

**saving
lives
time and
resources**






introduction



Since 1950, experts at the Texas A&M Transportation Institute (TTI) have developed solutions to the problems and challenges facing all modes of transportation.

A member of The Texas A&M University System, TTI has a breadth and depth of programs, facilities and capabilities unsurpassed by any other higher-education-affiliated transportation research organization in the United States. The Institute's research and development program has resulted in significant breakthroughs across all facets of transportation.

TTI research is widely known as an excellent value with a proven impact of saving lives, time and resources. The Institute's innovative strategies and products have saved the state of Texas and the United States billions of dollars and thousands of lives.

	Professional Researchers		Public and Private Sponsors	
\$58M+	400+	200+	200+	600+
Annual Research Expenditures		Students		Annual Projects



Our Vision

Six years after TTI was formed, U.S. President Dwight D. Eisenhower signed the interstate highway bill in 1956, establishing not only a transportation systems approach and a design concept for our nation's major roadways, but also a financing mechanism. The country established an interstate highway plan, a federal gas tax and a highway trust fund, all of which truly changed the nation and helped make the United States an economic superpower and the envy of the world.

Today transportation connects every aspect of our lives: home, work, education, commerce and recreation. Over the past 65 years, the U.S. population has more than doubled. The number of cars and trucks on the road reached almost 253 million. Now, the nation's roadway capacity is growing only modestly compared to the rate of expansion that resulted from the interstate highway bill. At the same time, there are more cars on the road than ever before competing for the available roadway supply. TTI's annual *Urban Mobility Report* illustrates the national interest and concern about mobility and congestion, the time lost, and the costs encountered. The need for transportation research has never been greater.

A successful 21st century transportation system must be different from the past. At TTI, we are focusing our attention on research development and entrepreneurship. We are working to leverage the present transportation infrastructure more effectively and operate existing transportation facilities in the optimal manner. We are seeking to manage the demand on the system by studying usage patterns and identifying choices, such as additional transit availability and bicycling and pedestrian options, as well as behavioral changes, such as telecommuting, flexible work options, and other trip reduction strategies.

Freight transportation and intermodal connections are high priorities, and TTI is coordinating efforts among transportation modes. Our experts are focusing on how to connect our roadway infrastructure to fast-developing automated and connected vehicle technologies, and the policy implications of these new technologies. The results of our efforts will be a comprehensive, systematic approach to providing a productive, scalable 21st century transportation system for generations to come.

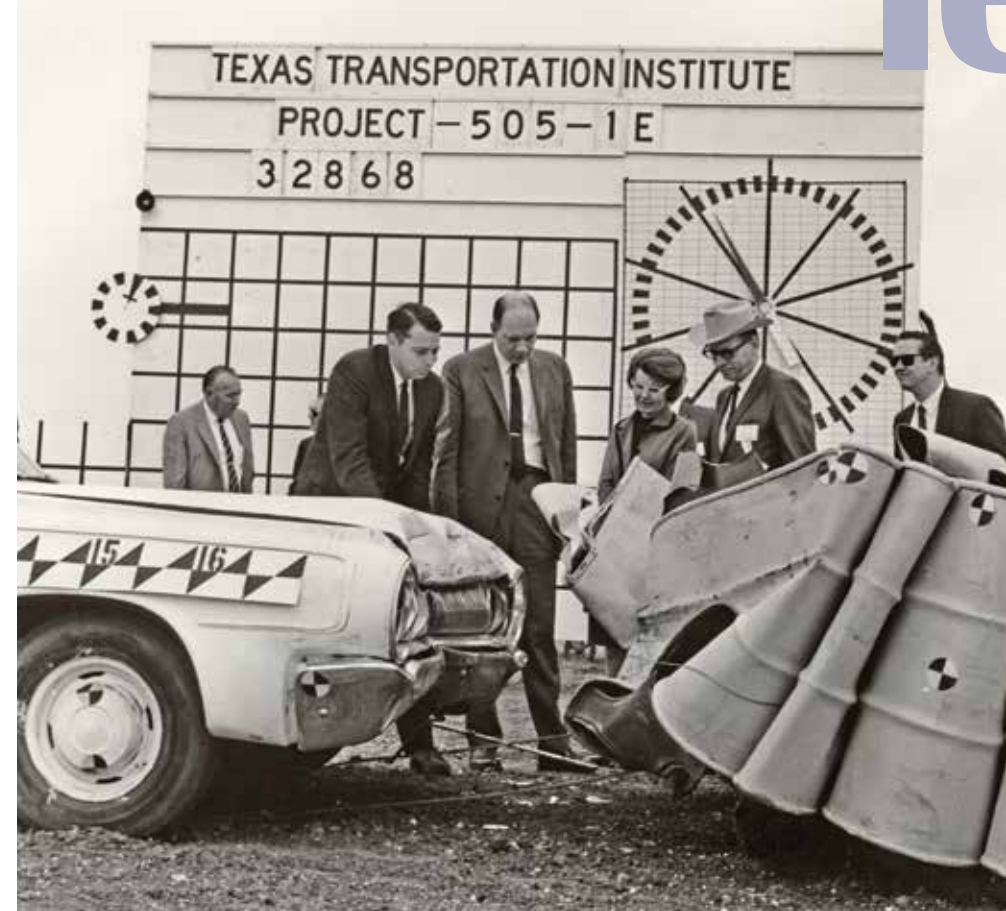


the 21st century transportation system

TTI's commitment...



to **preserve,**
maximize and
expand our
transportation options.



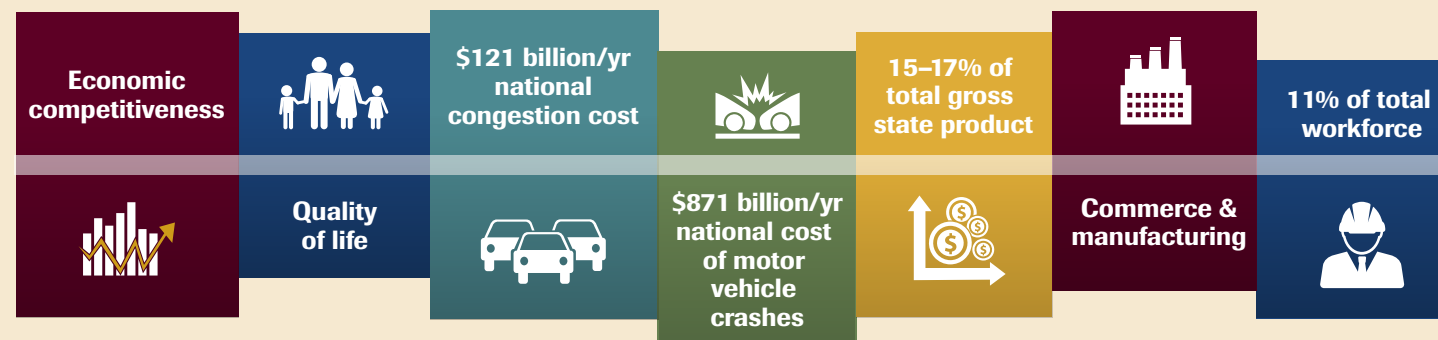
Early TTI Contributions:

- Improved pavement durability
- Roadside safety innovations
- Traffic management systems
- High-occupancy vehicle lane systems
- Expansion of transit services

The **legacy** of TTI is about a team of researchers in pursuit of a better way to develop and maintain a safe and efficient transportation system – saving lives, time and resources.

The original 1950 charter of TTI, established by the Agricultural and Mechanical College of Texas Board of Directors, charged the Institute with enlisting the broad resources of the college in all forms of transportation research, while giving students the opportunity to study and work in the transportation profession. This agreement solidified the Cooperative Research Program between the then Texas Highway Department – now the Texas Department of Transportation (TxDOT) – and TTI. It formed the basis for TTI's development and success through the years.

Why Transportation Is Important



our focus areas



Mobility

Mobility analysts at TTI examine problems associated with congestion and access to transportation, develop innovative solutions, and measure the effectiveness of the outcomes. TTI prepares the definitive national study documenting congestion costs and trends in almost 500 U.S. urban areas. The Institute also provides expertise in metropolitan, urban, and rural bus and passenger-rail transit planning and operations.

Infrastructure

TTI is finding innovative and cost-effective ways to maintain and rehabilitate roadway infrastructure. Researchers have assessed land-side improvements that may be needed to effectively serve additional port, rail and truck traffic generated by the expansion of the Panama Canal.

Safety

The Institute's safety innovations can be found throughout Texas and around the world. Major advancements have occurred in the design of roadside safety devices such as guardrails, crash cushions and sign supports. TTI is leading other significant advancements in traffic signals and signs, distracted driving and crash analysis, and bicycle and pedestrian safety, just to name a few.

Freight Movement

TTI is exploring innovative solutions that support the use of multiple modes of transportation, facilitate freight transfer and operation, enhance freight mobility, improve air quality, and reduce border wait times. TTI has also developed an innovative technology called the Freight Shuttle System, which has the potential to revolutionize freight movement by improving safety, reducing emissions and decreasing shipping costs.

Human and Behavioral Studies

Roadway users play a critical role in the safety of our nation's roadways. TTI's Human Factors Program examines human limitations and capabilities, and works to optimize the user-vehicle and user-roadway interfaces to improve safety. The Behavioral Research Program examines roadway user attitudes and actions to help identify methods to promote safer behavior.

Security

The Institute has successfully developed and evaluated new technologies resulting in the cost-effective implementation of devices and standards to help keep our country safe from terrorists. In the area of homeland security, TTI conducts testing of antiterrorist safety barriers for the U.S. Department of State, Bureau of Diplomatic Security, U.S. Army Corps of Engineers and private-sector companies.

Environment

As the U.S. Environmental Protection Agency's standards evolve, the sophistication of the environmental research methods necessary to test for these standards also changes. TTI is focusing on transportation-related air quality, sustainability, energy and climate change, and sediment and erosion control through its environmental research programs and facilities.

Workforce Development

TTI employs more than 200 students in its research laboratories and offices. Over 40 Texas A&M University faculty regularly work on TTI research projects. TTI experts also provide training on transportation topics. Many of TTI's researchers are recognized national and international leaders in their fields, including about 80 who lead or serve on Transportation Research Board (TRB) committees.

Economics

TTI has extensive expertise in transportation economics and finance research, working closely with public agencies and private-sector companies to evaluate the economic impacts of the transportation network and explore options for financing our transportation system. TTI-developed tools allow decision makers to prioritize projects based on robust benefit-cost analyses.

Policy

TTI provides information critical to state and national decision makers in the areas of transportation policy. Institute researchers are often asked to offer objective and credible testimony on a wide range of transportation topics and emerging issues. With the addition of the Transportation Policy Research Center in 2013, TTI continues to serve as a valuable resource to the Texas Legislature.

Connected Transportation

TTI researchers are developing and testing innovative applications for advancing connected transportation. Along with the Accelerate Texas Center, TTI's connected transportation initiative includes an automated and connected transportation system testing facility in development at TTI's Proving Ground and a variety of urban test beds.

Planning and Operations

Researchers at TTI continue to be at the forefront of using data collected from Bluetooth® devices, cell phones, GPS, web surveys and virtual open houses to engage the public and other stakeholders. The information collected includes trip purposes, origins and destinations; travel times and speeds; and needed improvements. This input helps determine a desirable combination of multimodal transportation projects.

Locations

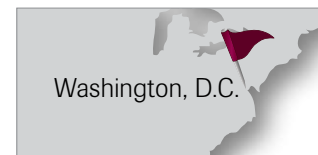
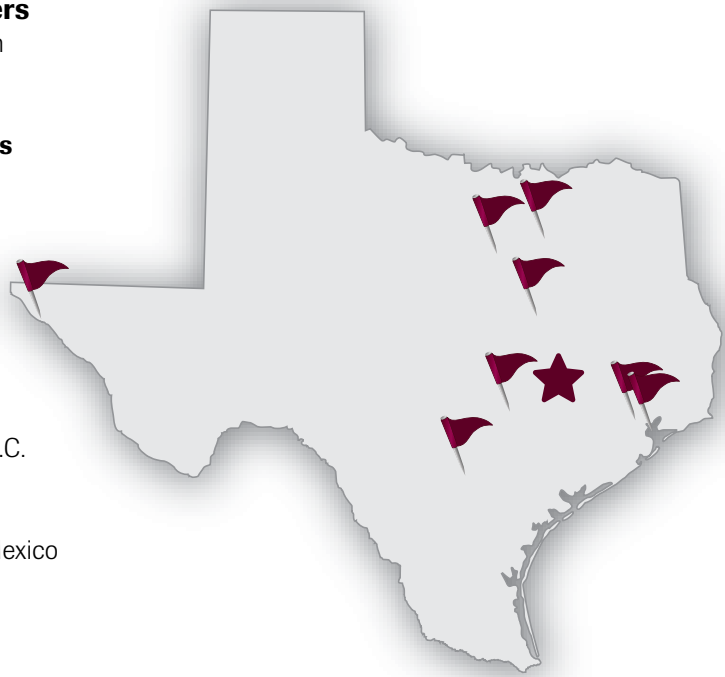
TTI's headquarters

is located on the campus of Texas A&M University in College Station. The Institute maintains numerous laboratories and research facilities on the university campus in both Bryan and College Station. TTI has eight urban offices in Texas and an office at The Texas A&M University System Washington, D.C., facility. Internationally, TTI has an office at the university's Mexico City facility, which addresses transportation challenges in Latin America, and a presence in Doha, Qatar, at Texas A&M University at Qatar.

★ **Headquarters**
College Station
Bryan

🚩 **Urban Offices**
Arlington
Austin
Dallas
El Paso
Galveston
Houston
San Antonio
Waco
Washington, D.C.

📍 **International**
Mexico City, Mexico
Doha, Qatar



TTI on the Border

As economies become more global, international urban border centers like El Paso face increasing pressures on their local transportation networks. These challenges help drive the transportation research conducted by TTI's Center for International Intelligent Transportation Research, located in El Paso, and TTI's Mexico City Office. Research findings often provide the foundation upon which public- and private-sector stakeholders build new opportunities for improving and expanding international trade and tourism.

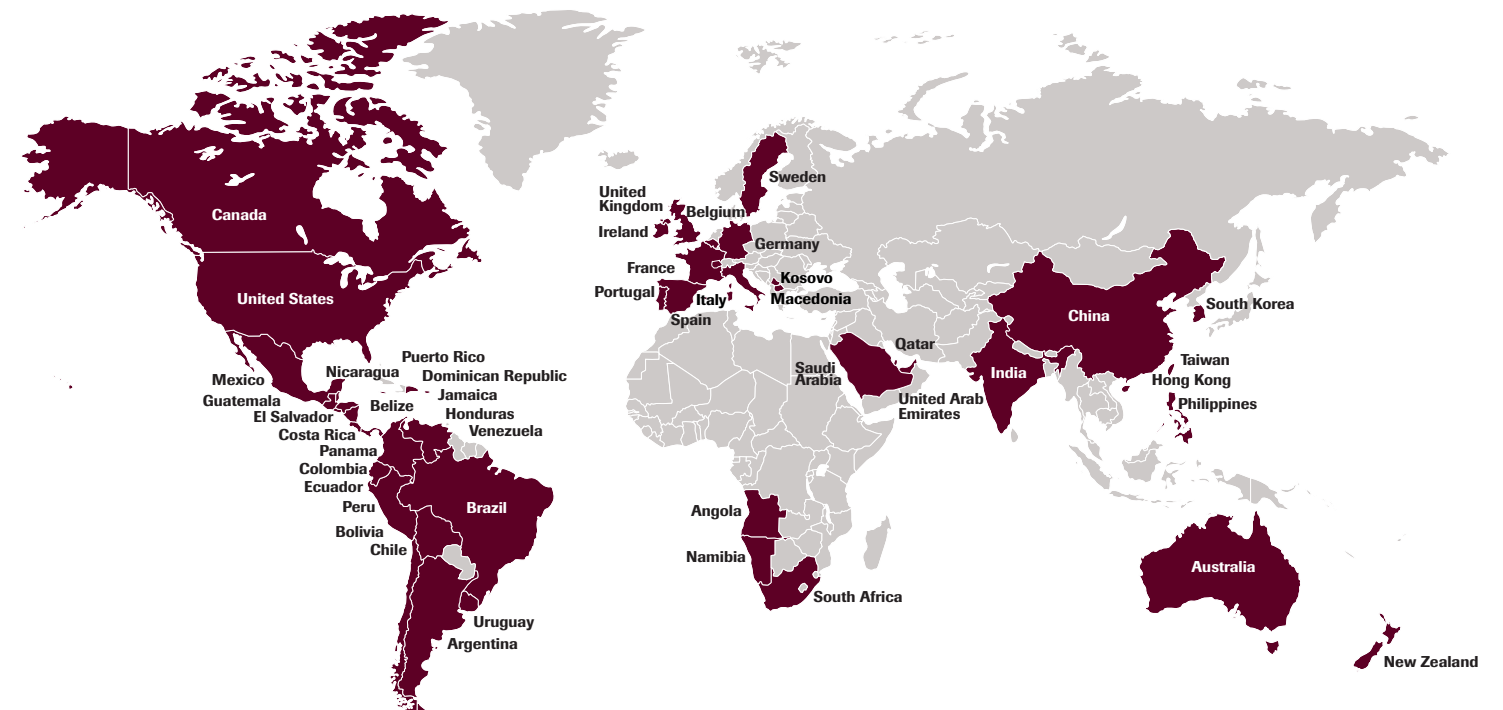
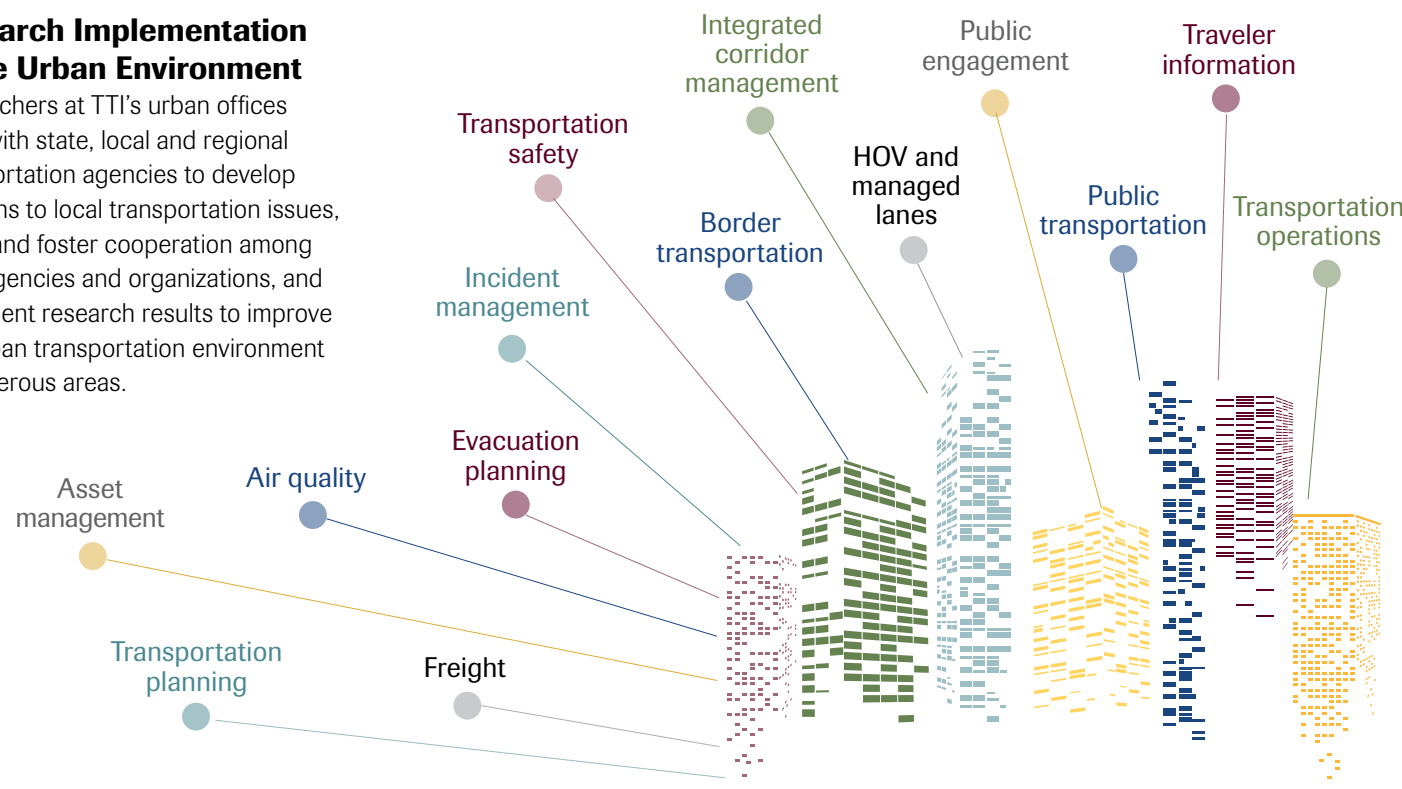
National and International Presence

At any one time, TTI has research projects under way in about 30 states and has conducted research in all 50 states. TTI researchers have worked in more than 40 foreign countries to enhance transportation infrastructure and promote a vibrant global economy.

our presence

Research Implementation in the Urban Environment

Researchers at TTI's urban offices work with state, local and regional transportation agencies to develop solutions to local transportation issues, assist and foster cooperation among local agencies and organizations, and implement research results to improve the urban transportation environment in numerous areas.



Traveler Information

Innovative research for TxDOT on the Central Texas I-35 corridor has resulted in implementation of the most advanced online, real-time construction traveler information map in the nation. A unique end-of-queue warning system works with radar detection devices and portable changeable message signs deployed in work zones to warn drivers of stopped traffic. These technologies are helping reduce congestion and the frequency of rear-end collisions.

Visibility

Enhanced pavement marking research is testing various camera-based systems and new sensing technologies to detect existing and prototype pavement markings. The research will support automated vehicle deployment and is identifying possible limitations, areas for further research and new applications.

Connected Transportation

The I-35 Connected Work Zone, a project TTI is undertaking for TxDOT, will focus on improving freight movement along the construction corridor by providing trucks with traveler information through onboard devices capable of receiving work zone infrastructure data. The project, funded by the U.S. Department of Transportation, will provide lane closure locations, delay lengths and projected delays up to a week in advance.

Asset Management

TTI conducted an extensive pavement evaluation of 160 miles of I-20 in the Odessa TxDOT District using Ground Penetrating Radar and Falling Weight Deflectometers. Researchers analyzed core samples, assembled traffic load data and compiled maintenance histories. After a complete data analysis, researchers developed a 10-year rehabilitation plan with priorities and proposed short-term and long-term rehabilitation options, which have saved several million dollars to date.

Integrated Corridor Management

TTI has been a key member of a U.S. Department of Transportation-sponsored team that is pilot-testing and implementing an innovative decision support system for traffic operations agencies and commuters in the Dallas area. With a 20:1 return on investment over 10 years, the project is making real-time incident, delay and alternative route information easily available.

Transportation and Public Health

Data specialists are consolidating and analyzing trauma, crash, citation, engineering and emergency management system data. This effort will help prevent crashes and improve injury treatments by increasing the understanding of how crash, response, transport and treatment characteristics affect medical outcomes.

Freight Shuttle

The Freight Shuttle System (FSS) consists of electrically powered, autonomous vehicles that travel on an elevated, derailment-proof guideway between strategically located terminals. As a commercially sustainable transport option for shippers and trucking interests, the FSS, currently in development in the private sector, will also provide improved highway safety, congestion relief and reduced infrastructure damage.

Sustainability

The TTI-developed *Guidebook for Sustainability Performance Measurement for Transportation Agencies* provides a generally applicable framework that transportation agencies can adapt and use, either in their existing performance measurement programs or as a part of a new sustainability initiative. The guidebook offers a practical approach for identifying and applying sustainability-related performance measures.

Big Data

TTI has a rich history in big data development and analysis in such areas as intelligent transportation systems and integrated corridor management on U.S. highways and at international borders. Using geographic information system tools and color-coded maps, TTI researchers are visually layering various transportation data sets, providing a more thorough assessment of diverse and sometimes competing transportation needs.

Driver Behavior

A TTI analysis is the first to compare voice-to-text and manual texting on a handheld device in an actual driving environment, finding no differences in the level of driver distraction between the two activities. The findings offer new insights but are only a part of the knowledge needed to improve roadway safety.

Energy Development

Energy development impacts on the transportation system span multiple areas, such as pavement life, right of way, roadside and operational safety, and economics. To tackle these issues, multiple TTI projects are developing and implementing technologies such as GPS and radar-based pavement diagnostics, 3D right-of-way management tools, geodatabases, and a roadmap for sustainable transportation and energy systems initiatives.

Travel Forecasting

Advanced travel forecasting techniques developed at TTI are helping decision makers determine which transportation investments will be the most effective. These techniques help predict demand in highly congested corridors, such as I-35 in Central Texas and U.S. 59 in southwest Houston, and include simulations of individual driver responses to proposed facility designs.



Freight Shuttle System



future innovations



Academic Involvement

TTI plays a key role in training and educating the next generation of transportation professionals. Over 40 TTI researchers hold joint academic appointments at Texas A&M. One-third of TTI's staff are students – about half are undergraduates and half are graduate students. The academic faculty facilitate the educational mission of the Institute and help attract students into the transportation profession. TTI faculty relationships also provide a direct link to scientific expertise, technologies and equipment that provide a competitive edge for TTI's research program.

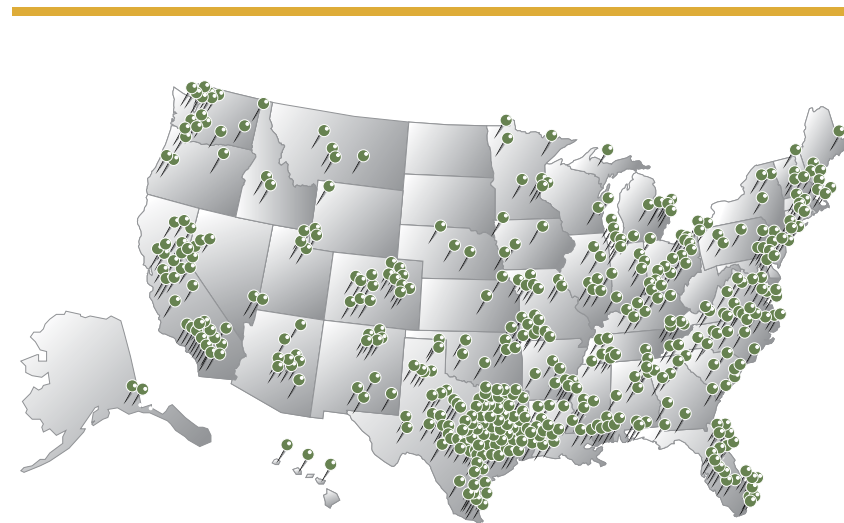
The Institute maintains a close association with the Texas A&M University Dwight Look College of Engineering, the College of Architecture, and the George Bush School of Government and Public Service, as well as other academic units within the A&M System and other collaborating universities.



Broad Expertise

TTI employs nearly 700 professionals, students and support staff from over 50 different countries. TTI staff are known for their credibility, technical expertise and reputation for objectivity. Many are recognized national and international leaders in their fields. TTI researchers contribute to the growth of the transportation profession by participating in and leading hundreds of local, state and national organizations. For example, since the inception of the TRB Cooperative Research Program, TTI has been a leading participant in the National Cooperative Highway Research Program. The Institute also has led and participated in cooperative research programs in transit, aviation, freight and hazardous materials.

With expertise in areas such as engineering, planning, economics, policy, public engagement, landscape architecture, environmental sciences, computer science and the social sciences, TTI researchers serve as objective transportation experts. They provide a resource to local, state and national agencies and groups, helping them solve transportation challenges and make informed decisions.



The workforce developed through TTI's research program spans the country. The pins represent locations where over 4,000 Texas A&M University graduates and/or former TTI employees are practicing transportation professionals.





research:
how we will know more
tomorrow
than we do today

Research is how we will know more tomorrow than we do today; laboratories — on campus and in the field — are where we will make and validate those discoveries.

TTI researchers have access to more than 300 full-scale laboratories and field-testing devices, from the High-Bay Structural Testing Facility to an instrumented vehicle designed to measure driver behavior behind the wheel.



Proving Ground

More than 4,000 full-scale crash tests have been conducted here since TTI began such testing in 1965. Vehicles ranging from subcompacts to 80,000-pound tractor-trailer rigs have been used to test the effectiveness of roadside safety devices, crash cushions and barrier systems. One of only a few university-based facilities of its kind in the United States, the Proving Ground includes a 3.5-mile test track used to simulate highway traffic conditions at speeds up to 70 miles per hour, special pads designed for conducting tire skid tests on road surfaces of various textures, a hydroplaning trough for studying the phenomenon of vehicle hydroplaning, and an outdoor pendulum used to simulate low-speed vehicle impacts on roadside appurtenances.



Visibility Research Laboratory

This one-of-a-kind facility is used to measure highway visibility products, including signs, pavement markings, and traditional and new lighting technologies, such as LEDs. The lab also measures specialized visibility-related materials, including photo-luminescent devices, and is equipped with state-of-the-art photometric equipment used to develop new test methods and specifications to meet the needs of nighttime drivers.



Sediment and Erosion Control Laboratory



Environmental and Emissions Research Facility



Eye-Tracking Equipment



High-Bay Structural Testing Facility

our facilities

Sediment and Erosion Control Laboratory

This 19-acre indoor/outdoor facility provides testing capabilities for technology, products and devices used for erosion and sediment control, vegetation management, and stormwater-quality improvement. The laboratory's bench-scale capabilities include scale slope testing and channel erosion testing. A 2,800-square-foot, climate-controlled greenhouse is used for growing approved seed mixes free from weeds and other outside contaminants. The indoor rainfall simulator has adjustable soil beds to provide a practical range of desired slopes and control over water drop size, distribution and impact velocity. A mobile rainfall simulator is available to provide similar test conditions at any remote location.

Environmental and Emissions Research Facility

One of the largest drive-in environmental chambers in the United States is used for research and testing designed to help lower vehicle emissions, improve air quality, and provide reliable information for state and national policy makers. This 7,500-square-foot facility can house tests using a full tractor-trailer rig or municipal bus at constant temperatures ranging from -25°F to $+131^{\circ}\text{F}$ and a controllable relative humidity of up to 70 percent. Solar loading lights and wind simulator fans further support the simulation of a variety of weather conditions. With the recent addition of a full-scale dynamometer, tests can simulate various driving speeds and conditions.

High-Bay Structural Testing Facility

Located on the Texas A&M University campus, this facility allows researchers to perform full-scale tests on structural systems and their assemblages using different types of loading that simulate real-world conditions. With a ceiling height of 40 feet and a heavily reinforced floor, this 4,000-square-foot laboratory accommodates a variety of structural specimens simultaneously.

Laboratories and Field Equipment

- Advanced Materials Characterization Laboratory
- Asphalt Binder and Chemistry Laboratory
- Asphalt Mixture Testing Laboratory
- Concrete Laboratory
- Connected Vehicle/Automated Vehicle Test Bed
- Hardware-in-the-Loop Simulation Test Bed
- I-35 Austin High-Volume Detector Test Bed
- Mobile Retroreflectivity Certification Test Deck
- Model and Machining Facility
- Pavement Nondestructive Testing Equipment
- Signal Control Laboratory

Eye-Tracking Equipment

TTI's eye-tracking systems use small infrared emitters and cameras to track eye movement and pupil size with respect to what drivers are seeing in real time at 60 Hz. These systems assess driver look behavior in the TTI driving simulator or on the open road both in the daytime and at night. Behaviors examined include primary driving tasks, such as reading signs or detecting pedestrians, and non-driving tasks, such as texting while driving.



Bridge Performance Test Bed

A spread slab beam test bridge, developed for a TxDOT research project, uses fewer beams than traditional slab beam bridge designs, with the goal of maximizing road-building dollars. The test bridge is instrumented with multiple load cells, strain gauges and string potentiometers. Load cells below each beam determine how the load is distributed when a heavy vehicle crosses the bridge. The resulting data provide insight into best practices for future bridge design.



Driving Simulator

TTI's driving simulator provides measurements of driver responses to roadway situations. The driving simulator provides a safe and controlled environment to further explore comprehension and compliance in response to traffic control devices. In the simulated environment, it is possible to inexpensively test multiple variations of the design and placement of a new device. The simulator also provides a platform to safely evaluate driving distractions and driver interaction with in-vehicle technologies.



McNew Pavements and Materials Laboratory

The McNew Laboratory supports TTI's innovations in transportation, materials and pavements. Using aggregates, soils, base courses, asphalt cements and emulsions, bituminous and concrete mixtures, and recycled materials, the laboratory helps researchers provide solutions that not only use the current state-of-the-practice but often define the future state-of-the-practice. Similar to TTI as a whole, the McNew Lab provides a premier breadth and depth of capabilities, supporting high value outcomes of saving lives, time and resources.



Computer Modeling and Scanning Facility

TTI operates a computer modeling and scanning facility that uses state-of-the-art scanning equipment and software to develop detailed three-dimensional models of vehicles and other structures. This capability allows researchers to scan and develop models of vehicle parts as well as components of roadside safety and perimeter security devices for use in crash simulations.

TTI is home to nine state and national research centers, all approved by The Texas A&M University System Board of Regents. These centers help illustrate the depth and breadth of the Institute's capabilities. The products and recommendations generated by these centers enhance the economy and improve quality of life.

Center for International Intelligent Transportation Research

Established by the Texas Legislature in 2006 to help enhance the efficient, safe and secure movement of people and goods across U.S. borders.

Center for Railway Research

Established in 2011, the center includes a research laboratory sponsored by the Association of American Railroads and focuses on engineering problems confronting the railroad industry.

Accelerate Texas Center

A public-private collaboration established in conjunction with TxDOT in 2014 to help position Texas to become a leader in the commercialization of connected/automated vehicle technologies and attract economic development to Texas.

Center for Transportation Safety

Established by the Texas Legislature in 2001 to conduct traffic safety research, education and outreach.

Center for Transportation Computational Mechanics

Designated by the Federal Highway Administration in 1998 to develop and use advanced computer simulation in testing and analysis.

Center for Ports and Waterways

Established by the Texas Legislature in 1995 to produce benefits-oriented research for the water transportation industry.

Southwest Region University Transportation Center

Established in 1988 and renewed most recently in 2011 to focus on advancing the United States Department of Transportation's strategic goals.

Transportation Policy Research Center

Launched in 2013 under the direction and support of the Texas Legislature to provide a sustained, objective transportation policy research capability in support of the state's transportation challenges and to serve as a policy analysis resource.



new demands – drive change



1957
US 81, Austin

Over the past **65** years the U.S. population has **doubled**

“ Transportation, whether measured in ton-miles, vehicle-miles or passenger-miles, is consumed. It cannot be stockpiled or accumulated. Each day’s transportation total is gone forever, and each new day will provide new demands.”

Thomas H. MacDonald
Chief, Bureau of Public Roads, 1919–1953, and one of the early leaders of TTI

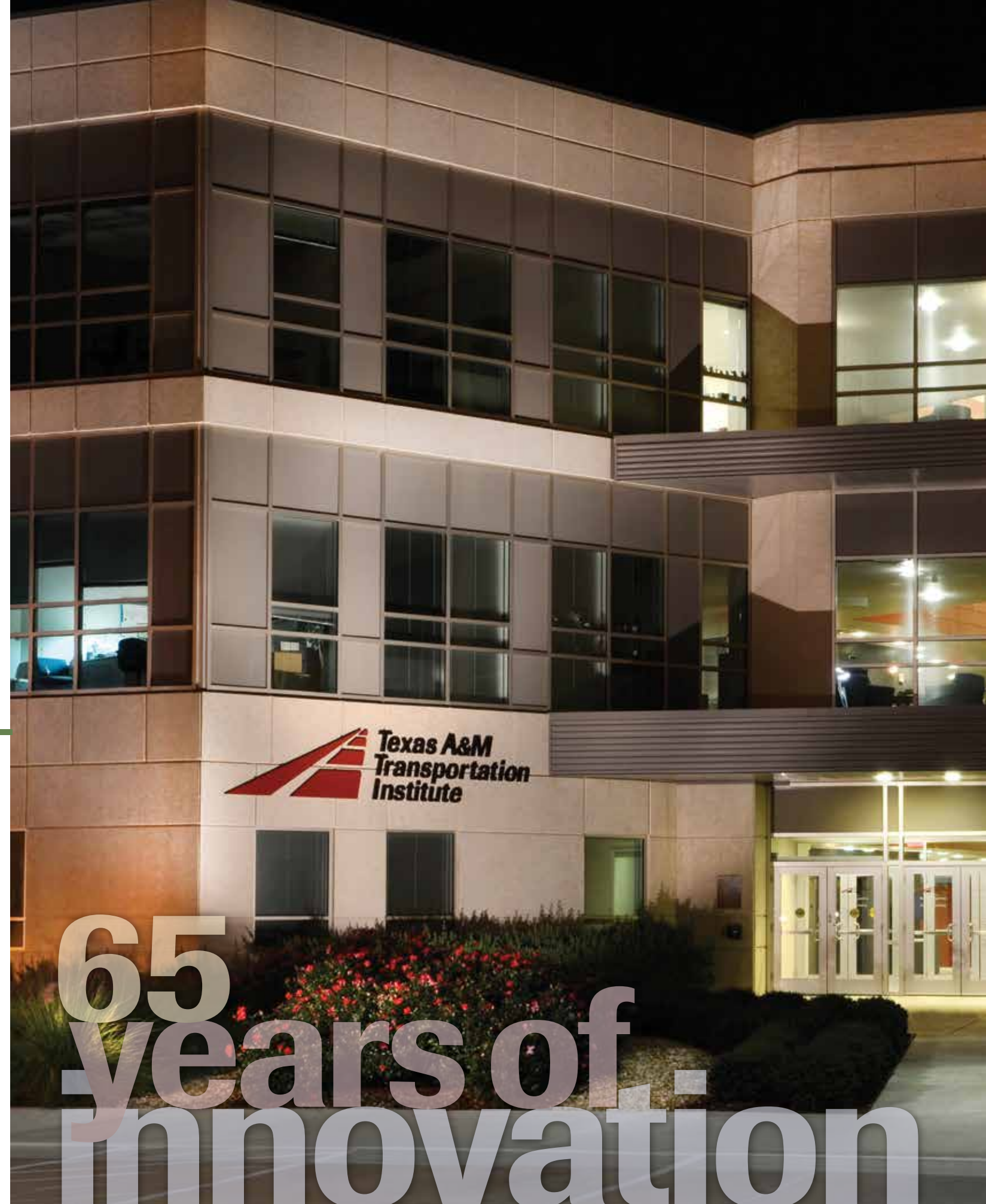


2011
I-35, Austin

The number of cars and trucks on the road has reached almost **253** million

“ We turned 100 years old in 2003. And from the time my great-grandfather founded Ford until the centennial, we hadn’t had a lot of change. We’d had a lot of evolution – very few revolutions. That’s all changing now.”

William Clay Ford Jr.
*Executive Chairman
Ford Motor Company
Remarks at ITS World Congress, 2014*



65 years of innovation



Resources

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