



## Program Progress Performance Report for University Transportation Centers

- **Federal Agency and Organization Element to which Report is Submitted**  
United States Department of Transportation (USDOT), Office of the Assistant Secretary of Transportation for Research and Technology (OST-R)
- **Federal Grant or Other Identifying Number Assigned by Agency:** DTRT13-G-UTC59
- **Project Title:** University Transportation Center for Railway Safety
- **Project Director (PD) Name, Title, and Contact Information**  
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- **Submission Date:** April 30, 2014
- **DUNS and EIN Numbers**  
DUNS: 069444511 and EIN: 746002942
- **Recipient Organization:**  
The University of Texas-Pan American (UTPA)  
1201 West University Drive, Edinburg, TX 78539-2999
- **Recipient Identifying Number or Account Number:** 41EMEC040
- **Project/Grant Period:** September 30, 2013 – September 30, 2017
- **Reporting Period End Date:** March 31, 2014
- **Report Term or Frequency (annual, semi-annual, quarterly, other):**  
Semi-annual
- **Signature of Submitting Official**



Dr. Constantine Tarawneh, Director, University Transportation Center for Railway Safety



1. ACCOMPLISHMENTS:

**What are the main goals and objectives of the program?**

The UTCRS will develop knowledge, diverse human resources, and innovative technology in support of strategic safety plans for the U.S. rail transportation industry. The Center will engage and focus its partners’ established expertise and leverage and expand their existing resources to establish comprehensive programs of railway safety research, education, technology transfer and implementation, and workforce development.

UTCRS Strategic Research Goals aim to fundamentally improve railway safety outcomes by the following means:

- 1) Reducing fatalities and injuries at highway-rail grade crossings (HRGCs)
- 2) Reducing failures by developing more durable materials and systems
- 3) Developing advanced technology for infrastructure monitoring
- 4) Developing innovative safety assessments and decision-making tools

In working towards the overall goal of establishing comprehensive programs of railway safety research, education, technology transfer and implementation and workforce development, the following was accomplished for this reporting period:

Research Activities	Status	% Complete
Call for Problem Statements	Complete	100%
Request for Proposals	Complete	100%
Proposals Reviewed by Executive Committee	Complete	100%
Review Budgets	Complete	100%
Final Proposal Ranking & Selection	Complete	100%
Research Projects under Contract	Complete	100%
Technology Transfer Tech Briefs, Webinars, & Presentations on Research Results	On Schedule	15%
Applicable Slides, Handouts, Videos, Podcasts, etc. Posted	On Schedule	15%
Website	On Schedule	100%
Final Reports Due & All Research Projects Complete	Forthcoming	0%
<b>Leadership Activities</b>		
Coordination with UTCRS Directors	Complete	100%
<b>Educational &amp; Outreach Activities</b>		
Application Packets finalized for Research Experience for Undergraduate students	Complete	100%
Call for UTCRS Research Experience for Undergraduate student participants	Complete	100%

Review and Selection of the students to participate in UTCRS Research Experience for Undergraduates (UTCRS-REUs)	<b>Complete</b>	<b>100%</b>
Application Packets finalized for Research Experience for Teachers (RETs)	<b>Complete</b>	<b>100%</b>
Call for UTCRS Research Experience for Teachers	<b>Complete</b>	<b>100%</b>
Review and Selection of the teachers to participate in UTCRS Research Experience for Teachers (UTCRS-RETs)	<b>Complete</b>	<b>100%</b>
Developed Application Packets for the UTCRS Summer Camp (English Version)	<b>Complete</b>	<b>100%</b>
Developed Application Packets for the UTCRS Summer Camp (Spanish Version)	<b>Complete</b>	<b>100%</b>
Developed flyers to market the UTCRS 2014 Summer Camp	<b>Complete</b>	<b>100%</b>
Disseminated camp packets via email and website to local school districts and the university community	<b>Complete</b>	<b>100%</b>
Developed an additional application for the full day summer camp - High School Track	<b>On Schedule</b>	<b>100%</b>
Participated in mandatory training for all students and staff that will be working on the camps	<b>On Schedule</b>	<b>100%</b>
Processing applications for the UTCRS 2014 Summer Camp	<b>On Schedule</b>	<b>25%</b>
<b>Technology Transfer Activities</b>		
UTCRS Supported Presentations, Specialty Conferences, Workshops, and Short Courses	<b>On Schedule</b>	<b>20%</b>
UTCRS Website Information Dissemination	<b>On Schedule</b>	<b>25%</b>
UTCRS Social Media Sites Information Dissemination	<b>On Schedule</b>	<b>15%</b>
<b>US DOT RITA: Reporting</b>		
Posting Directory of Key Center Personnel	<b>Complete</b>	<b>100%</b>
Posting Research Project Descriptions	<b>Complete</b>	<b>100%</b>
UTC Program Progress Performance Reports (Quarterly)	<b>On Schedule</b>	<b>25%</b>
Federal Financial Reports (Quarterly)	<b>On Schedule</b>	<b>25%</b>
Annual Performance Indicators Report	<b>Forthcoming</b>	<b>0%</b>

### **What was accomplished under these goals?**

In order to work towards accomplishing the Center's goals and objectives, the UTCRS' immediate order of business consisted of hiring administrative staff and research assistants. Ms. Adriana Hinojosa, Sr. Program Coordinator, was hired in November 2013, and Ms. Melissa Peña, Office Assistant III, joined our team on March 1, 2014. The Center has also hired a total of 27 graduate and undergraduate research assistants thus far, as shown hereafter.

Student Classification	Number	Male	Female
Undergraduate Research Assistants	16	13	3
Graduate Research Assistants	7	4	3
Doctoral Research Assistant	4	1	3
Totals	27	18	9

The University of Texas-Pan American (UTPA) is moving towards becoming the new University of Texas-Rio Grande Valley (UTRGV) in Fall of 2015. One of the core missions of the new University is to provide an outstanding education and greater career opportunities to the students of South Texas. The University Transportation Center for Railway Safety (UTCRS) shares those core values and has been working towards providing opportunities for students by establishing comprehensive programs of railway safety research, education, technology transfer and implementation and workforce development.

During this reporting period of October 1, 2013 through March 31, 2014, the UTCRS has made great strides towards its goals and objectives. As of the end of this reporting period, all UTCRS planned activities are on schedule, complete, or forthcoming.

In doing so, the UTCRS is also aligned to the goals and guiding principles of the new university. It is maximizing students' success by developing and providing programmatic opportunities to strengthen current and future students' interest in engineering and other STEM fields. The Center has provided opportunities for undergraduate, graduate, and doctoral students and has exposed them to applied research opportunities.

As proposed in the prospectus, the UTCRS call for proposals for year one projects were determined using an abbreviated form as part of the grant proposal development process that was submitted on March 18, 2013. Once the USDOT grant awardees were announced, an official call for proposal was announced in October 2013 and PI's submitted detailed research proposals outlining the scope of work for their projects. The executive committee reviewed the proposals and verified that the projects were in line with what was proposed in the original grant proposal. A list of the selected projects is provided hereafter.

<b>RESEARCH AREAS addressed in prospectus:</b>
1. Single Bearing Test Rig with Vertical, Lateral, and Impact Load Capabilities
2. Conductive Elastomers for Steering Pads
3. Modeling the Residual Useful Life of Bearing Grease
4. Applications of Magnetostrictive Materials for Real-Time Monitoring of Vehicle Suspension Components
5. Structural Integrity of Railroad Bearing Adapters with Modifications for Onboard Monitoring Applications
6. Development of Corridor-based Traffic Signal Preemption Strategies at Signalized

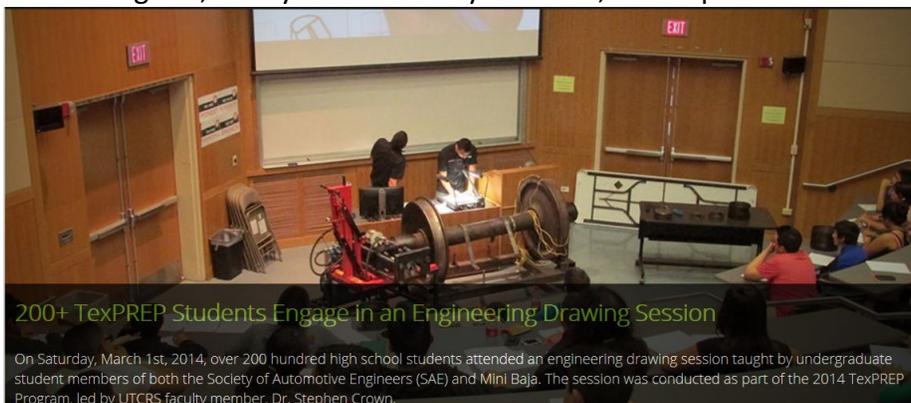
Intersections near Highway Railway Grade Crossings
7. Drivers' Perceptions of Highway-Rail Grade Crossing Safety and Their Behavior
8. Safety Modeling of Highway Railway Grade Crossings using Intelligent Transportation System Data
9. Safety Visualization of Highway-Rail Grade Crossings
10. Rail Neutral Temperature In-Situ Evaluation
11. Ultrasonic Tomography for Infrastructure Inspection
12. High Speed Train Geotechnics
13. Optimizing Performance of Railroad Rail through Artificial Wear
14. Vehicle-Bourne Autonomous Railroad Bridge Impairment Detection Systems

As for education and outreach activities for the reporting period, details are provided hereafter.

### EDUCATION & OUTREACH ACTIVITIES for period (October 1, 2013-March 31, 2014)

Outreach and Educational Activities aimed at Increasing Awareness of Transportation Engineering and Railway Safety

- Among the Outreach Activities, the UTCRS conducted presentations to 100 students from William J. Clinton Elementary School visiting our research facilities on November 13, 2013
- Presented to 250 high school students at the Region One Technology Student Association Leadership Conference (TSA) on January 24, 2014. Undergraduate research assistants from the UTCRS-UTPA presented the timeline status of their research projects
- Presented to 200 Texas Pre-Freshman Engineering Program (TexPREP) high school students on February 1, 2014 about research initiative at the UTCRS
- On Saturday, March 1, 2014, approximately 200 TexPREP high school students attended an engineering drawing session in relation to railway research components and were taught by undergraduate student members of both the Society of Automotive Engineers (SAE) and Mini Baja. The session was conducted as part of the 2014 TexPREP Program, led by UTCRS faculty member, Dr. Stephen Crown.



200+ TexPREP Students Engage in an Engineering Drawing Session

On Saturday, March 1st, 2014, over 200 hundred high school students attended an engineering drawing session taught by undergraduate student members of both the Society of Automotive Engineers (SAE) and Mini Baja. The session was conducted as part of the 2014 TexPREP Program, led by UTCRS faculty member, Dr. Stephen Crown.

## UTCRS HIGHLIGHTS for period (October 1, 2013-March 31, 2014)

The University Transportation Center for Railway Safety (UTCRS) held its grand opening by hosting a ribbon cutting ceremony on Monday, February 10, 2014. The UTCRS has been featured in several mediums such as all local television stations, newspapers, and write-ups at our institutions. UTCRS and its consortium partners from TAMU and UNL, along with UTPA's key administrators, faculty, staff, students, and community members were present. UTCRS was also honored by the attendance of Mr. Gregory Winfree, Assistant Secretary of Transportation who was accompanied by key USDOT personnel.



On March 21, 2014, U.S. Congressman Rubèn Hinojosa and UTPA President Robert Nelson visited the UTCRS and met with the faculty, staff, and students involved in the various Center activities.



The UTCRS students presented to 44 students from the Aida Diaz Jr. High School on April 10, 2014 where they talked about the ongoing research activities of the Center, and took the opportunity to market the upcoming summer camp.



## **What opportunities for training and professional development has the program provided?**

During this reporting period, both graduate and undergraduate students had the opportunity to develop their presentational skills in several occasions by presenting their research to K-12 students, visitors, other staff, and faculty members. These presentations served several purposes. To mention a few, they served to engage pre-college students to become interested in engineering while exposing them to railway research and other transportation fields and encourage undergraduate students to experience what a graduate level student entails, and create a supportive environment in which all students can succeed and reach their fullest potential.

Graduate students' leadership role encompassed serving as mentors to undergraduates and assisting PIs with oversight of the research projects. Such activities facilitate establishing mentoring programs to ensure that UTCRS undergraduate and graduate students have the necessary support system to succeed by acquiring the skills, knowledge and work habits that are essential to thrive in a multidisciplinary research and educational setting. A list of such activities appears on Page 5 and Page 6.

In research, the project related to the development of carbon nanofiber/thermoplastic polyurethane elastomer composite, the preliminary work has resulted in an initial demonstration of technical feasibility, and planning has begun for a large scale field trial. In this particular project, the students involved have developed skills in areas of material compounding, testing, and thermal analysis, machining, instrumentation and data acquisition, coding and programming, organization, planning, product design, and presentation.

On Friday, January 31st, 2014, UTCRS Director, Dr. Tarawneh, conducted an all-day training event for the new research assistants. The training included railroad bearing component assembly and inspection techniques, pressing bearings onto axles, and experimental setup procedures.

Another opportunity for professional development has been the outreach activities with local school districts that have focused on communication and preparation with local school districts in anticipation of the upcoming UTCRS 2014 Summer Camp.

## **How have the results been disseminated?**

Research teams, staff, and students meet frequently and no less than once a week in order to ensure that all UTCRS activities are on schedule. The executive committee meets weekly via a Skype conference call to ensure that the consortium institutions are on track with all planned activities. Thus far, one of the projects has yielded a co-authored conference publication between two undergraduate students and their two faculty supervisors. Results of the UTCRS activities will be disseminated in the future through papers, publications, presentations, webinars, and posted on the UTCRS website.

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

- Implementation of the activities outlined in the table above for all research, education, workforce development, and technology transfer projects will continue toward completion on-schedule.
- Website will be updated accordingly for each of the research projects.
- The Center will remain vigilant of timeline progress of each research project by requesting progress reports to be turned in on schedule to ensure the timely submittal of PPPR #2 to the designated USDOT program manager.
- Continue conference calls with consortium Associate Directors and administrative staff.
- Continue bi-weekly research meetings with PIs, and Co-PIs, research student staff, and administrative staff in order to address research needs and how center staff can assist in each project's research needs. (*i.e.* place orders, contact university departments for services needed to complete the research projects in a timely manner)
- Continue faculty seminars to UTCRS research teams.
- Continue weekly meetings with research faculty, staff, and students in charge of summer outreach activities to ensure that the summer camps and all related issues are addressed in a timely manner working towards a very successful summer education and outreach programs.
- Continue facilitating weekly meetings with Associate Directors from TAMU and UNL with Research Experiences for Undergraduates (REUs) in preparation for their participation in the upcoming summer research experience at the consortium institutions.
- Faculty researchers will continue to reach out to industry partners to address their workforce development needs.
- Sr. Program Coordinator with assistance from all partner institutions will continue to organize and work on key activities, such as maintenance of the UTCRS program projects onto TRB database in preparation of the annual report.

## 2. PRODUCTS

Publications, conference papers, and presentations:

Ongoing work on one of the University Transportation Center for Railway Safety (UTCRS) sponsored projects has resulted in a conference paper co-authored by two undergraduate students and the faculty that supervise them;

- Montalvo, J., Trevino, A., Fuentes, A.A., and Tarawneh, C.M., "Structural Integrity of Conventional and Modified Railroad Bearing Adapters for Onboard Monitoring," Proceedings of the ASME 2014 International Mechanical Engineering Congress & Exposition, IMECE2014, November 14-20, 2014, Montreal, Canada.

#### Website or other Internet Material:

The UTCRS website went live on December 23, 2013. Since its inception, the Center website has been a great resource for everyone involved in the various center activities. The website received a lot of traffic during the announcement and application periods of the Research Experience for Undergraduates (REUs) and the Research Experience for Teachers (RETs). The website has also seen increased activity over the month of April as parents, guardians, teachers, and school administrators are rushing to complete applications for the 2014 UTCRS Summer Camp. In fact, during the month of April alone, the statistics look as follows:

April 1, 2014 – May 1, 2014:

Pageviews = 2,644 ; Average Time on Page = 1 minute and 40 seconds

The UTCRS website features a picture slider that showcases the most recent activities of the center: <http://railwaysafety.utpa.edu/>

The UTCRS was also featured on all local news stations in the Rio Grande Valley. A link to the news segment that aired on local TV is provided hereafter:

<http://www.kveo.com/news/utpa-report-university-transportation-center-railway-safety>

Links to the REU and RET Programs, and the UTCRS 2014 Summer Camp are provided hereafter:

REU Program: <http://portal.utpa.edu/railwaysafety/education/internships/reu>

RET Program: <http://portal.utpa.edu/railwaysafety/education/internships/ret>

UTCRS 2014 Summer Camp: <http://portal.utpa.edu/railwaysafety/education/outreach/summercamp>

The UTCRS website is updated weekly to incorporate any news, events, or other ongoing center activities and outreach programs.

#### Technologies or techniques:

One of the products of the UTCRS is the Single Bearing Tester (depicted in Figure 1) that provides unique testing capabilities in which vertical, lateral, and impact loading can be applied simultaneously. This tester makes it possible to characterize the performance of railroad tapered-roller bearings in environments that closely mimic those of field service operation. This tester is vital for characterizing railroad bearing performance under realistic operating conditions. There are currently no other test rig designs that can duplicate this tester's functionality.



Figure 1. A photograph of the Single Bearing Test Rig with vertical, lateral, and impact loading capabilities.

All other current research and workforce development activities are under implementation.

Inventions, patent applications, and/or licenses:

Nothing to report, all current research and workforce development activities are under implementation.

Other products:

As the project selection process is complete, the following research projects listed by university have been approved for funding. The links to their research project descriptions can be found below:

University Name	Project Category	Project Title	Lead PI	Project Link
UTPA	Research	Structural Integrity of Railroad Bearing Adapters with Modifications for Onboard Monitoring Applications	Fuentes, Arturo	<a href="http://portal.utpa.edu/railwaysafety/research/mechanical/projects/2014/adapter-structural-fea">http://portal.utpa.edu/railwaysafety/research/mechanical/projects/2014/adapter-structural-fea</a>
UTPA	Research	Conductive Elastomers for Steering Pads	Jones, Robert	<a href="http://portal.utpa.edu/railwaysafety/research/mechanical/projects/2014/conductive-pad">http://portal.utpa.edu/railwaysafety/research/mechanical/projects/2014/conductive-pad</a>
UTPA	Research	Modeling the Residual Useful Life of Bearing	Timmer, Doug	<a href="http://portal.utpa.edu/railwaysafety/research/me">http://portal.utpa.edu/railwaysafety/research/me</a>

		Grease		<a href="http://portal.utpa.edu/railwaysafety/research/mechanical/projects/2014/lubrication-study">chanical/projects/2014/lubrication-study</a>
UTPA	Research	Applications of Magnetostrictive Materials for Real-Time Monitoring of Vehicle Suspension Components	Foltz, Heinrich	<a href="http://portal.utpa.edu/railwaysafety/research/mechanical/projects/2014/sensor-technologies">http://portal.utpa.edu/railwaysafety/research/mechanical/projects/2014/sensor-technologies</a>
UTPA	Research	Single Bearing Test Rig with Vertical, Lateral, and Impact Load Capabilities	Crown, Stephen	<a href="http://portal.utpa.edu/railwaysafety/research/mechanical/projects/2014/single-bearing-tester">http://portal.utpa.edu/railwaysafety/research/mechanical/projects/2014/single-bearing-tester</a>
TAMU	Research	Rail Neutral Temperature In-Situ Evaluation	Hurlebaus, Stefan	<a href="http://portal.utpa.edu/railwaysafety/research/infrastructure/projects/2014/rail-neutral-temp-eval">http://portal.utpa.edu/railwaysafety/research/infrastructure/projects/2014/rail-neutral-temp-eval</a>
TAMU	Research	Ultrasonic Tomography for Infrastructure Inspection	Hurlebaus, Stefan	<a href="http://portal.utpa.edu/railwaysafety/research/infrastructure/projects/2014/ultrasonic-tomography">http://portal.utpa.edu/railwaysafety/research/infrastructure/projects/2014/ultrasonic-tomography</a>
TAMU	Research	High Speed Train Geotechnics	Briaud, Jean-Louis	<a href="http://portal.utpa.edu/railwaysafety/research/infrastructure/projects/2014/high-speed-train-geotechnics">http://portal.utpa.edu/railwaysafety/research/infrastructure/projects/2014/high-speed-train-geotechnics</a>
TAMU	Research	Optimizing Performance of Railroad Rail through Artificial Wear	Fry, Gary	<a href="http://portal.utpa.edu/railwaysafety/research/infrastructure/projects/2014/optimizing-rail-through-artificial-wear">http://portal.utpa.edu/railwaysafety/research/infrastructure/projects/2014/optimizing-rail-through-artificial-wear</a>
TAMU	Research	Vehicle-Borne Autonomous Railroad Bridge Impairment Detection Systems	Fry, Gary	<a href="http://portal.utpa.edu/railwaysafety/research/infrastructure/projects/2014/vehicle-borne-bridge-impairment-detection">http://portal.utpa.edu/railwaysafety/research/infrastructure/projects/2014/vehicle-borne-bridge-impairment-detection</a>
UNL	Research	Development of Corridor-based Traffic Signal Preemption Strategies at Signalized Intersections near Highway Railway Grade Crossings	Rilett, Laurence	<a href="http://portal.utpa.edu/railwaysafety/research/operations/projects/2014/corridor-based-traffic-signal-strategies">http://portal.utpa.edu/railwaysafety/research/operations/projects/2014/corridor-based-traffic-signal-strategies</a>

UNL	Research	Drivers' Perceptions of Highway-Rail Grade Crossing Safety and Their Behavior	Khattak, Aemal	<a href="http://portal.utpa.edu/ra/ilwaysafety/research/operations/projects/2014/drivers-perceptions-hgrcs">http://portal.utpa.edu/ra/ilwaysafety/research/operations/projects/2014/drivers-perceptions-hgrcs</a>
UNL	Research	Safety Modeling of Highway Railway Grade Crossings Using Intelligent Transportation System Data	Rilett, Laurence	<a href="http://portal.utpa.edu/ra/ilwaysafety/research/operations/projects/2014/safety-modeling-hgrcs">http://portal.utpa.edu/ra/ilwaysafety/research/operations/projects/2014/safety-modeling-hgrcs</a>
UNL	Research	Improving Safety at Rural Highway-Rail Grade Crossings by Utilizing Light Detection and Ranging (LIDAR) Technology	Khattak, Aemal	<a href="http://portal.utpa.edu/ra/ilwaysafety/research/operations/projects/2014/safety-rural-hgrcs">http://portal.utpa.edu/ra/ilwaysafety/research/operations/projects/2014/safety-rural-hgrcs</a>

UTPA – University of Texas-Pan American

TAMU – Texas A&M University; UNL – University of Nebraska-Lincoln

### 3. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS:

#### What individuals, organizations, or collaborators have worked on the program?

During the current reporting period, the following individuals, organizations, and collaborators, listed hereafter, have been an integral part of the various educational, research, workforce development, and outreach activities of UTCRS.

NAME	ORGANIZATION NAME	RELATION	GENDER
Tarawneh, Constantine, Ph.D.	UTCRS – Director Assoc. Professor, Mechanical Engineering University of Texas-Pan American 1201 West University Drive Edinburg, TX 78539	Researcher	Male
Fry, Gary, Ph.D., P.E.	UTCRS – Associate Director TAMU Assoc. Professor, Civil Engineering Texas A&M University 3135 TAMU College Station, Texas 77843-3135	Researcher	Male
Rilett, Laurence, Ph.D., P.E.	UTCRS – Associate Director UNL Professor, Civil Engineering University of Nebraska-Lincoln 262D Whittier Research Center P.O. Box 830851, Lincoln, NE 68583-0851	Researcher	Male

Freeman, Robert, Ph.D.	UTCRS – Associate Director UTPA Professor and Chair Mechanical Engineering	Researcher	Male
Lawrence-Fowler, Wendy, Ph.D.	UTCRS – Diversity Coordinator UTPA Professor, Computer Science	Researcher	Female
Pena, Carmen, Ph.D.	UTCRS – Education Coordinator UTPA Assoc. Professor, Curriculum & Inst.	Researcher	Female
Hinojosa, Adriana	UTCRS – Sr. Program Coordinator UTPA	Staff	Female
Pena, Melissa Iliana	UTCRS – Office Assistant III UTPA	Staff	Female
Parra, Nayely	Undergraduate Research Assistant, UTPA	Staff	Female
White, Amy	Program Coordinator Center for Railway Research Texas A&M Transportation Institute 3135 TAMU College Station, TX 77843-3135	Staff	Female
Thandayithabani, Laviana, M.B.A.	Assistant Director of Operations University of Nebraska-Lincoln 2200 Vine Street 262D Whittier Research Center P.O. Box 830851, Lincoln, NE 68583-0851	Staff	Female
Timmer, Douglas, Ph.D.	Professor & Assoc. Dean for Research Manufacturing Engineering, UTPA	Researcher	Male
Crown, Stephen, Ph.D.	Professor and Director of TexPREP Mechanical Engineering, UTPA	Researcher	Male
Foltz, Heinrich, Ph.D., P.E.	Professor and Department Chair Electrical Engineering, UTPA	Researcher	Male
Fuentes, Arturo, Ph.D.	Professor, Mechanical Engineering, UTPA	Researcher	Male
Jones, Robert, Ph.D.	Professor, Mechanical Engineering, UTPA	Researcher	Male
Chapman, Angela, Ph.D.	Assistant Professor, Curriculum & Inst., UTPA	Researcher	Female
Hurlebaus, Stefan, Ph.D.	Civil Engineering Texas A&M University 3135 TAMU College Station, Texas 77843-3135	Researcher	Male
Briaud, Jean-Louis, Ph.D.	Civil Engineering Texas A&M University 3135 TAMU College Station, Texas 77843-3135	Researcher	Male
Aemal Khattak, Ph.D.	Civil Engineering University of Nebraska-Lincoln 262D Whittier Research Center P.O. Box 830851, Lincoln, NE 68583-0851	Researcher	Male
Villalobos, Cristina, Ph.D.	Director – C-STEM Center UTPA	Center	Female

Lozano, Karen, Ph.D.	Director – Nano Materials Center UTPA	Center	Female
Ben Ghalia, Mounir, Ph.D.	NSF RET/ENET Grant PI UTPA	Collaborator	Male
Kypuros, Javier, Ph.D.	Associate Professor & NSF-STEP Grant PI Mechanical Engineering, UTPA	Collaborator	Male
Wilson, Brent, Ph.D.	Director of Research and Development Amsted Rail 1700 Walnut St., Granite City, IL 62040	Collaborator	Male
Trejo-Vasquez, Cristina	UTPA Community Engagement Liaison	Community	Female
Vasquez, Aydee	Research Experience for Teachers (RET) Edinburg C.I.S.D	District Level	Female
Sanchez, Jose Jesus	Research Experience for Teachers (RET) Pharr-San Juan-Alamo I.S.D	District Level	Male
Gonzalez, Nora	Research Experience for Teachers (RET) Edinburg C.I.S.D	District Level	Female
Garcia, Rene	Research Experience for Teachers (RET) Pharr-San Juan-Alamo I.S.D	District Level	Male
Benitez, Andres	Research Experience for Teachers (RET) Sharyland I.S.D	District Level	Male
Reyes, Velinda	UTPA Director of Corporate and Foundation Relations	Institutional	Female
Moya, Hiram	Assistant Professor, Manufacturing Engineering, UTPA	Institutional	Male
Mahmoud, Enad	Assistant Professor, Civil Engineering, UTPA	Institutional	Male
Garza, Barbara	Director, Office of P-16 Initiatives, UTPA	Institutional	Female
Dove, Russell	Web Designer II Internet Services Department UTPA	Institutional	Male
Cazares, Jose	REU, UTPA Student going to TAMU	REU	Male
Gonzalez, Christian	REU, UTPA Student going to TAMU	REU	Male
Gonzalez, Zyndee	REU, UTPA Student going to TAMU	REU	Female
Martinez, Melissa	REU, UTPA Student going to TAMU	REU	Female
Guajardo, Ana Laura	REU, UTPA Student going to UNL	REU	Female
Mann, Roxxie	REU, UTPA Student going to UNL	REU	Female
Perales, Gabriela	REU, UTPA Student going to UNL	REU	Female
Sias, Cassandra	REU, UTPA Student going to UNL	REU	Female
Abrego, Rigoberto	Undergraduate Research Assistant, UTPA	Student	Male
Bantz, James Leland III	Graduate Research Assistant, UTPA Technology Transfer Services	Student	Male
Basaldua, Daniel Thomas	Graduate Research Assistant, UTPA	Student	Male
Drouin, Marc	Undergraduate Research Assistant, TAMU	Student	Male
Estrada, Raul Gilberto	Graduate Research Assistant, UTPA	Student	Male

Foster, Virginia	Graduate Research Assistant, TAMU	Student	Female
Garza, Mark Anthony	Undergraduate Research Assistant, UTPA	Student	Male
Hessler, Brian	Undergraduate Research Assistant, TAMU	Student	Male
Hurley, Sam	Graduate Research Assistant, TAMU	Student	Male
Kiani, Maysam	Doctoral Research Assistant, TAMU	Student	Male
Lyons, Kimberly	Graduate Research Assistant, TAMU	Student	Female
Martinez, Jackeline Kafie	Doctoral Research Assistant, TAMU	Student	Female
Martinez, Thania	Graduate Research Assistant, UTPA	Student	Female
Mealer, Arthur Alonzo	Undergraduate Research Assistant, UTPA	Student	Male
Moczygamba, Cody	Undergraduate Research Assistant, TAMU	Student	Male
Montalvo, Joseph	Undergraduate Research Assistant, UTPA	Student	Male
Moreno, Rene	Undergraduate Research Assistant, UTPA	Student	Male
Owens, Allen Edward	Undergraduate Research Assistant, UTPA	Student	Male
Posey, Johanna	Undergraduate Research Assistant, TAMU	Student	Female
Ryan, Cynthia	Undergraduate Research Assistant, TAMU	Student	Female
Tafti, Somayeh Rezaei	Doctoral Research Assistant, TAMU	Student	Female
Trevino-Flores, Alexis	Undergraduate Research Assistant, UTPA	Student	Male
Villarreal, Anthony Alex	Undergraduate Research Assistant, UTPA	Student	Male
Xiayun, Huang	Doctoral Research Assistant, TAMU	Student	Female
Zapata, Edson Edelmiro	Undergraduate Research Assistant, UTPA	Student	Male

UTPA – University of Texas-Pan American, 1201 W. University Dr., Edinburg, TX 78539

#### 4. IMPACT:

##### **What is the impact on the development of the principal discipline(s) of the program?**

One of the major impacts of the Center thus far is the overwhelming interest in the need for camps designed to introduce students to science and engineering concepts and applications. Since posting marketing and informational materials in the Center’s Web Site, parents have been calling the UTCRS office expressing a need for summer camps for high school students who may not qualify for other camps such as TexPREP; yet who still want to learn about science and engineering. Although the University Transportation Center for Railway Safety (UTCRS) has established a partnership with TexPREP to introduce high school students in that program to engineering concepts related to railway safety, there seems to be a great demand for a separate summer camp for high school students that do not qualify for TexPREP. The UTCRS is working on addressing that need.

Although much of the impact of the summer camp will be realized in June and July when they are implemented and when all four professional development modules are made available to the public, there has been significant progress for each of the two major activities. First, simply advertising the camp has led to a realization of the great need for educational summer camp activities for school age children in the Rio Grande Valley. Simply put, there are not enough opportunities for students to expand their intellectual horizons during the summer, and the

camps that are available are quite costly (averaging approximately \$300/week) and/or have very stringent entrance criteria. Hence, the UTCRS summer camp, which is aimed at increasing awareness of transportation engineering fields with emphasis on railway safety, has received tremendous response from the community as evident by the 120+ applications that have been submitted thus far by parents of students in several school districts in the Rio Grande Valley. It is expected that the UTCRS summer camp will attract approximately 600 K-12 students, effectively making it the largest summer camp in the history of The University of Texas-Pan American (UTPA). A large percentage of the applicants are woman and minorities who are underrepresented in the transportation engineering fields. The main objective of the UTCRS summer camp is to expose students to engineering concepts related to transportation fields, and attract them to these fields at an early stage of their academic careers.

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

Even though the UTCRS has only been established for a mere seven months, one of its immediate impacts is the fact that it brought together faculty and students from six different departments and three colleges at UTPA. Two of the five research projects are a collaborative effort between mechanical, electrical, and manufacturing engineering faculty and students all working together towards improving railway safety. The educational and workforce development efforts of the Center are led by two faculty from the curriculum and instruction department (College of Education) in collaboration with the various engineering programs involved in the Center (mechanical, civil, electrical, manufacturing, and computer science). Furthermore, the UTCRS has partnered with the TexPREP Program, and the newly established NSF-STEP Program, to serve the needs of high school students and expose them to engineering concepts and applications related to transportation fields with emphasis on railway safety.

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

Workforce development contributions are primarily in the thorough introduction to railway systems for the participating graduate and undergraduate students involved in the UTCRS. The Center is training a critical mass of engineering students in the transportation field pertaining to railway safety in terms of mechanical, infrastructure, and operations research. The students are developing advanced engineering skills in materials development, manufacturing, design and fabrication of mechanical systems, structural design, operations management, and instrumentation and controls. Additionally, the students are cross-trained to use mechanical and electrical equipment in order to build an efficient system. Having mechanical engineering students working alongside electrical and civil engineering students provides these students with valuable expertise that will help them moving forward with their careers in the transportation engineering fields.

The second major impact will be realized through the web based modules in transportation engineering that are currently being developed. Any interested individual can learn more about transportation engineering and railway safety through online modules to be made available through the UTCRS website. These modules will contribute to the professional development

and career advancement of individuals in the railroad industry, and will serve to educate the general public on matters of railway safety.

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

As a part of the conductive polymer pad scale-up study, the students involved in that project have designed and are building and programming a digitally controlled feed system for the existing laboratory mixing extruder so that compounds can be made with controlled proportions of fiber and polymer compositions. The latter is a substantial enhancement to the existing university resource as it will permit larger scale projects on that machine in the future.

The UTCRS has also expanded the collaborations between the various departments and colleges involved in this effort, which has greatly facilitated and expedited the progress in the various center activities. For example, mechanical and civil engineering students have learned a great deal from their fellow electrical engineering students and vice-a-versa and the resources of the three departments were made available to all students involved in the center, which has led to increased productivity and efficiency. The cross-training of students in these engineering fields is essential for workforce development efforts in the area of railroad research.

Furthermore, the REU and RET Programs that are sponsored by the UTCRS will generate tremendous benefits to all three consortium institutions. The eight students already selected for the REU Program will be traveling to TAMU and UNL to get a jump start on their graduate education by participating in a 10-week immersive research experience. Currently, UTPA's College of Engineering and Computer Science does not have a doctoral graduate program, and it does not have a Master's Program in Civil Engineering. Hence, the REU Program will help establish a pipeline of students from undergraduate and Master's programs at UTPA to doctoral programs at TAMU and UNL, while facilitating and providing the students the opportunity to continue pursuing research in the areas of transportation engineering. On the other hand, the five teachers already selected for the RET Program will assist the UTPA faculty and staff in running the UTCRS summer camp while working on developing specialized teaching modules that they can incorporate in their classrooms. The devised teaching modules will use science and engineering concepts and applications to demonstrate railway safety to K-12 students. Hence, the RET Program is a mutually beneficial relationship between K-12 teachers, UTPA, and the UTCRS as we all work together to meet our educational goals by encouraging students to pursue careers in STEM, while raising awareness about the transportation field with emphasis on railway safety.

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

A web site has been created for the UTCRS which contains information about the various educational, research, workforce development, and outreach activities of the Center. The

Center web site has seen increased online activity as evident by the fact that it is the number one visited site in terms of “railway safety” in the Google Search engine, as of April 30, 2014. Since the web site was updated to reflect the information regarding the UTCRS summer camp, the Center has received no less than 40 to 60 calls daily from parents, teachers, and school administrators inquiring about the camp and how to enroll their kids in this camp.

Furthermore, in terms of research, the Single Bearing Test Rig (see Figure 1) capable of applying simultaneous vertical, lateral, and impact loading has been designed and built and is a few weeks from being operational. This tester design, which is the only one of its kind in the US, allows the Center to be able to characterize the performance of railroad tapered-roller bearings under operating conditions that mimic closely those of real field service operation.

The research conducted by the UTCRS has also attracted attention from a major railroad industry company that expressed interest in the conductive polymer pad project. The company would like to use the scale-up results of the study, once they become available, to fabricate some of these conductive pads and put them through extensive laboratory and field testing to see if they meet the needs of the railroad industry. The latter is in line with one of the core missions of the Center, which is to accelerate product development of material that will promote railway safety. In this case, operator safety is enhanced by making the compliant steering pad in a railcar suspension a reliable and durable conductor. This will reduce operator exposure to dust, noise, and the risk of injury from manual intervention in loading and unloading of bulk product railcars.

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

The University Transportation Center for Railway Safety (UTCRS) has had a noticeable impact on society as evident by the number of hits the web site has been viewed. Since its inception on October 1, 2013, the Center has advertised the summer Research Experience for Undergraduates (REUs), summer Research Experience for Teachers (RET), and the UTCRS summer camp. Each of these announcements was met with great interest from people around the country. The Center received 19 applications for the REU Program, 10 applications for the RET Program, and 120+ applications for the UTCRS summer camp. The teachers that applied for the RET program were from Texas, Florida, Nebraska, Louisiana, and California.

The impact on the Rio Grande Valley has been tremendous given the fact that prior to the UTCRS, people in this region of the country did not know or hear of the USDOT UTC Program and its benefits. The graduate and undergraduate students involved in the Center presented their work as part of the Center’s community outreach activities to 250 high school students from the Region One Technology Student Association (TSA) on January 24, 2014, 200 high-school students from the Texas Pre-freshman Engineering Program (TexPREP) on February 1, 2014, and 44 students from Ida Diaz Jr. High School on April 10, 2014. Additionally, the TexPREP students returned later on March 1, 2014 to learn how to prepare engineering drawings of railroad truck assembly components and test equipment.

Finally, the UTCRS has engaged more than 35 graduate and undergraduate students, fifteen faculty, and five staff members in its various educational, research, workforce development, and outreach activities thus far. The latter has helped increase awareness of railway safety initiatives and demonstrated the USDOT's commitment to enhancing railway safety across the nation.

5. CHANGES/PROBLEMS:

Nothing to Report.

6. SPECIAL REPORTING REQUIREMENTS:

Nothing to Report.