

TEXAS TRANSPORTATION

Researcher

A PUBLICATION OF THE TEXAS TRANSPORTATION INSTITUTE ■ MEMBER OF THE TEXAS A&M UNIVERSITY SYSTEM ■ VOL. 42 ■ NO. 2 ■ 2006



In the eye of the storm

TTI research prepares our urban areas

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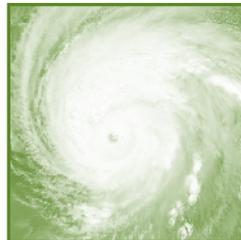
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ON THE COVER: Hurricane Rita as seen over the Gulf of Mexico. Image courtesy of MODIS Rapid Response Project at NASA/GSFC.



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Researcher

A PUBLICATION OF THE TEXAS TRANSPORTATION INSTITUTE and MEMBER OF THE TEXAS A&M UNIVERSITY SYSTEM

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Texas Transportation Researcher is published by the Texas Transportation Institute to inform readers about its research, professional and service activities. Opinions expressed in this publication by the editors/writers or the mention of brand names does not necessarily imply endorsement by the Texas Transportation Institute or The Texas A&M University System Board of Regents.

Texas Transportation Researcher (ISSN 00404748) is a quarterly publication of TTI Communications, Texas Transportation Institute, The Texas A&M University System, 3135 TAMU, College Station, Texas 77843-3135. For more information or to be added to the mailing list, contact the address below, call (979) 458-8834 or e-mail Nancy Pippin at n-pippin@ttimail.tamu.edu. Periodicals postage paid at College Station.

TTI.RESR0603.0706.3850

POSTMASTER, PLEASE SEND ADDRESS CHANGES TO:

Texas Transportation Researcher
TTI Communications
Texas Transportation Institute
The Texas A&M University System
3135 TAMU
College Station, TX 77843-3135

TTI officially opens El Paso office

The Texas Transportation Institute (TTI) has taken its long-standing commitment to the El Paso region to a higher level with the official opening of its full-time office.

Local and state leaders joined TTI staff on April 13 to welcome more than 60 guests to the Institute's newest office, which houses the Center for International Intelligent Transportation Research. State Senator Eliot Shapleigh of El Paso, who sponsored the appropriation that established the new Center, noted during the open house ceremony that TTI's presence would help improve transportation not only for the West Texas region, but for cities all along the U.S.-Mexico border.

"Free trade depends on the safe, smart and fast movement of people and products around the world, but especially across borders," says Shapleigh. "Our new center will be a world leader in critical new technologies on how to make that happen."

Earlier this year, TTI established a regional division at the University of Texas at El Paso to facilitate collaboration with students and faculty in transportation. TTI Director Herb Richardson notes that the new office and Center would result in an even stronger commitment to efficient transportation in the region, and to educate future transportation leaders.

TTI will focus its El Paso-based efforts in three areas:

- Transportation operations, directed by Russell Henk — Work focuses primarily on TransVista traffic management center assistance, courtesy patrol operations improvements, managed lanes operations and Teens in the Driver Seat, a peer-to-peer driving safety initiative.
- Border crossing issues, directed by Bill Stockton — Work centers on facilitating and evaluating

implementation of express lanes at border inspection facilities, developing an international border crossing protocol, measurement of port-of-entry travel times, support for the U.S. Department of Homeland Security and development of an automated freight shuttle.

- Air quality issues, directed by Brian Bochner — Work focuses primarily on the study of emission rates for refuse trucks and drayage trucks, and efforts to enhance emissions modeling for Texas by the U.S. Environmental Protection Agency.

Joining Richardson and Shapleigh in marking the occasion were: Leo Sayavedra, A&M System Vice Chancellor; Barry Benedict, UT-El Paso Dean of Engineering; and Ted Houghton, Texas Transportation Commission member.

Research Scientist Rafael Aldrete-Sanchez heads TTI's El Paso office, located at 4050 Rio Bravo, Suite 151. The staff can be contacted at 915-532-3759. 

"Free trade depends on the safe, smart and fast movement of people and products around the world, but especially across borders. Our new center will be a world leader in critical new technologies on how to make that happen."

State Senator
Eliot Shapleigh, El Paso



Gathering at the El Paso office open house were Rafael Aldrete-Sanchez, Herb Richardson, Senator Eliot Shapleigh and Barry Benedict.

Texas Transportation Forum

Inaugural Forum highlights past and future transportation challenges



Photo courtesy of TxDOT.

Opening Session had a full house in attendance for the Texas Transportation Forum in Austin.

The first Texas Transportation Forum, sponsored by the Texas Department of Transportation (TxDOT), and co-sponsored by the Texas Transportation Institute (TTI), the Associated General Contractors of Texas, and the Texas Good Roads and Transportation Association, was a rousing success attracting 1,334 participants from nine states and the countries of Spain, Costa Rica and Canada. The forum featured keynote speeches by the Texas Governor, Secretary of the United States Department of Transportation and the Texas Secretary of State. The TTI-produced video about the history of the Interstate Highway System was introduced in the opening session by TTI Deputy Director Dennis Christiansen.

The 50th Anniversary of the Interstate Highway System set the mood for the two-day event June 8-9 at Austin's Hilton Hotel. "We'll never know where we're

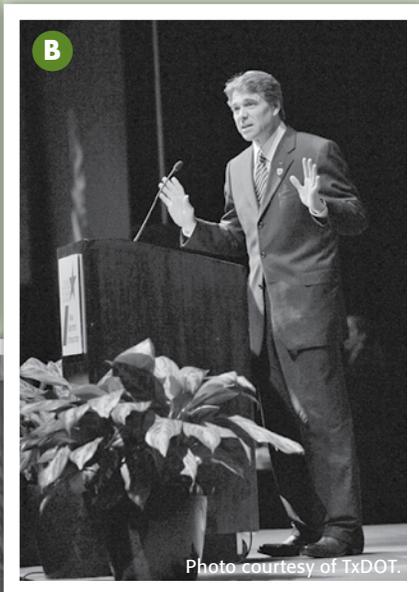
going if we don't know where we've been," the Executive Director of TxDOT Michael Behrens told the crowd gathered in the Hilton's Governor's Ballroom. "The reason we are here is obvious—Texas is facing some great transportation challenges and requires solutions that can only be achieved with collaboration and teamwork."

Those transportation challenges dominated the speeches and breakout sessions during the Forum. Topics covered included funding issues and the use of public-private partnerships, congestion problems, the future of road building, Regional Mobility Authorities and the Trans-Texas Corridor.

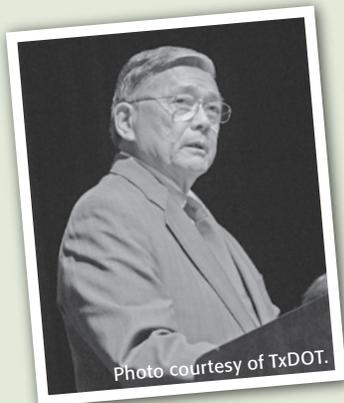
During his keynote address, Governor Rick Perry drew comparisons between the critics 50 years ago of the Interstate Highway System plan and the critics today of the Trans-Texas Corridor. "There are two kinds of people in this world: those who say it can't be done, and those who are busy getting it done. The people in this room are getting it done," says Perry. **R**



A) Lawrence Olsen, Executive Vice President, Texas Good Roads Transportation Association addresses forum attendees at the Road Hand Award Luncheon.
B) Texas Governor Rick Perry.



C) Ric Williamson, Chair, Texas Transportation Commission.
D) Roger Williams, Secretary of State, Texas, sends attendees off to do good work at the Closing Session.
E) Hope Andrade, Commissioner, Texas Transportation Commission.



The Honorable Norman Y. Mineta, Secretary, United States Department of Transportation addresses the forum at the Road Hand Award Luncheon.

Mineta Urges Partnerships to Fight Congestion

According to the U.S. Transportation Secretary, Texas is “well ahead of the curve” when it comes to finding new ways to fund highway construction to ease congestion. The Honorable Secretary Norman Mineta was the keynote speaker for the opening luncheon at the first Texas Transportation Forum. Mineta spoke to more than a thousand attendees three weeks after announcing a national initiative to fight the congestion that “costs the nation 2.3 billion gallons of wasted gasoline and \$200 billion for Americans every year.”

Mineta urged the use of public-private partnerships to fund new highway construction. Earlier in the day, Mineta toured a section of the Central Texas Turnpike with Governor Rick Perry that is planned to open a year ahead of schedule and \$400 million under budget. The governor says the accelerated completion date is thanks to the public-private partnership funding mechanisms authorized by the legislature and approved by voters in 2001. **R**

Johnson becomes first 2006 Hall of Honor inductee

- A) (L-R) Michael Behrens, Mark Goode, Mark Stiles, Luther DeBerry, Tom Johnson, Robert Lanier, Doug Pitcock, Arnold Oliver and Ray Stoker.
- B) TxDOT Executive Director Michael Behrens.
- C) Former Houston Mayor Bob Lanier speaks at Tom Johnson's Hall of Honor induction ceremony.



Tom and Kay Johnson pose beside his Hall of Honor plaque.

The executive vice president of the Associated General Contractors (AGC) of Texas was inducted into the Texas Transportation Hall of Honor during a ceremony at Austin's Dewitt C. Greer Building held June 7. Thomas L. Johnson Sr. became the 21st person inducted into the Hall of Honor since it was established in 2000.

"Tom Johnson's work with highway commissioners and state and federal elected officials, as well as the executive branch of government, has helped give the construction industry in Texas the best market and working conditions in the nation," TTI Deputy Director Dennis Christiansen says in announcing Johnson's induction. "Past, present and future Texans owe many thanks to Tom for the impact he's had on our great state."

Three other 2006 inductees will join Johnson in the Hall of Honor during ceremonies this year. They are Gordon Bethune of Continental Airlines, Cyrus R. Smith of American Airlines and John F. Strickland, an interurban rail industry pioneer. **R**

HALL OF HONOR TEXAS TRANSPORTATION

2006 INDUCTEES



GORDON BETHUNE

Gordon Bethune earned worldwide acclaim at Continental Airlines for spearheading one of the most dramatic corporate turnarounds in U.S. history. Bethune joined Continental Airlines as president and chief operating officer in 1994. He was named chief executive officer in 1994, and was elected chairman in 1996. Bethune served in those capacities through 2004.

In 1994, Continental ranked last in every measurable performance metric. Under his leadership, and recognizing the employees' hard work, Continental won more customer satisfaction awards from J.D. Powers and Associates than any other airline. *Fortune* magazine named Continental among the "100 Best Companies to Work for in America" for six consecutive years.

Business Week named Gordon one of the top 25 global managers for 1996 and 1997. He was ranked among the 50 best CEOs in America by *Worth* magazine from 1999-2001. A native Texan, Gordon Bethune was inducted into the Texas Aviation Hall of Fame in 2003. In 2004, the Wings Club honored Gordon with the Distinguished Achievement Award.

Continental Airlines has its corporate headquarters in Houston and operates a major hub with some 500 flights per day at George Bush Intercontinental Airport. ■



THOMAS L. JOHNSON SR.

Tom Johnson (A&M '59) is a native of Ysleta, Texas. He has worked for the Associated General Contractors of Texas since 1967 and has served as executive vice president since 1970.

His work with highway commissioners, state and federal elected officials, as well as the executive branch of government has helped give the construction industry in Texas the best market and working conditions in the nation. His many professional accomplishments were recognized by the American Road and Transportation Builders Association which named him one of the "Top 100 Private Sector Transportation Professionals of the 20th Century."

Mr. Johnson's years of dedicated public service at all levels culminated in his appointment by the Secretary of the Interior to the National Park Foundation Board, made at the request of President George W. Bush.

If asked about his greatest accomplishments, Tom quotes the following poem of unknown source, "One hundred years from now it will not matter what kind of house we lived in, how much money we had, or what my clothes were like. But the world may be a little better because I was important in the life of a child." ■



CYRUS R. SMITH

A native Texan, Cyrus Smith was born in Minerva in 1899 and attended The University of Texas at Austin.

Smith became president of American Airlines in 1934. Over the next five years, he consolidated American's route structure into a smooth, sensible network and standardized the company's heterogeneous collection of airplanes with a fleet of new DC-3s. By 1941, Smith had helped American become the leading domestic carrier in the United States. As he led American Airlines for the next 34 years, he helped shape the entire airline industry.

He was an aviation pioneer, entering the airline business in the days of open-cockpit biplanes. During World War II, Smith served in the Army Air Corps, helping to organize the Air Transport Command and rising to the rank of Major General.

By the end of the 1940s, American was the first airline to operate a fleet of all pressurized, air-conditioned, post-war produced aircraft. Later, he led American into the jet age with the introduction of the first transcontinental jet service on January 25, 1959. Throughout the 1960s, Smith led the effort to construct DFW Airport. In 1968, President Johnson named Smith as his Secretary of Commerce. ■



JOHN F. STRICKLAND

Born in 1860, Colonel J. F. Strickland traveled to Texas by wagon train in 1878. Strickland would create in central and north Texas the largest interurban rail system in the Southwestern United States.

In 1892 the Colonel became involved in electric power generation in Waxahachie. He would become president of companies such as the Texas Power & Light Company and the Dallas Power & Light Company.

Construction of interurban railroads was a complementary function of many electric power companies. These railroads had a tremendous impact on both travel and development patterns.

In 1908, a Strickland company began interurban service from Dallas to Sherman, at the time the longest interurban line in the Southwest. It would soon be extended to Denison and the Red River. In 1912, service from Dallas to Waxahachie was initiated, and was extended to Waco in 1913. In that same year the Dallas to Corsicana interurban opened. In 1917, Strickland merged his Southern Traction Company and his Texas Traction Company to create the Texas Electric Railway Company.

Colonel Strickland's vision, talent and persistence made him the outstanding figure in the electric utility business in the Southwest and a master interurban builder. ■

TTI Council convenes in College Station

Graham Hill visit highlights annual meeting



The 2006 TTI Council poses in front of the plaques commemorating the Texas Transportation Hall of Honor recipients.

“The background and experience these council members bring to the table is invaluable to TTI. In forums like this one, we receive the benefit of their vast knowledge and experience that helps guide the institute in effectively planning our research program.”

TTI Deputy Director
Dennis Christiansen

The Texas Transportation Institute (TTI) Council held its annual meeting in College Station on May 30-31 at the Gilchrist Transportation Research Building. The council is comprised of distinguished, high-level transportation professionals from across Texas. TTI draws on the expertise and guidance of the council in the development and conduct of its programs.

The annual meeting started with an evening reception at the Gilchrist Building. TTI researchers provided a tour of the TransLink Laboratory and highlighted recent research projects applying advanced technologies to address critical transportation issues.

The next morning David Cain, the chair of the TTI Council, welcomed the members and introduced Tim Ward, president of Alliance Air Services, as the newest member of the council. TTI Director Herb Richardson delivered an overview and update on TTI activities.

The morning session was rounded out with presentations from TTI researchers. The presentations covered many areas of transportation research including mobility monitoring, homeland security, tolling, air quality and border crossings. TTI's Roger Bligh completed the presentations with an array of crash testing video clips taken

- A) Tim Ward, president of Alliance Air Services, is the newest member of the TTI Council.
- B) TTI's Dan Middleton (left) and council member Bob Jones.
- C) Graham Hill, the majority staff director for the House Transportation and Infrastructure Committee, gave a speech during lunch on the significance of recent and future federal legislation.
- D) (L-R) TTI's Leonard Ruback and Kevin Balke; council members Arnold Oliver and Thomas Kornegay.
- E) TTI Council members were given a tour of the TransLink Research Laboratory during a reception at the Gilchrist Building.

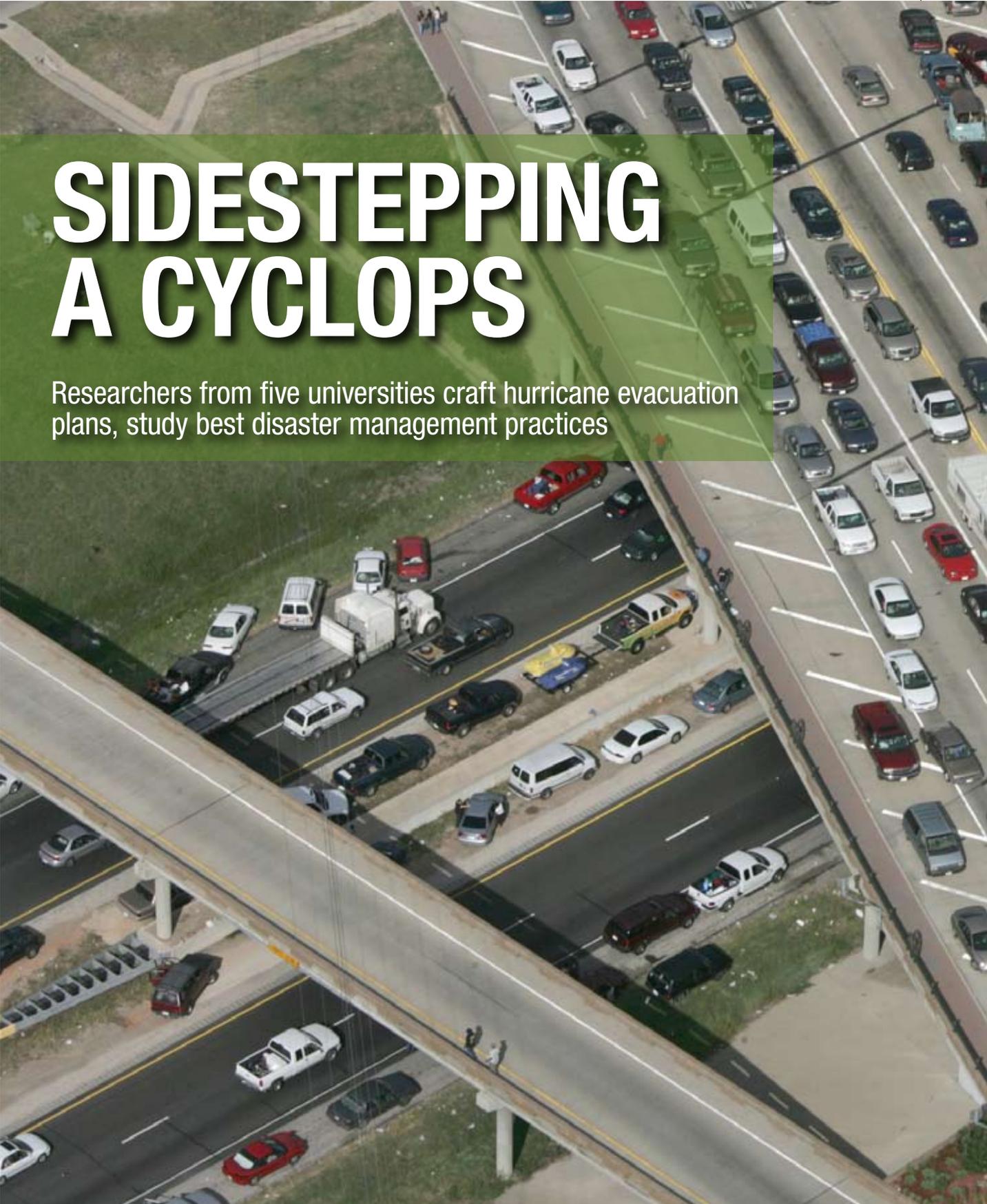


over a 40-year span at the Riverside Proving Grounds Facility.

The highlight of the day was the luncheon speaker, Graham Hill, the majority staff director for the House Transportation and Infrastructure Committee, United States Congress. Hill spoke on the significance of recent and future and federal legislation. While he noted that the Safe, Accountable, Flexible, Efficient Transportation Equity Act — A Legacy for Users (SAFETEA-LU), passed in 2005, was a “historic piece of surface transportation funding,” he cautioned about future challenges facing transportation funding. He suggested that the gasoline tax revenue may not be sufficient to sustain a viable highway trust fund by 2009. Hill was one of the key authors of SAFETEA-LU.

After lunch, the council shared thoughts and ideas about critical issues in transportation. Key research needs suggested by members included financing options for all modes, public/private partnerships to construct and operate roads and transit systems, intermodal linkages, economic impacts of toll facilities, freight and goods movement, aging infrastructure and border transportation and security.

“The background and experience these council members bring to the table is invaluable to TTI,” notes TTI Deputy Director Dennis Christiansen. “In forums like this one, we receive the benefit of their vast knowledge and experience that helps guide the Institute in effectively planning our research program.” **R**



SIDESTEPPING A CYCLOPS

Researchers from five universities craft hurricane evacuation plans, study best disaster management practices

Hurricane Rita evacuees jam Interstate 45. About 96 percent of evacuees fled by car, and 18 percent of them headed north on I-45, making it the area's most-used freeway during the flight to safety.



THE GREEK MYTHOLOGICAL CYCLOPS WAS A GIANT WITH A SINGLE EYE IN THE MIDDLE OF ITS FOREHEAD. THE MONSTROUS TITAN INHABITED SICILY AND HAD BUT ONE MAIN TASK—TO FORGE THUNDERBOLTS FOR ZEUS.

In late 2005 when residents along the Gulf Coast faced the one-eyed monster hurricanes Katrina and Rita, they endured much more than thunderbolts hurled from above.

Katrina came ashore on August 29 packing winds of 140 mph, devastating New Orleans with a storm surge that destroyed the protective levees around the city, and torrential rains and high winds in parts of Mississippi. Thousands of residents fled to Texas, where 27 days later hurricane Rita slammed the state with 120 mph winds and a storm surge in Texas and Louisiana of 15 feet.

The year 2005 marked the first time in recorded history that two hurricanes reached Category 5 strength in the Gulf of Mexico in the same season, and Rita went down as the strongest hurricane measured on record. While cleanup began and states helped the people of the Gulf Coast pick up the pieces of their lives, work was already underway—and had been for years—on Texas' comprehensive evacuation and disaster management plan.

June 1 marked the beginning of the 2006 hurricane season, which lasts through November. Thanks to research sponsored by the Texas Department of Transportation (TxDOT), the state stands ready to move Texans out of harm's way—and our neighbors too, if need be.

Responding to Rita

Russell Henk, a Texas Transportation Institute (TTI) research engineer and division head, is spearheading a team of researchers from eight entities at five different universities that is studying disaster preparedness in Texas. TxDOT's new Government and Business Enterprises Division (GBE) sponsored the team's disaster

The Disaster Preparedness Study Team:

- Texas Department of Transportation
- Texas Transportation Institute
- The Center for Transportation Infrastructure Systems, University of Texas at El Paso
- Prairie View A&M University
- Texas Southern University
- University of Texas at Austin, Center for Transportation Research
- University of Texas at Austin Center for Space Research
- University of Texas at Austin, McCombs Business School
- The Hazard Reduction and Recover Center at Texas A&M University

preparedness study, which encompasses freeway contraflow lane plans, surveys, policy recommendations, and public outreach.

“We’re excited about the diverse team of experts TTI has worked hard to assemble, and the solid progress the team has made to date,” says Tonia Ramirez, Manager of GBE Division’s Research Section, who is TxDOT director on this project. “If the near-term results of this research can help us educate the public to make an informed decision in preparation for natural and man-made disasters, we can really help TxDOT and our state improve operations during future evacuations. We’re hoping to couple these near-term results and recommendations with some other innovative and long-term thinking to help the state better serve its citizens before, during, and after future disasters.” The study expands on strategies developed by a taskforce assembled by Governor Rick Perry, and to which Henk was appointed.

The “wrong way” on roads, done right

Researchers at TTI have been studying hurricanes and related evacuation techniques since 1999, when hurricane Bret struck south Texas. It was the first major hurricane in a decade to hit the Texas coast, and it resulted in a formal contraflow plan to reverse the flow of traffic on I-37 so all lanes travel outbound from Corpus Christi for approximately 100 miles.

“TxDOT, the Department of Public Safety (DPS), and a lot of TTI staff have done a great deal of work since Hurricane Rita,” says Henk. “We’re in significantly better shape than we were at the beginning of last hurricane season.”

According to Henk, one of the keys to contraflow is to control entry and exit points along major roadways, like I-10, I-45 and I-37. He says contraflow is not a “one size fits all” panacea for all public roadways.

“You don’t just want one entry point and one termination point, because those become major choke points,” says Henk. “You want 2 or 3 entry points and multiple exit points to bleed off demand prior to contraflow ter-

mination—something we determined six years ago in our work that has now become the recognized national best practice. You also have to plan for where to fuel up vehicles—called ‘keeping the routes wet’—and how to get supplies to people on evacuation routes.”

One idea being studied is a ‘mega’ comfort station concept. With leadership from TxDOT’s GBE division, researchers are studying private/public partnerships that could result in placing businesses that produce and/or distribute gasoline, bottled water, pharmaceuticals, and other vital supplies and products in centralized locations along evacuation routes.

“Tax abatements or other incentives could motivate companies to build facilities along major evacuation corridors,” says Henk. “The advantage to this idea is that 99 percent of the time these companies function as a normal business that routinely turns over its inventory, keeping everything fresh. In an emergency situation these companies could stand ready with essential items people need when they flee their homes and become stranded or have special needs en route.”

Asking those who were there...

The research team is also conducting post-Rita surveys that Henk says will result in the most thorough post-event assessment for a hurricane in Texas history. Thousands of coastal Texans are being surveyed to learn where they headed when Rita struck, how much their evacuation cost, and where they might go, if anywhere, when the next storm strikes. The comprehensive results will be used in each of the other components of the overall GBE sponsored study.

Head out or hunker down?

“While contraflow is an important evacuation strategy, it’s also important for residents to know if they might be safer sheltering in place,” says Henk. “We learned with Rita that two out of three evacuees had no life-threatening need to leave. They incurred costs, wasted time, and stress at the family level that was not really necessary.

Billion Dollar Storms*

The United States has endured 67 weather-related disasters between 1980 and 2005 with overall damages and costs that reached or exceeded \$1 billion. In 2005 alone, hurricanes Katrina and Rita accounted for two multi-billion-dollar disasters. Rita struck the Gulf Coast within 27 days of Katrina.

2005 HURRICANES	KATRINA	RITA
Date of landfall	August 29, 2005	September 24, 2005
Category at landfall	3	3
Wind speed at landfall	120 mph	125 mph
Number of deaths	Unknown—more than 1,300	119
Damage	\$100 billion+	\$8 billion+
Storm surge	25 ft.	15 ft.

*Information compiled from NOAA.

Public outreach and solid information in the media will help the citizens most at risk know when they should leave and where they should go, as well as those who can safely shelter in place understand how and why to do so.”

TxDOT is working with the research team to develop prototypes of public outreach and information materials, including brochures, informative radio and television announcements, and comprehensive, real-time disaster information for the internet.

“A strong public outreach strategy is designed to get people thinking about situations and decisions they may face in a real emergency. A focused outreach and education program gives people access to easy-to-remember tools and methods for making decisions and preparing for a potential evacuation,” says Rob Robideau, director of TTI communications and a member of TTI’s GBE study team. “The more information we can get to the public before they are threatened with a real emergency, the better prepared they will be to make informed decisions based on safety instead of panic, including the need to evacuate or shelter in place.”

The GBE-sponsored study wraps up in December of 2006, though a related “best practices” study being conducted by research engineer Andy Ballard continues through next summer.

Best practices, better prepared

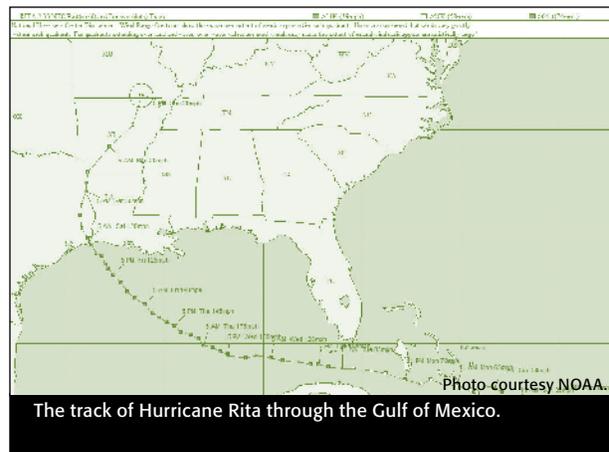
Ballard’s work on hurricanes and disaster preparedness, TxDOT project 0-4962, has expanded from developing guidelines for hurricane evacuation signing and markings along roads to a broader scope of studying best practices for evacuations.

“This important project has led to immediate, implementable results that will make a significant difference in preparing for future evacuations,” says Sally Wegmann, director of transportation operations for TxDOT’s Houston District.

The major elements of the research include:

- identifying best practices for traffic operations during hurricane evacuations,
- asking residents and other stakeholders questions in focus groups to see what issues may exist with evacuation signing and markings,
- assisting TxDOT with contraflow planning, and
- developing guidelines for hurricane evacuation signs and markings.

“The normal situation is a four-lane rural expressway, with two lanes headed inland and two heading toward the coast,” says Ballard. “Contraflow sends traffic outbound along all lanes. When you convert a shoulder to an additional lane you might assume that offers a 50 percent increase in capacity as two lanes are expanded into three lanes. But the evac-u-lane offers perhaps a 30 percent increase in capacity because of traffic friction issues and the ever-present risk for stalled vehicles occupying that lane.”



John Gaynor, director of transportation management systems for TxDOT’s Houston District, says storms on the horizon heighten the importance of finding evacuation strategies that work.

“This research has documented valuable techniques to evacuate people from various cities and states that adjoin the U.S. coastline that could be seen as state-of-the-practice and should be studied by emergency managers throughout the country,” says Gaynor.

Selected best practices from Ballard’s research include:

- using existing traffic management centers in urban areas to provide geographically large, online maps that evacuees could access to see where traffic is, how fast it’s moving, and how long it might take to evacuate to their planned destination,
- using flip down signs for detours to clearly explain where contraflowing vehicles should go;
- conducting annual field exercises rather than only table-top exercises;
- preparing damage assessment and repair teams in advance of an event;
- developing generator and fuel deployment plans for traffic signals, communications equipment, and traffic management field equipment; and
- providing redundancy in communications technologies.

“Four sizeable storms hit Florida in 2004,” says Ballard. “Much closer to home, in 2005 Katrina struck next door in Louisiana. Rita landed right in our own backyard. TxDOT and TTI have ramped up our efforts significantly to give Texans some tools and techniques to deal with, and if necessary flee from, these mega storms.” **R**



MORE INFORMATION

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Please see page 19 for related reports.



Working to stop the number-one killer of teenagers in America

What many federal officials are now calling an epidemic is especially problematic in Texas, where more than 500 teen drivers and passengers die each year. While teenage drivers account for 15 percent of all crashes nationwide, they account for 22 percent of crashes in Texas.

Traffic crashes kill more young people, by far, than any other cause. In recent years (1993 to 2003), as the overall number of United States traffic fatalities has leveled off, the total for young drivers has risen 21 percent. Equally alarming is the fact that young drivers generally aren't aware of the risks that place them in the driving population's highest-risk group.

In an effort to reverse this deadly trend, Texas Transportation Institute (TTI) researchers have enlisted teen drivers themselves in the first peer-to-peer driving safety program of its kind. Unlike any similar effort, Teens in the Driver Seat (TDS) involves the target audience directly to help develop and deliver the right messages. Early indications suggest that the idea is working, as TDS has taken root in several different parts of Texas, with several others cur-

rently reaching out to TTI staff for help in addressing a problem that kills more than 6,000 young people nationwide every year.

"That's the equivalent of a commercial airliner loaded with teenagers crashing to the ground every week for an entire year," says Russell Henk, a TTI research engineer and the program director for TDS. "But that's not how these tragedies happen; they happen one or two at a time in communities throughout

our state and nation, which is why this problem isn't getting the attention we believe it deserves."

What many federal officials are now calling an epidemic is especially problematic in Texas, where more than 500 teen drivers and passengers die each year. While teenage drivers account for 15 percent of all crashes nationwide, they account for 22 percent of crashes in Texas.

"We're working to stop the number-one killer of teenagers in America," Texas Transportation Commissioner Andrade says. "We know that our peer-to-peer approach can work, and that it has significant potential to save young lives."



Teens in the Driver Seat is introduced at a San Antonio news conference. Pictured left to right are Susan Reed, Bexar County District Attorney; Allison Reyes, Julie Gonzales and Melessa Rodriguez, teen program participants; and Hope Andrade, Texas Transportation Commissioner.

According to state and national statistics, crashes involving teenage drivers result from a lack of experience, coupled with one or more of five specific risks:

- driving at night,
- distractions (primarily cell phones and too many teenage passengers),
- speeding,
- low safety belt use, and
- alcohol and drugs.

Alcohol is at the bottom of the list for good reason, researchers say, because it is a factor in less than 15 percent of fatal crashes involving the youngest drivers on the road. At the same time, it is one of the most often-mentioned risks among teenage drivers.

The first phase of audience research, conducted at two San Antonio high schools in 2003, demonstrated a generally limited knowledge of teen driving risks. Of more than 3,000 students surveyed, only 4 percent recognized that nighttime driving was risky. Speeding and distractions from other teen passengers were cited by 21 percent and 44 percent of respondents, respectively. Responses from parents reflected similarly low levels of risk awareness, a fact that raises concern for researchers, since some 40 percent of teens in Texas are pursuing a license through parent-taught driver's education.

Another round of audience research this year illustrated equally disturbing knowledge levels. Of more than 600 students surveyed at the annual conference of the Texas Association of Student Councils, 90 percent cited drinking alcohol as a risk, while only 2 percent cited driving at night.

Shortly after the first round of research in 2003, TDS Program developers worked with high school students to produce and launch a pilot effort at Taft High School that successfully boosted risk awareness levels of the lesser-known risks by margins of 44 to 202 percent. Since that time, the program has enjoyed several advancements, including:

- establishment of the Teens in the Driver Seat Coalition, a collection of civic and political leaders in San Antonio led by Hope Andrade;
- enthusiastic support and interest from every region in Texas, as well as Georgia and North Carolina;
- an extensive series of audience focus groups, employed to further refine TDS and ensure the highest possible level of teen involvement;
- two national awards (Telly and Videographer) for excellence in video production for TDS program materials; and
- the support of the program's first corporate sponsor, AT&T.

Teens in cities as big as San Antonio (population 1.2 million) or as small as Louise (population 967) are guiding the development of program tools—wristbands, slogans, testimonial videos and more—and then delivering those tools and associated messages to their peers. All of the program's elements and available resources are available on the TDS web site, www.t-driver.com. Researchers have employed the full range of traditional outreach strategies, and are trying new ones as well by hosting webinars and capitalizing on the popularity of teen social networking web sites. TDS developers plan to integrate a program component aimed at parents in the coming months.

"We have a firm foundation based on solid science," Henk says. "TDS is off to a meaningful start, but we realize we still have a great deal of work to do."

Since the program's launch, several areas of Texas (El Paso, Corpus Christi, Tyler, Fort Worth, Midland/Odessa and Austin) have taken steps to implement TDS, and the program has drawn inquiries from safety advocates at an array of federal agencies, insurance interests and research/academic circles. That growing interest is fueling optimism for program developers and advocates alike. **R**



MORE INFORMATION

For more information, please contact Russell Henk at (210) 979-9411 or r-henk@tamu.edu, or Bernie Fette at (979) 845-2623 or b-fette@tamu.edu.

For more information, please visit www.t-driver.com.



SLOW DOWN!

TTI Researchers recommend strategies for slowing drivers around work zones

Texas Department of Transportation (TxDOT) employees working in work zones watch drivers whiz by them, often at speeds well above the posted limit. Encouraging those drivers to comply with traffic regulations, particularly speed limits, is challenging.

Driver compliance within work zones can be particularly important to the safety of both the work zone personnel and the drivers themselves. According to the Texas Department of Public Safety, more than 9,500 crashes occurred in Texas work zones in 2000, resulting in 143 fatalities and 9,900 injuries. Speed is cited as a contributing factor in approximately 42 percent of these crashes.

“Getting people to slow down in work zones could potentially save hundreds of lives and injuries,” says Texas Transportation Institute (TTI) Researcher Marcus Brewer. “Figuring out how to get them to slow down—now there’s the challenge.”

TxDOT is sponsoring a project conducted by Brewer and his research team to make recommendations on strategies and devices to improve compliance with work zone speed limits (WZSL). TTI’s team conducted an extensive literature review, sur-

veyed TxDOT and other DOT personnel around the nation, and field tested three devices to determine their effectiveness in reducing driver speed. Surveys went out to all 25 TxDOT districts and 47 other DOTs, and researchers discovered that agencies use a variety of methods for installing treatments and arranging for enforcement. Synthesizing the survey results, they then picked three devices to field test: orange-border speed limit signs, speed display trailers, and portable changeable message signs with radar. Results from their field tests indicated that devices displaying a driver’s speed increased compliance rates by 10 to 27 percent points compared to when the devices were not used.

While the research showed that specific devices varied in their ability to improve compliance, central to TTI’s findings is the notion that drivers will drive at whatever speeds they feel comfortable, taking into account other factors like construction occurring in the work zone and an evident law enforcement presence. Taking into account these other factors, work zone speed limits should be posted at

According to the Texas Department of Public Safety, more than 9,500 crashes occurred in Texas work zones in 2000, resulting in 143 fatalities and 9,900 injuries. Speed is cited as a contributing factor in approximately 42 percent of these crashes.

realistic levels (i.e., what drivers could realistically be expected to comply with) and confined as much as possible to the specific areas where work is taking place. Using these results, TTI produced recommendations for inclusion in TxDOT’s *Work Zone Safety and Mobility Manual*, including a flowchart to aid project engineers in deciding which devices and strategies to use in a particular work zone for maximum effectiveness.

“TTI’s contribution to our overall understanding of driver behavior will not only improve safety in our work zones,” explains Darren McDaniel, TxDOT’s director on the project, “but also help to streamline the decision-making process before projects are even implemented. And that will make our roads just that much safer for everyone involved.” **R**



Large, visible signage is crucial for notifying drivers of an upcoming work zone.



MORE INFORMATION

For more information, please contact Marcus Brewer at (979) 845-2640 or m-brewer@tamu.edu.

Please see page 19 for related reports.

Can you read me now?

Changeable message signs keep drivers informed



Arming motorists with the right information at the right time can not only help them make good decisions—it can also help to keep them safe.

Portable changeable message signs (PCMSs) are one tool often used in work zones to keep motorists apprised of important traffic information. Making sure that information is presented in the most reader-friendly way helps ensure that drivers understand and can act upon it

“How much information you display really affects how well motorists can read and remember the message,”

Jerry Ullman,
TTI program manager

accordingly. And that, in turn, can help keep both drivers and work zone personnel safe. In a project sponsored by the Texas Department of Transportation (TxDOT), Texas Transportation Institute (TTI) researchers developed specific implementation guidelines to assist field personnel in selecting and using proper PCMS messages in work zones. While guidelines exist in the Manual on Uniform Traffic Control Devices (MUTCD) for using PCMSs, the effectiveness of some of those guidelines had not been verified through objective research, until now.

“How much information you display really affects how well motorists can read and remember the message,” explains Jerry Ullman, TTI program manager. “If you have too much information for one sign, how do you split it up over multiple signs to ensure that motorists really do get the message?”

In a nutshell, those were the issues TTI researchers addressed. They first investigated how best to format and display calendar dates used to alert drivers to an upcoming event. Should a numeric only system (e.g., 09/05) or an alphanumeric system (e.g., SEP 05) be

used? Researchers also investigated how best to divide information over multiple PCMSs to ensure driver comprehension and retention.

Using laboratory simulations, researchers found that drivers are better able to interpret calendar dates presented alphanumerically. Not only did drivers strongly prefer this format (83 percent compared to a 17 percent preference for numeric only), but recognition levels proved 20 percent higher for alphanumeric signs.

Researchers also found that drivers could correctly remember and comprehend information presented on two sequential PCMSs as long as the total amount of information presented did not exceed four units. (A unit of information is defined as the answer to a simple question, such as “What is the problem?”) If presented with five units of information across two signs, driver comprehension was 54 percent, compared to 78 percent if signs were limited to four units.

The TTI team then created a one-page field guide to assist TxDOT personnel in selecting appropriate PCMS messages for a variety of current and future work zone activities. The team recommends distributing the guide statewide and incorporating it into current construction contract standard plans and special specifications for PCMSs as appropriate.

“TTI has helped to refine the MUTCD,” observes TxDOT Project Director Ismael Soto. “Their work will prove vitally important to the safe, effective display of messages to motorists.” **R**



MORE INFORMATION

For more information, please contact Jerry Ullman at (979)845-9908 or g-ullman@tamu.edu.

Please see page 19 for related reports.

TTI hosts Metro District Engineers

TTI hosted the annual meeting of the TxDOT Metro District Engineers (DEs) and Deputy District Engineers (DDEs) in College Station May 23-24. As in previous years, the meeting started with a working lunch and round table discussion with the DEs and DDEs highlighting current issues and activities in their Districts. TTI researchers also presented updates on current projects. The DEs and DDEs spent the remaining time meeting on their own.

Issues identified by the DEs and DDEs included performance

specifications for contract maintenance, hurricane evacuation planning, design specifications for cable barriers, transportation needs in rapidly growing rural areas, and managing day-time construction. Planning and implementing toll roads continues to be a key issue in the Metro Districts. Issues associated with environmental documents, CDAs, public/private partnerships, and the roles and responsibilities of TxDOT, MPOs, RMAs, and regional toll authorities were highlighted. "We get a much better understanding of the

issues facing the Metro Districts," says Associate Director Katie Turnbull. "It helps in identifying possible research projects that address those issues. In turn, the TxDOT engineers have a better idea about the results of current research projects that can help address needs in their Districts." ■

Awards

TTI Program Manager Jean-Louis Briaud won the American Society of Civil Engineers (ASCE) 2007 Martin S. Kapp Award for Excellence in Foundation Engineering.



Briaud

The award is given to an individual on the basis of the best example of innovative or outstanding design or construction of foundations, earthworks, retaining structures or underground construction. The award is named after Martin Kapp who was Chief Engineer at the Port Authority of New York and designed the foundation of the World Trade Center in 1969.

The Post-Tensioning Institute (PTI) recently named Dr. Robert Lytton a "Legend of Post-Tensioning." PTI presented the award during a May 16 ceremony held in conjunction with the 2005 PTI Technical Conference and Exhibition in Denver. The "Legend of Post-Tensioning" awards are intended to honor those individuals who have made a significant and lasting long-term contribution to the development of the post-tensioning industry in North America. Lytton is the Benson Chair Professor in materials engineering, director of the Center for Infrastructure Engineering and a research engineer for the Texas Transportation Institute. ■



Lytton

EPA recognizes DCAT

Drive Clean Across Texas (DCAT), the nation's first statewide public outreach and education air quality campaign, has received a Special Recognition Certificate from the United States Environmental Protection Agency (EPA). As part of its Clean Air Excellence Awards Program, EPA recognizes and honors outstanding and innovative efforts to achieve cleaner air. More than 100 entrants applied to the awards program. DCAT was one of a select few campaigns to receive such recognition.

Sponsored by the Texas Department of Transportation and the Texas Commission on Environmental Quality, DCAT was developed by TTI and launched statewide in March of 2002. The transportation-related air quality campaign is designed to raise awareness of and change attitudes about air pollution. Its chief goal is to inspire changes in driving behavior that will help improve air quality in cities across Texas. ■



Director's Research Champion Lecture



William Millar

Bill Millar, president of the American Public Transportation Association, traveled to College Station on March 30 to present the first Director's Research Champion award lecture. Millar was presented with the award at this year's Transportation Research Board annual meeting in Washington D.C. in January.

Approximately 75 people attended the lecture, entitled *The State of U.S. Public Transportation*. Millar noted that United States public transit use is increasing. Ridership was up 1.4 percent in 2005, at a time when private vehicle miles driven increased by only 0.1 percent. Even though only 3 percent of Americans use public transportation compared with 10 percent in Europe, Millar told the crowd that people want more choices. He pointed to statistics showing that 84 percent of U.S. transit referenda were approved last year.

Millar also met with TTI researchers while in College Station. Researchers highlighted recent transit and mobility studies. Millar also provided insight into critical national transit research needs. ■

Director search committee making progress

Although the 11-member search committee commissioned to find a replacement for TTI Director Herb Richardson is under no specific deadline, the process is moving forward, according to Bill Stockton, one of six TTI employees on the committee. The process involves identifying qualified candidates for submission to Chancellor McTeer and Dr. Kem Bennett, Vice Chancellor for Engineering for the Texas A&M University System, for their review. They in turn will make recommendations to the Board of Regents.

Richardson has indicated he would like to retire September 1, but would stay at the helm until October if necessary for a smooth transition.

"The committee is moving diligently to identify top candidates in accordance with the desired schedule Dr. Richardson has announced," says Stockton. "We are trying to find the person who has the vision to lead TTI well into the future, and I think we can do that. We are making good progress." ■



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R Related reports

The following reports provide information about topics covered in this issue of *Texas Transportation Researcher*. Please see back cover for ordering information. Related reports might be available or scheduled for later publication:

Technical Report 0-4707-1, "Identification and Testing of Measures to Improve Work Zone Speed Limit Compliance," by Marcus Brewer.

Technical Report 0-4748-2, "Development of a Field Guide for Portable Changeable Message Sign Use in Work Zones," by Gerald Ullman.

Project Summary Report 0-4707-S, "Summary of Treatments to Improve Work Zone Speed Limit Compliance," by Marcus Brewer.

Project Summary Report 0-4748-S, "Improved Work Zone Portable Changeable Message Sign Usage," by Gerald Ullman.

Technical Report 0-4748-1, "Advanced Notification Messages and Use of Sequential Portable Changeable Message Signs in Work Zones," by Gerald Ullman.

Product 0-4962-P2, "Recommended Practices for Hurricane Evacuation Traffic Operations," by Andrew Ballard.

THE BACK ROAD



Sadly, many of our fellow citizens are still dealing with the devastating effects of hurricanes Katrina and Rita even as the 2006 hurricane season rapidly approaches. Having learned valuable lessons from last year's storms, and with a broad base of experience in managing traffic congestion in all weather, TTI researchers are playing a major role in solving the problems associated with

hurricane evacuations. Two major projects—one of which actually started well before Katrina—are underway, aimed at easing traffic congestion resulting from emergency evacuations, disseminating essential information to travelers, and creating plans for preparedness. These projects aim to evaluate contraflow operations in relation to an evacuation plan, identify those evaluation practices which have worked, and develop guidelines for hurricane evacuation signing and markings. Another related project, TxDOT's Disaster Preparedness Study, involves setting up a multi-use complex between major cities that can store emergency supplies and essentials. TTI researchers are also analyzing data collected from Houston residents who were caught up in the Hurricane Rita exodus in order to learn how people chose

to evacuate and what traffic solutions could have eased that difficult situation.

This issue also describes an innovative TTI program, Teens in the Driver Seat (TDS), which directly involves teenage drivers in shaping and delivering safety messages to their peers. This TTI-initiated effort is working to stop the number-one killer of teenagers in America—automobile crashes—through peer-to-peer education. The first program began in San Antonio, but with the strong support of Transportation Commissioner Hope Andrade and elected officials, it will be expanded to other areas of the state this year.

In addition to those major stories, you'll also learn about our new office in El Paso—the Center for International Intelligent Transportation Research—which was recently opened in partnership with the University of Texas-El Paso. The new CIITR will focus on traffic management, border issues and air quality research aimed at enhancing the efficient, safe and secure movement of people and goods across the Texas/Mexico border and within the El Paso area.

As we come to the end of another academic year, I want to thank you again for your interest and support for the Institute. We continue to strive to be worthy of that support and to serve the people of Texas by helping to keep our transportation system one of the best in the nation.

Herb Richardson



TECHNICAL REPORTS

"Pilot Implementation of PAVE-IR for Detecting Segregation in Hot-Mix Asphalt Construction," by Stephen Sebesta, **5-4577-01-1**, 02-March-06.

"Comparisons of Crashes on Rural Two-Lane and Four-Lane Highways in Texas," by Kay Fitzpatrick, **0-4618-1**, 07-March-06.

"Characterization of Design Parameters for Fiber Reinforced Polymer Composite Reinforced Concrete Systems," by David Trejo, **9-1520-3**, 07-March-06.

"Evaluation of Traffic Control Devices: Second Year Activities," by Gene Hawkins, **0-4701-2**, 07-March-06.

"Aggregate Imaging System (AIMS): Basics and Applications," by Eyad Masad, **5-1707-01-1**, 09-March-06.

"Database of Sulfate Stabilization Projects in Texas," by Pat Harris, **0-4240-4**, 21-March-06.

"Rubblization for Rehabilitation of Concrete Pavement in Texas: Preliminary Guidelines and Case Studies," by Stephen Sebesta, **0-4687-1**, 22-March-06.

"Preliminary Quality Control/Quality Assurance Standards (Criteria) for Inspection and Testing of FRP Bars," by David Trejo, **9-1520-P1**, 24-March-06.

"Design, Construction, and Maintenance of Bridge Decks Utilizing GFRP Reinforcement," by David Trejo, **9-1520-P2**, 24-March-06.

"Development of Warranty Based Specifications for Construction," by Stuart Anderson, **0-4498-3**, 31-March-06.

"Design Procedure for Pavements on Expansive Soils: (Volume 1, 2 or 3 available)," by Robert Lytton, **0-4518-1**, (V1) 21-April-06, (V2) 17-May-06, (V3) 31-March-06.

"Content for the Forensic Rigid Pavement Knowledge Management System," by Paul Krugler, **0-4505-P6**, 04-April-06.

"Methods of Reducing Joint Reflection Cracking: Field Performance Studies," by Christopher Von Holdt, **0-4517-3**, 06-April-06.

"Repeatability and Reproducibility Study for Tube Suction Test," by Bogdan Barbu, **5-4114-01-1**, 06-April-06.

"Using Rolling Deflectometer and Ground Penetrating Radar Technologies for Full Coverage Testing of Jointed Concrete Pavements," by Tom Scullion, **0-4517-2**, 12-April-06.

"Improved Quantification of High Occupancy Vehicle (HOV) Lane Delay Savings: Year Two Results," by David Fenno, **0-4740-3**, 18-April-06.

"Field Evaluation of New Technologies for Measuring Pavement Quality," by Tom Scullion, **0-4774-2**, 18-April-06.

"Distributed Architecture and Algorithm for Robust Real-Time Progression Evaluation and Improvement," by Montasir Abbas, **0-4729-2**, 18-April-06.

"New Infrared and Radar Systems for Detecting Segregation in Hot-Mix Asphalt Construction," by Stephen Sebesta, **0-4577-2**, 20-April-06.

"Interim Roadway Safety Design Workbook," by Jim Bonneson, **0-4703-P4**, 21-April-06.

PROJECT SUMMARY REPORTS

"Improved Work Zone Portable Changeable Message Sign Usage," by Gerald Ullman, **0-4748-S**, 07-March-06.

"Development of TxDOT Warranty Implementation Plan," by Stuart Anderson, **0-4498-S**, 31-March-06.

"Identification, Quantification, and Stabilization of Sulfate-Bearing Soils in Texas," by Pat Harris, **0-4240-S**, 04-April-06.

"Summary of Comparison of Crashes on Rural Two-Lane and Four-Lane Highways in Texas," by Kate Fitzpatrick, **0-4618-S**, 10-April-06.

"PILOT 05 - Pattern Identification Logic for Offset Tuning," by Montasir Abbas, **0-4729-S**, 03-May-06.

"Improved Quantification of High Occupancy Vehicle (HOV) Lane Delay Savings: Summary Report," by David Fenno, **0-4740-S**, 05-May-06.

"Research Recommendations for Pavement Marking Words and Symbols," by Sue Chrysler, **0-4471-S**, 11-May-06.

"Investigation of the Effects of Routine Overweight Truck Traffic on SH4/48," by Emmanuel Fernando, **0-4184-S**, 12-May-06.

"Summary Report: Water Quality Characteristics and Performance of Compost Filter Berms," by Beverly Storey, **0-4572-S**, 19-May-06.

"Developing Statewide Recommendations for Rehabilitating Jointed Concrete Pavements," by Tom Scullion, **0-4517-S**, 19-May-06.

ORDERING INFORMATION

To order published reports or project summary reports listed above, please contact:

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e-mail: n-pippin@ttimail.tamu.edu

Report prices vary depending on the length. Project summary reports are \$5.00 each. The Texas Transportation Institute accepts checks, money orders and credit cards.

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