Meeting the Challenges of Highway Safety

TEA-21 and NHTSA Research Programs

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The highest transportation priority of President Clinton and Transportation Secretary Slater is safety, and motor vehicle safety is a vital element of the safety goal. In addition to losses in terms of human suffering, losses in productivity due to motor vehicle crashes place a large burden on the U.S. economy—more than $150 billion annually.

Between 1966 and 1997, travel on U.S. roadways increased by approximately 170 percent. During that same time, the fatality rate per 100 million vehicle miles traveled dropped from 5.5 to 1.7. From 1992 (with the lowest fatality total in more than 30 years) to 1997, however, deaths on U.S. highways increased from 39,250 to 41,967. Similarly, the number of police-reported crashes in the United States in 1997 was estimated to be 6.764 million, an increase of 13 percent over the 6 million reported in 1992.

The National Highway Traffic Safety Administration leads the U.S. Department of Transportation's efforts related to motor vehicle safety. Within NHTSA, the offices of Research and Development and Traffic Safety Programs (TSP) lead the agency's research efforts associated with improved highway safety. These two offices have proposed aggressive programs for R&D and traffic safety aimed at finding effective and innovative solutions to the new and emerging traffic safety challenges of the 21st century.

The Transportation Equity Act for the 21st Century provides the framework for these efforts. The new legislation includes specific direction for initiatives aimed at improving frontal crash protection, increasing seat belt use, and reducing the number of intoxicated drivers. Additionally, the act directs the Department to carry out a comprehensive program of intelligent transportation system research focused on crash avoidance and integration of crash protection technologies. Following are highlights of the programs continued, expanded, and initiated under TEA-21.

Impact Injuries

TEA-21 provides funding that allows NHTSA's National Transportation Biomechanics Research Center to continue its efforts to increase understanding of transportation-related impact injury biomechanics and develop technologies that can help reduce impact injuries on the nation's highways. The center's major programs include the following:

- The Crash Injury Research and Engineering Network enables medical researchers to work in close collaboration with researchers in government, industry, and academia, applying a multidisciplinary approach to understanding the mechanisms of crash injury.
- Analytical modeling and simulation is focused primarily on the development and validation of finite-element and multibody models of the human anatomy.
- Impact injury research utilizes established, university-based impact trauma laboratories to investigate and develop more definitive injury criteria and mechanisms of injury for major crash modes.
- Anthropomorphic dummy development involves efforts to understand the complex responses and interactions of the human body during an automotive impact event.

Injuries and Fatalities Related to Air Bags

In recent years, a number of crashes have been reported in which injuries and fatalities have been the result of aggressive air bag deployment. Those

most susceptible to injury or death from aggressive air bag deployment include out-of-position child passengers, out-of-position adult drivers (usually unbelted), and infants in rear-facing child safety seats. In March 1997 NHTSA published a final rule temporarily amending the agency's occupant crash protection standard, Federal Motor Vehicle Safety Standard (FMVSS) No. 208, so that vehicle manufacturers could quickly redesign air bags to inflate less aggressively. Research has been under way toward upgrading the FMVSS No. 208 injury criteria, test devices, and test procedures. This research directly addresses the requirements of Section 7103 of TEA-21, which states: "Not later than September 1, 1998, the Secretary of Transportation shall issue a notice of proposed rulemaking to improve occupant protection for occupants of different sizes, belted and unbelted, under FMVSS No. 208, while minimizing the risks to infants, children, and other occupants from injuries and deaths caused by air bags, by means that include advanced air bags."

NHTSA's R&D office is investigating the real-world crash environment and projecting occupant injuries that will occur after full implementation of driver and passenger air bags in the fleet. This program focuses on intrusion-related injuries and fatalities and the costly lower-extremity injuries observed in crashes involving vehicles equipped with air bags.[a] NHTSA is developing an offset frontal test (a test in which only a portion of the front end of the vehicle is engaged), taking into account the new injury modes, injury criteria, and test surrogates that might be necessary for this type of test.

The Air Bag Safety Program will involve the formation of partnerships with private-sector organizations to increase the number of people exposed to air bag safety messages. NHTSA will assess the effectiveness of the Air Bag Safety Program in achieving its goals and will report the findings of this assessment to the nation.

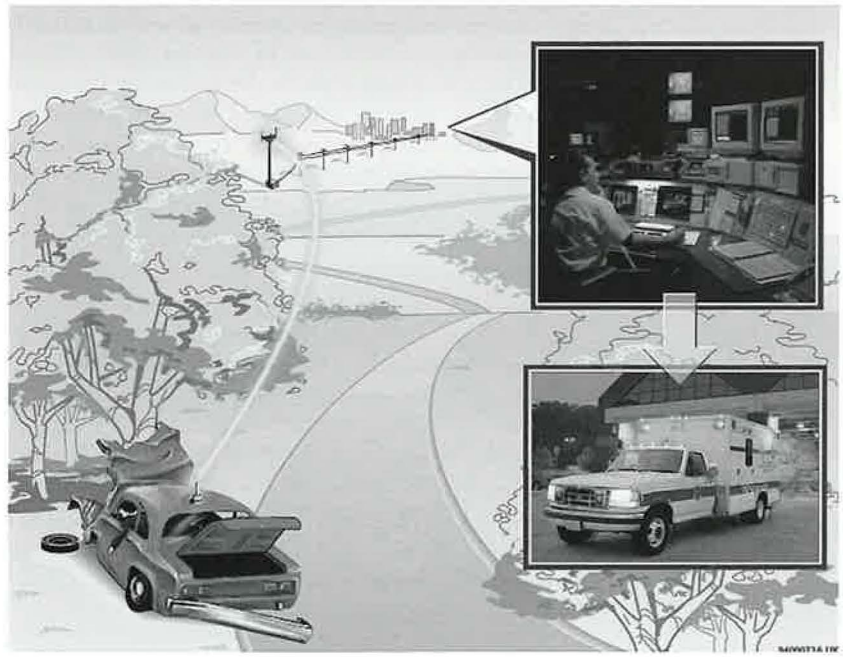
Vehicle Compatibility in Multivehicle Crashes

Light trucks and vans currently account for more than one-third of registered U.S. passenger vehicles. Yet collisions between these vehicles and automobiles are responsible for more than half of all fatalities in crashes involving two light vehicles. Nearly 60 percent of all fatalities resulting from light-vehicle side impacts occur when the striking vehicle is a light truck or van. NHTSA has initiated a research program to investigate the problem of vehicle compatibility in multivehicle crashes. The objective of this program is to identify and characterize compatible vehicle designs, with the expectation that improved vehicle compatibility will result in large reductions in crash-related injuries.

Variable Dynamic Test Vehicle, built under ITS program, is a unique vehicle that incorporates electronic controls for all vehicle control systems, such as steering, braking, and suspension.

Crash Avoidance Research

Traditional work in the field of crash avoidance has focused on how essential equipment such as brakes, lights, and tires can be improved to enhance the crash avoidance capability of the driver. Starting about 6 years ago, NHTSA began exploring how advanced



With the Advanced Collision Notification System, developed under the ITS program, in the event of a crash a central monitoring system is automatically contacted by the vehicle involved which reports crash location, severity, and other information, thereby expediting emergency medical services.

[a] Intrusion-related injuries and fatalities result from contact with interior components of the occupant compartment that have moved or become deformed as the result of crash forces.

Changes in Highway Safety Research Under TEA-21

- NHTSA is directed to improve protection for occupants of different sizes, belted and unbelted, while minimizing the risk to infants, children, and other occupants from injuries and deaths caused by air bags.
- TEA-21 authorizes new programs to reduce the number of impaired drivers on the nation's highways and provide incentives to increase the number of persons wearing seat belts.
- The Secretary of Transportation is directed to carry out a comprehensive program of research, development, and operational testing of intelligent vehicles.

electronics and other technologies could help drivers avoid crashes. This research is the cornerstone of a broader U.S. DOT program entitled the Intelligent Vehicle Initiative (IVI). The IVI program emphasizes development and deployment of advanced-technology vehicle-related crash prevention and safety systems. NHTSA's primary role in IVI is to serve as a facilitator in these efforts through research that results in a good understanding of how a system must work if it is to provide a truly effective solution to an identified safety problem.

Continuation of the IVI program is authorized by the Intelligent Transportation Systems Act of 1998, which is part of TEA-21. Under TEA-21, the Secretary of Transportation is directed to carry out a comprehensive program of research, development, and operational testing of intelligent vehicles. As part of this research program, the Secretary is to give priority to projects that focus on crash avoidance and integration of in-vehicle crash protection technologies with other on-board safety systems; projects that incorporate human factors research, including the science of the driving process; and projects that facilitate the integration of intelligent infrastructure, vehicle, and control technologies.

The interaction between driver and vehicle is a key element of highway safety. With the advent of high-technology systems to improve safety, increase productivity, and provide greater convenience, drivers are now faced with the increasingly difficult task of assimilating this new information while still performing the functions of driving safely. Under NHTSA's Driver/Vehicle Performance Program, research is being conducted into the interaction between human and vehicle. This research supports both the agency's advanced and its more traditional crash avoidance safety improvement programs.

Early in the year 2000, NHTSA will put the world's most technically sophisticated and powerful research driving simulator into operation at the University of Iowa. The National Advanced Driving Simulator is a revolutionary new concept in high-fidelity driving simulation that will provide an unparalleled degree of realism in the visual, dynamic, auditory, and tactile cues provided to the driver. Soon, engineers and scientists will be able to conduct driver-related research in total safety and under the precisely controlled and repeatable conditions of the laboratory.

Heavy Vehicle Safety

Although heavy vehicles comprise a relatively small percentage of the vehicles on the road, their high exposure in terms of annual miles driven, along with their size, mass, and other physical characteristics, results in their being overrepresented among vehicles involved in serious crashes. NHTSA's R&D efforts under TEA-21 will foster improvements in heavy vehicle safety, focused specifically on:

- Braking—the development of improved performance tests for electronically controlled braking systems, especially if used in conjunction with air disc brakes.
- Rollover—the development of systems to mitigate heavy vehicle rollovers, which not only are severe crashes to the occupants of the vehicles involved, but also create massive problems in terms of traffic tie-ups. A system has been developed to warn truck drivers as their vehicle approaches the rollover threshold for safe operation. Future research under TEA-21 will involve exploring the possibility of linking this on-board system to an infrastructure-based system. The latter system would notify the driver of an upcoming curve that could result in a rollover in time for the driver to slow the vehicle to a safe speed.

Occupant Protection and Increased Seat Belt Use

TEA-21 provides resources for the National Occupant Protection Program. This program directly supports the goal of President Clinton's Initiative for Increasing Seat Belt Use Nationwide—to increase use of seat belts to 85 percent by 2000. NHTSA will conduct research and evaluation activities, as well as provide technical assistance to other federal departments and agencies in monitoring progress in seat belt usage by federal employees and those working in national parks and defense installations, as well as on highways in Indian territories. Given the heightened national attention to seat belt use, a broadened, more intensive program is expected to be implemented.

Regional intermodal coordination is planned to ensure that targeted states (those with low seat belt usage) receive broad highway safety attention. TEA-21 will also be used to raise the participation of states in grant-assisted education and enforcement projects, including those at the local level.

Beginning in fiscal year 1999, TEA-21 authorizes $500 million over 5 years for incentive grants to encourage states to raise seat belt use rates. States will receive funds based on projected annual savings in federal medical costs resulting from increased seat belt use. States may use grant funds for any eligible Title 23 project, including construction projects.

TEA-21 authorizes a two-part, $83 million program over 5 years to target specific occupant protection laws and programs. Under part one, a 5-year program beginning in fiscal year 1999, states will receive grants if they demonstrate that they have in place certain occupant protection laws and programs, such as primary safety belt use laws and special traffic enforcement programs. Under part two, a 2-year program in fiscal years 2000 and 2001, states will receive grants if they carry out educational activities related to child passenger protection. States may use these grant funds for occupant protection programs.

Impaired Driving

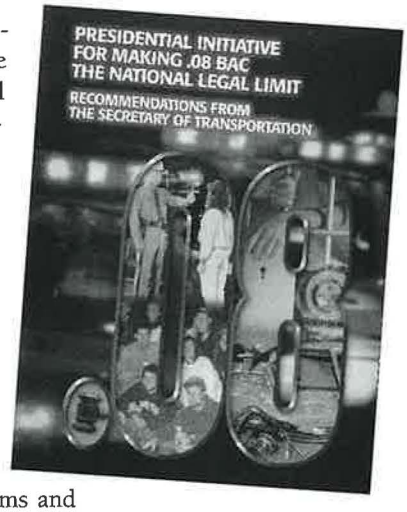
Funding under TEA-21 will allow NHTSA to support President Clinton's Initiative on Drugs, Driving, and Youth. Research will continue to focus on determining the human causes of crashes, identifying target populations, acquiring the research foundation for the development of countermeasures, and evaluating the effectiveness of safety programs.

TEA-21 will provide substantial resources for NHTSA to make progress toward the 2005 goal of no more than 11,000 alcohol-related fatalities. The agency will initiate demonstrations of innovative strategies in targeted states with higher-than-average numbers of such fatalities. These strategies will include public education; legislation; enforcement/adjudication; technology applications; and partnerships with the health-care community, businesses, and employers. As part of a four-point strategy to combat increased drug use by youth, NHTSA will provide federal guidance to support a demonstration program, to be conducted by two to four states, that will involve devising and testing a program to administer a drug test prior to granting of a driver's license.

President Clinton's Initiative on Drugs, Driving, and Youth is also supported with funding for the Drug Evaluation and Classification Program, as well as the Drug Incentive Grant Program, under TEA-21. Beginning in fiscal year 1998, TEA-21 authorizes $500 million over 6 years for incentive grants to states that enact and enforce laws making operation of a motor vehicle with a blood alcohol concentration of .08 or more a per se offense of driving while intoxicated. States may use these grant funds for any eligible Title 23 project, including construction projects.

Other Programs

The Safe Communities Program provides the basis for NHTSA to continue expanding its partnerships with the business and health-care communities. The program helps communities use their own data to identify, understand, and address their traffic safety problems. Communities also benefit from information on best practices disseminated by NHTSA. NHTSA, working with other U.S. DOT agencies, will develop regional intermodal safe community initiatives. Large-scale evaluations of the Safe Communities Program strategies will be conducted to determine the effectiveness of the Safe Communities model, as well as to test alternative strategies.



The President's Initiative on Drugs, Driving, and Youth includes making .08 blood alcohol content the national legal limit.

The Police Traffic Services Program will continue to develop demonstration programs and provide technical assistance and public information toward the development of effective and efficient traffic law enforcement programs. TEA-21 resources will be used for education and enforcement activities related to aggressive driving and unsafe driving behaviors.

Efforts under the Emergency Medical Services Program will be aimed at further enhancing the National Standard Curricula (a national publication describing emergency medical technician training), as well as maintaining a leadership role for trauma systems in the emergency medical community. NHTSA will also demonstrate emergency department/trauma system intervention programs and their impact on impaired drivers.

The Records and Licensing program will continue to support assessments of state records, and

continued on page 39

This 40-km-per-hour, 40 percent offset test is part of advanced frontal research in support of improved occupant protection.

Research and Technology

continued from page 5

needs of the nation. The United States should be leading the development of a world-class transportation R&D capability. This can be accomplished by sharing information across transportation S&T networks; by leveraging resources and forming public–private partnerships; and by supporting the important foundations of long-term research and investment in education and training in math, science, and technology.

Transportation is undergoing a technology revolution: the transportation system of the 21st century will adapt to people. Technology is key to accomplishing the ultimate goal of a safe, accessible transportation system that enhances the natural and human environment, supports the nation's domestic economy and international trade, and protects our national security. TEA-21 will help us achieve this goal.

Meeting the Challenges of Highway Safety

continued from page 25

to provide information on driver improvement and testing, fraudulent ID detection, and graduated licensing.[b] NHTSA regional offices also will be able to expand technical assistance to states in program evaluation and data analysis. Additional funding provided by TEA-21 will be used to improve the documents accepted by federal agencies for identification purposes.

[b] Graduated licensing is a three-tiered licensing system comprising a learning permit, a restricted license period, and then graduation to a full nonrestricted license.

NOTE: *The following individuals contributed to the preparation of this article: Joseph Kanianthra, Rolf Eppinger, William Hollowell, Duane Perrin, Keith Brewer, August Burgett, and Patricia Breslin, Office of Research and Development, and James Fell, Office of Traffic Safety Programs, National Highway Traffic Safety Administration, U.S. Department of Transportation.*

Innovation in Transit

continued from page 12

Transit benefits are a provision of the Internal Revenue Code that permits an employer to pay for an employee's cost of commuting to work by transit or eligible vanpool. This provision is designed to improve air quality, reduce traffic congestion, and conserve energy by encouraging employees to commute in other than single-occupancy vehicles.

Prior to TEA-21, the Internal Revenue Code allowed employers to provide only transit or vanpool benefits in addition to and not in lieu of compensation. Under TEA-21, effective January 1, 1998, transit and vanpool fringe benefits can be provided in addition to compensation, in lieu of compensation, or a combination of both, up to the maximum limit.

Conclusion

In conclusion, accomplishing the goals of FTA's research and technology programs will depend on the agency's ability to form partnerships with public- and private-sector organizations willing to join in leading the transit innovation process. Many activities will require commitments of staff and funds from sponsoring partners, as well as from FTA and other federal agencies. Clearly, the federal government has a vital interest in funding transit research and innovative technologies. Transit increases basic mobility for millions of Americans, provides congestion relief, and promotes livable communities. TEA-21 affirms that transit is a critical element of the nation's transportation system.

Readers are encouraged to visit the FTA Web site at http://www.fta.dot.gov/library for additional information on transit and TEA-21.