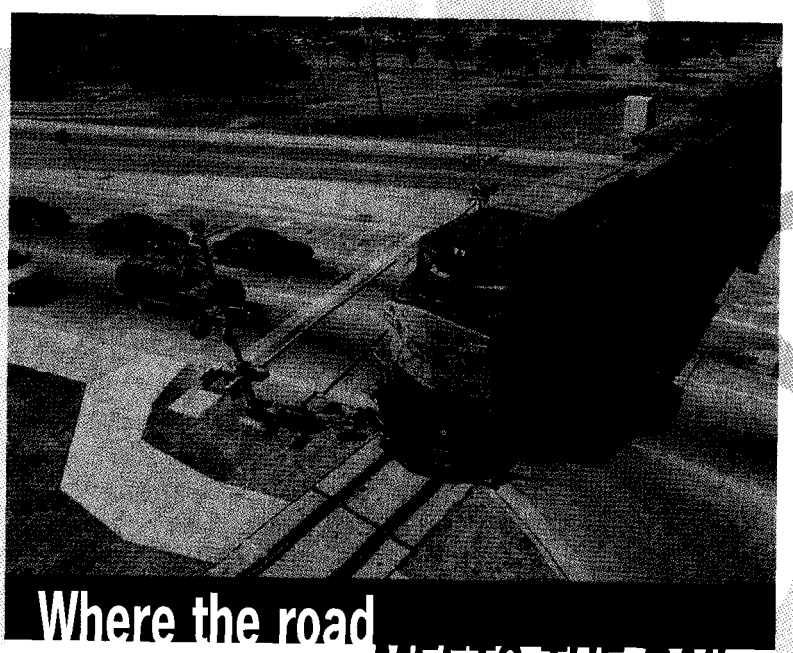
TEXAS TRANSPORTATION
Researcher
A Publication of the Texas Transportation Institute • Part of The Texas A&M University System • Vol. 35 • No. 2 • October 1999

INSIDE



Where the road MEETS THE RAIL

Even though crashes and fatalities have dropped by almost one-third over the past five years, there were still more than 430 deaths and 1,300 injuries caused by more than 3,500 train-vehicle collisions in 1998.

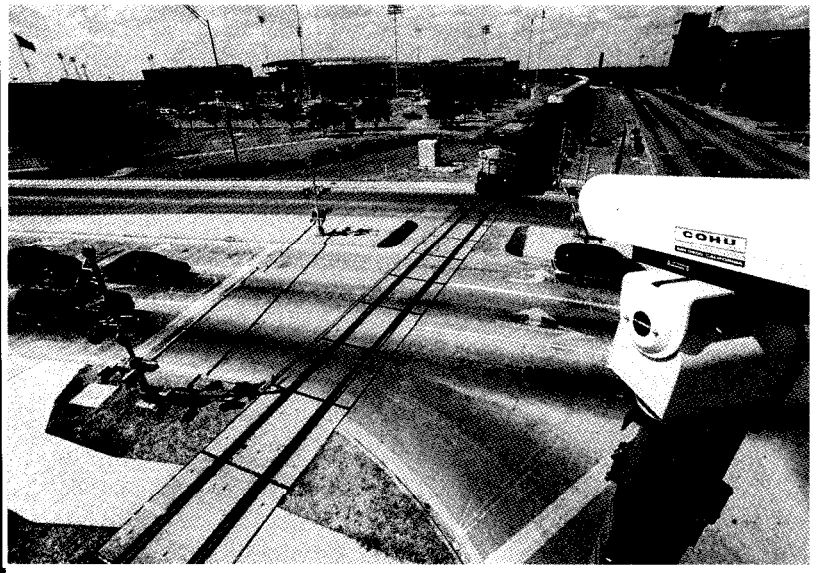
THERE ARE MORE than 3.9 million miles of road and 300,000 miles of railroad track in the U.S. Cars on these roadways and trains on these tracks interact daily at almost 260,000 public and private highway-railroad intersections (HRIs). Millions of drivers never see a train as they daily cross a public HRI.

But when trains approach a crossing, a number of events occur — at the intersection, on the track, and on the road. For many well-traveled public HRIs, these complex series of events take place to make

Continued on page 6

Caught on camera

With more than 12,000 public highway-rail intersection (HRIs) in Texas, it is not an easy task to police every location for potential violators. However, Texas Transportation Institute (TTI) research personnel are working to make that job a little easier by proving the feasibility of video detection technology in recording violations.



With successful automated enforcement programs being operated in a number of cities around the nation, TTI recently finished testing the feasibility of camera/video detection system usage at HRIs in Texas.

"It's not cost effective to have police officers patrol every crossing," says Kay Fitzpatrick, TTI associate research engineer. "By automating the monitoring of these crossings, transportation and law enforcement agencies can use technology to tell them who, when and where the problem are."

In 1995, the Texas Legislature passed a bill that required the Texas Department of Transportation (TxDOT) to install and operate automated HRI enforcement systems as a demonstration project. TxDOT enlisted TTI to facilitate the process.

The purpose of the demonstration project was to determine whether the current technology could adequately identify violations. After searching a database of all HRIs in Texas, Fitzpatrick, TTI assistant research engineer Paul Carlson and representatives of TxDOT selected three sites. Two vendors with experience in automated enforcement were selected to install equipment at the three sites.

The systems, once installed and activated, photographed vehicles driving under and around the gate arms. The images and information were sent to a processing center where a clerk confirmed the violation and recorded the license plate number and physical characteristics of the vehicle. The vehicle information was then sent to TxDOT's motor vehicle registration department, who in turn provided the vendor with information on the vehicle's owner. Depending on the site, the vendor or the police department mailed education letters to violators.

Fitzpatrick notes, "Many of the lessons learned during this project point to the need for active communication between all of the different agencies and organizations involved." For example, proper and timely deployment of the equipment needs clear discussions between railroad companies and vendors regarding the installation of the detection equipment. In addition, vendors need a clear understanding of the local law enforcement agencies' definition of a violation.

Another significant finding from this project was the identification of types of violations that exist at gated HRIs. Although not a prime focus of the project, the research team monitored 19 HRIs for a total of approximately 600 hours. Carlson says, "We were surprised to learn that on average, one violation occurs per gate activation?

While the project shed light on the potential of using automated systems at public crossings in Texas, Fitzpatrick notes that there is still work to be done. The issuance of citations and public reaction to mailed citations are two areas that still need to be studied. "Since this was a project to demonstrate the technology, these issues were not included," says Fitzpatrick. Citing other successful automated enforcement programs already in operation in cities around the nation, most notably Los Angeles, Fitzpatrick says, "Other projects around the nation, however, have demonstrated that automated enforcement can reduce violations and incidents at crossings? ●

For more information:
Contact: Kay Fitzpatrick
Phone: (409) 845-7321
E-mail: k-fitzpatrick@tamu.edu

Contact: Paul Carlson
Phone: (409) 8456004
E-mail: paul-carlson@tamu.edu

TTI center tests new train detection technique

For years, traffic management centers (TMCs) have been looking for a way to integrate train information into their day-to-day strategies. Train information would alleviate some of the headaches that can occur when the train crosses the highway-railroad intersection (HRI). However, according to Leonard Ruback, Texas Transportation Institute (TTI) associate research scientist, "Current rail and highway systems don't 'speak' to each other except at traffic signals near HRIs, and while this data exchange is sufficient for basic operation of the intersection, it's not very helpful for advanced management applications?

Using the city of College Station, Texas, and a six-mile stretch of its Wellborn Road rail corridor as a test bed, Ruback and colleagues from TTI are developing and testing a promising new technology — radio-frequency Doppler radar. Ruback says Doppler radar systems are a good choice because the systems provide a continuous stream of information, allowing direction and train speed to be recorded. The Doppler systems also have a long detection range, allowing the system to be installed alongside the railroad tracks but outside the railroad right-of-way.

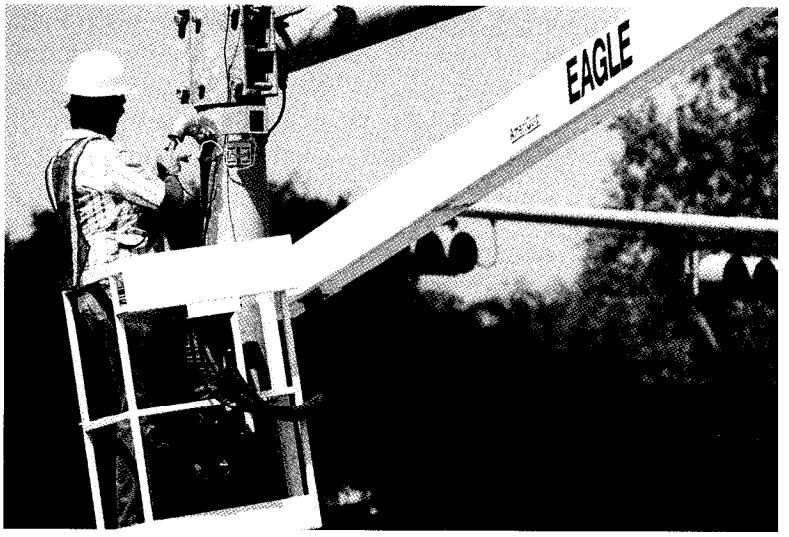
A data collection station provides power and communications for the Doppler system and real-time data feeds to the TMC — in this case the TransLink® Research Center. Ruback says that the data collection stations are designed to be self-sufficient — powered by a single solar panel. The data collection station is connected to TransLink using a corridor-wide wireless data network. "We chose solar power and wireless communications because this eliminates the costs associated with traditional power/telephone hookups — and allows a data collection station to be deployed anywhere," says Ruback.

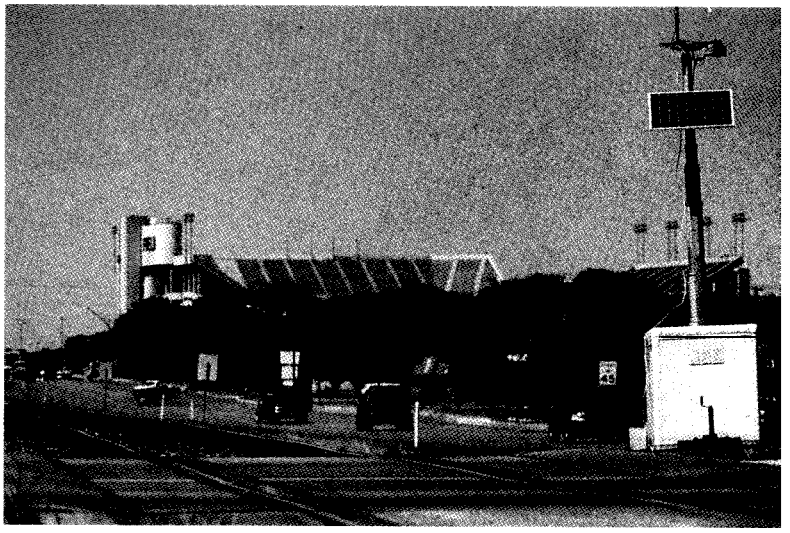
Ruback is currently developing a new technique for train detection that will provide train speed, direction, length and presence information from a single sensor — and that will be linked into a TMC. "Our goal is to explore alternative detection methods that will supplement or further enhance current vital systems in the field," adds Ruback.

After initial testing, data collection stations at HRIs along the Wellborn corridor now report train direction, speed and approach times to each of the selected HRIs. Now a train's approach is known from three to five minutes before it actually arrives at select HRIs in College Station.

Ruback says that this kind of advanced detection could be of great use to TMCs. For example, bus drivers can be given alternate routes when notified of an approaching train, keeping schedules tighter and on time. Using dynamic message signs, commuters can know where trains are and what options are available to them, preventing long lines of vehicles at HRIs. "Basically, we are trying to push the information out — making it available to the general public, giving them advanced knowledge," says Ruback.

The Internet also plays an important part in the research. All of the recorded train data is viewable over the Internet. "We want to make the data available for researchers who might want to use our test bed even though they may be across the country," says Ruback. "Plus, the Internet opens up a new channel for distribution of train data to people who need live feeds of data such as emergency services dispatchers or other transportation professionals:'





Mounted on traffic signal poles (top) and in portable trailers alongside railroad tracks (bottom), Doppler-radar systems are being tested as a supplement to current advanced train detection information.

For more information:
Contact: Leonard *Ruback*
Phone: *(409)* 862-4343
E-mail: *lruback@tamu.edu*

When every second counts

The call comes in to the dispatch — a fire. In one minute, the dispatcher takes the call and routes the information to the appropriate fire station. One minute later, firefighters are equipped and the truck is rolling. With the new fire station, the travel time to most emergency scenes in the city of College Station, Texas, will be 4.5 minutes or less.

For College Station, the addition of a new fire station means quicker response to fires and emergency situations. However, each fire station faces an element that could make the difference between a house on fire and a pile of ashes — a highway-railroad intersection (HRI). For example, according to College Station's recent redrawing of fire district lines, the newly constructed Fire Station #4 now sits across the railroad tracks from most of its district, including the 5,200 acres and 100-plus buildings that make up Texas A&M University's campus. If a train enters the HRI while the fire truck or ambulance is en route, 4.5 minutes could become 7 minutes or longer — all because they did not know that the train would be at the HRI.

And this is not a small inconvenience. 'On a busy day,' approximately 20 trains will pass through College Station. Combined, those trains will block the road that serves as Fire Station #4's principal fire track route for almost an hour each day. However, emerging technology being developed at the Texas Transportation Institute's (TTI's) TransLink" Research Laboratory has the capability to make the travel time and travel routes of fire trucks and ambulances shorter and train free.

According to Eric Hurt, College Station Fire Department assistant fire chief, the idea of train monitoring came up while working with TransLink on traffic signal preemption. "I told them that I wished there was a way to preempt trains, not so much to give us right-of-way but to know ahead of time when they would be there," says Hurt.

As it happened, TransLink has been working on a radio-frequency Doppler radar system that monitors trains along College Station's portion of the Wellborn corridor. At the time, they were first testing the system and were able to tell when trains were approaching or leaving an HRI.

Now, TransLink personnel are finishing up the coding and testing of a graphic display interface that converts the data stream into a more user-friendly and visual format. The display shows the speed of the train, its distance from each HRI along the Wellborn Road corridor, its estimated time of arrival (ETA) and estimated time of departure (ETD) from each intersection. According to TTI assistant research scientist Leonard Ruback, the information this system provides will let firefighters be more proactive and predictive in choosing a route, rather than reactive to what is currently happening or has happened.

The first step, Ruback and Hurt believe, is to put the system on a laptop for use at the fire station. "By putting it in the fire station, we can begin to build awareness of the system as well as confidence in the information that it provides," says Ruback. "Plus, the firefighters will be able to give us better feedback as they use the technology and information

Hurt agrees that the system needs to be put first in the fire stations to get firefighters used to the system. "Firefighters must have confidence in and be able to trust their equipment — and even more so with new technology," says Hurt.

The second step would be to wire the information into the dispatch center to further increase reliability. This will allow fire trucks from nearby fire stations to be dispatched should a train block an emergency or fire response route. Knowing the ETA and ETD of trains at all of College Station's HRIs, dispatchers can send other trucks along clear routes by crossing HRIs already passed or yet to be entered by the train. 'There are so many things to consider because of the train — we can't make the tracks an imaginary dividing line for how we dispatch our vehicles," says Hurt.

Continued on page 10

Assistant Fire Chief Eric Hurt (left) and TTI researcher Leonard Ruback (right) are looking to use advanced train information gathered from Doppler radar systems to help plan travel routes for fire and emergency vehicles in College Station, Texas.

Every second, continued from page 4

Ultimately, as the city grows or in other cities, a computer could be mounted on board the fire truck or ambulance and be fed real-time location information. The computer would serve as a live connection between the truck, the dispatcher and incoming train approach information.

Both Hurt and Ruback agree that the time and safety benefits could be tremendous. "The quicker we can get there, the better job we can do, but the shortest distance is not always the quickest," says Hurt. "And time is always critical:'

For more information:

Contact: Leonard Ruback

Phone: (409) 862-4343

E-mail: lruback@tamu.edu