Introduction

Photo © Kenny Johnson

"Transportation safety is the Department of Transportation's (DOT) top strategic priority. Because the human toll and economic cost of transportation accidents are massive, sustaining continuous progress in improving transportation safety is the first objective of all DOT operations." — Department of Transportation Secretary Norman Y. Mineta, *2005 Budget in Brief*

For more than three decades, the Volpe Center has supported the DOT in addressing safety issues in all modes of transportation. Until the DOT was founded in 1967, there was no one agency that had transportation safety as a central mission. With the DOT's establishment, safety received more national attention; the Department implemented federal transportation safety initiatives that led to steady and dramatic safety improvements.

During the last 25 years, aviation fatalities have decreased more than 50 percent, and similar trends are seen in rail transportation. Deaths from motor vehicle accidents have been reduced by approximately 16 percent a year, and accident and fatality rates at highway-rail grade crossings by approximately 70 percent. However, safety improvements appear to have stalled in some sectors or they are improving only slowly. Recently released data from the National Highway Safety Administration (NHTSA) reveal that 42,636 people died on the nation's highways in 2004, down from 42,884 in 2003. The fatality rate was also down slightly from 1.48 per 100 million miles in 2003 to 1.46 in 2004. Secretary Mineta commented that *"Drivers are safer on our nation's highways today than they ever have been, in part because of safer cars, higher safety belt use and stronger safety laws the this Department (DOT) has helped champion, but as long as the number of highway deaths remains as high as it is, we will keep advocating for the kinds of vehicles, roads, driving habits that make people safer in their cars and trucks."*

Today's transportation researchers endeavor to support DOT's goal of improved safety. Researchers realize that many of the obvious advances have been made and continuing to make improvements requires thinking in new and innovative

ways. They must refine their approaches and find new ways to improve safety.

This issue of the Volpe Journal provides a framework for transportation safety research and presents examples of the Volpe Center's work within this framework. More importantly, this issue proposes future directions for transportation safety and asks questions that will help determine the best approaches to increasingly complicated transportation problems.

STRATEGIES FOR IMPROVING TRANSPORTATION SAFETY

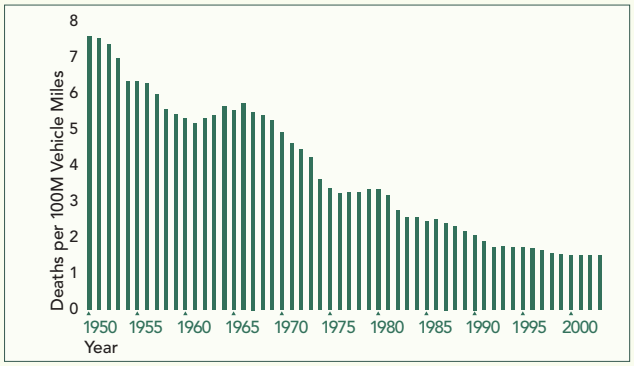
Meaningful safety advancements require a thorough understanding of the complex nature of the transportation enterprise and a systems approach that looks beyond purely technical issues to consider the political, operational, societal, economic, institutional, and environmental contexts. The Volpe Center embodies this comprehensive approach, with teams and methodologies that identify the causes and consequences of accidents and develop ways to prevent accidents or mitigate their impact.

PREVENTING ACCIDENTS

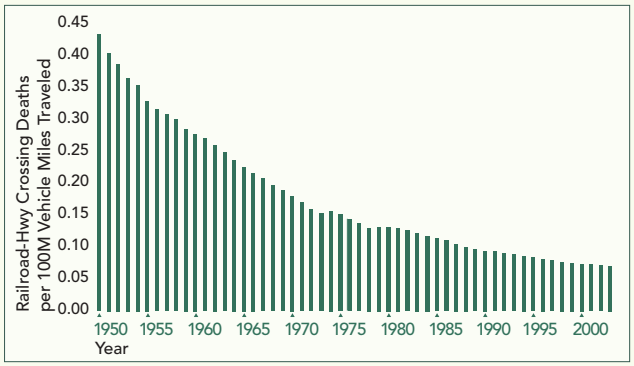
Accidents happen for two reasons: people make poor decisions because they are either fatigued or lack critical information, or their equipment fails. The Volpe Center is engaged in major efforts to predict the likelihood of accidents and develop interventions. Techniques used include statistical analysis, risk assessments, and data mining as well as human factors research. Work in the human factors arena spans all modes. It includes examining the interaction of humans and machines, and studying human fallibility, fatigue, aging, alcohol, operator distraction, and risky behavior, so that technology, operations, and organizations can be designed to help people avoid accidents. An integral element of accident prevention is understanding safety data and applying analyses so that improvement efforts are focused on the most promising areas. Volpe teams have developed systems that spot accident trends and their causes before they become widespread, monitor aviation safety performance, and analyze and distribute motor carrier safety information. Other Center teams have identified the most common types of motor vehicle crashes, proposed interventions for these

Transportation Safety Progress 1950 to 2003

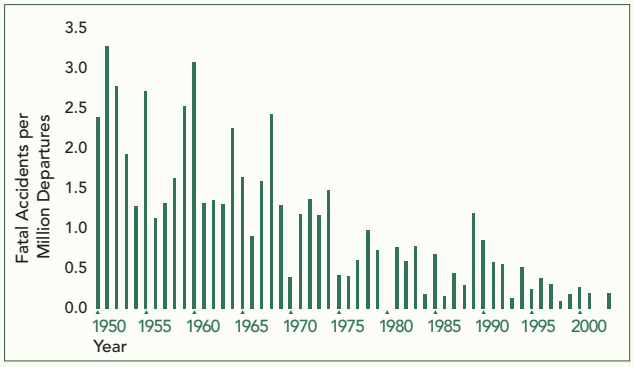
Transportation safety statistics show that safety improvements made rapid progress early in this period, but have leveled off since the mid-1990s.



TRAFFIC FATALITY RATES: U.S. Motor Vehicle Fatalities per 100 Million Vehicle Miles, 1950-2003. (National Highway Traffic Safety Administration)



RAILROAD-HIGHWAY CROSSING FATALITY RATES: U.S. Railroad-Highway Crossing Fatalities per 100 Million Vehicle Miles, 1950-2003. (Federal Railroad Administration, Bureau of Transportation Statistics)



AVIATION FATALITY RATES: Fatal accidents per million departures for U.S. scheduled service airlines, 1950-2003. Accidents due to sabotage or terrorism are not included. (Air Transport Association)

crash types, and are evaluating new crash avoidance systems, which show promise in reducing accidents.

MITIGATING THE CONSEQUENCES OF ACCIDENTS

Center staff work to understand and minimize the effects of accidents and decrease the number of injuries and fatalities. Since the early 1970s, the Center has developed occupant protection strategies in all transportation modes. This work includes studying the complex body movements of a crash victim. This research began with occupant-motion sensors and instrumented dummies, and today has evolved to include computerized crash simulations. This research helps in the development of safer vehicles. If emergencies do occur, it is essential that emergency responders have the knowledge and training to respond. The Center has been developing emergency response guidelines since 1980 and still continues to examine the best responses to new emergency challenges. This involves developing case studies that look at actual responses to emergencies and determine lessons learned from these events and offering workshops and training opportunities to transportation practitioners—under the auspices of the DOT administrations.

FUTURE DIRECTIONS FOR TRANSPORTATION RESEARCH

Transportation system designers will continue to pursue new ways to move people and goods faster and more efficiently while improving safety, security, and supporting environmental stewardship. Future challenges will involve new modalities, new technologies, and new energy sources that must be subjected to careful scrutiny to ensure their safety. As part of DOT's new Research and Innovative Technology Administration, the Volpe Center is well positioned and well equipped to support "the first objective of DOT operations."

Transportation Safety Legislation – Significant Dates

1949 First Under Secretary for Transportation is appointed in Department of Commerce.

1966 National Traffic and Motor Vehicle Safety Act and the Highway Safety Act placed the federal government in a leadership role for a national effort to reduce the numbers of deaths and injuries on United States highways.

1967 Department of Transportation (DOT) established as the primary agency in the federal government with responsibility for shaping and administering policies and programs to protect and enhance the safety, adequacy, and efficiency of transportation systems and services.

DOT issued the 20 federal motor vehicle safety standards and 13 national highway safety standards.

National Highway Safety Bureau established. The new agency later became the National Highway Traffic Safety Administration, responsible for setting up safety programs that include highways, motor vehicles, and their operators.

1968 Federal-aid Highway Act established national bridge inspection standards—following the collapse of the Silver Bridge connecting Point Pleasant, West Virginia and Gallipolis, Ohio—killing 46.

Natural Gas Pipeline Safety Act authorized DOT to prescribe safety standards for the transportation of gas and for pipeline facilities.

1970 Transportation Systems Center established in Cambridge, Massachusetts (now the Volpe National Transportation Systems Center).

Federal Railroad Safety Act promoted the safe operation of railroads and gave the Secretary authority over such previously excluded areas as track maintenance and equipment standards.

1971 Federal Boating Safety Act provided the Coast Guard with the authority to establish minimum safety construction standards for boats and associated equipment.

1974 Transportation Safety Act made the Transportation Safety Board into an independent agency and authorized the DOT Secretary to regulate the transportation of all hazardous materials and to impose civil and commercial penalties for violations.

1975 Materials Transportation Bureau established within DOT Office of the Secretary to coordinate responsibilities concerning pipeline safety and the safe shipment of hazardous materials.

1983 Presidential Commission on Drunk Driving issued its report, recommending that Congress deny some federal highway funds to states that did not adopt a minimum drinking age of 21.

1984 Final rule issued mandating air bags and/or automatic seat belt restraints in all automobiles after 1990 (unless states representing two-thirds of the American population voted for mandatory use of seat belts).

1991 Aging Aircraft Safety Act authorizing the FAA to require certain airworthiness reviews and inspection for airliners in service more than 15 years.

Intermodal Surface Transportation Efficiency Act (ISTEA) provided a six-year reauthorization to restructure highway, highway safety, and transit programs.

1994 Highway-Rail Safety Action Plan—Always Expect A Train, designed to educate motorists and pedestrians about fatal consequences of car-train crashes and pedestrian-train collisions.

Hazardous Materials Transportation Authorization Act broadened the regulatory and enforcement authority of the DOT Secretary to provide protection against the risks to life and property during the transportation of hazardous materials. The statute covered the transportation of hazardous materials by aircraft, rail, ships, and vehicles.

DOT issued final alcohol and drug testing rules for more than 7.4 million employees who performed safety-sensitive functions in transportation industries.

1995 Grade Crossing Safety Task Force formed to conduct a comprehensive review of highway-rail grade crossing design and construction.

1998 The Transportation Equity Act for the 21st Century (TEA-21) authorized the federal surface transportation programs for highways, highway safety, and transit for the six-year period 1998-2003. TEA-21 included a strengthening of safety programs across the DOT.

NHTSA announced a proposed rule that would require air bags to pass safety tests using crash dummies of all sizes—large adult, small adult, child, and infant.

1999 Motor Carrier Safety Improvement Act established the Federal Motor Carrier Safety Administration (FMCSA)—responsible for management of the federal motor carrier safety programs, including the oversight of annual motor carrier safety grants to state and local governments, overseeing state commercial drivers license programs, and conducting research into crash causation and improved analysis of crash data.

2000 Transportation Recall Enhancement, Accountability, and Documentation (TREAD) Act required automobile, tire, and auto parts manufacturers to make several changes to improve tire safety.

2003 FMCSA issued the first significant revision to the Hours of Service (HOS) regulations in more than 60 years. The new regulations provided an increased opportunity for drivers to obtain necessary rest and restorative sleep, and at the same time reflected operational realities of motor carrier transportation.

2005 The Research and Innovative Technology Administration (RITA) and the Pipeline and Hazardous Materials Safety Administration (PHMSA) established. Authorized 2004 by the Norman Y. Mineta Research and Special Programs Improvement Act (2004). RITA focuses on innovation and research in transportation technologies and concepts, and PHMSA on pipeline and hazardous materials safety.

Source: *http://dotlibrary.dot.gov/historian/historian.htm*