

TTI's Toyota Project Aims
to Proactively Detect Driver
Stress, Vehicle Errors

TTI and Texas A&M
Organize, Lead Transportation
Technology Conference

The Many Modes of
Transportation Economics

TEXAS TRANSPORTATION Researcher

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Tomorrow's Growth:
**Nurtured by
Research**



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ON THE COVER: Research will play a more important role than ever in transitioning a transportation network largely built in the 20th century toward a system that meets the needs of the 21st century's global economy.



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by Dennis Christiansen
Agency Director

Transportation Research: An Economic Necessity in a Time of Change

TRANSPORTATION TODAY IS IN TRANSITION. Congestion is clogging our roadways, particularly in urban areas, wasting fuel, polluting air, and negatively impacting the quality of life for everyday commuters. Expanding economies are demanding more responsiveness from our transportation system to optimize shipping and squeeze every ounce of efficiency out of the bottom line. Yet many of our roadways, bridges and other structures are in dire need of repair.

Do we fix what we have — at the cost of billions of dollars — or focus on paving the way for the connected and automated vehicle revolution already under way? Well, we have to do both. The world economy depends on a healthy, mobile transportation network to grow, so we must prioritize not only how we maintain the current system, but also how we integrate new technologies like self-driving cars into existing infrastructure. The challenge to accomplish both these economic necessities simultaneously is becoming more acute with time. Yet, agencies are finding their resources more stretched than ever to meet that challenge.

That's where transportation research comes in. It's part learning from the past, part looking into the future, and bridging the two as efficiently, safely and cost-effectively as possible. This issue of the *Texas Transportation Researcher* looks at how Texas A&M Transportation Institute (TTI) researchers continue to solve problems plaguing our existing system while also planning how best to transition from the old to the new.

For example, TTI's Infrastructure Investment Analysis Program looks

at every aspect of transportation — ports, transit, highways and pipelines, to name a few — to determine how to best to use the resources we have to build the system we need. TTI's Center for Transportation Safety is studying how vehicle error and driver stress can be minimized to improve safety and, thereby, reduce the societal costs associated with them. The Institute's Transportation Policy Research Center (PRC) has studied what factors are most important in bringing businesses to Texas, and decision makers can use its findings to make our state more attractive to entrepreneurs. In fact, researchers working on PRC projects regularly brief the Texas Legislature on transportation issues to help members understand the interdependence of transportation and economics and how they're evolving together.

Part of that change involves how we move freight from the manufacturer to the marketplace. On behalf of the Texas Department of Transportation, TTI's Multimodal Freight Program personnel have examined more than 50 advanced freight-movement strategies and technologies used around the world to see which ones can serve the future

interests of Texas. And for the past seven years, TTI's Center for International Intelligent Transportation Research has identified trends for freight movement across the U.S.-Mexico border to help both countries and Canada optimize the process and, ultimately, benefit consumers. You'll read about the center's latest conclusions in these pages.

How we get where we're going and move goods to store shelves — through ports and over roads, by trains, planes and semi-trucks — is changing. We can't build our way out of our problems of congestion, pollution and rising shipping costs; we just don't have the money. We can't simply snap our fingers and wake up in a future of automated vehicles talking seamlessly to roadside infrastructure. But by researching the big questions and finding the right answers, TTI can help mitigate the growing pains of our maturing transportation network while preserving, even enhancing, our nation's economic vitality.

Tomorrow is coming. We all want it to be prosperous. Choosing the right road to get there is what research is all about. ■



To detect and measure stress levels, researchers examined 59 volunteer drivers who wore a heart-rate monitor and skin conductance device. Participants were videotaped using a thermal-imaging camera.

TTI's Toyota Project Aims to Proactively Detect Driver Stress, Vehicle Errors

Can driver stress levels and abnormal vehicle operations be detected

and measured to help prevent crashes? Texas A&M Transportation Institute (TTI) researchers and members of its multidisciplinary, multi-institution team have completed the second year of a three-year project looking at that question. So far, the answer seems to be a resounding “yes.”

The TTI project is funded by the Toyota Economic Loss Settlement — money set aside for transportation safety research. Robert Wunderlich, director of TTI's Center for Transportation Safety, is the principal investigator and leads a research team from TTI, Texas A&M's Dwight Look College of Engineering, the University of Houston, the University of Michigan Transportation Research Institute and Texas Tech University.

To detect and measure stress levels, researchers examined 59 volunteer drivers who wore a heart-rate monitor and skin conductance device and were videotaped using a thermal-imaging camera. The volunteers drove the same driver simulation course in four different scenarios — under normal conditions, while distracted with cognitively challenging questions, while distracted with emotionally charged questions, and while preoccupied with texting.

“It’s well known that high levels of stress can contribute to driver error by lowering reaction time, so alerting a stressed driver to that condition has the potential for improving safety,” says Mike Manser, manager of TTI’s Human Factors Program. “Thanks to a multidisciplinary team of dedicated researchers, we’ve made real progress in the first key step of this project. We’re all very pleased with what we’ve been able to accomplish.”

In addition to detecting and measuring driver stress levels, the team is developing sensors able to detect vehicle errors — another potential crash factor. Researchers will then develop and test potential countermeasures, which would let the driver know that either stress levels are high or something is wrong with the vehicle.

“It’s well known that high levels of stress can contribute to driver error by lowering reaction time, so alerting a stressed driver to that condition has the potential for improving safety.”

*Mike Manser,
TTI Human Factors Program Manager*

Part of the work centers around the development of a series of algorithms to determine the onset of unintended acceleration during driving. But the models could have other applications, such as detecting aggressive driving.

“We are pleased to work with TTI researchers on a meaningful and potentially high-impact project,” says Reza Langari, head of Texas A&M’s Engineering Technology and Industrial Distribution Department. “The work brings together expertise in vehicle dynamics, human factors, machine learning and decision analysis to address an important problem in transportation safety — detection of abnormal driving conditions.”

The ultimate goal of the project is the development of a countermeasure that alerts the driver of abnormal conditions — either with the vehicle or the driver.

“We envision a time in the near future when these systems can be installed in a vehicle,” Manser says. ■



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Unexpected Findings: Study Reveals Driver’s Sixth Sense, Texting Dangers

The Toyota Economic Loss Settlement Research Project has uncovered some unexpected findings — evidence of why texting can be so dangerous. Moderate levels of other driver distractions, like being upset or absent minded, trigger a sixth sense in the brain and can eventually help drivers stay safe.

Though the study’s volunteer drivers became stressed and jittery with each distraction-causing intervention, they were able to stay on course and in their lanes — except when they were texting.

“A likely explanation for this paradox is the function performed by a part of the brain called the anterior cingulate cortex, or ACC,” says Ioannis Pavlidis, director of the University of Houston’s Computational Physiology Laboratory. “The ACC is known to automatically intervene as an error corrector, instantly counterbalancing jitters in this case.”

He explains that for the ACC to perform this corrective function, it needs support from the driver’s eye-hand coordination loop. If the loop breaks, as it does when the driver texts, then the ACC fails, resulting in a significant lane deviation.

The volunteers were monitored while driving a simulated course. The project will continue with other stress tests for drivers in an instrumented vehicle on an actual course located at the recently announced Texas A&M University RELLIS Campus.

“The driver’s mind can wander, and his or her feelings may boil, but a sixth sense keeps a person safe — at least in terms of veering off course. What makes texting so dangerous is that it wreaks havoc on this sixth sense,” Pavlidis says. ■



GROWTH IS A GOOD THING.

In economic terms, it can mean increased opportunity for businesses and more choices for consumers. But economic growth also means more demands on — and often more congestion for — our transportation system. Sometimes, the rate of economic expansion can outpace the capacity of our transportation infrastructure.

“Texas is a very diverse state with a wide array of needs. Not every option applies to every situation. Freight improvement needs vary from rural to urban communities, from seaports to airports, and from short-haul to long-haul shipping.”

*Curtis Morgan,
TTI Multimodal Freight Program
Manager*

In its 2013 report *Freight and Economic Development: Driving the Texas Economy*, the Texas Freight Advisory Committee noted that for the Lone Star State to stay competitive economically, “the right freight transportation infrastructure is absolutely essential to enable businesses” to compete. This report was followed up by the *Texas Freight Mobility Plan* adopted by the Texas Transportation Commission in early 2016.

As Texas continues to grow and people’s buying habits evolve, the Texas Department of Transportation (TxDOT) is assessing the best ways to meet the state’s future freight needs. Recent changes in consumer purchasing resulting in more direct home-package delivery are dramatically changing distribution patterns, increasing the number of intercity and local delivery trucks on Texas roadways. Emerging freight delivery technologies and innovative operational freight strategies offer the potential to use available infrastructure more efficiently.

“Others around the globe are doing really innovative things to move freight efficiently, reliably and safely,” says Curtis Morgan, manager of the Texas A&M Transportation Institute’s (TTI’s) Multimodal Freight Program. “We’ve looked at many of those possible options for TxDOT and evaluated them in the context of what’s most effective for Texas.”

Project 0-6837, Assessment of Innovative and Automated Freight Systems and Development of Evaluation Tools, is part of TxDOT’s Innovative Research Projects Program. The program is aimed at proactively addressing issues before they become problems. Based on the findings of recent assessments by TTI and others, many would argue that some aspects of freight movement in Texas are already problematic.

“Congestion resulting from inadequate capacity is already an issue according to Texas business leaders, and if we don’t adopt new strategies to improve freight mobility, the problem’s only going to get worse,” explains Morgan. “Manufacturers are also trying to get more goods to market than ever before. In the end, someone — usually the consumer — has to pay for any shipping inefficiencies.”



In phase 1 of the project, Morgan and his team researched 57 potential innovative and automated freight-system strategies and technologies to identify lessons learned around the globe. They looked at what worked where and how much it cost to implement. Most importantly, they evaluated whether or not a given strategy or technology could meet the specific needs of Texas.

Potential solutions to enhancing freight movement include automation (like truck platooning), dedicated roadways for trucks to alleviate delays due to congestion, signal coordination systems that prioritize freight movement in corridors, and alternative-fuel vehicles that would benefit both a shipper's bottom line and the state's environment. Researchers considered solutions involving air, land and sea legs of the shipping process. Phase 1 selection criteria included:

- documenting the implementation history of each technology in the United States and worldwide;
- identifying the prospective institutional barriers to U.S. and Texas implementation;
- estimating the cost relative to other, more traditional transportation-system projects; and
- cross-referencing each proposed strategy/technology with Texas' freight needs identified in the draft *Texas Freight Mobility Plan*, the current Texas Rail Plan Update, other TxDOT modal plans, and major freight planning efforts of Texas metropolitan planning organizations.

"Texas is a very diverse state with a wide array of needs. Not every option applies to every situation," says Morgan. "Freight improvement needs vary from rural to urban communities, from seaports to airports, and from short-haul to long-haul shipping."

Researchers narrowed down the options by applying screening criteria, analyzing and ranking potential solutions with the help of subject-matter experts, and discussing options with the TxDOT project team. Out of the nearly five dozen potential solutions studied, nine strategies/technologies were selected by the TxDOT panel and will be further investigated in phase 2 of the project:

- automated, zero-emission freight systems;
- freight rail public-private partnerships;
- natural gas, electric/hybrid, and other alternative fuel freight vehicles;
- truck-shipper matching systems;
- port intelligent transportation systems;
- separation of trucks from automobiles;
- truck parking information systems;
- freight village facility development; and
- border advanced freight traveler information.

Each will be analyzed for evaluation as long-term TxDOT implementation alternatives to address specific freight-system needs.

"TTI's expertise has helped us identify the most promising strategies and technologies for moving freight in the future," states Wade Odell, research engineer with TxDOT's Research and Technology Implementation Office. "We look forward to working with TTI to refine those recommendations in the second phase of the project." ■



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Things are looking up for the U.S. economy. Or that's what freight moving across the U.S.-Mexico border between 2012 and 2014 seems to indicate.

There are 25 land ports of entry (POEs) along the 1,969-mile U.S.-Mexico border that serve as trade gateways between the two countries. Recent negative changes in the global economy resulted in a significant decline in trade and freight movement worldwide. This downturn prompted the United States to examine its border trade more closely. What goods are moving where? What POEs are most popular? What transportation modes are favored?

Despite the recession of the early 2000s and the global financial crisis of 2007, surface trade between the United States and Mexico essentially

quadrupled from approximately \$100 billion in 1995 to \$400 billion in 2012. Since 2009, the Texas A&M Transportation Institute's (TTI's) Center for International Intelligent Transportation Research (CIITR) has studied the freight activities of U.S.-Mexico POEs in Texas, California, Arizona and New Mexico. Using data from the Trans-Border Surface Freight Database of the U.S. Bureau of Transportation Statistics, CIITR researchers identify and study trends in what commodities move across the border and quantify any noted changes. As part of the analysis, freight is classified by mode of transport (e.g., trucks and railcars, empty and loaded), six commodity groups and freight destinations.

"The steady upward trend between 2010 and 2012 essentially leveled off for about a year through mid-2013," explains TTI Associate Research Engineer Geza Pesti. "But since then and through 2014, surface trade between the United States and Mexico recovered its upward momentum."

Pesti and his team also identified those interior U.S. states, including Michigan and Illinois, with businesses generating significant surface trade with Mexico, usually via Texas POEs. Knowing the destinations of frequent shipments from Mexico can help state officials to better prioritize border-related transportation infrastructure needs, thereby maximizing the economic benefits of efficient trade for those states and the nation as a whole.

In 2014, cross-border trade grew by 7 percent — up from the anemic 1 percent low point of the year before. Maintaining its longitudinal ratio, the value of U.S. imports was about 25 to 35 percent higher than exports: 44 percent of the total surface trade with Mexico was exports, while 56 percent was imports. Another consistent factor over time — trucking dominated freight movement in 2014 as well, accounting for 82 percent of trips in both directions, with rail (18 percent export and 15 percent import) making up the difference.



Recent Cross-Border Freight Traffic Might Spell Good News for U.S. Economy

“More efficient freight movement means improved just-in-time delivery and can result in reduced shipping costs that ultimately benefit the consumer.”

*Geza Pesti,
TTI Associate Research Engineer*

“Knowing when freight is slowing down at the border gives local authorities on both sides an opportunity to focus on improving mobility at those times,” says Pesti. “More efficient freight movement means improved just-in-time delivery and can result in reduced shipping costs that ultimately benefit the consumer.”

Armed with findings from Pesti’s study, policy makers can make more data-based decisions regarding, for example, allotting their state department of transportation’s limited resources to facilitate trade (e.g., prioritizing the repair of roads used by long-haul trucks). Members of the driving public can plan cross-border leisure and business travel around peak bottleneck times. And environmental agencies can more easily mitigate border-town air pollution caused by the long wait times by knowing when and where it’s likely to be worst.

Pesti and his team are currently analyzing 2015 data to update the ongoing study. ■



Freight activities at Texas POEs (particularly Laredo) are considerably greater than in the other four states that border Mexico combined. Though still the primary trading partner with Mexico among all U.S. states, Texas did experience a 1.4 percent reduction in the value of its surface trade with its neighbor to the south in 2014. And wait times for commercial vehicles — a new facet of the study, with data analyzed between May 2013 and December 2014 — yielded some interesting findings.

On weekdays, commercial vehicles crossing the border in Pharr and at the World Trade Bridge in Laredo experienced the longest wait times at more than 60 minutes. Shippers using other POEs, like Brownsville, Zaragoza and the Columbia Bridge, experienced significant wait times as well, often approaching an hour. The longest day to wait? Put it this way: don’t try to move cross-border freight on Saturdays.



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The Many Modes of Transportation Economics

As part of one of the largest port systems in the United States, Texas ports play a vital role in the state's total economic activity.

Building and maintaining Texas' transportation infrastructure are costly endeavors. Research conducted by the Texas A&M Transportation Institute's (TTI's) Infrastructure Investment Analysis Program (IIAP) helps inform policy makers how best to mitigate those costs and provide the greatest return to Texas taxpayers.

"The importance of transportation to the economy is obviously significant," says IIAP Manager David Ellis. "But it doesn't just entail funding highways; it cuts across all types of transportation modes."

Ports

As part of one of the largest port systems in the United States, Texas ports play a vital role in the state's total economic activity. For example, Port Freeport, which handled over 19.7 million short tons of cargo in 2013, generates significant dollars for Texas. To better understand the port's contribution, TTI researchers examined its major stakeholders, key economic impacts and state funding for Texas ports, as well as the port's history, defining characteristics and current development.

"We created an economic impact study of the port by looking at outputs such as jobs created, indirect income as a result of job creation, economic activity and tax revenue," says TTI Assistant Transportation Researcher Brett Huntsman.

These data were used in a model to determine the economic impacts of the port's operation. Researchers presented the results of the analysis to Port Freeport's Board of Commissioners.

"The analysis numbers we showed them revealed significant growth at the port," says Huntsman. "They were very pleased with our results and the transparency we offered as a transportation agency to achieve those results."

Transit

Dallas Area Rapid Transit (DART) is the largest light-rail system in the southern United States by ridership. The sprawling system includes 90 miles of infrastructure that serves 62 stations in Dallas and 12 surrounding cities that pay for the service using a 1 percent sales tax revenue.

TTI researchers developed a web-based model for DART that provides macro-level estimates of the potential economic impacts and benefits



DART is the largest light-rail system in the southern United States by ridership.



With so many highways to maintain and limited funding, project prioritization is of major importance to the Texas Department of Transportation.



TTI researchers have investigated the efficacy of using seawater desalination combined with a pipeline network to distribute water.

associated with opening new DART stations to increase the service agency's area. These impacts include the additional property tax revenues, sales tax revenues, employment and economic activity associated with the development of each new station.

"The model was created to provide a cost/benefit analysis for cities that want to become part of the DART network but do not have the available sales tax to pay for it," says TTI Research Scientist Jeff Borowiec. "For many cities, this money simply isn't available. This model allows prospective cities to examine other funding options such as the use of 4a or 4b tax money, which is still sales tax revenue but is limited to economic-development-related uses. Our tool gives them the ability to input known factors and view the costs and potential economic benefits that would come to their city and region."

Highways

Given so many highways to maintain with limited funding, project prioritization is of major importance to the Texas Department of Transportation (TxDOT). TTI Assistant Research Scientist Brianne Glover recently led a cost/benefit analysis project on roadway segments. Her team's goal was to provide TxDOT with information to help the agency prioritize certain projects based on each one's potential return on investment.

"Each district has a map of projects under consideration," says Glover.

"We took each project and evaluated such factors as safety benefits, vehicle operational cost savings, business output and other factors to provide a benefit/cost ratio to determine which projects to prioritize."

The team also researched the economic impact of expediting projects in rural areas. Researchers conducted two case studies involving the development of mobility projects in rapidly growing small urban areas in Texas. The first case study reports on the expansion of a parkway that connects a fast-growing industrial park with important north-south routes around Odessa, Texas. This project was selected in part because of its importance to the region's oil and gas sectors.

"The John Ben Shepperd Parkway overpass at Business 20 opened up an additional entrance into Odessa from I-20," explains Tracy Jones, economic development specialist at the Odessa Chamber of Commerce. "This new gateway into the community spurred the location of Standard Sales Company's \$16 million wholesale distribution center, West Texas Food Bank's \$8 million regional distribution center, Saulsbury Industries' corporate headquarters and the construction of several new hotels."

Pipelines

Though drilling in the Eagle Ford Shale region has slowed recently, the practice of hydraulic fracturing (i.e., fracking) still results in increased levels of truck traffic. Shale-related energy production causes an

estimated \$2 billion annually in damage to Texas roads, with \$1.3 billion of that occurring on roads in the Eagle Ford Shale region alone. This damage is primarily caused by trucks hauling water necessary for the drilling and fracking process.

TTI researchers have investigated the efficacy of using seawater desalination combined with a pipeline network to distribute the water to the users instead. The project was funded by The Texas A&M University System's Area 41 Institute, the mission of which is to "foster and support collaborative research and education across The Texas A&M University System on critical issues facing the state of Texas and the nation in the next three decades."

"We've looked at the economic viability of building a desalination plant along the Texas coast and then building a network of pipelines that would bring the water to within a mile or two of the wells," says TTI Assistant Transportation Researcher Max Steadman. "Our goal is to reduce truck traffic by 40 percent. In addition to fracking, the water can also be used to meet agricultural or municipal needs. The cost/benefit to the state in reduced road damage could potentially be several hundred million dollars per year." ■

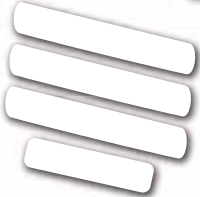


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TTI and Texas A&M Organize, Lead Transportation Technology Conference

When cars are able to talk to other cars and the road itself, our transportation system could be safer, less congested and a lot more efficient. Experts believe connectivity and automation can get us there.



Texas A&M University System Chancellor John Sharp wants to ensure this technology becomes a reality and that Texas A&M plays a chief role in transforming modern transportation. He announced a \$150 million

investment during the Texas A&M Transportation Technology Conference held at the George Bush Presidential Library in College Station, Texas, May 1-3.

Sharp's vision calls for upgrading a 2,000-acre facility located just outside Bryan, Texas, that was once a U.S. Air Force base. Now called the RELLIS Campus — named for the Texas Aggie core values of respect, excellence, leadership, loyalty, integrity, and selfless service — the facility will include an expanded engineering and educational program. It will also be home to the development and testing of various connected and automated transportation technologies.

"We believe now is the time to transform this prime property into a premier campus dedicated to economic development and public-private partnerships," Sharp told conference attendees, many of whom were representatives of private-sector companies like General Motors, Hyundai Motor, Toyota, IBM and Texas Instruments. "Among its other advantages, this will help accelerate the deployment of transportation technology through advanced research and education." Also participating in the conference were Peloton Technologies, Bosch and Navistar.

Sharp also announced the creation of the Campus Transportation Technology Initiative designed to combine the efforts of Texas A&M, the Texas A&M Transportation Institute (TTI) and the Texas A&M Engineering Experiment Station (TEES).

"We believe we can offer the transportation industry and other public- and private-sector partners unique



Working with advanced technologies, Texas A&M students will learn by doing as part of the Campus Transportation Technology Initiative.



TEES will team with other Texas A&M agencies, including TTI, to conduct advanced transportation research at the new RELLIS Campus.



opportunities that no other university has to offer,” said M. Katherine Banks, vice chancellor and dean of engineering and director of TEES. “We are enthusiastic about creating a campus dedicated to moving research discoveries into the marketplace.”

The Campus Transportation Technology Initiative will create a test bed at the RELLIS Campus that allows the private sector to evaluate its products using the professional knowledge of Texas A&M personnel and university students.

“The level of expertise we can offer is unsurpassed,” said TTI Agency Director Dennis Christiansen. “We believe this will result in safer, more-effective solutions to the transportation challenges we face. The RELLIS Campus will create numerous opportunities to develop public-private partnerships of mutual interest in the transportation arena.”

Last year, Christiansen made it clear that TTI would be a major player in the advancement of connectivity and automation when he appointed Senior Research Engineer and Assistant Agency Director Christopher Poe to a new position as TTI’s connected and automated (CV/AV) transportation strategy lead. With 30 years of experience in transportation system operations and intelligent transportation systems, Poe has served as the vice chair of the Connected Vehicle Task Force for the Intelligent



The intersection of John Kimbrough Boulevard and Olsen Boulevard on the Texas A&M University campus is an example where a smart intersection could be helpful. Smart intersections detect traffic flow and volume, analyze complex traffic data in real time, calculate multiple route alternatives and send the resulting recommendations to vehicles approaching a congested intersection.

“This conference was a great opportunity to open a discussion on how Texas A&M can work with the private sector to develop technology solutions that serve the needs of public agencies and consumers.”

*Chris Poe,
Assistant Agency Director and
CV/AV Transportation Strategy Lead*

Transportation Society of America and secretary of the Transportation Research Board’s Vehicle-Highway Automation Committee. He is leading coordination of TTI’s CV/AV research efforts and serving as a liaison to all the other connected and automated transportation activities within The Texas A&M University System.

One of the top priorities in this new position was to hold this first-of-its-kind transportation technology conference at Texas A&M. “This conference was a great opportunity to open a discussion on how Texas A&M can work with the private sector to develop technology solutions that serve the needs of public agencies and consumers,” Poe says. “The partnerships going forward will allow Texas A&M to develop the facilities that help get technology, products and services to market faster and more successfully.”

Poe also noted that deploying CV/AV technologies holds the greatest promise for reducing crashes and improving the mobility challenges facing our transportation system. “The well-attended Transportation Technology Conference shows me that Texas A&M and TTI can serve an important role in bridging the solutions of the private sector with the needs of the transportation system owners and operators,” he says. ■



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Teens in the Driver Seat® Hosts Annual Summit to Celebrate, Educate Student Advocates of Teen Driving Safety





Nearly 200 student leaders from Texas and around the nation attended the annual Teens in the Driver Seat (TDS) Summit held May 15–17 at the Great Wolf Lodge in Grapevine, Texas.

TDS, a peer-to-peer teen driver safety program, brought together teen traffic safety experts and interactive safety exhibits, as well as recognized students and other program partners, for their dedication to improving teen driver safety in their local communities. Recognition at the event included a wide variety of awards and college scholarships.

“Each year we bring our student advocates together to show appreciation for their efforts to champion safer driving behaviors to their peers,” says TDS Director Russell Henk, manager of the Texas A&M Transportation Institute’s Youth Transportation Safety Program.

About 2,800 U.S. teens die each year in car crashes; that’s the equivalent of a school bus loaded with teenagers crashing once every week for an entire year. Since Henk founded TDS in 2002, the program has won more than 20 local, state and national awards and is recognized as a national best practice program for teen driver safety. During that same period, to date Texas has seen a 70 percent decrease in the frequency of fatal crashes involving 15- to 17-year-old drivers.

Teens attending the summit participated in informational sessions and activities to educate and encourage them to be safer drivers. Activities included TDS’s DWI simulator, which demonstrates the adverse impacts of impaired driving, and students drove pedal carts through an obstacle course while wearing Fatal Vision (drunk) goggles. The goggles teach them firsthand about the effects of alcohol on vision

and motor skills. A feature of the obstacle course provided hands-on experience with the adverse impacts of texting while driving.

“Each year we bring our student advocates together to show appreciation for their efforts to champion safer driving behaviors to their peers.”

*Russell Henk,
TDS Director and Manager,
TTI’s Youth Transportation Safety Program*

Much of what TDS has accomplished is made possible by long-standing relationships with the Texas Department of Transportation and State Farm, which fund, among other things, TDS materials distributed in high schools at no charge to the schools.

“State Farm is a proud supporter of Teens in the Driver Seat sustaining teen driver-safety conversations throughout the school year,” says Chris Pilcic, spokesman for State Farm. “As the largest automobile

insurer in the United States, we have a commitment and responsibility to work for safer roadways, which is part of the State Farm heritage and who we are today.”

The event garnered unprecedented media coverage by multiple television stations, including the local FOX, CBS, and CW affiliates, as well as the *Dallas Morning News*.

“We’re gratified the media took such an interest in our event this year,” says Henk. “Our best spokespeople are the students themselves, who do a fantastic job getting the word out to their peers and the public alike.” ■



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The Infrastructure Magnet

How Essential Is Transportation to Pulling in and Retaining Businesses?



A system that supports the efficient movement of cars, trucks, aircraft, trains and ships — and the people and goods on board — is central to any economy. That's a given. But what's less clear is how (and to what degree) Texas' transportation system is important to various industry sectors. A Transportation Policy Research Center (PRC)-sponsored study at the Texas A&M Transportation Institute (TTI) intends to answer those questions. Chris Simek and Matt Miller, both assistant research scientists in TTI's Public Engagement and Mobility Management programs, respectively, are co-leading the project.

The researchers conducted more than 20 interviews with economic developers, professional site selectors and private industry professionals regarding factors that influence facility location or relocation decisions. They found that three factors tend to rise to the top of the list: skilled workforce availability, access to adequate production materials and transportation infrastructure.

"It's like a three-legged stool," Simek says. "While various industry sectors may place varying degrees of importance on each leg, if any leg is deficient, your ability to recruit new businesses to your region or get existing businesses to expand is significantly inhibited."

The information and computer technology sector, for instance, may be concerned primarily with access to skilled labor. A lot of those workers place a premium on quality-of-life issues, one of which is access to multiple transportation options in their daily commute. So if a city doesn't have a robust public transit system, that city might lose out when a large tech employer is looking for a new home.

Another example is the advanced semiconductor manufacturing industry (think silicon wafers), which uses large amounts of water in its production processes. "Lack of a dependable and inexpensive supply of water could be a significant red flag," Miller says, "even if the region is attractive because it has a great workforce and excellent transportation infrastructure."

And, for the energy sector, reliable transportation infrastructure that provides access to oil and gas sites in a specific shale region is important.

What researchers are learning has direct consequences for a state that's

a major worldwide economic player. According to the Texas Comptroller of Public Accounts, the state's economy is bigger than those of Australia and Mexico, and it rivals those of Russia and Canada. Texas is also the nation's number-one exporting state and has been for more than a decade.

Committees of the Texas Legislature routinely consider policies that affect business interests throughout the state. These may include workplace issues and employment practices, as well as infrastructure development matters, and related policy actions can have both immediate and lasting implications for the state's economy.

"The issues and decisions confronting our legislators can have powerful impacts on the full range of industries in Texas," says Ginger Goodin, PRC director. "Through the work we're doing now, we hope to give policy makers more of what they need to inform those decisions." ■



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Advancing the Vision

The Texas A&M Transportation Institute (TTI) Advisory Council is comprised of a small group of high-level transportation professionals from across Texas and every sector of the transportation world. The council, which meets annually, offers a tremendous service to the Institute by advising on transportation issues and trends and supporting TTI's research programs and initiatives. TTI profiles several council members in each issue of *Researcher*. ■



Steven Albright

Deputy Policy Director
Office of Texas Gov. Greg Abbott
Austin, Texas

Steven Albright is deputy policy director for Texas Gov. Greg Abbot. He specializes in the areas of transportation, energy, natural resources and homeland security policy. He previously served eight years as chief of staff in the Texas Senate for Sen. Robert Nichols and was policy director for the Texas Senate Committee on Transportation.

Albright also has served as a legislative director in the Texas House of Representatives, focusing on natural resources and finance-related policy. He has more than 15 years of experience in the legislative and executive branches of Texas government, including 20 regular and special legislative sessions. ■



Mike Carrell

Regional President
Frost Bank
Corpus Christi, Texas

Mike Carrell earned his MBA in 1981 and went into the banking profession in 1983. He also holds undergraduate and master's degrees in civil and structural engineering, respectively, and has held engineering positions with M.W. Kellogg, Urban Engineering and Exxon. He continues to maintain his license as a professional engineer in the state of Texas.

Carrell is former chairman of the Port of Corpus Christi, serves as a board member of the Coastal Bend Community Foundation and the United Way of the Coastal Bend, and is a board member and past president of the USS Lexington Museum on the Bay Association. He is a past president of the Corpus Christi Business Alliance (now the Corpus Christi Chamber of Commerce). ■



Jungus Jordan

City Councilman
Fort Worth, Texas

Jungus Jordan was re-elected to his sixth term of office on the Fort Worth City Council in 2015. He is a retired lieutenant colonel in the U.S. Air Force, serving in Vietnam, Germany and the Office of the Secretary of Defense at the Pentagon. Upon retirement, Jordan served as development officer at Texas Christian University and later in management positions in marketing and financial advising.

Jordan is a board member of the National League of Cities and the North Texas Commission. He is a past president of the Texas Municipal League, vice chair of the North Central Texas Clean Air Steering Committee, and former chair of the North Central Texas Regional Transportation Council. He also serves as chair of the Passenger Rail Working Group and the Tarrant Regional Transportation Coalition. ■

NHTSA's Rosekind Addresses TTI's Annual Traffic Safety Conference

Advanced vehicle technologies represent a "safety innovation revolution," according to Mark Rosekind, head of the National Highway Traffic Safety Administration (NHTSA). Rosekind met with TTI leaders and researchers and was keynote speaker for the 2016 Traffic Safety Conference, which TTI hosted in College Station, Texas, June 6–8.

"Over the last 50 years, [seat belts and air bags] have saved 613,501 lives," the administrator told the 300 people in attendance. "The advanced safety technologies we are seeing today represent us being on the cusp of a safety innovation revolution. That's what's coming."

Rosekind praised attendees, who included law enforcement, safety experts from the public and private sectors, municipal transportation planners, and university-based transportation researchers.

"[You're] amazing, passionate, dedicated people who are saving lives in their communities," he said. "All of you are beacons. You're the folks we need to

support as you go about saving lives and preventing crashes. The work you do makes a difference. No one will ever say thank you enough."

Rosekind also told the luncheon group that a lot of work is left to do, pointing to the 32,675 deaths resulting from crashes in 2014, the latest year of safety statistics captured by NHTSA. The 2015 fatality numbers, he previewed, will show an increase when the report is released soon. As part of the solution, Rosekind pointed to automated vehicle technologies, which could hold "massive, life-saving potential."

He applauded the recently announced RELLIS Campus at Texas A&M University, which will be partially dedicated to transportation technology research. "The interesting question is — how many lives can be saved by tech? We really are excited to find out that answer," he said.

Each year, the Traffic Safety Conference, sponsored by the Texas Department of Transportation and TTI, brings together public policy makers, traffic safety practitioners,



NHTSA Administrator Mark Rosekind was the keynote speaker for TTI's Traffic Safety Conference.

law enforcement, traffic engineers, public health officials and many others passionate about traffic safety for a three-day forum. At this year's conference, more than 300 attendees broke into 16 different sessions. Topics included engineering, roadside safety, outreach campaigns, pedestrian and bicycle safety, data analytics, safety cities, motorcycle safety, traffic safety culture indexing, and Vision Zero, a multinational road traffic safety project begun in 1997 in Sweden with the goal of zero fatalities or serious injuries resulting from road traffic. ■



Clifford Spiegelman (right) receives the 2016 Don Owen Award from ASA San Antonio Chapter Vice President Joel Michalek.

Spiegelman Receives Don Owen Award

Clifford Spiegelman, senior research scientist at TTI and distinguished professor with the Texas A&M Department of Statistics, has received the Don Owen Award from the San Antonio Chapter of the American Statistical Association (ASA). The award was presented to Spiegelman this spring during the Conference of Texas Statisticians at Trinity University. Spiegelman was selected for his "excellence in research, statistical consultation, and service to the statistical community."

Spiegelman is an author, researcher and expert in statistical and environmental forensics. One of the highlights of his 40-year career includes the international attention he received in 2007 for his work on computational bullet fragment analysis, which challenged the evidence for the lone-gunman theory in the John F. Kennedy assassination.

"This is a high honor, and I am grateful to receive it," Spiegelman says, "I think the award reflects well on the people who work with me." ■

TTI Secures Patents Related to Embassy Protection, Freight Movement

Working with officials from the U.S. State Department, three TTI researchers have helped design a new safety barrier that's easier and less costly to repair than current systems now used around embassies and other sensitive compounds. Their invention, Surface Mount Wedge Barrier, was recognized this spring during the annual Patent and Innovation Awards Luncheon held at the George Bush Presidential Library.

"We designed a prototype that has been crash-tested at the Riverside Campus," says TTI Assistant Agency Director Dean Alberson, manager of the Institute's Crashworthy Structures Program. "We were able to easily remove the aboveground damaged section after the full-scale impact. This allows a rapid replacement of the upper section since the in-ground portion of the system was undamaged. This will save time and money each time these barrier systems suffer a nuisance or even full-scale hit."

Along with individuals from the State Department, Michael Brackin, D. Lance Bullard and Alberson were awarded patent #8,956,072 by the U.S. Patent Office.

TTI Assistant Agency Director Stephen Roop, who developed the innovative Freight Shuttle System (FSS), was also recognized. Roop has been awarded numerous



Holding their TTI patent awards are (from left to right), Michael Brackin, D. Lance Bullard and Dean Alberson. They are flanked by Executive Director of Texas A&M Technology Commercialization Brett Comwell (left) and Texas A&M Vice President for Research Glen Laine (right).

patents related to the project, including patent #9,176,076 — Cargo Inspection System. The privately funded FSS, now in the prototype stage, is an electric-powered system that combines proven technologies in a new way.

"The system allows for a 100 percent inspection of the freight moving between the United States and Mexico, and provides for the information flow between U.S. Customs and Border Protection and its Mexican counterpart," Roop explains. ■

Transportation Technology and the Law: TTI Takes Part in Symposium

TTI researchers recently played a major role in a Texas A&M School of Law conference dedicated to the future of transportation. The Changing Landscape of Transportation: Technology, Data and the Law was held in Fort Worth April 1. The symposium was organized and hosted by students associated with the *Texas A&M Law Review*.

Ginger Goodin, director of TTI's Transportation Policy Research Center, moderated two sessions of the symposium — Emerging Intersections in Transportation and Automated Controls: Legal and Ethical Concerns.

"Transportation will certainly look different in the next decade with

cars and infrastructure talking to each other, not to mention the advent of self-driving cars," Goodin says. "But legally, there's a lot to consider. This symposium was important in advancing the dialogue between those responsible for implementing advanced transportation and those responsible for legislating it."

Allan Rutter, head of TTI's Freight Mobility Division, also spoke at the symposium. His presentation examined how technology is affecting the freight industry. "Technology has certainly changed the way shippers and carriers work together, and freight regulations are changing along with the technologies," Rutter says. ■



TTI's Allan Rutter speaks at a Texas A&M Law School symposium. Ginger Goodin (sitting) was a moderator at the event.

For more information about TTI News, contact **Rick Davenport** at (979) 862-3763 or r-davenport@tti.tamu.edu.

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.

TTI's Infrastructure Investment Analysis Program:
<https://vimeo.com/135390622>

Making Traffic Demand Models More Realistic Representations of Congestion:
<https://vimeo.com/170486486>

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

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

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

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

TECHNICAL REPORTS

Alternative Fuel Vehicle Forecasts: Final Report, by Trey Baker, **PRC 14-28F**, April 2016.

Conceptual Design of a Connected Vehicle Wrong-Way Driving Detection and Management System, by Melisa Finley, **0-6867-1**, April 18, 2016.

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.

An Economic Analysis of Four Options for Dealing with Low-Volume Roads in Energy-Impacted Areas of Texas, by Bill Stockton, **0-6806-TTI-1**, April 7, 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 15-25F**, June 2015.

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

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

New Laboratory Design Tools and Field Performance Monitoring Equipment for Permeable Friction Courses, by Tom Scullion, **0-6741-1**, April 12, 2016.

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

Revolutionizing Our Roadways: Implications of Automated Vehicle Crash Scenario, by Mohammad Poorsartep, **PRC 15-46 F**, May 2016.

Survey of State Funding Practices for Coastal Port Infrastructure: Final Report, by Jim Kruse, **PRC 15-51-F**, May 21, 2015.

Texans 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.

Texas Gulf Intracoastal Waterway Master Plan: Technical Report, by Jim Kruse, **0-6807-1**, April 7, 2016.

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.

Connected Vehicle Wrong-Way Driving Detection and Mitigation Demonstration, by Melisa Finley, **0-6867-S**, April 21, 2016.

Draft Test Protocols for PFCs in TxDOT Format, by Tom Scullion, **0-6741-P1**, April 12, 2016.

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

Highlights of the Texas Gulf Intracoastal Waterway Master Plan, by Jim Kruse, **0-6807-P1**, April 7, 2016.

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

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

New Laboratory Design Tools and Field Performance Equipment for Permeable Friction Courses, by Tom Scullion, **0-6741-S**, April 12, 2016.

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

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.

Traffic Control for Access Points within a Lane Closure on a Two-Lane, Two-Way Road, by Melisa Finley, **0-6708-S**, February 4, 2016.