

TEXAS TRANSPORTATION

# Researcher

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Michael Amador/TxDOT International Relations Office

## Where we've been and where we're going:

**An overview of  
TTI's border  
research program**

- **Improving Border Trade**
- **Serving Border Communities**
- **Building Border Information Resources**



# TTI's border research spans

1975

*TTI conducts Port of Brownsville Rail Relocation project.*

1979

*TTI conducts the El Paso/Juarez Border Crossing Study.*

1985

*Growth of Maquiladora industry prompts TTI to study needs of the Maquiladora plants.*

1994

*Texas A&M Research Center of Excellence at TTI begins initiative to successfully deploy the use of intelligent transportation systems (ITS) technologies and improved movement through regulation facilities along the border.*



The Texas Transportation Institute (TTI) began addressing issues along the Texas-Mexico border more than 25 years ago with a study of railroad relocation and other multimodal port issues in Brownsville. Beginning in the early 90s, the Texas A&M Intelligent Transportation Systems (ITS) Research Center of Excellence (RCE) examined applications of ITS technologies to the movements of freight in and through the border zone. The Institute has also explored other issues unique to the border area, including bilingual signing, traffic controls in border zone areas, transportation needs of the Maquiladora industry in Mexico and a detailed economic/financial assessment of the Camino Colombia toll road—a privately financed facility that was built 20 miles upriver from Laredo, connecting I-35 with the Colombia Bridge. Researchers also recently completed two studies exploring the governmental structure for transportation policy, programs and projects in Mexico, as well as the legal framework governing commercial vehicle operations in Mexico and Canada. Researchers from the three North American Free Trade Agreement (NAFTA) countries contributed to these studies. Several TTI researchers were members of the binational study team that did the definitive work to date of the transportation planning and programming processes on the U.S.-Mexico border. The Institute also maintains a Memorandum of Agreement with the Institute of Mexican Transportation (IMT). Through the Southwest University Transportation Center (SWUTC) consortium, TTI is currently working with IMT, The University of Texas Center for Transportation Research (UT/CTR), North Dakota State University, the University of Denver and the University of Manitoba to find other venues for partnering in the highly complex and dynamic area of NAFTA trade and transportation. Included on page 16 is a bibliography of selected works published over the last 10 years.



# a quarter of a century

1995

*NAFTA passes and border transportation issues intensify. TTI establishes a memorandum of agreement with the Institute of Mexican Transportation (IMT) to collaborate on border issue studies.*

1997

*TTI contributes to the U.S.-Mexico binational transportation study, examines highway and pollutant levels along the Texas-Mexico border and assesses traffic control devices in Texas border areas.*

2000

*TTI partners with University of Texas Center for Transportation Research (CTR) to create a model border crossing.*

2001

*TTI continues to work with the Texas Department of Transportation and CTR to improve coordination and goods movement at border facilities.*

**T**he last few years have revealed unprecedented challenges on the Texas-Mexico border: the good — explosive growth in trade and economic development, interrupted occasionally by the bad — drug smuggling, illegal immigration and the threat of terrorism. A central element to these considerable challenges is transportation — a medium for commerce or a tool of the miscreants. Most of the issues require innovative approaches in planning, design, data collection and operations.

The mutually dependent economies of the United States, Mexico and Canada call for increased efforts toward facilitating international trade through expediting commercial traffic and reducing delays and obstacles. Recent events compel all nations to enhance border security, often requiring measures that slow physical movement or increase paperwork. These paradoxical goals must be reconciled, as there will never be enough resources available to apply a 100 percent inspection approach to assuring security.

As the United States searches for the delicate balance of achieving an open yet secure border, the role for transportation research will grow. TTI is part of a team exploring a vision for a “smart border,” where the processes of a healthy economy are improved and the security of a watchful nation is enhanced. A smart border represents an opportunity to rethink ways in which the application of technology and innovative practices augment or replace manual procedures from the past, improving the accuracy of border functions at a reduced cost.

Examples of smart border opportunities include ideas such as “x-raying” of trucks to simultaneously detect safety flaws and security breaches, or the electronic “sniffing” of cattle trucks to detect both disease and contraband. Many disciplines will be involved as these concepts mature, but efficient transportation will be a thread binding the pieces together.

Over the coming quarter century, TTI, along with many partners, will play a key role in the successful evolution of border infrastructure, technology and trade.

Future



## Model shows improved border crossing

In 2000, more than 85 percent of surface trade crossing into Texas from Mexico moved by truck. Commercial truck movements across the border are already resulting in congestion and long delays, and strong growth in the sector holds the potential to overwhelm border processing personnel and equipment.

Working together in a project commissioned by the Texas Department of Transportation (TxDOT), the Center for Transportation Research (CTR) at the University of Texas at Austin and the Texas Transportation Institute (TTI) at Texas A&M University have developed a model facility and process designed to expedite border crossings. The model streamlines processes and uses automated technology that identifies drivers, checks records and tracks vehicles. Creation of the model is a step toward meeting requirements of Senate Bill 913, adopted during the 1999 Texas legislative session, which calls for eventual implementation of reduced-stop border facilities.

"We are delighted with the results this partnership project

has put together. TTI border research and CTR border research complement each other, and projections from the model show what we can produce together," says Edward Wueste, assistant executive director for border trade transportation at TxDOT. "When this facility is implemented, time and money saved during commercial vehicle border crossings will be significant."

CTR leads the project, and many organizations have contributed time and ideas to the model design. The effort's cooperative nature draws from experience gained in numerous border-related studies conducted over the past decade by both CTR and TTI. Through an expert working group, representatives from universities with expertise in border

studies contribute to the project and also serve as liaisons to local community members involved in border operations. TxDOT selected the project as one of the top eight most innovative projects of 2001, commending its methods and findings.

The project team has presented the model to a number of groups and individuals, including the Texas Transportation Commission, Secretary of State, Texas legislators, and the U.S. Secretary of Transportation.

"Reception has been enthusiastic," says Bill Stockton, associate agency director of TTI and TTI's lead member on the project. "So far, everyone recognizes that the model is possible and represents optimal border operation. Our next step is to demonstrate that the model is credible and works in the real world."

### Automated Truck Processing

In initial stages of investigation, the research team found that a reduced-stop, even no-stop, automated border process is feasible for the majority of large trucks crossing the border. The

model uses existing transportation technology to achieve an automated process, which allows properly equipped and cleared vehicles to proceed quickly through border stations unless selected for random inspection or completion of required records.

At each station, the vehicle and driver are electronically identified, the status of paperwork is electronically checked and automated message signs direct the driver where to proceed. The model structure houses seven stations designed to process eligible vehicles — six in the federal border facility and one in the adjoining state vehicle safety inspection facility.

Findings from the project indicate:

- The recommended process and necessary technology do not add substantially to infrastructure costs compared to the cost of current border facilities.
- Linking the state Department of Public Safety inspection facilities to federal agency facilities will foster desired vehicle safety compliance levels.
- Institutional changes and a binational planning agreement with Mexico are essential to improving border processing efficiency using the prototype system.
- The concept developed in this project is applicable to the entire southern U.S. border.

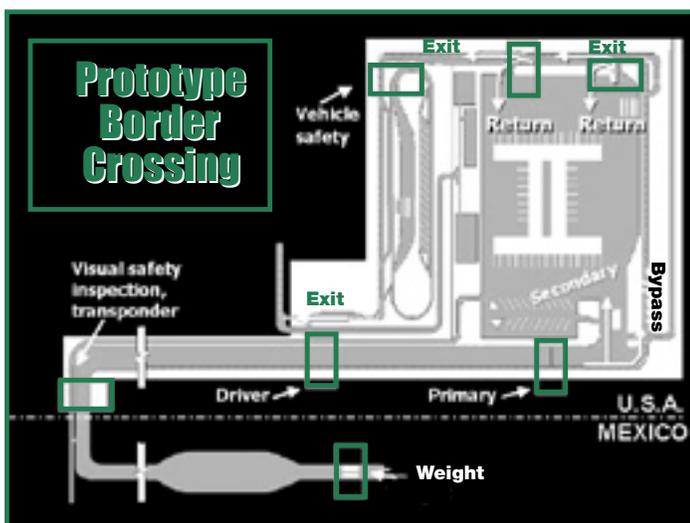
### Development Strategies

The project team solicited input from a cross-section of stakeholders from El Paso to Brownsville, including:

- Mexican transportation officials
- inspection agency personnel
- port-of-entry operators
- community leaders
- border transportation researchers

“This project is an excellent example of cooperation, pulling from the considerable talents throughout the Texas university community. Using a joint project structure between TTI and CTR in collaboration with other universities works very well as a basis for outreach. It gives us a means to reach out to organizations quickly and address the issue effectively under tight time constraints,” says Rob Harrison, executive director of CTR.

Another innovative strategy is use of a public web site as a means of communication (<http://bordercross.tamu.edu>). Through the web



The model border crossing facility uses seven checkpoints for verification and inspection of trade traffic.

site, team members can efficiently communicate with each other and exchange resources. At the same time, the site provides public access to reports and findings. In conjunction with the web site, the project team uses a variety of media to explain characteristics and operation of the proposed facility — including conceptual and graphic models, video and computer animation and other educational materials.

For the animation and computer design needed to explain the model, the team turned to engineering design graphics classes at Texas A&M University. As part of their learning experience, students created much of the computer video, animation and graphics used on the web site and in the CD-ROM presentation.

### Model Design

The model border crossing facility uses seven checkpoints for verification and inspection of trade traffic. It proposes the use of a radio frequency identification tag in each vehicle that automatically responds to an electronic checkpoint inquiry. The checkpoints also use video recognition technology for driver identification.

“The model system requires the shipper to submit considerable information about the driver, the tractor, the trailer and the cargo — not just the cargo as is predominant currently. That information is prefiled ahead of arrival and primary inspection,” explains Harrison. When the shipment does arrive for primary inspection, it will have already received preliminary risk analysis, giving agencies more time and better bases for determining whether to inspect the vehicle individually or let it move on.

The model is designed to improve crossing time, security and documentation. If the vehicle and driver match prefiled report data, the truck moves through the checkpoint. If any information varies or irregularities show up, the truck is flagged for manual inspection.

“We want to expedite crossings for the ‘good guys.’ We want to make it not only difficult but impossible for the ‘bad guys’ to cross the border. Bad guys might be people who have not paid proper duties or who operate drugs, cross illegally or might do harm once they enter the country,” says Stockton. “Whatever form they take, we want to identify and stop them.”

### The Next Step

The next step is to integrate the model process with the International Trade Database System (ITDS) currently in development at the federal level. The ITDS identifies agencies that play a role in or use data from border crossings. So far, over 100 federal agencies that use data from border crossings have been identified for inclusion in the database. TxDOT has authorized the project team to continue work toward implementation of the model.

“We are absolutely convinced that the average truck will save at least 30 minutes per trip using this model border crossing process and facility,” says Stockton. “That half hour accounts for a savings of \$25 to \$50 million per year to the trucking industry. We believe the model will save time and money, expedite crossing and improve security and enforcement opportunities.”



For more information, contact **Bill Stockton**, (979) 845-9947 or [bill.stockton@tamu.edu](mailto:bill.stockton@tamu.edu).

Related Publication: *A Prototype Southern Border Facility to Expedite NAFTA Trucks Entering the United States*. Transportation Research Board. January 2001.

## Coordinated system will aid ports of entry

In an effort to facilitate operations, many U.S.-Mexico ports of entry have adopted their own systems for improving coordination among their stakeholders — inspection agencies, trade community members and others. The Texas Transportation Institute (TTI) is taking the lead role in a recent project, conducted jointly with the Center for Transportation Research and sponsored by the Texas Department of Transportation, that captures best practices universally applicable to U.S. ports of entry.

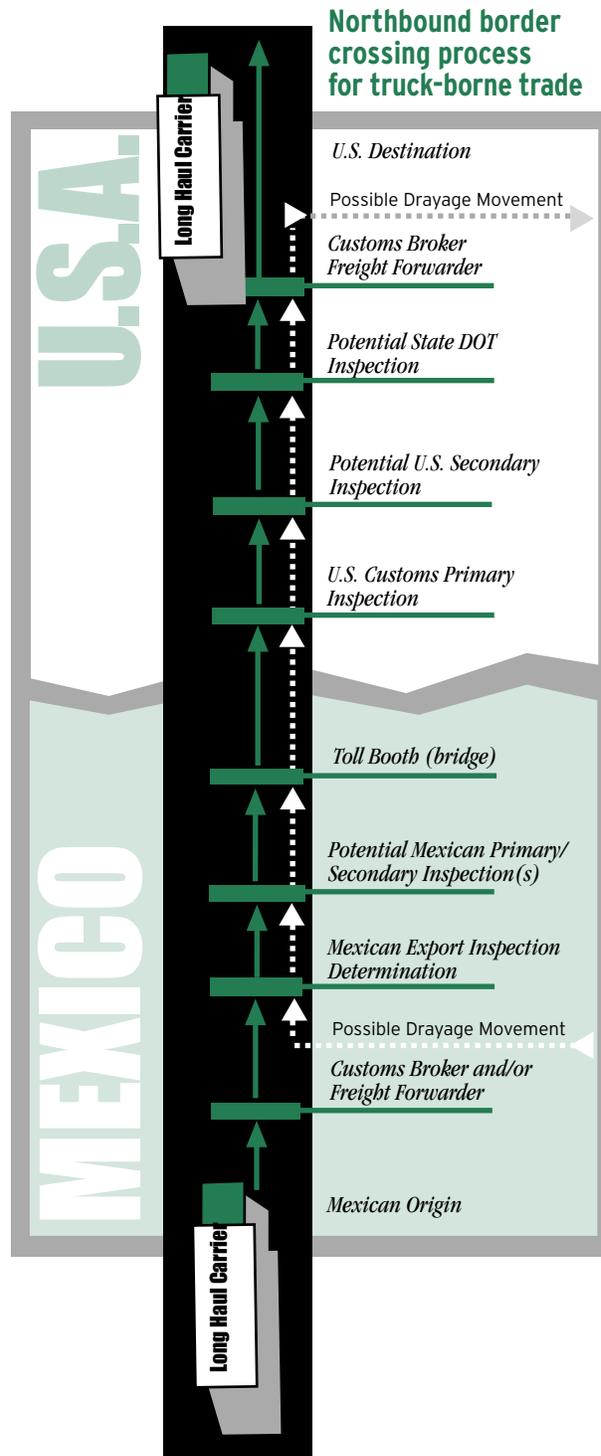
“This project will identify opportunities to reduce the overall time it takes to move goods from origin to destination across the U.S.-Mexico border. Border crossing is only a part of that process. We’re looking at the shipment process from point to point and finding ways to coordinate the process all along the Texas border to produce smoother operation with improved security and interdiction,” says Bill Stockton, associate agency director of TTI.

One of the first tasks undertaken as a part of this project is review of the enormous, diverse body of information regarding U.S.-Mexico border trade operations. The project team is reviewing available reports, evaluating them and summarizing the reports when appropriate. Summaries and resource listings will be publicly available and posted on a project web site for easy access.

*Project tasks fall into four phases:*

- Identify coordination problems and quantify related costs
- Develop a general coordination system applicable to all U.S.-Mexico border ports
- Use pilot projects at a minimum of three ports to evaluate implementation of the system
- Propose an action plan to prioritize and implement the resulting coordination system in other U.S.-Mexico border ports

“Security and trade facilitation are natural byproducts of an efficiently operated border,” notes Stockton. “If we can coordinate the overall process to improve order and efficiency, we will improve both border security and trade opportunities.”



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# Strengthening the U.S.-Mexico Rail Connection

## Will private railroads and closer ties help?

“Will the privatization of Mexico’s railroad system and closer operational ties to U.S. railroads serve to offset the increase in international truck trade passing between the U.S. and Mexico?”

This is a question that Texas Department of Transportation (TxDOT) asked Texas Transportation Institute (TTI) researchers to answer as part of the ongoing border research effort and to begin addressing the issue of how to better integrate rail planning into the state’s future transportation system.

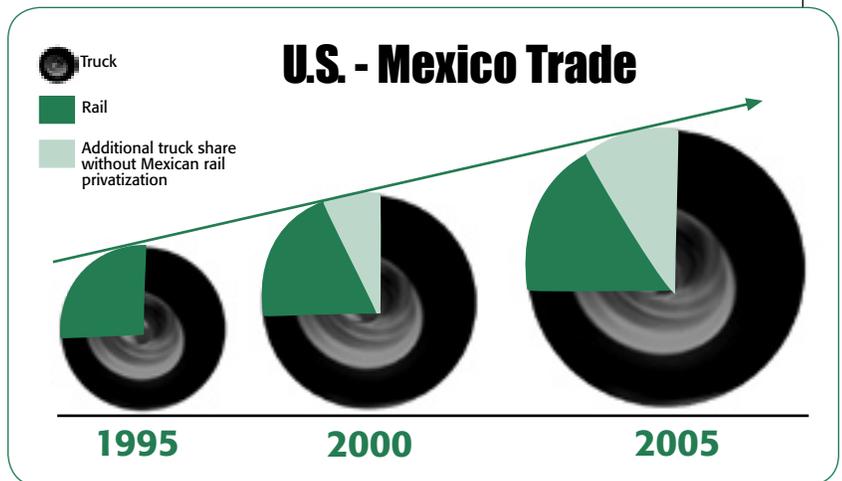
Growing at an average annual rate of 17 percent since the inception of the North American Free Trade Agreement (NAFTA), U.S.-Mexico trade was at a record high of \$261.7 billion in 2000. The resulting growth in truck traffic has placed costly demands on Texas highways — a network that carries approximately 70 percent of the total incoming truck traffic to and from Mexico. If more companies involved in NAFTA-related trade ship via railroad, it could offset the amount of damage done to Texas roads due to increased truck traffic.

Recognizing the need for an improved and competitive rail system, Mexico began privatizing and revitalizing its rail service in 1995. Since then, according to Instituto Mexicano del Transporte (IMT) estimates, Mexican rail systems have grown (in terms of freight tonnage), on average, 10.1 percent annually — largely due to better performance and coordination between U.S. and Mexican carriers. TTI’s collaborative relationship with IMT, the official transportation agency of the Mexican federal government, helped TTI researchers gather data and estimates used in the project, as well as garner insights into the Mexican government’s policy initiatives pertaining to the rail industry. Researchers also utilized contacts with U.S. and Mexican railroads to collect information on investments, traffic projections and emerging trends in U.S.-Mexico cooperation.

“We found that the privatization of the Mexican railroad system will clearly have a positive impact on the quantity of freight transported by railroads in the U.S. and Mexico,” says Steve Roop, the TTI research supervisor of the project. The research evaluation showed that the railroads are performing remarkably well. In fact, some within the industry estimate that the railroad’s U.S.-Mexican trade volume will grow at a double-digit rate — perhaps 10 to 12 percent per year.

In order for rail transportation to completely offset the growth in trucks, the Mexican and American rail industries would have to grow faster than the overall trade rate. Available data for the project, however, predict that trade will grow 17 percent and rail at 10 percent. “Our findings do show that the significant increase in rail traffic serves to partially offset the growth in truck traffic,” says Roop. “Without this improvement, the rate of increase in trucks on Texas highways would be even greater.”

The findings of this research will be used in updating the Texas Transportation Plan and the State Rail Plan, as well as in Texas transportation developments over the next 25 years. In addition, some consideration is being given to accommodating



Rail-truck modal share under conditions of NAFTA growth.

rail facilities on the new I-69 highway.

According to Wayne Dennis of TxDOT’s Multimodal Section, “The reports produced on this project have given us very good background and helped us understand more about how the Mexican rail system works. That’s been particularly helpful as we’ve worked with Mexican companies concerning the state’s recent purchase of the South Orient Rail Line, which runs from the border town of Presidio to Coleman, Texas.”



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*Related Publication:* Report 2128-2, The Impact of Mexican Rail Privatization on the Texas Transportation System

## Train notification system alerts drivers

*Before drivers reach the area, the system broadcasts information to let them know if the intersection is blocked, how long the train has been moving through the intersection, and what direction the train is headed.*



*Leondard Ruback and Ricky Parker calibrate the train detection equipment.*



*The exhaust from that truck is killing me. Man, how much longer am I going to have to wait in this traffic?*

*I drive this road every day, but I never know the quickest way to go if there's a train on the track. If I'd known which way the train was headed, I could have turned off before I rounded the curve and I would have avoided this delay.*

*Now I have no choice but to wait it out.*

Drivers on Mines Road near IH-35 and the binational World Trade Bridge in Laredo face frequent long delays from heavy traffic and numerous trains. Over the years, the Texas Department of Transportation (TxDOT) has used several approaches to solving the problems drivers encounter at this intersection. The most recent solution uses a flashing sign system that notifies travelers if the intersection is blocked, but TxDOT realized that additional information would help drivers make better decisions and face fewer delays.

"The neighborhood is both residential and home to forwarding agencies and trucking companies, so it has heavy traffic, and there's only one main arterial to get in and out," explains Bobby Rodriguez, traffic systems supervisor at TxDOT's Laredo District. "We were looking at options to improve traffic flow, and we needed something that would help right away while we explore long-term options."

Recent increases in trade between the U.S. and Mexico have increased both vehicular and railroad traffic in the border area. In an effort to reduce traffic delay at this congested intersection in one of the country's busiest locations for inland international trade, the Laredo District office of TxDOT is working with Texas Transportation (TTI) staff in San Antonio and College Station to implement a train monitoring system.

The system developed for the site monitors train activity at the crossing, then notifies approaching drivers of the train's status over car radios using a

highway advisory radio (HAR) frequency. Armed with this information, drivers have the opportunity to change routes to reduce delay or avoid waiting time altogether. This system benefits all drivers and is especially helpful to emergency service vehicles and commercial trucks.

“Advance information lets drivers avoid the traffic wave generated by the train. The concept is to tell travelers that the intersection is blocked, approximately how long it’s been blocked and the direction the train is traveling so they can choose an alternate route. Because there are no other obvious routes in the immediate vicinity, drivers need to know the situation ahead of time,” says Leonard Ruback, associate research scientist at TTI.

With a crossing blockage time of six to seven minutes, even a recently cleared intersection could mean delay from long queues of backed-up traffic. Before drivers reach the area, the system broadcasts information to let them know if the intersection is blocked, how long the train has been moving through the intersection, and what direction the train is headed.

“This train monitoring and motorist information system has the potential to reduce traffic demand through the crossing and provide short-term relief. When a train approaches, the system signals the HAR to play the appropriate message and triggers warning lights and signs positioned around the area. Drivers are alerted to tune to the HAR on their radios and get complete information,” says Rodriguez.

The train monitoring system in Laredo uses equipment designed as part of a corridor management project in College Station. Using

a component based on the College Station system, combined with existing warning signs already in place, enabled the Laredo setup to become functional quickly. The previous system used signs to notify approaching vehicles when crossing gates were down at the intersection, indicating a blocked intersection. The additional information provided in the current system, along with flexibility of broadcast information instead of signs, gives drivers a better basis for choosing a route through or around the crossing. If the installation receives feedback indicating its usefulness to travelers, an enhanced version may become a part of Laredo’s overall traffic management operations.

“This project is a win-win situation,” adds Ruback. “The driving population benefits from easier travel. Community transportation planners are able to use new technology where they need it. Researchers want to see research applications made available to travelers across the state, which is what we have been able to do in this cooperative project with the Laredo District. It works well for everyone involved.”



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*IH-35 and Mines Road Interchange in Laredo, Texas, is one of the country’s busiest locations for inland international trade. Increases in trade between the U.S. and Mexico mean increases in vehicular and railroad traffic in the border area. In an effort to reduce traffic delay, the Laredo District office of TxDOT is working with TTI staff in San Antonio and College Station to implement a train monitoring system.*

## Improving camioneta van service in Texas

Most passengers riding on commercial vehicle carriers presume they are safe. They assume the vehicle is mechanically sound, the driver is well rested and the company has a safety and operational procedures plan. For passengers riding on camioneta vans in Texas, though, the prospect of riding on a vehicle that meets none of the above criteria is very real.

Camioneta vans are 15-passenger vans that operate in a similar manner to a motor coach carrier in that they are carriers-for-hire, transporting individuals for a fee between predetermined points. The primary routes of camioneta vans originate along the Texas-Mexico border and lead to major cities including Houston, San Antonio, Dallas, Atlanta, New Orleans and as far north as Chicago. The major attraction of the camioneta is door-to-door pickup service, frequency of service and low costs.

The lack of information regarding commercial van operations (commonly referred to in South Texas as camionetas) in Texas prompted the Texas Department of Public Safety (DPS) to sponsor a study conducted by the Texas Transportation Institute (TTI). The study's objectives were to define the extent of border-area commercial van operations, determine the extent of safety problems associated with these operations and recommend strategies for communicating and enforcing the Federal Motor Carrier Regulations (FMCRs) that apply to camioneta operators.

In the past, the camioneta vans were exempt from complying with FMCRs regarding hours of service and driver qualification and testing because they carry 15 or fewer passengers. "They are doing the same thing a commercial bus operation does, but they do not have to meet the safety regulations that a traditional bus operation would have to meet with respect to driver qualifications and the

safety of the vehicles," says David Ellis, the TTI researcher in charge of the study.

The departure point for the vast majority of camioneta vans is on the United States side of the border, so the researchers conducted voluntary surveys at inland United States Border Patrol checkpoints. The results of the 64 vans surveyed indicated that the possibility exists for serious safety problems with camioneta van operations. The researchers made the following observations:

- high mileage on a majority of the vans
- poor outside appearance
- luggage not secured inside the vehicle
- seat belts not being worn or in good working order
- driver's stated travel plans made for a potentially unsafe amount of time driving

The Motor Carrier Safety Improvement Act of 1999 was passed in an effort to improve safety on our roads by requiring the Federal Motor Carrier Safety Administration to make its commercial vehicle safety regulations applicable to camionetas. Compliance became mandatory on July 13, 2001, and the researchers say the key to educating camioneta operators on FMCRs and to making current operations safer is to assure them the system will be fair and consistent.

Ellis says he believes the study was successful in providing a good starting point for the federal government to enforce laws, in providing statistics, and in giving an overall view of the whole industry. Written testimony before the Federal Highway Administration by Dudley Thomas, DPS director, emphasized the need for research that seeks to prevent accidents. "There are times when the government has to be proactive instead of reactive. We have to strive to prevent loss of life when the opportunity presents itself, instead of reacting to it."

*The study gave a good overall view of this industry, along with statistics, providing a good starting point for the federal government to begin enforcing laws.*



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*In the past, camioneta vans were exempt from complying with FMCRs, even though they were performing the same operation as commercial buses.*



# TTI helps obtain vans for colonia community centers

*In the United States, approximately 1,450 colonias along the Texas-Mexico border are home to 350,000 people. These rural settlements typically do not have water, sewer and electricity. Residents usually don't have access to education and medical care. They live isolated lives, largely due to the lack of transportation.*

In 1994, the Texas A&M University Center for Housing and Urban Development (CHUD) began a project designed to improve the lives of impoverished people living in colonias along the Texas border. The objective of the Colonias Program was to promote "community self-development," a concept by which the residents became involved in activities to improve the social infrastructure of the community. At the core of the program was an unmet need to provide residents with transportation to the community centers set up in the colonias and to other towns.

The Southwest University Transportation Center (SWUTC)—a joint effort of TTI, the University of Texas at Austin and Texas Southern University — joined with CHUD and funded a project to look at transportation issues and possible solutions. After evaluating the needs of the colonias, SWUTC developed a demonstration project to supply a 15-passenger van for transportation service for a community center in El Cenizo, a Webb County colonia.

The success of the pilot program prompted SWUTC and CHUD to approach the State Energy Conservation Office (SECO) to buy additional passenger vans for the established centers in the colonias. "Once the use of that one 15-passenger van proved to be a good idea in that community center, we approached the SECO to look into options for more vans in additional locations," says Kermit Black, director of CHUD. "We have replicated the approach of the pilot project many times now and are approved for the purchase of 31 vans."

Before a colonia with a community center can acquire a van, a local subcontractor must be identified to purchase a vehicle. The subcontractors, typically cities, school districts, counties and local organizations, are given a fixed level of funding to purchase a van and then assume ownership and responsibilities such as insurance, maintenance and operation of the vehicle. The subcontractors also provide operator and driver-related funding.

Bob Otto, program administrator with SECO, believes the program has been a big success. "A lot of these residents who don't have a vehicle now have the opportunity to become part of the community by being able to attend some of the community services at the resource centers," says Otto. "The resource centers are kind of a gathering place now for the people in that community."



Colonia residents who once lived isolated lives now have more choices. "This program gives the residents an alternative, so they can come to the center and access a van that will take them into town to see a doctor, get a prescription filled or buy groceries," Dock Burke, SWUTC director, says. "These transportation services help provide accessibility to many residents in colonias who would otherwise be isolated."

Additional funding to improve and build colonia roads should be available with the passage of Proposition 2 in November. This constitutional amendment will benefit colonia residents by supplying millions of dollars of in-state aid for road improvements.



*Before a colonia with a community center can acquire a van, a local subcontractor must be identified to purchase a vehicle, typically cities, school districts, counties and local organizations. The subcontractors then assume ownership and responsibilities such as insurance, maintenance and operation of the vehicle. The van pictured above was subcontracted by Lyford C.I.S.D. for the Martin Cavazos Community Center.*



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# MEASURING

# TIME

Free trade between the United States, Mexico and Canada is crucial to the success of the North American economy. Consequently, freight trucks crossing international borders need to do so with as little delay as possible. Unfortunately, with so many different operating agencies with so many different missions in the crossing process, delays are often lengthy. In response to this problem, and to the Government Performance and Results Act (which requires federal agencies to measure their performance), the Federal Highway Administration needed a performance measure and evaluation technique for the trans-

portation system at international border crossings between the United States, Mexico and Canada.

The Texas Transportation Institute (TTI), led by the Battelle Memorial Institute, began a project that focuses on measuring the time it takes freight trucks to cross the border. Specifically, which parts of the crossing process can local and state transportation agencies improve?

A key objective of the project was to develop a uniformly applicable measure of the performance of the North American border crossings that incorporates the following features:

- measures progress toward important transportation agency goals
- responds to measurement uses of inspection and transportation agencies
- communicates performance measure results clearly to audience
- remains consistent with the perceptions of border crossing users and operators
- illustrates the effects of potential improvements

TTI researchers have successfully developed a cost-effective procedure to collect data that tracks the length of time it takes vehicles to travel across the international border. The measure uses crossing time during lightly traveled time periods as a baseline measure. Crossing time during other hours of the day is compared to the low-volume time, and the difference is the amount of delay that the transportation agencies may have some ability to improve. The project used a method, also developed at TTI (see related story on p. 13), to collect vehicle data.

The procedures used in the study had to accommodate the reality that delays at most border crossings are not due only to deficiencies in existing infrastructure, such as the total number of toll booths or road lanes on either side of the border. Instead, delays also come from factors such as the number of tollbooths open, the hourly usage patterns and the traffic routing patterns in the constricted areas at most crossings. The performance measure and data can be used to study improvements such as

- encourage shippers to cross the border at times less traveled
- provide additional road space for truck queuing
- increase the number of inspection lanes open during busy portions of the day

## TTI Evaluates Delays at International Border Crossings

## Palmtop devices improve data collection at border crossings

Because the measure uses off-peak travel time as a baseline, it should be less sensitive to changes in inspection or security practices.

“The idea for this research comes from a need to measure performance of the movement of freight across borders. With the passage of NAFTA, border commerce has increased, and we wanted to investigate the issues that keep the border crossings from being as efficient as they could be,” says Bob Davis, project manager with the Federal Highway Administration (FHWA). “This study told us that each crossing has different issues to deal with in terms of maximizing efficiency.”

The U.S. Department of Transportation is using the measure TTI developed in its performance plan. Although data are being collected at some sites, it will take a couple of more years to gather enough data and computer modeling to get complete measures estimated for the major crossings at both borders. “I think DOT believes we’ve got a good measure and a good way to get the data,” says TTI researcher Tim Lomax. “It will be even better in a few years when the borders have more automated inspection and clearance technology that will allow us to electronically monitor the system performance all the time.”

Lomax believes the fallout from the terrorist attacks will have an effect on the time required to cross the border. “Historically, when Customs has a reason to be on alert, they always tighten up security, and everything takes longer,” Lomax says. “But given the importance of border crossings to the economy, maybe in the future there will be more resources given to doing effective inspections in a timely manner.”

Davis is confident the results of the research will help the FHWA determine what it can do to improve border crossing times. “Delays will probably increase as NAFTA traffic picks up,” says Davis. “This research will show us what works, does not work, and where we need to focus our resources.”



For more information, contact **Tim Lomax** at (979) 845-9960 or [t-lomax@tamu.edu](mailto:t-lomax@tamu.edu).



*As part of collecting vehicle travel times, surveyors use palmtop devices to gather license plate information on vehicles as they progress through border check points.*

A key task in measuring and evaluating overall travel time of vehicles crossing the border involves the actual collection of the needed data. Co-sponsored by the Texas Department of Transportation (TxDOT), this project’s main objective was not just to collect vehicle travel times, but also to develop an efficient and accurate methodology for gathering the data that could be used by consultants nationwide.

Rene Arredondo, the lead Texas Transportation Institute (TTI) researcher on the subtask, devised such a methodology for data collection that involves identifying vehicles at four sequential stations along both sides of the border crossing facilities. Each station has two data collection surveyors, one to read the license plate number and the other to input the information on a license plate number recording program installed in a personal data assistant (PDA) palmtop device. When the license plate of a vehicle is entered into the system, the information is date and time stamped. At the end of the study, the information gathered is downloaded onto a database that combines the information of all four stations and matches up the vehicles that were identified at multiple stations. The goal is to gather travel time information on the same vehicle as it progresses through each station and identify the delay associated with each segment.

“PDAs are increasingly being used as data collection tools for a variety of applications because of their versatility, low cost, and compatibility with desktop computer applications” says Cesar Quiroga, associate research engineer with TTI. “We have used PDAs for origin-destination and license plate number data collection in south Texas for several years and saw the license plate number data collection at the international border crossings as a natural extension of the type of things we do in that area,” adds Quiroga.

“There are thousands of commercial vehicles crossing daily through the border stations, so it’s not possible to collect information on each vehicle,” says Arredondo. “But with this system, you can potentially gather more information on a vehicle much more quickly and ultimately gather a higher number of sample points than if you would if you were trying to write down all this information manually.”

As a part of its joint project with TTI, Batelle Institute is currently using the method developed by Arredondo. “We wanted a system that we could run on a palmtop and interface with Windows,” says Mark Lepofsky, project manager with Batelle. “This process allows you to perform data collection and entry at the same time, which is an improvement over manually writing it down and having someone else transcribe the information.”

“The project was a big success. We were able to develop a simpler method of travel time data collection that any consultant could come in and use in a way that might even be standard throughout the nation,” Arredondo says.



For more information, contact **Rene Arredondo** at (210) 731-9938 or [r-arredondo@tamu.edu](mailto:r-arredondo@tamu.edu)

## Integrated border data **KEY** to improved operations

*A Texas Transportation Institute (TTI) project, sponsored by the Southwest Region University Transportation Center began last September to:*

- *identify agencies that collect relevant data on both sides of the border*
- *develop a system for compiling and accessing data*
- *produce metadata files describing data files in the system*
- *document technical and institutional challenges that impact data integration*

Lack of access to data showing operations on both sides of the border leads to an incomplete understanding of border needs. Transportation officials along the U.S. side of the border, for example, are often not able to identify transportation activity on Mexican transportation networks. Mexican transportation officials cannot know exactly what is occurring on U.S. transportation networks. This lack of integrated understanding has a negative effect on the capabilities of engineers and planners to develop systems that work well for everyone involved.

In fast-growing regions experiencing vast changes, like those along the U.S.-Mexico border, access to more complete data will give planners, engineers and decision makers a clearer understanding of ways to cope with growth and change.

“An integrated approach to collecting and analyzing transportation data along the Texas-Mexico border is critical to coordinated transportation operation systems in border regions,” says Cesar Quiroga, TTI associate research engineer and principal investigator on the project.

The Laredo/Nuevo Laredo region will serve as a pilot study site for data source identification, compilation, documentation and access. A graphic interface website will make access to the data easy through the use of maps and tabular data based on geographic information systems (GIS) information. Once information is compiled for online access, users will have the capability to view and query maps to derive information. Versatile graphic interface tools for the internet using GIS-based technology have been developed in earlier TTI projects, and

this project will use those tools to provide a visual representation of data.

“We want to build on what is already out there. This project adds transportation information to the base of geopolitical and economic information being collected by several regions,” says Lisa Dye, international transportation program engineer with the Federal Highway Administration. Dye notes that the addition of integrated transportation data from this project will not only supply vital information to those involved in border operations, but will provide an example of ways to make complex information easy to access.

In addition to consolidating existing knowledge about border transportation issues and making it available to users, the project will serve to strengthen working relations among government and research organizations in the two countries.

“We have already been in contact with the Instituto Mexicano del Transporte (IMT) to conduct a parallel project on the Mexican side for more complete integration of data. TTI has a cooperative agreement with IMT, and this project will give us a chance to work together and strengthen our relationship, as well as develop strong relationships with other Mexican agencies and organizations,” notes Quiroga.

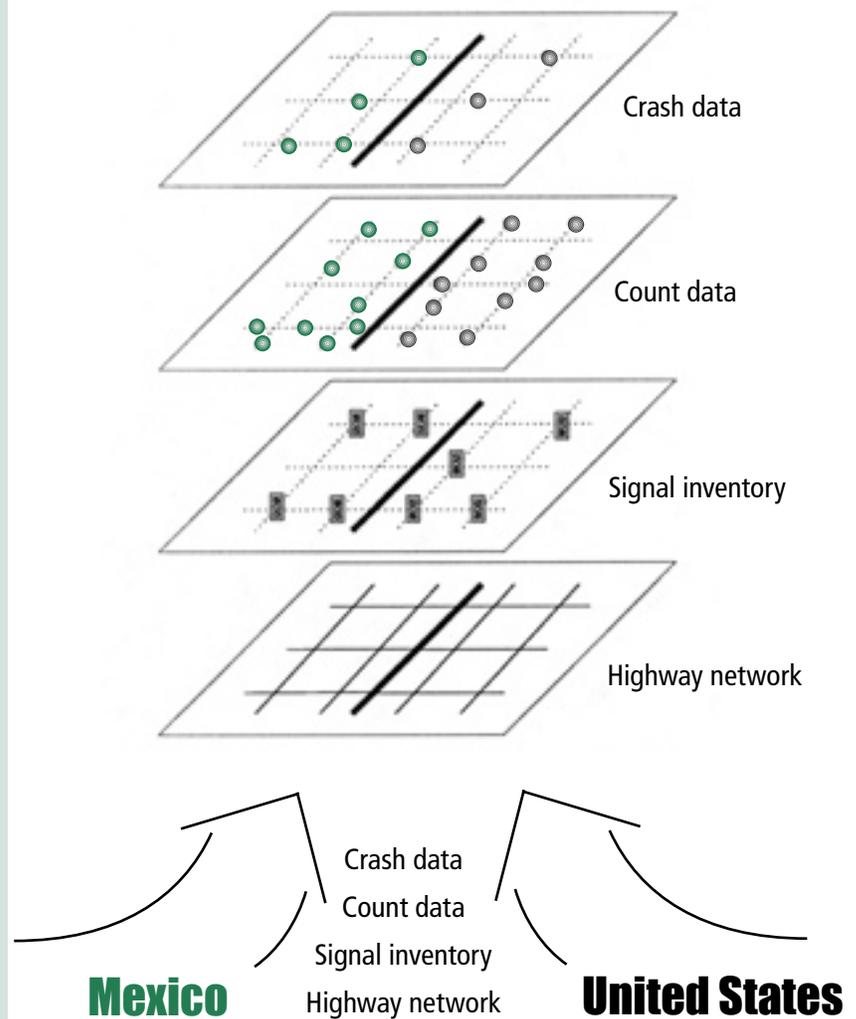
A large portion of the available data collected across the U.S. comes from state and federal highway systems. However, in many cities — including the Laredo area studied by this project — international traffic travels across many roadways owned and operated by other jurisdictions such as cities and counties. Researchers will work with these jurisdictions to locate and bring together their data and to evaluate and characterize its reliability and accuracy.

“We expect this project to provide a foundation for continuing work in transportation dynamics, with the ultimate goal of maximizing efficiency of the transportation system along the Texas-Mexico border region. This is particularly critical at this point given the impact that the events of September 11 had on border activity,” Quiroga adds, referring to the increased level of security and concern at borders following terrorist attacks on the U.S.



For more information, contact **Cesar Quiroga** at (210) 731-9938 or [c-quiroga@tamu.edu](mailto:c-quiroga@tamu.edu).

## INTEGRATED FRAMEWORK



*The integrated framework concept of this project pulls transportation data from a number of data sources on both sides of the border. A GIS-based interface layers the data into correlated graphic or tabular formats for easy access.*

# Selections from TTI's border publications over the last decade

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**EFFECT OF TELECOMMUNICATIONS DEREGULATION ON THE DEPLOYMENT OF INTELLIGENT TRANSPORTATION SYSTEMS IN TEXAS AND AT THE TEXAS-MEXICO BORDER – SUMMARY REPORT.** Pincus, M.L. Research Report TTI/ITS RCE-97/03. Texas A&M University ITS Research Center of Excellence, 1997.

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## ORDERING INFORMATION

A full catalog of TTI publications can be found online at <http://tti.tamu.edu/product/catalog>.

Include name and address of recipient. Prices include shipping and handling when mailed in the U.S. Texas residents are required to add 8.25% sales tax or enclose a tax-exempt form with the order. Send a check or money order (in U.S. funds and through a U.S. bank) payable to **Texas Transportation Institute** to this address:

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**KEESE-WOOTAN FELLOWSHIP PERMANENTLY ESTABLISHED**

The Charles J. "Jack" Keese - Charley V. Wootan Memorial Fellowship Fund recently met Texas A&M Foundation minimum requirements to permanently establish the fellowship. The Texas Transportation Institute (TTI) started the fund in partnership with the Foundation following the deaths of Director Emeritus Charley Wootan in March 2001 and Director Emeritus Jack Keese in April 2000.

Minimum requirements call for the collection of \$25,000 within 5 years. "The transportation community has been very supportive, and we're very pleased with the response from contributors," says TTI Deputy Director Dennis Christiansen. "The fact that we've reached minimum requirements in just 6 months is a testament to both Keese and Wootan and the impact they had on transportation research and education."

TTI will appoint a committee to develop selection procedures and criteria for this fellowship. The recipient will be a graduate student employed by TTI. While minimum requirements have been met, contributions continue to be accepted, and the size and number of fellowships awarded will depend on the ultimate balance in the account.

According to Doxie Wootan, "Charley had a lifelong commitment to education. He felt that everybody, no matter what their situation, deserves a chance to get an education. I can't think of anything that would have meant more to him. And I know Jack and Charley felt the same about education. That's why it's so fitting to name the fund in honor of both men."

Dot Keese said, "Jack was an engineer and an educator, and this is something that will last forever – he would have thought it was wonderful."

*Contributions can be sent to:*

**Keese-Wootan Memorial Fellowship Fund  
Texas A&M Foundation  
401 George Bush Dr.  
College Station, TX 77840**

*Or via the web site:*

**<http://tti.tamu.edu/keese-wootan.stm>**



*(l - r)  
Charley Wootan  
and wife Doxie with  
Dot and Jack Keese.*



*Dr. Dionel Avilés, P.E., vice chairman, Board of Regents, The Texas A&M University System and Texas Transportation Commissioner John Johnson assist Senator Steve Ogden as he presents two resolutions from the Texas Senate and House of Representatives.*

**75TH ANNUAL SHORT COURSE RECOGNIZED BY TEXAS LEGISLATURE**

The Texas Transportation Institute (TTI) and the Texas Department of Transportation (TxDOT) celebrated the 75th anniversary of their annual Short Course held traditionally at Texas A&M University every fall.

State Senator Steve Ogden attended the opening ceremony and presented two resolutions – one from the Texas Senate and the other from the House of Representatives. Both resolutions acknowledged the value of the TTI-TxDOT partnership and congratulated the agencies on the anniversary of that partnership. Senator Ogden reiterated his commitment to help improve safety on Texas highways by pushing to pass better laws, increase enforcement, encourage better living and driving habits, and secure better funding for our transportation system.

Also in attendance and speaking were the members of the Texas Transportation Commission Ric Williamson, Robert Nichols and John Johnson. The newest member, Williamson pointed to the importance of Proposition 15, which would allow bonds to be issued to pay for state highways. "It will give TxDOT and the commission an important tool to envision and create big solutions to transportation problems," said Williamson.

TxDOT's new Executive Director Mike Behrens spoke to the need for the department to maximize shared expertise, common interests and technical knowledge in order to implement new solutions and better serve the citizens of Texas. Also speaking were TTI Director Herb Richardson and Don Aviles, Vice Chairman of the Texas A&M University System Board of Regents.

**STOCKTON TO BECOME SECTION REPRESENTATIVE TO ITE, DISTRICT 9**



Bill Stockton, associate agency director for Texas Transportation (TTI), has been elected to the board of District 9 of the Institute of Transportation

Engineers as a section representative. Stockton, whose research focuses on public policy and decision support for public agencies, said his section representative appointment begins in January 2002.

Stockton brings more than 25 years of public policy and technical transportation experience to his appointment, and he will replace one of three outgoing section representatives.

**CHRISTIANSEN APPOINTED TO TRB RESEARCH AND TECHNOLOGY COORDINATING COMMITTEE**

Dennis Christiansen, deputy director of TTI, has been selected as a



member of the Transportation Research Board (TRB) Research and Technology Coordinating Committee. The purpose of this committee is to review federally funded highway

research activities and provide an independent assessment of research opportunities and priorities.

**THOMAS HEADS CENTER FOR PROFESSIONAL DEVELOPMENT**

Dr. Gary B. Thomas joined the Transportation Operations Group at TTI in June, becoming the new director of the Center of Professional Development. The Center's mission is to educate current and future leaders of the transportation profession, transfer technology and foster research that incorporates technology transfer and research implementation. The Center accomplishes this mission through workshops, seminars, career guidance, technology transfer and research.

Thomas has a diverse background in traffic and transportation engineering. While pursuing his undergraduate degree he interned with the Minnesota Department of Transportation for over two years. He has spent approximately five years as a private consultant with Lee Engineering in Phoenix, Arizona, and SEH, Inc. in St. Paul, Minnesota. Much of that time he was involved in traffic signal system design, traffic impact studies, geographic information system applications, signing and

striping design and transportation modeling. For three and a half years, he served as the first traffic engineer for the community of Gilbert, Arizona (a city of nearly 100,000 in the Phoenix area).



While at Gilbert, he procured funding for the design and construction of an advanced traffic management system and oversaw the design before he left. Following that, he joined the civil engineering faculty at Iowa State University in Ames, Iowa, where he taught courses in traffic engineering and airport planning and design. Working in the public, private and academic sectors has given Thomas a unique view of transportation engineering which he hopes to draw upon in achieving the goals of the Center.

**THOMPSON SELECTED AS 2001 'FRIEND OF TTI'**



In September, Chancellor Emeritus of the Texas A&M System Dr. Barry Thompson was selected as the 2001 "Friend of TTI."

As chancellor from 1994 to 1999, Dr. Thompson was particularly supportive of the needs of TTI. He provided invaluable help and assistance during legislative sessions, and within the Texas A&M System he was instrumental in working closely with the Texas Transportation Institute (TTI) to bring about the construction of badly needed infrastructure improvements for the Institute.

Over the years, a large number of people have provided significant support for TTI. Beginning in 1999, the Institute decided to formally recognize individuals who are remarkably supportive. The director and deputy director of TTI annually select the "Friend of TTI."

The first recipient of the recognition in 1999 was Bob MacLennan, then general manager of the Metropolitan Transit Authority of Harris County. Bob Lanier was given the award in 2000. Bob is a former chair of the Texas Transportation Commission and the Board of the Metropolitan Transit Authority of Harris County, and is a former mayor of the City of Houston. Both of these individuals have also contributed significantly to the programs and stature of TTI.

# Third Annual Forum on Public Health and Transportation Safety

## **Sponsored by:**

Texas Transportation Institute  
Texas Medical Center  
Texas Department of Transportation  
University of Texas School of Public Health  
Texas A&M School of Rural Public Health  
Highway Safety Research Center, University of North Carolina  
Traffic Safety Center, University of California, Berkeley  
American Road and Transportation Builders Association

**When?** The Forum is scheduled for March 12-13, 2002, at the Hornberger Conference Center in Houston, Texas. Attendance will be limited to 400.

**How do I register?** Physical arrangements for the Forum (e.g., hotels, meals, registration) are being coordinated by Texas Transportation Institute Conference Services in cooperation with the staff of the Hornberger Conference Center. For more information, contact Conference Services at (979) 862-1225 or <http://tti.tamu.edu/conferences/>

**What will be included?** Presentations on work zone safety, emergency medical services, pavement markings and the Center for Disease Control (CDC) "Guide to Community Preventive Services," among others. In the next few months, the committee and cosponsors will develop a final list of session topics and speakers.

**What is the purpose of the forum?** Transportation-related deaths and injuries constitute a major public health problem in the United States. If this problem is to be addressed effectively, the combined efforts of professionals from many different fields will be required: medicine, public health, engineering, education, enforcement and the social sciences. The Forum offers a stage for professionals with different perspectives to discuss transportation-related deaths and injuries. Through these discussions, the Forum serves to foster collegiality and collaboration among the different disciplines represented.



## THE BACK ROAD



In the aftermath of the tragedy of September 11, we are all more aware of the urgent need to ensure safe borders for our nation. At the same time, we know that cross-border commerce is an increasingly important part of the economy. Ensuring that goods move easily and quickly across our borders has to be balanced with national security and contraband

interdiction concerns. Those challenges face state and national government agencies, as well as the private sector.

TTI researchers have been working on several fronts to address some of these key border transportation issues. A joint TTI/CTR (Center for Transportation Research at the University of Texas at Austin) project created a model border crossing facility and process that would expedite binational trade without compromising security or efforts to interdict illegal drugs and other contraband. The model uses existing technologies and compares favorably to current infrastructure costs. Related research includes using personal digital assistants (PDAs) to collect vehicle data at border crossings, and a study of how to use transportation operations data through an easy-to-use GIS-based graphic internet platform.

Other border-related research efforts are directed at improving driver notification at highway-rail intersections along the border where both rail and vehicular traffic has increased significantly, and looking at the possible impact of privatizing the Mexican railroads on truck traffic crossing the border. Researchers are also looking at the overall efficiency of border crossings with Mexico. A more localized project has been the Southwest University Transportation Center's partnership with Texas A&M's Center for Housing and Urban Development to support transportation development for Colonias residents.

These are just a few of the highlights of this issue of the *Researcher*. I hope you'll find all the information useful and interesting and that you'll let us know if there are particular topics you'd like to know more about.

# Researcher

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