

HUMAN FACTORS PROGRAM

The Human Factors Program is housed within the Center for Transportation Safety at the Texas A&M Transportation Institute (TTI). The goal of the program is to conduct basic and applied research to measure driver performance and behavior for varied driving situations, vehicle characteristics and roadway environments.

Researchers design and implement experiments with human subjects (including field and simulator studies) and survey subjects to identify driver safety issues, such as those related to traffic control devices, distraction and fatigue.

TTI's experimental psychologists and industrial engineers have conducted numerous studies related to driver response to roadway geometric design; visibility and driver comprehension of traffic control devices; driver distraction; and automotive adaptive equipment for disabled drivers, older drivers and short-statured drivers.



Research Areas

- Driver distraction
- Human interaction with in-vehicle systems
- Traffic sign and roadway design (in terms of being visible, understandable and presentable to drivers)
- Adaptive equipment
- Pavement marking design (in terms of being visible, understandable and presentable to drivers)

Measurement Tools and Facilities

Driving Studies

- **Test tracks:** Human factors and safety studies are conducted at the Proving Grounds Research Facility at the Texas A&M University Riverside Campus and at the Pecos Research and Testing Facility. Each closed-course facility is ideal for experimental research and testing in the areas of vehicle performance and handling, visibility, distracted driving and driver training.
- **Instrumented vehicle:** A 2006 Toyota Highlander serves as TTI's on-road research vehicle. The principal system within the instrumented vehicle is the Dewetron DEWE5000 data-acquisition integration system. Essentially a large portable computer, the DEWE5000 serves as the data-acquisition device for all the peripheral systems in the vehicle.
- **Eye tracker:** The Human Factors Group is home to two different types of eye-tracking devices, the faceLAB® eye-tracking system and the ViewPoint EyeTracker®. In both systems, cameras detect the reflection of infrared light from the irises of the eyes and the contrasting lack of reflection at the pupil. Software allows researchers to mathematically map the pupil's location to determine the subject's point of gaze.
- **Mobile surveillance equipment:** TTI has a mobile surveillance system that is a portable version of the Dewetron DEWE5000 data-acquisition computer with hand light detection and ranging (Lidar) guns for speed measurement. This portable traffic surveillance system uses two hidden radar systems that can be repositioned in the probe vehicle to measure ambient traffic speed and position.

Surveys and Focus Groups

- **SuperLab® survey software:** Surveys are displayed using SuperLab® survey software that can be tailored to the needs of the project. Using the software, researchers are able to run surveys in remote locations. Surveys can be timed, randomized or broken into sections to ensure that they are comprehensive and objective.
- **Visibility Research Laboratory:** The Visibility Research Laboratory is used for nighttime surveys that can be conducted during daytime hours. The lab provides an ideal location to simulate a consistent nighttime environment during all times of day and weather conditions, and can be used to test sign visibility, comprehension and retroreflectivity for readability.
- **Focus groups:** Focus groups are a useful interviewing tool to gain driver insight and form a foundation for study criteria. Typically, groups of eight to 15 individuals are led by a moderator and asked to provide their opinions and experiences relating to specific topics or roadway equipment.
- **Other equipment:** In-vehicle equipment such as reconfigurable touch-screen displays, peripheral detection lights and response joysticks simulate tasks collaboratively to create tests to measure anything from driver response times to driver awareness tasks. This equipment can also be used in the simulator.

Recent Projects

Test Procedures for Evaluating Distraction Potential in Connected Vehicle Systems

The purpose of this project was two-fold: to develop test procedures that can be used with production vehicles and nomadic technologies to assess distraction potential and usability, and to provide guidelines for interpretation and decision making about the testing outcomes.

This project consisted of interviewing potential users of the technologies, conducting driving studies on two low-cost driving simulators and testing on a closed-course track. Several in-vehicle displays were installed to replicate potential connected vehicle functions, and researchers recorded and analyzed the effects on driver performance.

Assessing Driver Distraction due to In-Vehicle Video Systems Through Field Testing

Existing and emerging in-vehicle technologies — entertainment systems, communications systems and intelligent transportation systems — have made travel hours more productive and entertaining, forever transforming the way drivers interact with the vehicle. This study used TTI's instrumented vehicle to examine driver distraction due to in-vehicle video systems. The vehicle contained cameras to monitor driver performance; an eye-tracking system; accelerometers; and sensors for brake, throttle and steering; and used advanced image-processing software to determine lane position. The project compared driving performance with and without an entertainment video screen present on a closed-course track.



An Investigation of the Effects of Texting While Driving

The primary objective of this project was to assess the distraction potential of sending and receiving text messages while driving. The two secondary objectives of this research were to see if drivers adjust texting behavior based on driving demand, and to assess the differential effects of age and experience on the ability to send and receive text messages while driving. Data were collected on a closed-course test track from participants ages 16 to 54, and the type of cellular device was recorded (touch screen or raised QWERTY keyboard).



Signing Guidelines for Flooding Conditions

In support of a research project examining signing strategies for flooding or water-crossing situations for the Texas Department of Transportation, focus groups and driver surveys were conducted to provide information about driver responses to flooded roadways in general and to various sign types and messages warning them about flooding conditions. The surveys were conducted using the SuperLab[®] software to present images of flooded roadways and signing treatments to participants.

TTI's Mission

To solve transportation problems through research, to transfer technology and to develop diverse human resources to meet the transportation challenges of tomorrow.

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