, L., Hannon, T., and Kostopoulou, E. 2022. Effectiveness of Bike Boxes in Massachusetts, MassDOT Transportation Innovation Conference, Worcester, MA, May 24-25.
 10. Han, Z., Gonzales, E., Christofa, E., and Oke, J. 2022. Modeling System-Wide Urban Rail Transit Energy Consumption: A Case Study of Boston. MassDOT Transportation Innovation Conference, Worcester, MA, May 24-25.
 11. Gonzales, E., and Christofa, E. 2022. Flexible Transit Services. MassDOT Transportation Innovation Conference, Worcester, MA, May 24-25.
 12. Kostopoulou, E., Gonzales, E., and Christofa, E. 2022. Measuring Accessibility to Improve Public Health. MassDOT Transportation Innovation Conference, Worcester, MA, May 24-25.

Books or other non-periodical, one-time publications

Nothing to report

3.2 Policy Papers

Nothing to report

3.3 Websites(s) or other Internet site(s)

[SAFER-SIM website](#) - contains descriptions of research projects and final reports, news articles about our work, contact information, and other important information related to the center. The website is updated regularly with news stories and outreach events. Traffic measures from the website are below:

| Metric | This Period | Lifetime |
|-------------|-------------|----------|
| Total Users | 2170 | 27,328 |
| New Users | 2100 | 26,698 |
| Sessions | 3248 | 50,230 |
| Page Views | 6247 | 104,676 |

[SAFER-SIM YouTube Channel](#) - contains webinars, virtual symposium presentations, simulation boot camp, and online traffic safety merit badge videos. Metrics from those videos are below:

| Metric | This Period | Lifetime |
|-----------------|-------------|----------|
| Uploaded videos | 1 | 130 |
| Views | 5968 | 48,185 |
| Subscribers | 16 | 224 |

[SAFER-SIM Twitter Account](#) – contains tweets about webinars, news digests, news articles, merit badge opportunities, and YouTube playlists. Metrics from the account are below:

| Metric | This Period | Lifetime |
|-------------------|-------------|----------|
| Tweets | 0 | 394 |
| Tweet Impressions | 0 | 82,600 |
| Followers | 0 | 170 |

[SAFER-SIM Dataverse](#) - data repository containing final data from research projects.

| Metric | This Period | Lifetime |
|----------------|-------------|----------|
| Datasets | 2 | 44 |
| File Downloads | 935 | 14,176 |

3.4 New methodologies, technologies, or techniques

Nothing to report

3.5 Inventions, patent, and/or licenses

Nothing to report

3.6 Other products

[Simulation Boot Camp Videos](#) –A webinar series developed by the collective expertise of SAFER-SIM to train researchers on using simulation as a research tool. The boot camp was translated into an in-person workshop at the Road Safety & Simulation conference. The online videos have been viewed 583 times.

[Online Traffic Safety Merit Badge](#) – 1081 Scouts have started the materials and 712 have completed the requirements. More information in [Section 1.2.3.](#)

| Metric | This Period | Lifetime |
|--------|-------------|----------|
|--------|-------------|----------|

| | | |
|------------------|----|------|
| Scouts Started | 61 | 1081 |
| Scouts Completed | 59 | 712 |

[Online Engineering Merit Badge](#) – 331 Scouts have started the materials and 168 have completed the requirements. More information in [Section 1.2.3](#).

| Metric | This Period | Lifetime |
|------------------|-------------|----------|
| Scouts Started | 18 | 331 |
| Scouts Completed | 13 | 168 |

[Two-page Project Summaries](#) – Each research project is required to submit a 2-page summary of the research for a quick overview and takeaways from the work. The summaries focus on recommended practices for transportation professionals providing easier access to key information than the technical report and are available on the “[Research](#)” tab of our website within specific project information.

[Biweekly News Digest](#) – The email campaigns serve to provide information about SAFER-SIM webinars, final reports, conferences, news articles, and job opportunities. Metrics from the news digest are below:

| Metric | This Period | Lifetime |
|----------------|-------------|----------|
| Subscribers | -18 | 333 |
| Campaigns Sent | 9 | 155 |
| # Opens | 875 | 11,321 |

4. Outcomes

SAFER-SIM included three performance measures related to outcomes in our technology transfer plan:

| Performance Measure | Target | Result | Target Next Period |
|---|--------|--------|--------------------|
| Number of improved or new technologies, software, methods, or processes adopted | 5 | 1 | 5 |
| Stakeholders who adopt, implement or deploy SAFER-SIM research findings or technologies through policy, practice, regulation, rulemaking or legislation | 2 | 0 | 2 |
| Number of projects that reach adoption, implementation or deployment | 1 | 0 | 1 |

Number of improved or new technologies, software, methods, or processes adopted

1. Project Title: Training to Improve Situational Awareness Regarding Operational Design Domain in Driving Automation Systems; PI(s): Shannon Roberts - Through this project, we developed a training program that better informs drivers of the limitations of automated vehicle technology. In comparison to no training and reading a user manual, the training system, which was delivered via PowerPoint, yielded optimal performance (i.e., drivers took back control of the vehicle quickly and efficiently).

Stakeholders who adopt, implement or deploy SAFER-SIM research findings or technologies through

policy, practice, regulation, rulemaking or legislation
Nothing to report

Number of projects that reach adoption, implementation or deployment
Nothing to report

4.1 Increased understanding and awareness of transportation issues

SAFER-SIM makes efforts to reach all stakeholders with our research and outreach. Researchers and students share work at conferences, meetings, and with the general public to promote safety and bring awareness to transportation issues.

4.2 Passage of new policies, regulation, rulemaking, or legislation

Nothing to report

4.3 Increases in the body of knowledge

SAFER-SIM research continues to build on the knowledge of transportation safety and simulation through final reports, summaries, journal articles, and presentations at conferences, meetings, and other avenues. Full list [here](#).

4.4 Improved processes, technologies, techniques and skills in addressing transportation issues

Highlighted in [Section 1.2.4](#) and in [Section 4](#).

4.5 Enlargement of the pool of trained transportation professionals

Our center supports the development of trained transportation professionals in numerous ways. College students directly involved in research will graduate and join the workforce as members of industry, academia, or government. Outreach efforts focused on middle school and high school students will spark the interest of some to study and join the transportation field. The recorded webinars and presentations from the boot camp continue to draw interest online.

4.6 Adoption of new technologies, techniques or practices

Nothing to report

5. Impacts

SAFER-SIM included two performance measures related to impacts in our technology transfer plan:

| Performance Measure | Target | Result |
|---|--------------------|------------------|
| Expected reductions in crashes from implemented policy, practice, regulation, rulemaking or legislation | Not yet determined | Not yet realized |
| Expected reductions in congestion and traffic conflicts implemented policy, practice, regulation, rulemaking or legislation | Not yet determined | Not yet realized |

Expected reductions in crashes from implemented policy, practice, regulation, rulemaking or legislation

1. Project Title: Development and Testing of an In-Vehicle Interface for Use in Automated Driving Contexts; PI(s): Shannon Roberts - If the advanced dashboard interface were implemented on a larger scale, more drivers would be aware of automated vehicle functionality and would more closely monitor the technology when it is activated. This would in turn lead to fewer instances of unexpected vehicle behavior (e.g., the vehicle doesn't stop for a pedestrian at an intersection) and fewer crashes.
2. Project Title: Development and Testing of an In-Vehicle Interface for Use in Automated Driving Contexts; PI(s): Shannon Roberts - Through this project, we developed two interfaces that better informs drivers of the functionality of automated vehicle technology. In comparison to a bare bones interface, the two improved interfaces yielded optimal performance (i.e., drivers took back control of the vehicle quickly and efficiently).

Expected reductions in congestion and traffic conflicts implemented policy, practice, regulation, rulemaking or legislation

Nothing to report

5.1 Impact on the effectiveness of the transportation system

SAFER-SIM's approach to understanding the role that humans play in a complex, ever-changing transportation environment will lead to improved safety and effectiveness of the transportation system. Our research will lead to a safer roadway environment that encourages multiple modes of transportation, thereby also reducing traffic congestion and preserving the environment.

5.2 Impact on the adoption of new practices, or instances where research outcomes have led to the initiation of a start-up company

Nothing to report

5.3 Impact on the body of scientific knowledge

Highlighted in [Section 1](#) and [Section 3](#)

5.4 Impact on transportation workforce development

Highlighted in [Section 1](#)

6. Changes/Problems

6.1 Changes in approach and reasons for change

The center is still affected by COVID-19 although we have returned to normal activities. Research projects have resumed progress toward completion, yet delays caused by the pandemic have resulted in projects completing at later dates than planned when they were funded. While project backlogs are easing significantly, they still exist. Research teams continue to balance multiple active projects with new, overlapping timelines causing delays in finalizing report revisions and datasets. The administrative burden has increased to process these deliverables because the shifted timelines led more projects completing at the same time than originally expected.

We are working with PIs to complete all projects and finalize all deliverables and reporting materials within the grant performance period. All funded SAFER-SIM projects have plans to ensure completion before the end of the grant performance period.

6.2 Actual or anticipated problems or delays and actions or plans to resolve them

No problems or delays are anticipated.

6.3 Changes that have a significant impact on expenditures

No changes have had a significant impact on expenditures.

6.4 Significant changes in use or care of human subjects, vertebrate animals, and/or biohazards

No significant changes in use or care of human subjects, vertebrate animals, and/or biohazards have occurred.

7. Special Reporting Requirements

Nothing to report