SAFER-SIM PROGRESS PERFORMANCE REPORT FOR UNIVERSITY TRANSPORTATION CENTERS

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Signature of Submitting Official: [Signature]

SAFER-SIM PROGRESS REPORT Page 1
Overview

Safety Research using Simulation (SAFER-SIM) University Transportation Center (UTC) was awarded a Tier 1 UTC grant with a research priority of promoting safety in the 2016 competition. The consortium consists of the University of Iowa (lead site), University of Central Florida, University of Massachusetts – Amherst, University of Puerto Rico – Mayaguez, and University of Wisconsin – Madison. These sites worked together on the 2013 UTC and built strong relationships through collaboration that will lead to the further advancement of transportation safety research, education, and workforce development.

SAFER-SIM sites are working diligently on completing projects and submitting deliverables associated with the 2013 UTC. The center plans to close out the 2013 grant next period, which will allow continuous full effort. Planning for the initial projects for 2016 SAFER-SIM is complete, and these projects will begin next reporting period. Nine initial projects are supported by Year 1 funding, 3 collaborative involving more than one consortium member. With the announcement of Year 2 funding, an RFP will be issued in September 2017.

SAFER-SIM researchers continue to participate extensively in leadership development including 7 invited presentations, serving on 29 advisory committees, 6 editorships, 15 editorial boards, and 14 positions in professional organizations. Our education and workforce development activities have reached 1,182 K-12, 30 university, and continuing education students, including 27 student employees (18 minority students) in addition to supporting three Masters and Doctoral theses.

SAFER-SIM continues successful technology transfer and collaboration through monthly webinars, 9 press releases, 35 media requests, 8 facility tours for 93 K-12 Students, events attended by 120 practitioners, a news digest that reaches 309 individuals.

This report will describe the accomplishments, products, impacts, and plans of the center.

A copy of this report can be found on the SAFER-SIM website under the “Reports” tab or at the following URL: http://safersim.nads-sc.uiowa.edu/reports.php

1. Accomplishments

a. Goals and objectives of the program

SAFER-SIM is comprised of a multidisciplinary, synergistic team of researchers in human factors, engineering, computer science, and psychology who will use innovative simulation approaches ranging from microsimulation to human-in-the-loop simulation to promote safety. SAFER-SIM will sponsor research, outreach activities in STEM areas, and workforce development efforts in transportation safety.

SAFER-SIM’s multidisciplinary team studies study how road users, roadway infrastructure, and new vehicle technologies interact and interface with each other using microsimulation and state-of-the-art driving, bicycling, pedestrian simulators. Our platform will be used to not only understand present needs, but also to evaluate and develop futuristic technologies. Building on the 2013 UTC, the 2016 SAFER-SIM UTC will use simulation technology to address the following safety topics:

- **Automated vehicles technology**: assessing road users’ responses to automated vehicles, augmented reality, and in-vehicle safety systems,
- **Connected vehicles technology**: assessing user responses to connected vehicles technology (e.g., V2V, V2P, I2I),
- **Vulnerable road users**: examining risk factors for pedestrian and bicyclist collisions with vehicles, including high-risk groups (e.g., transportation workers, children, and the elderly),
- **Roadway infrastructure design**: assessing how safely drivers, bicyclists, and pedestrians interact with roadway infrastructure designs,
- **Distributed simulation technology**: assessing real-time traffic conflicts between drivers, bicyclists, and pedestrians through connected simulators.

SAFER-SIM will fully engage students at all levels of research and disseminate findings and techniques to the research community, safety professionals, and the public. Our center has identified seven areas of activity to attain these goals:

1. **Research Activities**

Year 1 funding will support 9 initial projects, 3 of those being collaborative with more than 1 consortium university. The updated abstracts, budgets, and timelines have been established for these projects, which will begin next reporting period. Information about these projects can be found on the Transportation Research Board’s Research in Progress (RIP) Database ([https://rip.trb.org/](https://rip.trb.org/)) as well as the SAFER-SIM website ([http://safersim.nads-sc.uiowa.edu/research_new.php?searchTerm=](http://safersim.nads-sc.uiowa.edu/research_new.php?searchTerm=)).

SAFER-SIM will issue an RFP in September 2017 during the next reporting period.

Below is information about the initial research projects and SAFER-SIM specific performance metrics related to Research Activities:

*Initial Research Projects*

<table>
<thead>
<tr>
<th>Research Project Title</th>
<th>School</th>
<th>PI(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrating Traffic Control Devices via Augmented Reality</td>
<td>UM</td>
<td>Siby Samuel, Eleni Christofa, Michael Knodler</td>
</tr>
<tr>
<td>To Trust or Not to Trust? A Simulation-based Experimental Paradigm</td>
<td>UM</td>
<td>Siby Samuel, Eleni Christofa, Michael Knodler</td>
</tr>
<tr>
<td>Using Driver State Detection in Automated Driving</td>
<td>UI</td>
<td>John Gaspar, Chris Schwarz, Timothy L. Brown</td>
</tr>
<tr>
<td>Augmented Reality for Safer Pedestrian-Vehicle Interactions</td>
<td>UW</td>
<td>David A. Noyce</td>
</tr>
</tbody>
</table>
### Collaborative Research Projects

<table>
<thead>
<tr>
<th>Research Project Title</th>
<th>School</th>
<th>PI(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessing the Impact of Smartphone Usage While Driving in Work Zones</td>
<td>UPR</td>
<td>Didier Valdes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Benjamin Colucci</td>
</tr>
<tr>
<td>Connected Vehicles (CV) Transition and Market Penetration</td>
<td>UCF</td>
<td>Mohamed Abdel-Aty</td>
</tr>
<tr>
<td>Using Simulation to Assess and Reduce Conflicts between Drivers and Bicyclists</td>
<td>UI</td>
<td>Joe Kearney</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jodie Plumert</td>
</tr>
<tr>
<td></td>
<td>UM</td>
<td>Eleni Christofa</td>
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<tr>
<td></td>
<td></td>
<td>Michael Knodler</td>
</tr>
<tr>
<td></td>
<td>UCF</td>
<td>Mohamed Abdel-Aty</td>
</tr>
<tr>
<td>Multi-modal Distributed Simulation Combining Cars, Bicyclists, and Pedestrians</td>
<td>UI</td>
<td>Joe Kearney</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jodie Plumert</td>
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<td></td>
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<td>Chris Schwarz</td>
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<td>UM</td>
<td>Siby Samuel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Michael Knodler</td>
</tr>
<tr>
<td>Enhancing School Zone and School Bus Safety</td>
<td>UCF</td>
<td>Mohamed Abdel-Aty</td>
</tr>
<tr>
<td></td>
<td>UPR</td>
<td>Didier Valdes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Benjamin Colucci</td>
</tr>
</tbody>
</table>

**External Grants related to SAFER-SIM – 3 grants**

The performance periods of these grants overlap the 2013 and 2016 UTC grants.
• University of Iowa
  o Gaspar, J. Aisin Technical Center of America to provide match for SAFER-SIM project. $27,000

• University of Massachusetts – Amherst
  o Noyce, Knodler, Hurwitz and Brehmer. Safety Evaluation of the Flashing Yellow Arrow Treatment at Signalized Intersections. National Cooperative Highway Research Program

2. Leadership Development

Developing the next generation of leaders in safety research and simulation methods is a key function of SAFER-SIM. This will be achieved through the use of seminars, symposia, web-based discussions, and other communications opportunities open to the public.

Below is information about SAFER-SIM specific performance metrics related to Leadership Development:

Invited Presentations – 7 presentations

• University of Iowa
  o Marshall, Dawn. Simulation: A Multi-use Tool for Transportation Safety. OST-R Transportation Innovation Speaker Series

• University of Massachusetts – Amherst
  o Christofa, E., 2017. Addressing Data Challenges for Bicycle Crash Analysis, Transportation Research and Education Center for Portland State University Friday Transportation Seminar Series, 10 March, Portland, OR.

• University of Puerto Rico - Mayaguez
  o Lectern presentation in the 19th Congress of Engineering and Surveying and Related Disciplines (COINAR 2017), March 2017, San Juan, Puerto Rico.

Advisory Committees – 29 advisory committee positions
• Dr. Mohamed Abdel-Aty (University of Central Florida)
  o Member, TRB Committee on Highway Safety Performance (AND25) (2014-ongoing)
  o Member, TRB Committee on User Information Systems (AND20) (2014-ongoing)
  o Member, TRB Committee on Data, Analysis and Evaluation (ANB20) (2017 – ongoing)

• Dr. Eleni Christofa (University of Massachusetts-Amherst)
  o Member and Paper Review Coordinator, TRB Traffic Signal Systems Committee (AHB25)
  o Member, TRB Task Force on Arterials and Public Health Member (TADD55)

• Dr. Benjamin Colucci (University of Puerto Rico-Mayaguez)
  o Applied Human Factors and Ergonomics (AHFE 2017) Scientific Advisory Board
  o Panel Member of NCHRP Project (SN4811): Practices in One Lane Traffic Control on a Two-Lane Rural Highway
  o Member TRB Committee AHB55 Work Zone Traffic Control
  o Member Best Paper Award TRB Committee AHB55 Work Zone Traffic Control
  o Member of the Advisory Committee of the Puerto Rico-State Transportation Innovation Council (STIC)
  o Member of the Advisory Committee of the US Virgin Island-State Transportation Innovation Council (STIC)
  o 2017 Latin American and Caribbean Consortium of Engineering Institution (LACCEI) International Multi-Conference for Engineering, Education, and Technology Scientific Advisory Board
  o Co-Chair of the Traffic Enforcement Committee, International Road Federation.

• Dr. John Gaspar (University of Iowa)
  o Member TRB Standing Committee AND20 User Information Systems

• Dr. Michael Knodler (University of Massachusetts-Amherst)
  o Member, 2017 Road Safety and Simulation Scientific Committee
  o Past Chair, ITE Transportation Educators Council
  o Member, Standing Committee on Traffic Control Devices (AND50)

• Dr. Jaeyoung Lee (University of Central Florida)
  o Member, TRB Committee on Transportation Safety Management (ANB10) (2016-ongoing)

• Dawn Marshall (University of Iowa)
  o Member TRB Standing Committee AND20 User Information Systems

• Dr. David A. Noyce (University of Wisconsin-Madison)
  o Member TRB Standing Committee ANB20 Safety Data, Analysis and Evaluation
  o Member TRB Standing Committee AHB50 Traffic Control Devices
  o Member TRB Standing Committee AHB20 Freeway Operations
  o Chair NCHRP Project Panel D2226 Identification of Factors Related to Serious Injuries in Crashes of Motorcyclists into Traffic Barriers
• Dr. Junyoung Park (University of Central Florida)
  o Member, TRB Committee on Traffic Control Devices (AHB50) (2017-ongoing)
  o Member, TRB Committee on User Information Systems (AND20) (2017-ongoing)

• Dr. Siby Samuel (University of Massachusetts-Amherst)
  o Member, TRB Standing Committee on Vehicle User Characteristics (AND10)
  o Member, TRB Standing Committee on Simulation and Measurement of Vehicle and Operator Performance (AND30)

• Dr. Chris Schwarz (University of Iowa)
  o Member TRB Standing Committee AHB30 Vehicle-Highway Automation

• Dr. Didier Valdes (University of Puerto Rico-Mayaguez)
  o Applied Human Factors and Ergonomics (AHFE 2017) Scientific Advisory Board

Journal Editorships – 6 editorships

• Dr. Mohamed Abdel-Aty (University of Central Florida)
  o Editor-in-Chief (July 2013 – present), Accident Analysis and Prevention, Elsevier

• Dr. Didier Valdes (University of Puerto Rico-Mayaguez)
  o Applied Human Factors and Ergonomics (AHFE 2017) Scientific Advisory Board
  o 15th LACCEI International Multi-Conference for Engineering, Education, and Technology

• Dr. Benjamin Colucci (University of Puerto Rico-Mayaguez)
  o Editor-in-Chief, Dimension Journal of the College of Engineers and Surveyors of Puerto Rico
  o Applied Human Factors and Ergonomics (AHFE 2017) Scientific Advisory Board
  o 15th LACCEI International Multi-Conference for Engineering, Education, and Technology

Journal Editorial Boards – 15 editorial boards

• Dr. Jodie Plumert (University of Iowa)
  o Journal of Experimental Psychology: Applied
  o Journal of Experimental Child Psychology
  o Ecological Psychology, reviewer

• Dr. Joseph Kearney (University of Iowa)
  o Journal of Virtual Reality and Broadcasting, reviewer
  o IEEE Transactions on Human-Machine Systems, reviewer
  o Accident Analysis and Prevention, reviewer
  o Transportation Research Part F: Psychology and Behavior, reviewer

• Dr. Michael Knodler (University of Massachusetts-Amherst)
o *Accident Analysis and Prevention, reviewer*
  o *Transportation Research Record*

- Dr. Eleni Christofa (University of Massachusetts-Amherst)
  o *Accident Analysis and Prevention, reviewer*
  o *Transportation Research Record*
  o *Transportation Research Part D: Transport and Environment*

- Dr. Siby Samuel (University of Massachusetts-Amherst)
  o *Applied Ergonomics, reviewer*
  o *Journal of Human Factors, reviewer*
  o *Transportation Science, reviewer*

*Leadership Positions in Professional Organizations – 14 leadership positions*

- Dr. Mohamed Abdel-Aty (University of Central Florida)
  o Department of Civil, Environmental & Construction Engineering at the University of Central Florida, Department Chair

- Dr. Benjamin Colucci (University of Puerto Rico-Mayaguez)
  o President of the Pan-American Transport Systems Committee, UPADI
  o Vice-President Caribbean Region of the Pan-American Union of Engineers in Association (UPADI)
  o Vice-President Caribbean Region of the LACCEI
  o Vice-President of the International Society for Maintenance and Rehabilitation of Transport Infrastructures (iSMARti)
  o Spokesperson for the Decade of Action Road Safety of Puerto Rico 2011-2020
  o Co-Chair of the Traffic Enforcement Committee, International Road Federation
  o UPRM Manager of the Dwight D. Eisenhower Transportation Fellowship Program for Hispanic Serving Institutions
  o Director of Abertis Chair of Puerto Rico
  o Member of the Board of Director of the College of Engineering of Surveyors of Puerto Rico-Mayaguez Chapter
  o Founder and Director of the Puerto Rico Transportation Technology Transfer Center (PR-LTAP)

  - Every Day Count (EDC) Program Technical Oversight Director of Puerto Rico PRHTA and U.S. Virgin Island DPW.

- Dr. Jaeyoung Lee (University of Central Florida)
  o Center for Advanced Transportation Systems Simulation at the University of Central Florida, Safety Program Director

- Dr. Joseph Kearney (University of Iowa)
  o ACM Symposium on Applied Perception, Program Committee

3. **Education and Workforce Development**
Our consortium feels strongly that the function of SAFER-SIM is to provide a multidisciplinary center within each member university to foster development of transportation professionals. The education and workforce development components will address K-12, university, and continuing education students.

Below is information about students and SAFER-SIM specific performance indicators relating to Education and Workforce Development:

### Table 3: SAFER-SIM Students

<table>
<thead>
<tr>
<th>Institution</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Iowa</td>
<td>5</td>
</tr>
<tr>
<td>University of Wisconsin-Madison</td>
<td>2</td>
</tr>
<tr>
<td>University of Massachusetts-Amherst</td>
<td>10</td>
</tr>
<tr>
<td>University of Central Florida</td>
<td>5</td>
</tr>
<tr>
<td>University of Puerto Rico-Mayaguez</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>27</strong></td>
</tr>
<tr>
<td><strong>Total Underrepresented/Minority</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

**Transportation-related M.A./PhD Theses – 3 theses**

- University of Massachusetts – Amherst
  - Farnoush Khalighi (MS): A Real-Time Signal Control System to Minimize Emissions at Isolated Intersections
  - Yashar Zeiynali Farid (PhD): Transit Preferential Treatments at Signalized Intersections: Person-based Evaluation and Real-Time Signal Control

**Curriculum Modules Developed – 1 module**

- University of Puerto Rico – Mayaguez developed Simulator Curriculum

**Presentations to student groups or classes – 9 presentations; 1,182 K-12 / 30 college students**

- University of Iowa
  - Linn County STEM Festival – 277 K-12
  - Merit Badge University – 7 K-12
Northeast Iowa Family STEM Festival – 222 K-12  
STEM Day on Campus – 200 K-12  
Southeast Iowa STEM Festival – 289 K-12  
Anamosa STEM Festival – 157 K-12  
Hawkeye Innovation Expo – 66 College

- University of Massachusetts – Amherst  
  - Christofa, E., 2017. Addressing Data Challenges for Bicycle Crash Analysis, Transportation Seminar Series, 2 March, University of Massachusetts, Amherst, MA. (~15 students).  
  - Christofa, E., 2017. Addressing Data Challenges for Bicycle Crash Analysis, Transportation Research and Education Center for Portland State University Friday Transportation Seminar Series, 10 March, Portland, OR. (~15 students)

- University of Puerto Rico – Mayaguez  
  - High school students from public and private schools enrolled in an engineering workshop of the Women in Engineering, were exposed to the benefits from the driving simulator. Also, the activity serves to promote and created highway safety awareness to approximately 30 participants. *Also counted in Diversity

Schools Visited – 2 schools; 133 K-12 students

- University of Iowa  
  - Bettendorf Middle School – 133 students

- University of Massachusetts – Amherst  
  - Portland State University visit (University of Massachusetts – Amherst)

Career Fairs – 1 career fair; 200 students

- University of Puerto Rico – Mayaguez  
  - MEGA Viernes Civil 2017 Annual Conference, March 31, 2017. This activity gathers high school and university students as well as multidisciplinary professional engineers of the public and private sectors. The activity serves to promote and created highway safety awareness to approximately 200 participants.

4. Technology Transfer

One of the main functions of the UTC program is to translate research into practice and policy. SAFER-SIM members have performed this important job through patents, partnerships with industry, interviews with national and local media, and by providing workshops and web resources for researchers, practitioners, and those seeking career information.

Below is information about SAFER-SIM specific performance indicators relating to Technology Transfer:
SAFER-SIM webinars

SAFER-SIM webinars continue from the 2013 UTC grant. The metrics were reported in the most recent PPPR for the 2013 UTC. Our center will continue supporting webinars for the 2016 UTC. Past webinars can be found at https://www.youtube.com/channel/UC8CN3JX8_mkAf8d8-UPzKQ.

- OST-R Transportation Innovation Speaker Series *
  - Simulation: A Multi-use tool for Transportation Safety
  - https://www.youtube.com/watch?v=Grr0Ly9EPPQ

* This webinar is also listed in Invited Presentations under Leadership Development

Press Releases – 9 press releases

- Research
  - National Advanced Driving Simulator receives grant to address safety issues prioritized by U.S. DOT
  - Why children struggle to cross busy streets safely
  - Study reveals dangers for kids while crossing streets
  - University of Iowa simulator named as pilot site for driverless cars
  - Wisconsin proving ground paves way for driverless vehicle research
  - Central Florida partnership will simulate, test connected vehicles
  - Iowa Driving the way for autonomous vehicles
  - National Advanced Driving Simulator Measures Driver Interactions with Automated Driving System

- Education
  - College of Education Provides hands-on STEM learning for students

Media Requests – 35 media requests

- 35 media requests nationwide stemming from Study reveals dangers for kids while crossing streets. Below are a few examples:
  - University of Iowa on WJXT-JAX - Jacksonville, FL
  - University of Iowa on KFXO (FOX) - Bend, OR
  - University of Iowa on KRBC (NBC) - Abilene, TX

Tours of Facilities – 8 tours; 93 K-12 Students

- National Advanced Driving Simulator – University of Iowa
  - 1/26/2017 – Lone Tree High School (25)
  - 2/8/2017 – Fort Dodge Senior High (15)
  - 3/3/2017 – Iowa City Chamber of Commerce Community Leadership Program (8)
- HANK Lab – University of Iowa
  - 4/20/17 - ABC’s Good Morning America recording crew
  - 4/21/17 - KCRG-TV9 recording crew
  - 5/5/17 - UI Computer Science graduates
  - 5/01/17 - Clinton High School Psychology all-female class (20) *Also counted in Diversity

Practitioner Attendance at Events – 120 practitioners

- University of Puerto Rico – Mayaguez
  - Over 120 professional engineers and surveyors participated in the 19th Congress of Engineering and Surveying and Related Disciplines (COINAR 2017), in San Juan, Puerto Rico. UPRM SAFER-SIM Research Team presented in the main auditorium of the Puerto Rico Engineering and Surveying College headquarters. The presentation was focused on the importance of the driving simulation as a tool for research study and potential improvement for safety and operation of resilient facilities.

5. Collaboration

Collaboration is an important part of SAFER-SIM and the UTC program. SAFER-SIM funds collaborative research projects across sites, interdisciplinary projects within sites, and supports collaborations through online forums and in-person gatherings.

Below is information about SAFER-SIM specific performance indicators relating to Collaboration:

**Collaboration with Industry Partners and Government Agencies – 1 industry partner**

- University of Iowa
  - Aisin Technical Center of America

**Graduates Hired at other SAFER-SIM/UTC Sites – 1 graduate hired**

- Yashar Farid completed a PhD at UMass Amherst and is now employed as a post-doctoral researcher at the University of Wisconsin

**Online Forum Use Statistics**

- SAFER-SIM Website
  - [http://safersim.nads-sc.uiowa.edu/](http://safersim.nads-sc.uiowa.edu/)
  - Website updated with 2016 UTC information
  - Initial research projects posted

- SAFER-SIM News Digest
  - 10 digests sent
- 307 subscribers – industry professionals, researchers, students, and public
- 9 SAFER-SIM final reports shared
- 11 career opportunities

- SAFER-SIM Social Media
  - Social media is used by SAFER-SIM to share information about final reports, webinars, and events to industry professionals, researchers, students, and the public
  - https://twitter.com/safersimutc?lang=en
  - https://www.facebook.com/SaferSimUTC/

6. Program Efficacy

SAFER-SIM has turned in deliverables on time for the 2016 grant.

- The Website and Directory of Key Personnel was updated before 2/1/17.
- The Data Management Plan was submitted before 3/1/2017 and has since been approved.
- The initial research projects have been added to the website and submitted to RIP database in a timely manner.

SAFER-SIM Principal Investigators have also been timely with submitting budgets, abstracts, timelines, and progress reports.

7. Diversity

To ensure that the Center’s activities are designed and implemented to address diversity goals, a conscious effort has been made to assemble a consortium of universities that already have activities in place for increasing diversity in the undergraduate and graduate educational programs. Each of the consortium members has active STEM and K-12 programs at their university and within their individual departments and research centers.

SAFER-SIM Underrepresented/Minority Students – 18 students *

* Students also listed in Table 3: SAFER-SIM Students

Underrepresented/Minority Events – 2 events; 50 students

- All Female Psychology Class Tour
- Women in Engineering Event

b. Products

Products are described in sections above. Product counts are indicated with bold text.
c. Participants & Collaborating Organization
Significant collaboration continues across departments and institutions within SAFER-SIM and with other partners. Consortium institutions collaborate with state DOTs and other organizations on events that focus on transportation safety and mobility.

d. Impact
SAFER-SIM’s multidisciplinary approach to understanding the role that humans play in a complex transportation environment is expected to lead to advances in road-safety research and hasten the adoption of new technologies that have the potential to reduce conflicts among drivers, cyclists, and pedestrians. The center’s education and workforce development roles will train the next generation of transportation professionals and will engage K-12 students in STEM fields.

Additional impacts will be described as research progresses.

e. Changes/Problems
Nothing to report.

2. Plan for Next Reporting Period
As the 2013 SAFER-SIM UTC completes all projects and submits all deliverables, site directors and PIs will be able to focus more time and energy to 2016 UTC. Researchers and students will begin submitting presentations and papers as the projects progress. Below is a list of plans for next reporting period:

- Attend summer CUTC meeting
- Initial research projects will begin
- RFP will be issued
- Proposals will be reviewed and projects selected
- Virtual Symposium will be held
- Continue education and outreach programming
- Continue online communications