Office of Safety R&D

www.tfhrc.gov

The Federal Highway Administration (FHWA) safety goal is to continually improve highway safety. FHWA contributes to the U.S. Department of Transportation safety improvement goal; the performance measurements over the next 10 years for this goal are: (1) a 20 percent reduction in fatalities, (2) a 20 percent reduction in injuries, and (3) a 50 percent reduction in truck-related fatalities.

*The **Office of Safety Research and Development (R&D)** is making major contributions to help FHWA meet its performance objectives through activities and accomplishments in the following six priority areas:*

Run-Off-Road

Interactive Highway Safety Design Model (IHSDM)

IHSDM is a suite of software analysis tools for evaluating safety and operational effects of geometric design decisions on two-lane rural highways. IHSDM is available for downloading free of charge at www.ihsdm.org. The Geometric Design Laboratory within the Office of Safety R&D provides free technical support to IHSDM users. Ongoing research and development will enhance and expand the capabilities of IHSDM, in coordination with the Transportation Research Board's Highway Safety Manual.

Roadway Visibility Program

The Roadway Visibility Program aims to reduce the number of crashes where poor visibility is a factor. The program includes evaluations of headlight technologies and fixed lighting systems to view the roadway and other road users. Virginia Tech's Smart Road is being used to evaluate pavement markings in wet weather. A separate project on the Smart Road is intended to develop guidelines for lighting midblock crosswalks.

Retroreflectivity for Traffic Control Devices

Several studies are underway to establish minimum levels of retroreflectivity for pavement markings and to develop effective methods to maintain them. The research findings of recent efforts on traffic sign retroreflectivity has been presented to FHWA's Safety and Operations Offices for use in developing guidelines for signs in the *Manual on Uniform Traffic Control Devices* (MUTCD).

Simulation and Advanced Computing Research

This cooperative research agreement between FHWA, the National Highway Traffic Safety Administration, and The George Washington University relies on finite-element analysis to study crash events. FHWA uses the research completed through the National Crash Analysis Center to develop improved roadside safety hardware.

Rollover Crashes

Rollovers occur in approximately one-third of all run-off-road crashes. This study investigates the causes of rollover crashes using simulation techniques and crash data collection. Guidelines will be developed to help practitioners identify site features with high rollover risk, and in identifying roadway design and other measures for minimizing that risk.

Intersections

Intersection Improvements

Intersection and intersection-related crashes make up more than 25 percent of all fatal crashes and 50 percent of combined fatal and injury crashes. The objectives of the Office of Safety R&D are to facilitate implementation of short-term strategies and to define and evaluate long-term, higher payoff strategies to improve intersection safety. Products include *Roundabouts: An Informational Guide* and *Signalized Intersections: Informational Guide*. Ongoing projects are evaluating novel intersection treatments and configurations, and roundabout accessibility enhancements.

Surrogate Safety Measures for Intersections

In a recently completed project, FHWA developed, and in an ongoing project, is validating and implementing intersection safety logic that can generate surrogate measures of safety from microscopic traffic simulation models. The objective is to enable these models to produce useful safety measures to complement the current operational measures used by decisionmakers in intersection design projects.

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Pedestrian and Bicycle

Safety Design and Operation of Shared-Use Path Intersections with Roadways

This study will identify conflicts between path users and motor vehicles at the intersections of shared-use paths and roadways. In addition, an evaluation tool for assessing intersection safety, capacity, and quality of service will be developed, and guidelines will be outlined for the design and operation of shared-use path intersections with roadways.

Pedestrian and Bicycle Data

Studies are being conducted to determine the characteristics of non-motorized road and trail users of tandem bicycles, wheelchairs, Segways™, and scooters. In addition, methods to automate collecting pedestrian and bicycle volumes will be investigated. Understanding the operating characteristics of these users, and facilitating the data collection of pedestrian and bicycle volumes, will help improve the design of pedestrian and bicycle facilities and the development and evaluation of safety countermeasures.

Safety-Management

Highway Safety Information System (HSIS)

Informed decision making requires an understanding of how safety is affected by the geometric design of the roadway, the selection and placement of roadside hardware, the use of traffic control measures, the size and performance capabilities of the vehicles, and the needs and abilities of the users. The HSIS is a database that was developed to meet these needs. The HSIS allows the simultaneous examination of crash, roadway inventory, and traffic volume data for nine States. The system has been used to study the safety effects of converting rural two-lane roadways to four-lane roadways, the relationship of median width and safety, the safety of lighting options on urban freeways, and many other safety topics.

SafetyAnalyst

A software package with state-of-the-art tools, *SafetyAnalyst*, is being developed to correspond to the six main steps in highway safety management: 1) network screening to identify sites and corridors that hold the most potential for reducing crashes; 2) diagnosis of safety problems at specific sites; 3) selection of appropriate countermeasures; 4) economic appraisal of candidate improvements; 5) priority rankings for candidate improvements; and 6) before-after evaluations of safety improvement projects.

Digital Highway Measurement Vehicle

Under the Digital Highway Measurement (DHM) project, the Advanced Research Team is developing an instrumented vehicle and associated software with increased resolution of measurements at levels that allows a systematic definition of the roadway geometry as built. These accurate measurements allow assessment of health conditions of the road and roadside. This vehicle can collect three dimensional geometry data of the highway at vehicle speeds of 97 km/h (60 mph) or less using a high-resolution inertial navigation unit (INU) and high accuracy differential Global Positioning System (GPS) all in real time. The vehicle also collects high resolution stereo images, pavement macro-texture data and lower resolution pavement edge data using a sweeping laser. Other sensors, such as Ground Penetrating Radar, are planned to determine the presence and condition of highway infrastructure features.

Speed Management

Variable Speed Limits

Variable speed limits that change automatically with road and traffic conditions in work zones are being tested in two States as a way to increase credibility of speed limits, improve safety, and smooth traffic flow. A companion project with the American Association of State Highway and Transportation Officials through the National Cooperative Highway Research Program is addressing legal and enforcement issues.

Rational Speed Zoning and Enforcement Demonstration

A series of cooperative tests are being carried out by seven State and local agencies to demonstrate the extent to which rationally established and strictly enforced speed limits lead to higher compliance and more effective management of crash risks. A key aspect of these demonstrations is the coordination of engineering, education, enforcement, and judicial elements.

Expert System for Speed Zoning

To assist practitioners in establishing appropriate and credible speed limits for a roadway, an expert system approach is being investigated. The computer-based expert system, USLIMITS, will provide an objective, quantifiable, and systematic tool to assist highway agencies in establishing consistent and safe speed zones. USLIMITS can be accessed at www.uslimits.com.

Human Centered Systems

Human Centered Systems Laboratory

The Human Centered Systems Laboratory supports the testing and evaluation of driver performance with a wide range of testing facilities, which include simulators and an instrumented vehicle. The laboratory performs ongoing research into a wide range of geometric, traffic control device, and operational issues, as well as the effects of these elements on drivers and pedestrians. The laboratory allows researchers to present specific stimuli to participants in a highly controlled environment, thereby incorporating the users' needs into FHWA's R&D program.

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