

Walk, Don't Drive: Active Transportation May Provide More than Health Benefits

Building Sustainability into Our Transportation System

TTI-Led Research Seeks to Expedite Emergency Care for Patients Crossing the Border

TEXAS TRANSPORTATION

VOL. 52 | NO. 1 | 2016

# Researcher

Getting Our  
*Transportation*  
System Back  
on Its Feet



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# TEXAS TRANSPORTATION Researcher

VOL. 52 | NO. 1 | 2016

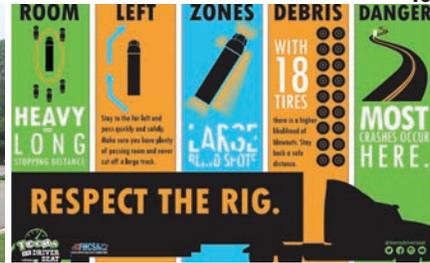
**ON THE COVER:** As the cost of building roads increases, new alternatives — such as encouraging different modes of transportation — can help create a sustainable, reliable transportation system for the future.



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*Texas Transportation Researcher* (ISSN 00404748) is a quarterly publication of TTI Communications, Texas A&M Transportation Institute, 3135 TAMU, College Station, Texas 77843-3135. Periodicals postage paid at College Station.

TTI.RESR1603.0516.4400

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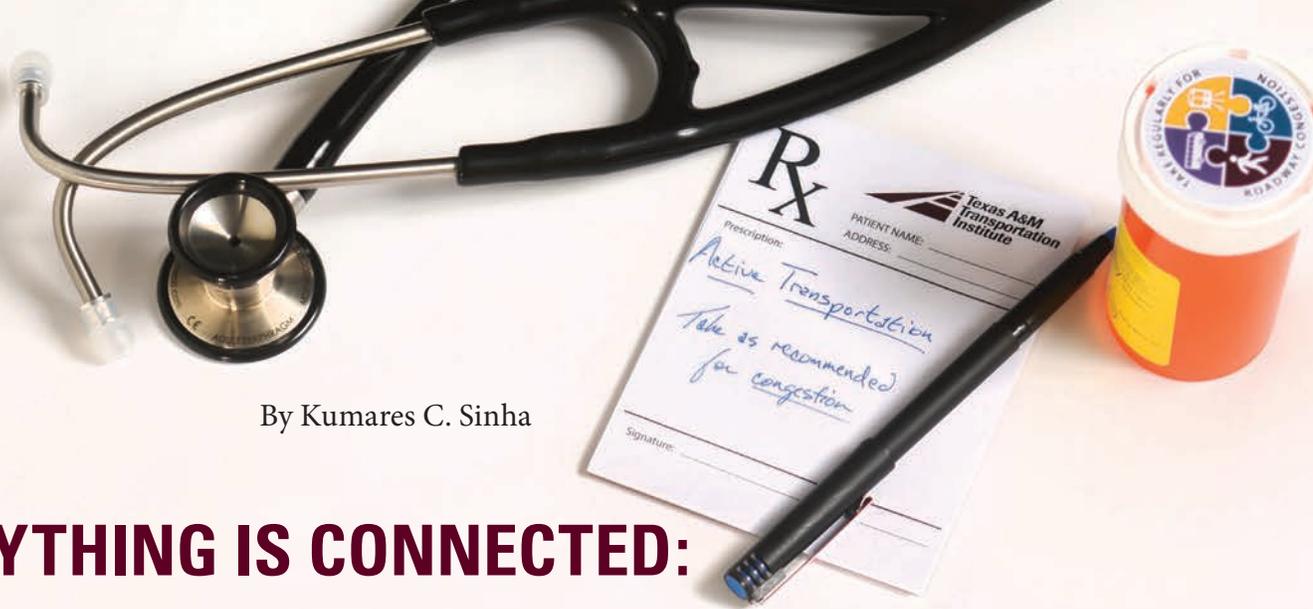
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Texas A&M Transportation Institute

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By Kumares C. Sinha

## EVERYTHING IS CONNECTED:

### Research to Bring Public Health and Transportation Together

Traditionally, transportation research has focused its agenda on building the system to improve access to markets and, more recently, meet the demands of a world economy. With the highway system mostly in place, transportation research is now focusing on enhancing system performance and minimizing detrimental side effects. Some of those side effects have reached the point of becoming serious public health concerns.

Road crashes remain a major problem. In addition, the reliance on automobiles for personal transportation has resulted in less physical activity and less-active lifestyles, contributing to an increasing incidence of obesity and related diseases such as diabetes. The lack of access to medical services for non-driving population groups is a growing health care problem in many communities. Transportation's increasing environmental footprint resulting from congestion and pollution has also added to adverse health effects. Ignoring these issues negatively impacts the economy and the quality of life in communities throughout the country. Concerted research efforts are needed to face these challenges.

In view of the importance and timeliness of the rising public health problem, the Transportation Research Board Executive Committee held a policy session on this topic in January. The purpose was to explore transportation's effects on health and disease and identify how to make the best use of transportation to enable health improvements. Broadly identified research areas included transportation and the spread of disease, designing urban systems to promote health and safe transportation options, enhancing access to health care, improving road safety and reducing transportation's environmental footprint.

I've become acquainted with the Texas A&M Transportation Institute (TTI) as a Faculty Fellow at the Texas A&M University Institute of Advanced Studies and through my

work with faculty from the Zachry Department of Civil Engineering in the Dwight Look College of Engineering, as well as with TTI researchers. TTI is in a unique position to address the multidimensional issues related to public health and transportation. Effectively meeting these challenges requires the participation of researchers from various disciplines and the support of multiple federal, state, and local agencies and private organizations. The Institute is able to draw on the Texas A&M Health Science Center School of Public Health, the Texas A&M Health Science Center College of Medicine and other departments. TTI can also extend its long-standing working relationships with the Texas Department of Transportation to other agencies to create a coordinated research agenda considering infrastructure, policy, medical, social and economic issues.

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### TTI is in a unique position to address the multidimensional issues related to public health and transportation.

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Only by addressing these issues can we save lives and resources, enhance economic vitality, and improve the quality of life. This issue of the *Texas Transportation Researcher* presents what TTI is already doing to make a difference. ■



*Kumares C. Sinha is the Edgar B. and Hedwig M. Olson Distinguished Professor of Civil Engineering at Purdue University's Lyles School of Engineering. He is currently serving as a Faculty Fellow at the Texas A&M University Institute of Advanced Studies. Sinha is also a member of the Transportation Research Board Executive Committee.*



# TTI Researchers Investigate Reasons Impaired Drivers Choose Transportation Network Companies to Provide Safe Rides

**FOR YEARS** transportation safety officials have encouraged impaired drivers to find a sober ride home — be it designating a driver, catching a cab or riding the bus. Another option became available in 2009, when transportation network companies (TNCs) first appeared.



TNCs provide on-demand taxi-like transportation via self-dispatched independent drivers. Riders summon drivers through a smartphone application that accepts fare payments on behalf of the driver. Uber and Lyft are two examples of this innovative approach to supplementing traditional taxi services or providing new options in areas where taxis are not available.

In a project titled Transportation Network Companies and Impaired Riders: Reducing Impaired Driving Through Passive Transportation, Texas A&M Transportation Institute (TTI) researchers are exploring the use of TNCs by impaired individuals. Preliminary findings suggest that impaired people are using TNCs rather than driving. What's more, the core TNC ridership represents the same segment of the population most likely to participate in impaired driving. According to the Fatality Analysis Reporting System, in 2013, the average age of impaired drivers involved in a fatal crash was 36 years old. In the same year, 21 year olds were the age group most frequently involved in fatal crashes. Among those over the age of 18, the most common age group served by TNCs is 25 to 34 years old.

average age of  
impaired drivers  
in a fatal crash

**36**



most fatal crashes

**21**  
year olds



**25 to 34**  
year olds



most  
commonly  
use TNCs

TTI Associate Transportation Researcher Zachary Elgart explains: “We know that impaired people are using these TNCs to safely get home, but we’re unsure of the decision process that results in those individuals choosing TNCs. For example, do people arrange all their travel for a night on the town with a TNC in advance? That’s what we’re looking at with this project.”

The growth of the industry is also what makes TNCs a potential alternative to other transportation modes. Uber, one of the largest TNCs, serves 382 cities in more than 60 different countries worldwide. Lyft is available in 206 U.S. cities, and there are many other companies that serve other areas.

Researchers will conduct focus groups to obtain information regarding people’s knowledge and use of TNCs. The groups will be held in College Station, Austin and Houston, and are a little different than those for a typical research project.

“We’re planning on recruiting participants in areas with a high concentration of bars and restaurants. We want to make sure we’re reaching our target audience,” says TTI Research Scientist Eva Shipp. “The surest way to do that is to go to the source.”

The project will also look at programmatic and policy concepts that encourage more people to choose options other than driving

**“The end goal is to get would-be impaired drivers to make an alternate travel choice. Once we discover why people are choosing TNCs over other modes, companies or transportation agencies can use incentives to encourage that behavior.”**

*Zachary Elgart,  
TTI Associate Transportation Researcher*

their own vehicle to make it home safely after a night out drinking. One such example is part of Austin’s Get Home Safe campaign. With proper documentation, the city will waive the fee of a parking ticket if the individual chooses another mode of transportation to get home, instead of deciding to drive after he or she has been drinking.

Another example of policies that incentivize impaired people to use TNCs is providing a discounted rate to those who use TNCs going to and from their destination. So far these discounts have typically been offered through a partnership with an alcohol company or professional sports team/league and a TNC. One such partnership is Miller

Light Free Rides. The program was launched in September 2015 to provide free or discounted rides to prevent drunk driving. The initiative involves several modes of travel including Uber, transit and taxis. According to the website, the program has provided more than 4.8 million free rides since it launched.

“The end goal is to get would-be impaired drivers to make an alternate travel choice. Once we discover why people are choosing TNCs over other modes, companies or transportation agencies can use incentives to encourage that behavior,” says Elgart. “Maybe that means making TNCs more accessible to take round-trip.” ■



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# New Rapid-Flashing Beacon Shows Great Promise in Improving Pedestrian Safety



*Rapid-flashing beacons with yellow indicators are proving effective at alerting drivers to pedestrians and, thereby, improving safety at crosswalks. Having the device active only when a pedestrian is present contributes to that effectiveness.*

**For many pedestrians,** crossing a busy multilane roadway without the protection of a traffic signal is a nerve-wracking, sometimes dangerous proposition, even when using a marked crosswalk.

As a means of improving safety at uncontrolled pedestrian crosswalks, the Federal Highway Administration (FHWA) has sponsored research on a variety of traffic control devices intended to increase driver awareness and improve drivers' yielding to pedestrians. One of the devices, the rectangular rapid-flashing beacon (RRFB), has shown positive results — an increase in the number of drivers yielding to pedestrians.

“The RRFB is very effective,” says Kay Fitzpatrick, manager for the Texas A&M Transportation Institute’s (TTI’s) Roadway Design Program. “A study conducted about 10 years ago found that you had to have a device that showed a red indication for drivers to yield at a high enough rate to be considered acceptable. Now with the RRFB, there is a device with a yellow indication where drivers are yielding at much higher rates. Having this device only active when a pedestrian is present is an obvious contribution to its effectiveness. We want to understand what, if any, other characteristics are contributing to the effectiveness.”

“Several agencies are interested in having the RRFB added to the *Manual on Uniform Traffic Control Devices* [MUTCD],” Fitzpatrick explains. Before adding this device to the MUTCD, however, refinements to its characteristics were needed. An FHWA project conducted by TTI started with a closed-course study conducted at the Texas A&M University Riverside Campus that examined driver detection of a cutout pedestrian photograph in the presence of light-emitting diodes with various brightness levels, flash patterns and locations within the sign assembly. The results from the closed-course study indicated that the flash pattern and the beacon location justified additional investigations on the open road.

The research team used a staged pedestrian approach to evaluate drivers' yielding on the open road. Under this protocol, a member of the research team acts as a pedestrian using the crosswalk to stage the conditions under which driver yielding would be observed.

The overall average driver yielding for each of the three flash patterns was between 78 and 80 percent for the eight sites in the study.



The TTI team developed a temporary light bar and control that permitted the research team to have control over the flash pattern and brightness. Three flashing light patterns were selected for use with the temporary light bars — the pattern currently being used with other installations along with two patterns developed by TTI in collaboration with FHWA and other transportation professionals.



*The open-road study found that driver yielding is the same whether the beacons are above or below the sign, while the closed-course study revealed there are potential benefits to having the beacon placed above the sign.*

The overall average driver yielding for each of the three flash patterns was between 78 and 80 percent for the eight sites in the study. The statistical evaluation found no difference in effectiveness between the three patterns. Because the tested flash patterns had similar driver yielding results, FHWA issued an official interpretation that favors one of the new

patterns (called WW+S) because it has a greater percentage of dark time when both beacons of the RRFB are off (a benefit identified in the closed course) and because the beacons are on for less total time (resulting in energy savings).

“FHWA also wanted to investigate on the open road whether drivers would continue to yield at the same rates if the beacon placement was different,” says Fitzpatrick. “We identified 13 test sites where the communities worked with us and moved the beacons from below to above the sign. That way we had similar drivers and site characteristics when we collected data for both conditions — when the beacons were above the sign and when the beacons were below the sign.”

The findings showed only minor, if any, differences between the above and below positions (the average daytime yielding for staged pedestrians was 64 percent for above and 61 percent for below), and the statistical test showed no noteworthy difference. With the open-road study finding that driver yielding is the same whether the beacons are above or below the sign, and with the closed-course study revealing there are benefits to having it above the sign, FHWA is planning to issue an official interpretation that will allow agencies to place the beacon above the sign.

“The findings from these FHWA studies are helping to refine the device characteristics, resulting in a pedestrian treatment being considered for the next edition of the MUTCD,” says Fitzpatrick. “More importantly, the device is being used in more locations, and drivers are noticing the rapid-flashing yellow beacons and yielding to pedestrians crossing the roadway.” ■



For more information, contact **Kay Fitzpatrick** at (979) 845-7321 or [k-fitzpatrick@tamu.edu](mailto:k-fitzpatrick@tamu.edu).



# BUILDING SUSTAINABILITY

INTO OUR

## TRANSPORTATION *System*

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**The connection between health and transportation has now become a strategic initiative at TTI. “We are in the early stages of making sustainable transportation a priority. The concept is not going away. Terminology may change, but the principle is here to stay.”**

*Joe Zietsman,  
TTI Environment and Air Quality Division Head*

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**VITAL TO ECONOMIC GROWTH,** transportation can also be a detriment to human health and the natural environment. That’s among the reasons why the concept of sustainable transportation is emerging in countries around the globe, among most state departments of transportation in the United States and, in increasing cases, as part of transportation engineering curricula.

“Sustainable transportation is an extremely broad topic that has hundreds of different definitions and could mean different things to different people,” explains Joe Zietsman, head of the Texas A&M Transportation Institute’s (TTI’s) Environment and Air Quality Division. “For some, it means the attempt to reduce congestion with high-occupancy vehicle lanes or reduce greenhouse emissions. For others, it’s wise land use and planning that makes room for sidewalks and bike lanes. Sustainable transportation is really a philosophy that should be incorporated into all aspects of transportation practice and decision making.”



## TTI's Sustainable Transportation Research

Early TTI work focusing on sustainable transportation included a 2002 Zietsman-led project sponsored by the Southwest Region University Transportation Center — Quantifying Sustainable Transportation Performance Measures. The project goal was “to provide a framework on how to identify, quantify and apply performance measures for sustainable transportation in the transportation planning process.”

Six years later, in 2008, Zietsman and a team of TTI researchers developed a performance-measurement approach to evaluate sustainability in the context of the goals of the strategic plan initiated by the Texas Department of Transportation (TxDOT) — reduce congestion, improve safety, increase economic opportunity, enhance the value of transportation assets and improve air quality. The team of researchers developed a methodology and an analysis tool to evaluate progress toward sustainability.

The TxDOT project led the way for a national effort to help all state transportation agencies identify and apply sustainability-related performance measures. National Cooperative Highway Research Program (NCHRP) Project 708, A Guidebook for Sustainability Performance Measurement for Transportation Agencies, was completed in 2011 and helped move sustainable transportation efforts to a new level. Zietsman collaborated with numerous experts for the NCHRP project, which led to a recently published textbook, *Sustainable Transportation: Indicators, Frameworks, and Performance Management* (see sidebar). In 2014, Zietsman used the NCHRP guidebook to help the Roads Authority of Namibia develop a Road Transport Sustainability Plan for the nation's transportation network.

## Health and Transportation Projects

The connection between health and transportation has now become a strategic initiative at TTI. The Institute has partnered with the Texas A&M Health Science Center (TAMHSC) following a collaborative workshop last year designed to examine future research opportunities. Two team projects are now under way — one that links crash data with individual patient outcomes (which could lead to improved treatments, faster emergency responses and effective safety countermeasures) and another that evaluates the health consequences of vehicle emissions along the Texas-Mexico border.

“Hidalgo County has among the highest rates of childhood asthma in the state. Is it related to worsening air quality issues along the border?” asks Natalie Johnson of the TAMHSC School of Public Health. “On the health side of the project, we're monitoring air pollution exposures of 25 expectant women through blood and urine samples. But we need TTI researchers to help us understand how the transportation sector is contributing to these exposures.”

The Strategic Research Development in Health and Transportation Initiative will help to develop additional research opportunities between health professionals and transportation researchers. “We are in the early stages of making sustainable transportation a priority,” Zietsman says. “The concept is not going away. Terminology may change, but the principle is here to stay.” ■



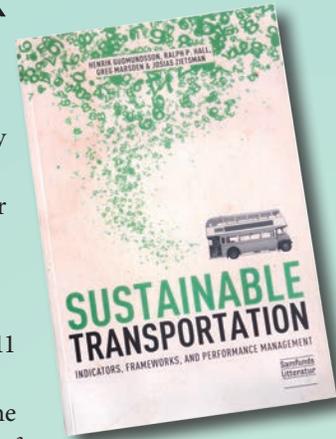
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## Collaboration Leads to Sustainable Transportation Textbook

A Guidebook for Sustainability Performance Measurement for Transportation Agencies, an NCHRP project completed in 2011 and led by Joe Zietsman, was the combined effort of numerous people, including three international experts on sustainable transportation — Henrik Gudmundsson of the Technical University of Denmark, Ralph Hall from Virginia Tech and Greg Marsden from the University of Leeds.

The researchers decided it was time for a full-length, detailed textbook on transportation sustainability because no such textbook existed. They met for a week-long brainstorming retreat in Yorkshire, England, to develop the content for the book. The outline was submitted to a book competition in Denmark and won an international award, which kept the effort going. Four years later, their work, *Sustainable Transportation: Indicators, Frameworks, and Performance Management*, was published. The book became the basis of a well-attended workshop at the 2016 Transportation Research Board Annual Meeting in January in Washington, D.C.

“It's clear that sustainable transportation is becoming a very popular and relevant topic among researchers and academia,” Zietsman says. ■





# Walk, Don't Drive

## Active Transportation May Provide More Than Health Benefits



*Designing more sustainable communities requires encouraging alternative travel modes.*

### **In the United States, more people live in suburbs than in central cities, and suburbanites drive automobiles or rely on mass transit to get to and from work.**

The construction of highways with multiple lanes and faster speed limits has been a common response to meet the growth of sprawling cities and the widespread ownership of private automobiles. This increased reliance on roadways has the unintended effect of creating additional demand and worsening urban sprawl by encouraging distance between residential and employment locations.

In most Texas cities, the options to walk or bike to work are very limited, especially when you consider the ground most travelers have to cover. But what if we had more options? What would that mean for our health and quality of life? And what would that mean for our transportation system?

Researchers at the Texas A&M Transportation Institute (TTI) are examining the effects of *active transportation* on quality of life. Active transportation refers to transportation modes that primarily use physical activity to move from one destination to another, usually by walking or bicycling.

TTI Assistant Research Scientist Ipek Sener explains, “It’s well recognized that active transportation can be a solution

to a variety of transportation and health problems ranging from congestion to obesity. But there’s an added dimension to the story — when walking or biking, we have increased opportunities to be aware of the people around us, interact with our neighborhood, and be more attentive to our environment.”

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**“My research deals with humans who are inherently affected by various emotional, physiological and social factors, as well as habits, inertia, attitudes and perceptions. The first step in promoting active transportation is to better understand an individual’s choice to be active or not.”**

*Ipek Sener,  
TTI Assistant Research Scientist*

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The majority of Sener's research has focused on understanding the factors influencing people's activity-travel behavior, and predicting how individuals would react to different transportation, land-use and public-health policies.

Sener's work has been published in several journals, including her recent technical article "Potential Health Implications and Health Cost Reductions of Transit-Induced Physical Activity" in the *Journal of Transport and Health*. The article reviews the associated health-cost benefits related to physical activity and transit use. According to Sener, transit use is associated with increased levels of physical activity and improved health outcomes, but the extent of these effects is uncertain.

The goal of these articles is to improve researchers' understanding of the link between health and transportation in the context of various projects recognizing the benefits of active transportation.

As part of a five-year collaborative project with The University of Texas Health Science Center in Houston and funded by the National Institutes of Health, Sener and her colleagues are looking at how extending the Metropolitan Transit Authority of Harris County's light-rail transit (LRT) lines affects the physical activity and travel behavior of Houstonians. Researchers are examining the effect on low-income, ethnically diverse adults residing along the new LRT lines. Now in year three of the project, the team has completed recruiting more than 800 participants and is collecting data for follow-up phases.

"My research deals with humans who are inherently affected by various emotional, physiological and social factors, as well as habits, inertia, attitudes and perceptions," says Sener. "The first step in promoting active transportation is to better understand an individual's choice to be active or not."

As part of a larger multimodal project for El Paso, Sener and her colleagues are conducting several analyses to better understand active travel behavior. They're looking at the factors, motivators and deterrents that influence decision making. Sener also emphasizes the importance of differentiating an individual's needs and desires. "It's important that we recognize an individual's constraints and try to develop solutions for people who are willing to be active but do not have the opportunity," she says.

"When you look at the population in the El Paso area, we have a very high rate of diabetes," states Michael Medina, executive director of the El Paso Metropolitan Planning Organization. "And so if you're able to identify a potential psychological perspective of why [citizens] pick a certain form of transit, what else would they need?"

Aside from the health benefits, other reasons exist for promoting active transportation — congestion management,



*Public transit, such as Capital Metro in Austin, Texas, is only part of the solution. All modes — such as bike, pedestrian and transit — must work together to promote mobility across our transportation system.*

air quality and energy dependency, to name a few. Fewer cars on the road mean less congestion, cleaner air and fuel conservation. We're also running out of space to build new highways, an ever-increasing and cost-prohibitive strategy to expand roadway capacity.

Sener explains that due to the growing financial and social costs of highway-oriented transportation, it is no longer possible to simply rely on increasing roadway supply to meet demand. That calls for developing new strategies that better use the system we currently have.

"It's essential that we look at alternative solutions in managing demand and responding to the adverse impacts of highway-oriented transportation solutions," Sener says. "Active transportation enters the picture at this point since it lies at the heart of sustainable and integrated transportation systems needed for a better future." ■



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*The Freight Shuttle System is energy efficient, using one-third the energy diesel trucks use at cruise speeds per vehicle mile traveled.*

# The Freight Shuttle System

## *Clearing the Air on Sustainable Freight Movement*

### **Doing more with less: that's the mantra of transportation agencies everywhere these days.**

We need to achieve greater mobility on our roadways, but we can't afford to build our way out of congestion. We need to clean the air around urban areas to improve public health, but policies enforcing clean air are difficult to pass and enforce. In short, we need to do better with the system we have.

While we can't afford to reinvent the wheel, we can make it turn more efficiently with innovative thinking. How we move freight — from ports of entry to, ultimately, the market shelves in our biggest cities — is one part of our transportation system that hasn't changed much in the past century. Ships offload international cargo, which is moved via freight train and 18-wheeler trucks to the marketplace. Today, almost all commercial cargo moving less than 500 miles is moved by truck, which causes significant congestion on our roadways and contributes considerably to, among other things:

- bottlenecks at border crossings, seaport regions and major intermodal cargo hubs;
- air pollution from engine exhaust;

- crashes; and
- road wear and the public costs associated with repairing it.

And as economies expand (a good thing), the problem is only getting worse. We need to move cargo smartly, cleanly and safely. Enter the Freight Shuttle System (FSS), recently noted as a “fascinating technology” that “could be a real key to [the] overall discussion [of relieving congestion]” by Texas Transportation Commissioner Jeff Moseley at the Feb. 25 Texas Department of Transportation Commission Meeting.

The FSS redefines how we move freight by its pioneering, patented application of proven technologies. Designed by Texas A&M Transportation Institute (TTI) Assistant Agency Director Steve Roop, the FSS is a low-emissions alternative to moving cargo and relieving congestion created by trucks in heavy freight corridors.

“Not only will we help mitigate roadway congestion, we'll benefit the environment and public health while doing it,” says Roop.



FSS personnel test the prototype Freight Shuttle at the Test and Evaluation Center in Bryan, Texas.

The FSS can move truck trailers and domestic intermodal containers up to 53 feet in length — as well as all sizes of ocean shipping containers — via emissions-free, electric-powered transporters. The transporters ride on elevated guideways in the medians of existing highways or other rights of way over distances of up to 500 miles. Running above existing roadways, the FSS transporters reduce the number of trucks that would otherwise be hauling freight over the highway.

Scientists have recently established a link between pollution and airborne illnesses, particularly in highly populated urban areas. While many other benefits accrue from this freight-movement model, it's the environmental (and associated health) benefits that potentially hold the greatest long-term contribution the FSS can make.

“Because we use electric rather than diesel power, our carbon footprint is minimal,” explains Roop. “For example, diesel trucks generate 43 times the nitrous oxide per vehicle mile compared to the Freight Shuttle System.”

Powered by linear induction motors — with steel-wheel technology that reduces friction and results in the exceptionally efficient use of electric power — the system can draw from any available source of energy, including solar and wind power, to operate transporters along a low-friction guideway. That conserves energy, minimally impacts the environment, and provides reliable, continuous movement of freight from point to point.

Many of our highways are near capacity, meaning a single crash can back up traffic for miles. The FSS is designed to

operate on an automated, dedicated, closed-loop system with custom-designed terminals and reliable scheduling that produces congestion-free operation. GPS and wireless communications, in conjunction with a fiber-optic backbone, will provide a constant flow of information on status, position and operating conditions to help ensure maximum safety and efficiency. A single system could operate up to 8,640 transporter trips daily in each direction, with 10-second intervals between transporters.

The FSS is energy efficient as well, using one-third the energy diesel trucks use at cruise speeds per vehicle mile traveled. Once implemented, the FSS could reduce fuel consumption by millions of gallons per year.

“If we’re able to introduce a more efficient alternative to trucking in certain areas, we’ll see a corresponding reduction in air pollution,” Roop says.

The FSS is currently in pilot testing at the 34-acre Test and Evaluation Center in Bryan, Texas, as a joint project among Freight Shuttle International, LLC; TTI; Curtis-Wright Corporation; ZAMTEK, LLC; Figg Bridge Engineers; Wells Engineering; Kapsch TrafficCom Group; and Jones|Carter, Inc. ■



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# VISUALIZING a Safer Transportation COMMUNITY

**From automated** cruise control to Google self-driving cars to trucks platooning, the world of connected, automated and autonomous vehicles is rapidly evolving. A research project sponsored by the Texas Department of Transportation (TxDOT) and conducted by the Texas A&M Transportation Institute (TTI) is examining connected and automated vehicle applications to improve transit, bicyclist and pedestrian safety.

The project, Automated and Connected Vehicle Test Bed to Improve Transit, Bicycle, and Pedestrian Safety, is part of the TxDOT Innovative Projects Program. In 2014, TxDOT supplemented its Cooperative Research Program with the Innovative Projects Program to proactively address issues before they become problems and to explore applications of rapidly evolving technologies.

“The goal of this project is to reduce the number of crashes among transit vehicles, bicyclists and pedestrians,” says Research Project Manager Wade Odell of TxDOT’s Research and Technology Innovation Office. “Concerns

found in the research include buses making turns at intersections or traveling in a straight line and negatively interacting with bicyclists and pedestrians, as well as distracted bicyclists and pedestrians not being aware of a transit vehicle.”

In the beginning of the project, TTI held meetings and workshops with modal stakeholders and conducted a technology scan to identify four near-term applications, three of which focus on collision avoidance with turning transit vehicles, straight-line travel and fixed objects. A fourth application is addressing bike-rack-on-buses safety.



*The Mobileye/Rosco Shield+™ collision-avoidance system can improve safety for bicyclists and pedestrians.*

In the longer term, the research team focused on the technologies associated with moving toward autonomous buses. The next step of the project is developing the concept of operations.

“In developing the concept of operations, we want to find out what technologies might be used, how you would operationalize those technologies, and what the test bed would look like,” says TTI Executive Associate Director Katie Turnbull. “During this phase, we discovered that the Mobileye/Rosco Vision Systems technology was available and that they were interested in testing their collision avoidance system in a campus setting. We thought it was a great opportunity to conduct a small pilot project on the Texas A&M University campus.”

Working in partnership with Texas A&M University Transportation Services, the Mobileye/Rosco Shield+™ collision-avoidance system was installed on one Texas A&M University bus that traverses the heart of campus, passing thousands of students daily.

“The system has four different cameras that are essentially aimed at the blind spots on the bus and where pedestrians and bicyclists are most

likely to show up and be in harm’s way,” says Shawn Turner, head of TTI’s Mobility Division. “What’s special about this technology is that it is able to detect when there’s an object that’s moving that looks like a person or a cyclist.”

According to Turner, one of the big blind spots on a bus occurs while making a turn. Two of the cameras are positioned to eliminate those blind spots, thus creating a safer environment for the driver, pedestrians and bicyclists.

“The nature of a large passenger bus is that when it turns, it sweeps a big arc,” notes Turner. “In other words it takes up more space when turning. What



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**“The Mobileye/Rosco Shield+™ collision-avoidance system has four different cameras that are essentially aimed at the blind spots on the bus and where pedestrians and bicyclists are most likely to show up and be in harm’s way.”**

*Shawn Turner,  
TTI Mobility Division Head*

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happens is people tend to walk out and think of a car turning and not realize they can’t get as close to a bus.”

The system provides two types of warnings to the bus driver. A yellow light goes off when a pedestrian or bicyclist is detected within range of the bus, alerting the driver to proceed with caution. A red light and a buzzer go off when a pedestrian or bicyclist is very close to the bus, alerting the driver to stop to avoid a possible collision.

The research team is currently assessing the system and developing the overall concept of operations plan for the test bed. A roundtable forum was held on March 8 in College Station, Texas, with representatives from TxDOT, transit agencies, school districts, cities and other stakeholder groups. Participants had the opportunity to ride the bus around campus, see the system in operation, and hear from Mobileye and Rosco personnel on the system features. ■

# Encouraging Safe Interactions Between Teens and Large Trucks

**In the past three years,** commercial motor vehicle crashes have increased 29 percent in the Permian Basin and 55 percent in the Eagle Ford Shale regions of Texas.

Between 2011 and 2012, such crashes involved an estimated 2,006 drivers under the age of 26. In response to the increase in crashes concurrent with the oil and gas boom, the Federal Motor Carrier Safety Administration (FMCSA) put out a high-priority call for proposals to address the issue of novice driver safety around large vehicles (e.g., commercial vehicles and buses).

Russell Henk, director of the Youth Transportation Safety Program and founder of the Teens in the Driver Seat® (TDS) program, and his team of experts were awarded \$114,000 by FMCSA to encourage safe interactions between teen drivers and large trucks. TDS is a peer-to-peer traffic safety program established in 2002 based at the Texas A&M Transportation Institute. Since its inception in Texas, TDS has expanded to over 1 million student drivers in more than 1,000 high schools in 38 states.

“TDS already has the established statewide network to reach out to teens in Texas,” explains Henk. “We can easily coordinate with schools and use existing web/media platforms to get the word out.”

The project is a web-based, hands-on outreach campaign called Respect the Rig that shares truck facts, safe-driving



tips, known crash risks and messaging that conveys respect for truck drivers to the teen audience. TDS is coordinating high-school safety fairs with the Texas Department of Transportation and local police departments in regions experiencing heavy truck traffic. The first event was March 11, 2016, at Lyford High School in Lyford, Texas, a town on the edge of the Eagle Ford Shale region. In the coming year, TDS is planning similar events across Texas to help young drivers become more aware of their surroundings when big trucks are present.

“I feel that this campaign is a valuable tool in FMCSA’s efforts to reduce crashes, injuries and fatalities on our nation’s roadways,” says U.S. Department of Transportation-FMCSA Programs Manager Rodney Baumgartner. “TDS’s peer-to-peer model has proven very effective, and I thank everyone, especially the teens, for their participation in, and support for, this important program.” ■



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# Aging Drivers Expected to Impact Transportation Landscape

## TTI, TAMHSC Lead Global Research Effort



**It's no secret that we are living longer,** healthier lives. But, does that also mean we are driving longer and traveling more? If so, it could have a dramatic impact on congestion, safety, public transportation and numerous other transportation issues — not only in the United States, but around the world.

A global research team, comprised of the Texas A&M Transportation Institute (TTI), the Texas A&M Health Science Center (TAMHSC) and transportation experts from China, Germany, Japan and the United Kingdom, has been assembled to study the issue. The project — Changing Mobility Patterns of the Senior Generation — is sponsored by the Institute for Mobility Research (IFMR), the research arm of automobile manufacturer the BMW Group.

TTI Senior Research Scientist Johanna Zmud is leading the consortium of experts, including Aging Specialist Marcia Ory of the TAMHSC School of Public Health. The team will examine historical travel patterns of the senior population in their respective countries, determine what factors will impact future driving behaviors, and produce simulation models that predict future scenarios for senior drivers through 2025.

“People are retiring later in life, which should mean they are still commuting to work,” explains Zmud. “What impacts will that have, especially as this trend continues?”

Of course, aging populations in different countries are not all the same. For example, Japan has the longest average life expectancy at age 84, the United States has 79, and China has 75.

“It's safe to assume that the amount of mobility is different among countries as well,” Ory notes. “In some countries, people rely on vehicles to get around, while in others people walk a lot. My role is to provide country-specific aging perspectives to the data.”

As they develop future mobility models for seniors, researchers will also consider the changes in automotive technologies — like automatic braking, blind spot detection and collision avoidance — that could make it easier and safer for seniors to drive.

“The elderly have always been a very important target group for BMW Group products,” says IFMR Senior Researcher Peter Phelps. “We need to understand how the mobility behavior of this age group might change in the next 10 to 20 years to derive the right requirements for future products, as well as mobility services such as car or ride sharing.” ■



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## TTI-Led Research Seeks to Expedite Emergency Care for Patients Crossing the Border

### Led by the Texas A&M Transportation Institute (TTI),

a team of public agencies including the Texas Tech University Health Sciences Center El Paso (TTUHSC El Paso) Department of Neurology, the El Paso Fire Department (EPPD) and Mexican ambulance companies are conducting research to speed up cross-border transportation for heart attack and stroke victims. Mortality rates increase sharply as time increases from incident to treatment, but quickly getting patients the care they need is sometimes challenging with tightened security measures at the border.

Evaluating Ambulance Cross Border Operations and Its Impact on Public Health in Border Regions is a project funded by TTI's Center for International Intelligent Transportation Research (CIITR) and TTUHSC El Paso. The ultimate goal of the project is to establish an operational protocol to expedite ambulance cross-border operations in the El Paso–Ciudad Juarez binational region.

“We are in the early stages of conducting meetings with all the stakeholders. We’re looking at current operational protocols and determining where the process can be streamlined to get emergency patients to El Paso hospitals quicker so treatment can begin earlier,” says David Salgado, TTI associate transportation researcher for CIITR and principal investigator on the project.

Currently, when a patient suffering a stroke or heart attack is transported from Juarez to El Paso, Mexican ambulances carry him or her to the border, where the patient must have the proper paperwork to cross. Once cleared by CBP, the patient is transferred to an EPPD ambulance that takes him or her to a U.S. hospital. In cases where the proper paperwork is missing, a border agent must ride with the patient to the hospital until the individual’s status is confirmed.

“Stroke is the number one cause of disability in the United States,” says Gustavo Rodriguez, M.D., TTUHSC El Paso neurologist. “It is imperative that stroke patients be treated quickly with a specialized clot-busting drug. Otherwise, the patient can suffer permanent damage.”

“Part of the delay occurs because, currently, CBP is not notified that an ambulance is en route to the border with a patient,” Salgado says. “Perhaps a pre-notification process can be established in which not only is CBP notified, but so is EPPD. Consequently, Mexican ambulances, CBP, and EPPD are fully coordinated and aware of the situation in real time.”

Researchers are currently studying how many patients are being transported and the magnitude of the delay problem. To that end, other stakeholder meetings are being planned, as well as a workshop to outline recommendations.

“If there is a weak link in this process, we need to find it,” says Lt. Oscar Salazar of EPPD. “If the border is part of the problem, we need to fix it. We want to make this as seamless as possible.” ■



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# Former TTI Agency Director Named Texas A&M Distinguished Alumnus

**Charley V. Wootan**, former Texas A&M Transportation Institute (TTI) agency director, was named a distinguished alumnus of Texas A&M University March 11 by the Association of Former Students.

Wootan joined TTI in 1956 as an associate research economist and served as the Institute's associate director (1966–1976) and director (1976–1993). Under his leadership, TTI grew to become the largest university-based transportation research agency in the nation.



*Former TTI Director Charley Wootan and two other TTI economics researchers Bill Haning and Hoy Richards examine selected economic impacts of highway projects to evaluate the consequences of constructing new highways. TTI researchers examined land use and values along freeways and rural stretches of highway.*

“I had the privilege of knowing and working with Charley Wootan for three decades,” says TTI Agency Director Dennis L. Christiansen. “He was a giant in the transportation field who tirelessly promoted the value of transportation research and made significant contributions to the growth and national reputation of TTI. He was a devoted Aggie who gave selflessly of his time to improve the world through research, education and service to others. This honor is well deserved.”

One of the founders of the Council of University Transportation Centers, Wootan was selected as its first president. He was actively involved in the Transportation Research Board (TRB) of the National Academies for more than 40 years and was elected chair of TRB in 1979 and again in 1983. He also served on the executive committee of the American Association of State Highway and Transportation Officials.

**“I had the privilege of knowing and working with Charley Wootan for three decades. He was a giant in the transportation field who tirelessly promoted the value of transportation research and made significant contributions to the growth and national reputation of TTI. He was a devoted Aggie who gave selflessly of his time to improve the world through research, education and service to others. This honor is well deserved.”**

*Dennis L. Christiansen,  
TTI Agency Director*

Wootan led the way for Texas to become a national model for how universities and state departments of transportation could work together to solve transportation problems. The path he forged remains the model that other states emulate today. He tirelessly contributed thousands of hours serving in state and national leadership roles on committees and task forces established to improve transportation throughout Texas and the United States. He won numerous awards for his contributions, including the TRB Distinguished Service Award, the George S. Bartlett Award for outstanding contributions to highway progress, and the Luther DeBerry award for significant accomplishments to Texas transportation from the Texas Department of Transportation.

Wootan actively mentored young people and promoted education as the path to professional success. More than 2,000 Texas A&M students studied in TTI laboratories and worked on TTI research projects during his tenure at TTI. ■



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The Texas A&M Transportation Institute (TTI) made an impressive showing during the Transportation Research Board (TRB) 94th Annual Meeting in Washington, D.C., Jan. 10–14. The meeting hosted 12,000 researchers, policy makers, practitioners and transportation professionals from around the world.

### Turnbull Appointed to TRB’s Executive Committee



Turnbull

TTI Executive Associate Director Katie Turnbull was appointed to the TRB Executive Committee for a three-year term. The executive committee is the senior policy-making body of TRB, providing guidance and oversight of TRB’s activities. Since 1988, Turnbull has been extremely active in TRB, including serving as chair or member of 23 TRB councils and committees. Last year she was honored with TRB’s W. N. Carey Distinguished

Service Award. In 2012, she was named a lifetime national associate of the National Research Council.

“It’s a real honor to be appointed to the Executive Committee,” notes Turnbull, “especially considering that TTI Directors Herb Richardson and Charley Wootan also served on that committee.” ■

### TDS Wins TRB Public Involvement Committee Outreach Competition



Tisdale

TTI’s Teens in the Driver Seat® (TDS) program won the TRB Communicating with John and Jane Q. Public competition, sponsored by the TRB Public Involvement Committee, which highlights successful transportation communication efforts. The theme of this year’s competition was “communicating transportation needs and issues with targeted populations.” Five recipients were chosen from 17 entries across the United States to present their

communication tools and techniques at podium and poster sessions. TDS was named the overall competition winner.

“Our program is peer to peer, so teens have a very big role in our communication efforts,” TTI Research Specialist Stacey Tisdale explains. “We study what they’re doing behind the wheel and then ask for their input. We polish up their ideas and then put it back out to them. As a result, the messaging is teen focused, which gives us more buy-in.” ■



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### Outstanding Student of the Year



Pappas

Former TTI Graduate Research Assistant Marea Pappas was recognized as a University Transportation Center (UTC)

Outstanding Student of the Year at the Council of University Transportation Centers Annual Banquet held at TRB. Pappas was selected by the University of South Florida’s National Center for Transit Research, with which TTI is partnered. Based on technical merit and research, academic performance, and professionalism and leadership, the recognition includes a \$1,000 cash award. Pappas was employed with TTI in 2015 and worked on a UTC project titled Exploring Transit’s Contribution to Livability in Rural Communities. ■

## TTI Researchers Recognized with TRB Paper Awards

Five TTI researchers were honored with Outstanding Paper Awards at TRB. Lead author Michael Pratt and co-authors Srinivas Geedipally and Adam Pike received the Fred Burggraf Award for “An Analysis of Vehicle Speeds and Speed Differentials in Curves.” The project analyzed state crash data and traffic operations on roadway curves, suggesting where high-friction pavement could be used to prevent crashes. The work was also recognized by the American Association of State Highway and Transportation Officials as a High-Value Research Project. Pratt presented the project during a TRB poster session.



Neil J. Pedersen, executive director of TRB, (left) poses with the recipients of the Burggraf Award (left to right): Mike Pratt, Srinivas Geedipally and Adam Pike.

TTI Associate Research Scientist Raul Avelar and Senior Research Engineer Karen Dixon were honored with the Patricia F. Waller Award for their paper “Evaluation of Intersection-Related Crash Screening Methods Based on Distance from Intersection,” first recognized for a Committee Paper Award by the TRB Safety Data, Analysis and Evaluation Committee. The researchers recommend that departments of transportation (DOTs) consider crashes as intersection related when they occur up to 300 feet away from signalized intersections for higher-speed facilities.



Standing with TRB Executive Director Neil J. Pedersen are the recipients of the Waller Award (left to right): Karen Dixon, Raul Avelar and Patricia Edith Escobar Roman.



Fitzpatrick



Pratt

The TRB Pedestrians Committee recognized “Road User Behaviors at Pedestrian Hybrid Beacons” by TTI Senior Research Engineer Kay Fitzpatrick and Assistant

Research Engineer Mike Pratt with a Committee Paper Award. Their research analyzed driver and pedestrian behaviors at pedestrian hybrid beacons (PHBs) and revealed that 96 percent of drivers yielded to pedestrians when the PHB was activated, a number comparable to those who yielded to traffic control signals. A greater number of pedestrians activated the PHB when on 45-mph posted speed limit roads as compared to roads with posted speed limits of 40 mph or less.



Brimley



Carlson



Hawkins

The TRB Traffic Control Devices Committee selected “Guidelines for Traffic Control Devices at Changes in Horizontal Alignment” by TTI Associate Transportation Researcher Brad Brimley, Senior Research Engineer Paul Carlson and Research Engineer Gene Hawkins, also an associate professor in the Texas A&M Zachry Department of Civil Engineering, for its 2016 Committee Paper Award. DOTs can use this research, based on extensive driver performance and crash data, to better determine which traffic control devices to use at curves. The guidelines developed from the research will be considered for inclusion in the *Manual on Uniform Traffic Control Devices*.



Wu

The TRB Safety Data, Analysis and Evaluation Committee picked TTI Graduate Research Assistant Lingtao Wu for a TRB Young Researcher Paper Award. Based on his dissertation, Wu coauthored “Validation of CMFs Derived from Cross Sectional Studies Using Regression Models” with TTI Associate Research Scientist Dominique Lord. The paper examines the quality of crash modification factors (CMFs) derived from regression models, focusing on potentially biased estimates resulting from CMFs. ■

## TTI's Katie Turnbull Named Texas A&M Regents Fellow

**T**TI Executive Associate Director Katie Turnbull was honored with the Regents Fellow Service Award during The Texas A&M University System Board of Regents Reception and Dinner Feb. 10. The Regents Fellow Service Award Program began in 1998 to recognize research professionals whose exemplary professional service has contributed to large and lasting benefits to Texas and beyond.

Turnbull's vast professional accomplishments, combined with her unique blend of management skills and volunteer efforts, made her TTI's top candidate for the award, according to TTI Agency Director Dennis Christiansen.

"She has brought professionalism, prestige and mission-critical research to TTI and has more than 40 years of service to the transportation industry," Christiansen wrote in nominating Turnbull. "Her many contributions have resulted in significant improvements to the transportation system — both statewide and nationally."

Turnbull began her TTI career in 1989 and became nationally recognized in the areas of high-occupancy vehicle and high-occupancy toll facilities, public transportation, travel demand management, and intelligent transportation systems. She manages TTI's Planning and Environment Research Group, which includes 100 researchers, support staff and students located in seven TTI offices in Texas, Washington, D.C., and Mexico City. Turnbull has also held leadership positions with the Transportation Research Board, the Institute of Transportation Engineers and the American Public Transit Association.

While Turnbull's career has focused on mobility enhancement, she has also helped develop the next generation of transportation professionals. She has authored or coauthored more than 200 publications and is the recipient of numerous achievement awards that recognize her leadership and tireless service to the transportation industry.



*TTI Executive Associate Director Katie Turnbull (center) is awarded the Regents Fellow Service Award by (left) Vice Chairman Elaine Mendoza and (right) Chairman Cliff Thomas of The Texas A&M University System Board of Regents.*

"Joining the list of TTI researchers who have received the Regents Fellow Service Award is a real honor," states Turnbull. "I have had the opportunity to work on numerous research projects that have resulted in improvements to transit services and the transportation system, benefiting the traveling public." ■



*Villa*

## Villa Heads TTI Team for New Center of Excellence

The Department of Homeland Security Science and Technology Directorate created its Centers of Excellence to develop multidisciplinary, customer-driven, homeland security science and technology solutions and help train the next generation of homeland security experts.

TTI is participating in the Center for Borders, Trade and Immigration Research (CBTIR), coordinated by the University of Houston. CBTIR's goal is to develop technology-based tools, techniques and educational programs for border management, immigration, trade facilitation, and targeting and enforcement of

transnational borders. TTI's team is led by Research Scientist and Regional Manager for Latin America Juan Villa and includes Director of External Initiatives Melissa Tooley and Associate Research Engineer Rajat Rajbhandari. The team aims to develop an enhanced border wait-time-measuring system at land ports of entry.

"As technologies become more pervasive and more functional, there is a need to enhance the systems developed by TTI to take advantage of emerging technologies such as connected vehicles, WiFi and GPS," explains Villa, whose research team will create a concept of operations that lays the foundation necessary to design an enhanced wait-time system. ■

## TTI Awarded Major FHWA Safety Contract



Carlson

Dixon

The Federal Highway Administration (FHWA) Office of Safety (HSA) has selected TTI for a major multiyear, multimillion-dollar contract for research aimed at improving transportation safety related to everything from highway design to bicycle/pedestrian safety and speed management.

“TTI is leading a team with 10 subcontractors,” says TTI Senior Research Engineer Paul Carlson, who’s leading the project. Carlson, head of TTI’s Traffic Operations and Roadway Safety Division, is recognized as one of the nation’s premier researchers in visibility safety. For example, he was one of five national experts invited to address FHWA’s 2014 workshop on transportation visibility held at the FHWA Turner-Fairbank Highway Research Center in McLean, Virginia.

“We’ve leveraged our national reputation in the transportation safety arena to provide FHWA with innovative ideas and solutions to enhance transportation safety,” adds TTI Senior Research Engineer Karen Dixon, co-principal investigator on the project with Carlson.

TTI was the only university-led team awarded a contract. TTI’s team includes faculty members from Texas A&M University’s Dwight Look College of Engineering and extensive training expertise from the Texas A&M Engineering Extension Service. The team will collaborate and assist HSA with policy and regulatory analysis, technical studies, guidebooks and training support, as well as outreach and marketing support.

“This significant contract is another example of how The Texas A&M University System coordinates across the university and its agencies to take a leading role on issues facing not only Texas but the entire nation,” notes A&M System Chancellor John Sharp.

TTI Agency Director Dennis L. Christiansen agrees, adding, “Our safety researchers are eager to begin the life-saving projects that will be awarded during the length of this contract. Their expertise in transportation safety is well known throughout the country, and their role as team leaders on this national contract is well deserved.” ■

## Polunsky Receives Straub Award

TTI Research Scientist Steven Polunsky has received the Curtis H. ‘Butch’ Straub Achievement Award, given to one student in each Naval Postgraduate School Center for Homeland Defense and Security (CHDS) class. Developed in 2002, the class assists “current and future leaders in homeland defense and security to develop the policies, strategies, programs and organizational elements needed to defeat terrorism in the United States.” Polunsky received the award, which is based on grades, a thesis and classroom leadership, during a ceremony Dec. 18 at the Naval Postgraduate School in Monterey, California.

“I’ve always had an interest in emergency response and homeland security, especially in how they relate to transportation,” Polunsky says. “Our transportation facilities are critical infrastructures. There are numerous facets to this problem, and we need to identify and address vulnerabilities.” ■

## Yu Elected to Chair Special Libraries Association’s Transportation Division



Yu

TTI Research Librarian Hong Yu was recently elected as chair-elect for the Special Libraries Association’s (SLA’s)

Transportation Division. Yu will serve in that capacity in 2016, which also includes being conference program chair for the 2017 annual conference. SLA is a nonprofit global organization for innovative information professionals and their strategic partners. It has more than 7,000 members in 75 countries in the information profession, including corporate, academic and government information specialists.

“This is an honor, an opportunity, and also holds a lot of challenges,” says Yu. “I am very grateful for all the support I have received. I will do my best to serve the division and the entire transportation community.” ■

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Steven Polunsky (left) receives the Straub Award from CHDS Director Glen Woodbury.

TEXAS A&M TRANSPORTATION INSTITUTE  
**PUBLICATIONS**



A full catalog of TTI publications and other products is online at <http://tti.tamu.edu/publications>. You can find the publications by searching for either the title or publication number listed here.

Most of these publications are available as free downloads in portable document format (PDF).

Printed, bound versions of these reports are also available through the URL above.

**RESEARCH VIDEOS**

Access the research topics listed below via the URLs shown.

*Active Transportation May Provide More than Health Benefits:*  
<https://vimeo.com/160007569>

*TTI's Environmental and Emissions Research Facility:*  
<https://vimeo.com/156735964>

*TTI Selects Strategy Lead for CV/AV Transportation Research:*  
<https://vimeo.com/147641712>

*TTI Enhances Its Proving Ground with New Research Facilities:*  
<https://vimeo.com/131557369>

*TTI's Air Quality Program:*  
<https://vimeo.com/123978706>

**TECHNICAL REPORTS**

*Considerations for Public Freight Rail Projects in Texas*, by Allan Rutter, **PRC 15-57 F**, September 2015.

*Dynamic Ride-Share, Car-Share, and Bike-Share and State-Level Mobility: Research to Support Assessing, Attracting, and Managing Shared Mobility Programs — Final Report*, by Kristi Miller, **0-6818-1**, March 16, 2016.

*Evaluate Methodology to Determine Localized Roughness*, by Emmanuel Fernando, **0-6610-2**, March 14, 2016.

*The Future of TDM: Technology and Demographic Shifts and Their Implications for Transportation Demand Management*, by Maarit Moran, **PRC 15-25 F**, June 2015.

*Improved Trip Generation Data for Texas Using Workplace and Special Generator Surveys*, by Ed Hard, **0-6760-1**, May 18, 2015.

*Investigation of New Vehicle Detectors for High-Speed Signalized Intersections*, by Dan Middleton, **0-6828-1**, March 16, 2016.

*Performance Studies and Future Directions for Mixes Containing RAP/RAS: Technical Report*, by Soohyok Im, **0-6738-2**, February 2016.

*Reducing Lane and Shoulder Width to Permit an Additional Lane on a Freeway: Technical Report*, by Karen Dixon, **0-6811-1**, May 21, 2015.

*Regional Mobility Authorities in Texas: History and Current Status: Final Report*, by John Overman, **PRC 15-41 F**, May 21, 2015.

*Revolutionizing Our Roadways: Data Privacy Considerations for Automated and Connected Vehicles*, by Jason Wagner, **TTI-2015-13**, November 2015.

*Texas Talk Transportation: Development of an Online Community, Phase I*, by Ben Ettelman, **PRC 15-42 F**, July 2015.

*Texas Freight Survey*, by Chris Simek, **PRC 15-43 F**, September 2015.

**PROJECT SUMMARY REPORTS AND PRODUCTS**

*The 2055 Freight Transportation System and the Impact of Near Term Rail Improvements on TxDOT Planning: Project Management Plan*, by Jolanda Prozzi, **0-6809-P1**, March 16, 2016.

*Binder Utilization Maps*, by Amy Epps Martin, **5-6616-01-P5**, April 28, 2015.

*Continuous Prestressed Concrete Girder Bridges*, by Mary Beth Hueste, **0-6651-S**, February 9, 2016.

*Dynamic Ride Sharing, Car-Sharing, Bike-Sharing and State-Level Mobility*, by Tina Geiselbrecht, **0-6818-S**, February 29, 2016.

*Impact of Changes in Profile Measurement Technology on QA Testing of Pavement Smoothness*, by Emmanuel Fernando, **0-6610-S**, March 23, 2016.

*Improved Trip Generation Data for Texas Using Workplace and Special Generator Surveys: Workshop Materials*, by Ed Hard, **0-6760-P2**, May 4, 2015.

*Interaction between Drilled Shaft and Mechanically Stabilized Earth (MSE) Wall*, by Jean-Louis Briaud, **0-6715-S**, March 26, 2016.

*Moving Texas Exports: Examining the Role of Transportation in Export Commodity Supply Chains*, by Jolanda Prozzi, **TTI-2016-1**, March 2016.

*Performance Studies and Future Directions for Mixes Containing RAP and RAS*, by Fujie Zhou, **0-6738-S**, February 16, 2016.

*Reducing Lane and Shoulder Width to Permit an Additional Lane on a Freeway*, by Karen Dixon, **0-6811-S**, May 22, 2015.

*Seal Coat Binder Performance Specifications: Technical Briefing Presentation, Task 1*, by Amy Epps Martin, **5-6616-01-P1**, April 28, 2015.

*SPG Specification for 2015 Implementation*, by Amy Epps Martin, **5-6616-01-P4**, April 28, 2015.

*Texas Freight 2055 Roundtable Workshop Materials*, by Jolanda Prozzi, **0-6809-P3**, March 16, 2016.

*The Texas Freight Transportation System 2055*, by Jolanda Prozzi, **0-6809-P2**, March 16, 2016.

*Texas Gulf Intracoastal Waterway Master Plan*, by Jim Kruse, **0-6807-S**, March 23, 2016.

*Texas Trip Generation Manual*, by Ed Hard, **0-6760-P1**, May 4, 2015.

*Traffic Control for Access Points Within a Lane Closure on a Two-Lane, Two-Way Road*, by Melissa Finley, **0-6708-S**, February 24, 2016.