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## Strategic Highway Safety Plan

**STRATEGIC HIGHWAY SAFETY PLAN**

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PLANNING AND ADMINISTRATION FOR TRANSPORTATION SAFETY**

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## **PREFACE**

The Transportation Research Board's (TRB) Committee on Planning and Administration for Transportation Safety developed a strategic planning process for the purpose of achieving a comprehensive highway safety strategy. This process, initiated several years ago, resulted in the production of TRB Circular #318, "Applying Strategic Planning to State Highway Safety Programs" (June, 1987), which describes the strategic planning process as applied to transportation. Subsequently, four subgroups were assembled to identify safety issues pertaining to the driver, vehicle, highway environment, and traffic records. Each subgroup identified pertinent issues, which they developed into working papers presented at a workshop in the summer of 1988.

In the summer of 1988, the Standing Committee on Highway Traffic Safety (SCOHTS) of AASHTO, established a task force to develop a comprehensive highway safety strategy. The task force was charged to "...conduct preliminary research, survey member departments for their recommendations as to priorities, conduct liaison with other highway safety organizations, and then design a long-term strategy and plan that will guide the Standing Committee on Highway Traffic Safety in the 1990's."

Numerous data sources were tapped to help identify the major safety concerns of both committees. Although, there is not a single unified data source that combines all reportable crashes, the Fatal Accident Reporting System (FARS) and the National Accident Sampling System (NASS) did provide excellent information on all highway deaths as well as a cross section of all crashes. These data sources, together with the summary Highway Statistics, and a review of recent research findings provide the primary resources for problem assessment used in this analysis.

The efforts of both of these committees along with various data sources led to the development of a draft strategic highway safety plan in the spring of 1989. The draft document was distributed to the AASHTO Standing Committee on Highway Traffic Safety and the TRB's Committee on Planning and Administration for Transportation Safety during their respective 1989 Summer Meetings. The comments and recommendations received at both of these meetings were incorporated into the present plan. The highway safety plan developed by this process provides the framework for a strategic approach to highway safety for the 1990's. It is designed as a flexible document to allow responsiveness to change and accommodate emerging technologies.



## SUMMARY

Many impressive highway safety gains have been realized as a result of the enactment of the Highway Safety Act of 1966. New high standard highways such as the Interstate Highway System have resulted in significantly safer travel. Safety features in vehicles such as the collapsible steering wheel, safety belt systems, and side impact protection have improved survivability and reduced injury in crashes. Stronger safety laws and public awareness safety campaigns have impacted driver performance particularly in the areas of increased safety belt usage and reduced alcohol impaired driving. However, even with these improvements, if trends in population, travel growth, and highway deaths continue, more than 500,000 people will die on the nation's streets and highways during the 1990's.

A strategic highway safety plan has been developed to address the critical safety issues which we face in the 1990's. Effective implementation of this plan will reduce the number of people who will die on our highway system. Effective implementation requires the careful allocation of limited resources to the issues having highest potential for cost-effective safety impacts. It must also be flexible enough to adapt to change so that the total safety impact can be maximized with the resources available.

### The Highway Safety Problem

While the fatal crash rate has been declining over the past several years, total highway deaths have been steadily climbing since 1983. If the trends over the past five years continue in the future, the following results can be expected over the next ten years:

- o More than 500,000 people will perish on the Nation's highways.
- o More than \$1.2 trillion will be lost in highway crashes.
- o One in every 19 children born this decade will die, be permanently disabled, or suffer a life threatening injury in a highway crash during his/her lifetime.

Highway crashes are complex events involving actions, interactions, and characteristics of drivers, other involved people, vehicles, and the highway. The potential for a crash and the resultant severity are dependent on several characteristics within each of these elements. Numerous discussions with representatives of the AASHTO Standing Committee on Highway Safety, TRB's Planning and Administration of Transportation Safety Committee, and Federal Highway Administration (FHWA) and National Highway Traffic Safety

Administration (NHTSA) officials, resulted in the identification of 19 specific safety issues that can be divided into five categories:

#### I. People

Alcohol/Drug Impairment  
Safety Belts  
Driver Performance  
Driver Examination  
Commercial Motor Vehicle Drivers  
Young Drivers  
Older Drivers  
Enforcement of Traffic Laws and Regulations  
Pedestrians

#### II. Vehicles

Passenger Cars  
Light Trucks and Vans  
Heavy Trucks

#### III. Highway Environment

Comprehensive Corridor Safety  
High Crash Locations  
Night Crashes

#### IV. Post Crash

Rural Emergency Medical Services

#### V. Safety Management

Traffic Safety Information Resource  
Training & Development for Highway  
Safety Managers  
Strategic Transportation Research  
Study for Safety

## PART A ELABORATION OF THE 19 SAFETY ISSUES

### CATEGORY I. THE PEOPLE

#### Issue: ALCOHOL/DRUG IMPAIRMENT

Alcohol-related crashes continue to be a prime concern in highway safety. All states have enacted legislation to prohibit under age 21 drinking, and may require prompt suspension of licenses for DUI offenses through an administrative revocation process. Programs to motivate beverage servers to limit excessive drinking by customers, utilize alternate means of transportation and agreements between teenagers and parents not to drink and drive, have all gained momentum in the past 5 years. Enforcement initiatives, such as sobriety checkpoints, are also increasing in use in deterring drinking and driving.

Despite all these initiatives, the alcohol-related crash problem is still the primary highway safety issue.

#### **Issue: SAFETY BELTS**

Since 1984, 34 states and the District of Columbia have enacted safety belt use laws. However, the usage levels measured throughout the United States show that although usage has increased, it is below the levels obtained in most other countries with belt use laws. The National Highway Traffic Safety Administration (NHTSA) has monitored belt usage in 19 cities in the United States since 1983. NHTSA reports that from January through March, 1989, driver belt use in the 13 cities with safety belt use laws was 50 percent, while in the six cities without those laws, the rate was 34 percent.

NHTSA has analyzed the fatality reduction throughout the United States resulting from belt use laws and estimates that in the four year period between 1983 and 1987, safety belt use laws saved 6,907 lives. Although the potential fatality reductions resulting from higher usage rates have yet to be realized, in 1984, NHTSA estimated that with 70 percent usage, safety belt use laws could save an additional 5,900 to 6,700 lives annually.

Some of the specific areas of concern are as follows:

##### **A. Safety Belt Use Laws**

The degree of effectiveness of belt use laws is determined by the type of law (primary or secondary), the level of enforcement, and the intensity and quality of awareness campaigns. Primary enforcement means that a motorist can be stopped and ticketed solely for a seat belt use violation. In contrast, secondary laws allow police to issue citations only if a motorist has been stopped for another offense. Research has shown that the combination of increased enforcement coupled with an intensified awareness campaign, particularly in states with primary laws produce the most belt use and attendant reduction in fatalities.

##### **B. Automatic Belts**

There are considerable variations in the usage levels measured in automatic restraint equipped cars. A study conducted by the Insurance Institute for Highway Safety in 1987 found that most non-detachable systems had far higher usage than non-motorized detachable systems.

##### **C. Proper Belt Use**

The effectiveness of belts in reducing injuries may be compromised by belt slack and misrouting of the belt.

Federal Motor Vehicle Safety Standard 208 currently permits tension relievers and other slack inducing features in seat belts. Tension relieving devices are found primarily in domestic cars. Drivers and occupants need to become more aware of the potential dangers of excessive slack and the need to retain a snug safety belt. Vehicle manufacturers need to explore and develop safety belt systems which minimize the occurrence of excessive slack.

##### **D. Child Restraint Compatibility**

Vehicles must be designed so they are capable of providing or accommodating restraints for occupants of all ages. Infants and young children need special restraints to best protect them and since all 50 states now require such restraints, it is important that the vehicle belt system be designed to easily and correctly secure those restraints in a vehicle. Ironically, as NHTSA acts to provide improved protection to older children and adults, the problem of properly securing child restraints may increase as more manual lap/shoulder belts are installed in rear seats.

##### **E. High Risk Groups**

Research has shown that belt use among drivers with relatively high risk of crashes are less likely to wear seat belts than drivers with lower crash risks even when required by law to do so. For example, young drivers, drinking drivers, and high-speed drivers are groups with high crash and injury risk who have been shown to be less likely to wear seat belts.

#### **Issue: DRIVER PERFORMANCE**

Each state maintains a system to deal with drivers whose problems are most frequently expressed as traffic violations. However, only a few programs have been evaluated for their impact on traffic safety. While the ultimate objective of any driver improvement system is to reduce crashes, substantial efforts are usually directed toward the more immediate goal of preventing repeated traffic offenses. Virtually all interventions by driver improvement systems are triggered by convictions for traffic violations. Consequently, many existing driver improvement activities are implemented some time after the occurrence of the violations. If the delay between violation and driver improvement is very long, it lessens the effectiveness of the intervention. This problem has led to the establishment of administrative per se programs for alcohol offenses. For the most serious problem drivers, states operate habitual traffic offender (HTO) programs. While there is considerable variance among the states with respect to HTO programs, the majority of programs involve long term sanctions. All sanctions share the common trait of being only partially effective.

Considerable research suggests that many drivers whose privileges have been suspended or revoked, continue to drive. Though this research indicates that crashes and violations are reduced during the suspension period, FARS data indicates that suspended drivers were involved in 3,782 fatalities in 1987 or 8.1 percent of the total.

#### **Issue: DRIVER EXAMINATION**

Some applied research conducted over the past 10-15 years has been directed toward identifying specific subsets of skills, functional capabilities, operating practices and knowledge elements that are essential to safe driving. Other research such as that performed in the development of the Commercial Drivers License Examination has identified performance criteria for this behavior and determined measurement techniques to assess them in an objective and reliable method. In many states and jurisdictions, however, there is a gap between desired program goals and present program performance. There is also a lack of standardization in testing practice for both knowledge and driving skills between states and sometimes even within one state. Although the question concerning the correlation between degree of knowledge, specific skills and actual driving performance has never been resolved, there is an assumed correlation in the basis for the testing program now in use for commercial drivers.

#### **Issue: COMMERCIAL MOTOR VEHICLE DRIVERS**

Heavy truck crashes continue to be a national concern primarily due to the injury/fatality differential in car-truck collisions. More than 4,000 people die each year in crashes involving heavy trucks. Driving a truck is a hazardous occupation. The occupational death rate for heavy truck drivers is five times greater than the average for all workers in the United States. Unfortunately, most heavy truck drivers receive training on the job; only 15 percent of truck crashes involved drivers who had formal commercial driver education. Heavy truck drivers with less than a year of experience are substantially over-involved in crashes compared with more experienced drivers. Passage of the landmark Commercial Motor Vehicle Safety Act of 1986 (CMVSA) placed a national emphasis on establishing a uniform national program to identify, qualify and control commercial drivers. In response, the states and FHWA are developing a national telecommunications and data exchange system to track truck and bus drivers with respect to license administration. A reliable set of knowledge and skill tests has been developed to examine and qualify commercial drivers.

#### **Issue: YOUNG DRIVERS**

Young drivers between the ages of 16 and 24 have the highest fatality rate per 100,000 population and per 100 million vehicle miles driven. For the 16 to 19 year age group, these rates are substantially higher than the 20 to 24 age group. Despite impressive reductions between 1982 and 1987, young drivers are still disproportionately represented in alcohol-related crashes. While drivers under 21 constitute only 8% of the driving population, they account for 17 percent of the drivers involved in alcohol-related fatal crashes. In addition to mixing alcohol and driving, young drivers lack experience in the driving task, exhibit a stronger tendency to take risks and often do not use safety belts.

A graduated licensing system for young drivers which tailors the licensing process to the development of a driver's skills has some promise for reducing the crash potential for young drivers. Several states have provisional licenses with nighttime curfews. An analysis comparing the effects of provisional licensing in Pennsylvania and New York, which have the longest curfew periods to Ohio, with no provisional licensing, found crash reductions when the curfew period was imposed.

#### **Issue: OLDER DRIVERS**

The number of older drivers in our society is increasing at a faster rate than any other segment of the population. It is estimated that the population age group 75 years or older will increase from 12.5 million in 1987 to 17.2 million by the year 2000, a 38 percent increase in 13 years. This is a serious concern to most safety experts because following young drivers under the age of 25, drivers 70 years and over have the highest fatality rate of any age group.

The recently released Transportation Research Board (TRB) study, Transportation in an Aging Society, offers a blueprint for a recommended comprehensive national program for older drivers and pedestrians. This critical study presents 28 recommendations for federal, state and local governmental action from highway signing to mass transit to older driver education.

Driving performance does decline with age. The most common problems are visual impairment due to the natural aging of the various eye structures and decremental cognitive and psychosomatic skills increasing with age but varying from one person to another. Other age related medical conditions affecting the driving task are cardiovascular disease, hearing disabilities, mental illness, metabolic diseases, musculoskeletal conditions such as arthritis, neurological disorders, alcohol /drug abuse and respiratory diseases.

With a few exceptions, driver license screening processes for older drivers are either non-existent or extremely limited. While some states issue limited licenses to impaired drivers most of whom are older, to confine they're driving to certain hours of the day or to a specific geographic area, the issuance of limited licenses and the gradual withdrawal of the licensing privilege should be further researched.

Most older drivers learned to drive several decades ago and as a result their information on traffic laws may be outdated. Also, because aging is a very gradual process, many older drivers are not fully aware of the diminishment of their ability to drive.

Usually, design standards for roads and road signs were developed on the basis of younger populations. Thus older drivers are in a double bind. They may not be able to read the sign until it's too late for them to make a safe movement, and they no longer possess the reflexes that could compensate for their diminished visual ability. At night, they may not be able to read signs in ample time for proper decision-making. Road design, particularly on older roads, does not permit slower and more space consuming movement that the older driver needs to make because of diminished physical or visual capabilities. Medical technology has extended the life span of the average person and with it the expectation of a continuing ability to operate a motor vehicle. Unfortunately, there comes a time in everyone's life when driving is no longer safe and should not be permitted. At that time, the older person still needs mobility and must turn to alternative forms of transportation.

#### **Issue: ENFORCEMENT OF TRAFFIC LAWS AND REGULATIONS**

Enforcement is a crucial component of any comprehensive approach to transportation safety. Post licensing control of drivers and their vehicles depends on detection and reporting of errant driver behavior and vehicle safety-related defects. With increased travel and the introduction of new programs to enhance safety, enforcement agencies are experiencing an increased demand on their resources. Unfortunately, this increased demand for enforcement is occurring at a time of limited financial resources. Both federal and state government funding has remained static or has been reduced. Since enforcement relies heavily on the use of personnel, as resources become more scarce and demands for enforcement increase, it is becoming difficult to meet these needs.

New methods and approaches are needed that are not personnel intensive, yet will result in increased compliance with traffic laws and regulations.

#### **Issue: PEDESTRIANS**

Pedestrian fatalities comprise 15.8% of total motor vehicle related fatalities and account for 7,000 or more deaths annually. As expected, pedestrian fatalities are concentrated in urban areas (62%), primarily involve the old (over 65) and the young (under 15), and occur during hours of darkness (66%). Pedestrian fatalities, however, are over-represented on divided and multi-lane highways as indicated by the substantial problem on the Interstate System (8.3%).

In addition, a high number of pedestrian fatalities involve drinking pedestrians (26.5%). The National Safety Council (NSC) has developed a "Walk Alert" pedestrian safety program for the Federal Highway Administration (FHWA) and the National Highway Traffic Safety Administration (NHTSA). "Walk Alert" is a new cooperative effort of the NSC, FHWA, NHTSA, and more than 100 service and community organizations to reduce the incidence of pedestrian traffic crashes. The "Walk Alert" program makes use of the most current educational, engineering, and regulatory material and program activities available and offers considerable potential for reducing pedestrian crashes.

#### **CATEGORY II. THE VEHICLE**

##### **Issue: PASSENGER CAR SAFETY**

###### **A. Car Size**

Research has shown for years that people in small cars are injured more often and more severely than occupants of large cars. Small cars have less structure, mass, and size to absorb crash energy, so more injurious forces can reach their occupant in crashes. An analysis of 1988 FARS data shows that the death rate in the smallest cars on the road is more than double the rate in the largest cars (3.0 vs. 1.3 per 10,000 registered vehicles one to three years old in 1988). Research has shown there is a relationship between roadway design and rollover frequency for small cars. Researchers at the University of North Carolina's Highway Safety Research Center have analyzed crash data with small cars and found increased rollover frequency of these small vehicles in most type crashes. There is an increasing need to improve the fuel economy of today's vehicles. Although reducing vehicle weight (mass) is a prime means of increasing fuel economy, it is important that safety not be compromised in doing so.

Side Impact protection is one of the most important areas of current highway safety rulemaking. In August, 1979, NHTSA issued its first report evaluating the effectiveness of the side impact standard for passenger cars followed by a second report in November, 1982.



The reports indicate that while the current standard prevents a substantial proportion of deaths and severe injuries in impacts with fixed objects, such as trees, it is "significantly less effective in multi-vehicle collisions (such as intersection collisions) than in single vehicle crashes."

In January, 1988, NHTSA issued a proposal to limit chest and pelvic injuries in side impact crash tests. This is an important step in upgrading the side impact standard. Equally important is acting promptly to address head injuries resulting from side impacts. Research has confirmed that head injuries are a serious concern in side impact crashes. Overturns In 1987, 4,441 deaths or more than 17 percent of all passenger car fatalities involved overturn crashes. The likelihood of overturn increases as vehicle size decreases. As an example, on the rural Interstate system, 50.6 percent of all single vehicle minicompact fatalities involve overturning.

#### B. Crash Avoidance

There are also improvements in crash avoidance that would benefit passenger cars and other vehicles. Several studies have demonstrated the benefits of a lighting feature that reduces the incidence of daytime multiple-vehicle crashes. The feature is a daytime running light (DRL), that automatically turns on when the car is started. Another new technology that can improve vehicle braking and stability is the use of antilock brake systems. Expectations of these effects should be cautionary since a consensus does not exist regarding tradeoffs between stopping distance, yaw control and steering control.

#### Issue: LIGHT TRUCK SAFETY

The market share of light trucks, vans, and utility vehicles has almost doubled between 1971 and 1985. These vehicles now constitute a significant proportion of new passenger vehicles. Although they are being used in most cases just like passenger cars, they are not required to meet the same standards such as head restraints, side impact, roof crush, and most important, the automatic restraint standard. Data from the Fatal Accident Reporting System (FARS) show the need for additional protection for occupants of those vehicles. For example, the occupant death rate is higher in small pickup trucks than in any other kind of vehicle (3.2 per 10,000 registered vehicles one to three years old in 1988).

A very specific safety problem relating to utility vehicles involves their propensity to rollover and that they are driven primarily by young persons often in off-road areas. According to an analysis of FARS data, the occupant death rate in single-vehicle rollovers is about 25

times higher in small utility vehicles compared to the largest cars. More than half of all occupant deaths in small utility vehicles one to three years old in 1988 occurred in single-vehicle rollovers with ejection.

In contrast, only 16 percent of all deaths in the smallest passenger cars, and 2 percent in the largest cars, occur in this type of crash. Nearly half of all occupant deaths in small utility vehicles occur in single-vehicle crashes involving rollover, compared to under ten percent for midsize and large cars.

#### Issue: HEAVY TRUCK SAFETY

Because heavy trucks account for a significant number of highway deaths and injuries, the safety of those vehicles has been the subject of much research, legislation, and regulatory activity during the past decade. The Office of Technology Assessment reports that while fatalities in heavy truck crashes has remained between 4,000 and 5,000 annually, four out of every five people killed in crashes involving tractor-trailers are occupants of the other vehicle.

In direct response to this growing concern, Congress enacted the Surface Transportation Assistance Act of 1982 and the Commercial Motor Vehicle Act of 1986, and in so doing, dramatically raised the degree and level of governmental involvement in Commercial Vehicle Safety. These Acts established the Motor Carrier Safety Assistance Program (MCSAP) and provided Federal funding for the states to develop and enforce motor carrier safety regulations for both interstate and intrastate motor carrier operations.

Prior to the inception of MCSAP, roadside safety inspections were predominantly conducted by Federal safety inspectors. In the year preceding the MCSAP, these Federal inspectors conducted more than 24,700 inspections. In the first year of MCSAP, 1984, the number of roadside safety inspections increased to over 178,000 and by 1988 over 1,254,000 inspections were being conducted nationally.

As a result of the increased level of truck inspections and a more thorough review of crashes involving heavy trucks, it has become apparent that the design and maintenance of truck braking systems are a major safety concern. Increased efforts are needed to improve the compatibility of tractor and trailer brakes, to ensure proper brake adjustment, and most important, to improve vehicle stopping distances and stability and control through the use of antilock systems.

Other areas warranting attention are improving driver compliance with the federal hours of service requirement by using on-board recording devices, reducing underride crashes by installing effective underride guards, and

improving maintenance, driver training and crashworthiness.

## **CATEGORY II. THE HIGHWAY ENVIRONMENT**

### **Issue: COMPREHENSIVE CORRIDOR SAFETY**

Rural principal and urban arterials have a high number of fatalities and a high density of fatalities per mile. Over the next decade, existing trends indicate that 121,100 fatalities will occur on the rural and urban principal arterial system.

Every state has highway arterial corridors which have severe crash problems. Many of these corridors are characterized as free access facilities with operating speeds of 40 miles per hour or greater, high traffic volume and adjacent strip development. In many cases, these safety problems cannot be readily resolved by replacing the existing free access highway with an expressway/freeway because of major financial, environmental or social impacts.

### **Issue: HIGH CRASH LOCATIONS**

The Surface Transportation and Uniform Relocation Assistance Act of 1987 provided \$170 million per year (1987-1991) to eliminate or reduce hazards associated with identified highway locations, sections, and elements, including roadside obstacles and unmarked or poorly marked roads. In addition, \$160 million per year (1987-1991) was also provided for highway-railroad crossing improvements such as signing, active warning devices, crossing surfaces, grade separations, and crossing relocations.

Each program has been to be extremely cost-effective. The Hazard Elimination Program is estimated to have saved more than 9,000 lives at costs of \$364,200 per fatality. The Rail-Highway Program has saved over 5,000 lives at a cost of \$623,000 per fatality.

### **Issue: NIGHT CRASHES**

The fatal crash rate at night exceeds the daytime rate. Nighttime fatal crash rates between 2:00 AM and 3:00 AM are approximately ten times higher than between 8:00 AM and 9:00 AM. Furthermore, over 55% of all fatal crashes occur at night. In 1987, 25,911 night fatalities or 55 percent of all fatalities were recorded on FARS.

Some of the reasons for this gross disparity are:

- o Drivers are more fatigued and drowsy at night, particularly in the late evening-early morning hours.
- o Drivers are more likely to be driving under the influence of alcohol or drugs at night.
- o The potential for in vehicle distraction is greater at night because there may be more passengers at night than during the day.
- o Visibility is substantially reduced at night in comparison to daylight conditions.
- o Drivers often drive at speeds in which the stopping distances are greater than the effective illumination distances of headlamps for non-reflective objects.
- o Single vehicle run-off-the-road crashes are proportionately much greater at night.

## **CATEGORY IV. THE POST CRASH**

### **Issue: RURAL EMERGENCY MEDICAL SERVICES**

Emergency Medical Service (EMS) can be vital to the survival of persons sustaining life threatening injury as a result of traffic crashes. Its effectiveness is dependent on the time at which medical assistance is rendered and the quality of medical assistance given. A major concern is the number of severe injuries on rural highways, primarily interstate and principal arterials, which experience a high incidence of fatal crashes. In 1987, 8,007 people lost their lives in crashes on these highways (FARS).

Three accepted principles of EMS are:

- o Trauma patients must receive appropriate and specialized care in the shortest time possible after crashes.
- o Patients must be treated by an advanced level of pre-hospital care personnel such as emergency Medical Technicians (EMT) and Paramedics.
- o Direct communication between medical command physicians in hospitals and pre-hospital care personnel must be well established in the pre-hospital care phase.

There are two levels of training for EMS; Basic Life Support (BLS) and Advanced Life Support (ALS).

Basic Life Support provides emergency care to maintain breathing, clear airways and stop bleeding. Advanced Life Support, in addition to the Basic Life Support functions, also includes administering drugs, defibrillate the heart, provide blood transfusions and other complex life saving techniques. Advanced Life Support functions are usually found in and around urban areas and Basic Life Support is usually the level of EMS available in rural areas.

FARS data, while not containing the quality of medical assistance rendered, does capture response time from the time of crash occurrence to EMS arrival, as well as elapsed time from EMS arrival at the crash scene to arrival at a hospital. As expected, response times are much longer in rural areas, especially on rural interstate and principal arterials which have high numbers of fatalities.

The major concern is rural highways, primarily interstate and principal arterial, which have a high density of fatal crash occurrences of 0.5 to 1.0 fatalities over the last ten years. For these highways, response times measured from the time of the crash are high (on the rural interstate, it was more than 30 minutes 29 percent of the time). Most are serviced by EMS personnel with Basic Life Support rather than Advanced Life Support qualifications. Delivery times to the hospital are also lengthy, with 60 percent in excess of 30 minutes).

## **CATEGORY V. SAFETY MANAGEMENT**

### **Issue: TRAFFIC SAFETY INFORMATION RESOURCE**

The effective management of information requires awareness of the value of the information. To successfully identify problems, select alternatives and evaluate effectiveness, traffic safety managers need an efficient information management system.

Two recent studies by TRB emphasize the underutilization of traffic records systems as well as the need for more integration of traffic files.

A recent review by a sub-committee of the TRB Committee on Planning and Administration for Transportation Safety, comprised of members involved in the previous TRB studies proposed further pursuit of two major emerging issues in this area:

- o Implementation of a Commercial Driver Licensing Information System (CDLIS) Modernization of the National Drivers Register (NDR)/Implementation of American Association of Motor Vehicle Administrators Network (AAMVANET).

- o Traffic Records Management's Understanding of New Data Processing Technology.

### **Issue: TRAINING AND DEVELOPMENT FOR HIGHWAY SAFETY MANAGERS**

Highway engineers, technicians, law enforcement officers, administrators, emergency personnel and other highway safety personnel should all be required to maintain an acceptable level of traffic safety expertise. Currently, this expertise is acquired by pre-employment education training, and on-the-job experience.

The largest single source of qualified personnel is from the ranks of those already working in highway safety. As we move into the 1990's, federal, state, and local officials, facing a future of increasing demands and limited resources, will press for a new era in highway safety planning and management to emerge. The trend toward multiple disciplines responsible for transportation safety and the trend toward intermodal planning for the movement of people and goods, will demand a broader perspective for tomorrow's transportation safety manager.

### **Issue: STRATEGIC TRANSPORTATION RESEARCH STUDY FOR SAFETY**

Large amounts of funds are being invested annually in major safety initiatives such as licensing, enforcement, rehabilitation, vehicle inspection, emergency medical services, vehicle design, and highways. These safety initiatives, like other initiatives undertaken in the transportation field, are fragmented among thousands of federal, state, county, city and private organizations. There is no single organization that has the resources or the incentive to undertake major and comprehensive research to address and encompass the many aspects of the transportation safety issue.

A study was recently completed by TRB entitled Safety Research for a Changing Highway Environment; Special Report 229. This study which was jointly funded by the Federal Highway Administration (FHWA) and the National Highway Transportation Safety Administration (NHTSA), examined how well the highway safety research community is prepared to address emerging safety problems and to capitalize on opportunities for their solution.

The study included the investigation of roadway and roadside features, vehicle size and performance, traffic operation and control, and state and community driver safety program areas (including licensing, enforcement, adjudication, crash investigation, record systems, and driver training) and identified those promising research areas for which there is a high potential for reducing fatalities and injuries.

## PART B - IMPLEMENTATION STRATEGIES

The 19 issues identified in the previous section were consolidated into ten categories.

The 10 categories are as follows:

Safe Driving Performance  
Improved Pedestrian Safety  
Safe Commercial Motor Vehicle Operations  
Enhanced Vehicle Safety  
Vehicle Crash Avoidance  
Corridor Safety Improvements  
Improved Highway Safety  
Enhanced Rural EMS  
Safety Management  
Strategic Research for Safety

The following section provides an analysis consisting of a goal, an objective, a brief description and an action plan for each category. In most of the action plans, the initial tasks are to establish a multi-disciplinary team. A multi-disciplinary structure is suggested to create a broad base and synergistic approach to planning, resolving problems and developing and implementing strategies. Sample team compositions are identified in the appendix (Appendix A).

The inclusion of a project management system is also suggested. Project management is a critical aspect of the implementation plan, particularly when a multi-disciplinary and combined agency approach is used. In addition to a project management system, designating a project coordinator for each plan would provide greater assurance for the integration of components and smooth orchestration of the plan.

Safety strategies cannot be dealt with effectively in an isolated fashion, consequently, integrated strategies are stressed in the action plans. Likewise, there is an interrelationship between the ten areas presented. It is the implementation of interconnected safety strategies addressing each transportation component; the highway, the driver, and the vehicle that will create a cohesive plan for enhancing highway safety and improving the quality of transportation.

### SAFE DRIVING PERFORMANCE

#### Goal

- o Develop and deliver a comprehensive education/awareness/enforcement campaign that will reach all Americans and markedly improve safe driving characteristics.
- o Institute sufficient driving control mechanisms to reduce the crash

potential of young and new drivers, suspended drivers, diminished capacity drivers, and high risk drivers.

#### Objective

A minimum 10 percent annual reduction in deaths associated with unnecessary and unintended risk-taking.

#### Description

Studies have concluded that driver actions are responsible for approximately 85 percent of all crashes. The purpose of this initiative is to substantially upgrade driver performance by:

- o Communication of safe driving characteristics to all drivers through training and education.
- o Improved control of irresponsible drivers and actions.

One of the major driver performance deficiencies associated with approximately 40 percent of highway fatalities is alcohol and drug impaired driving. Emphasis is to be placed in mitigating this problem throughout both components.

A concise tabulation of key areas within each component is as follows:

#### Training and Education

- o Determination of key safe driving characteristics to be upgraded. (These include but are not limited to the following: increased safety belt usage, reduced drinking and driving, reduced speeding and tailgating, improved visual search techniques, increased state of alertness, safer night driving, safer driving under adverse conditions, better recognition of diminished capabilities and self-regulatory behaviors, better understanding of traffic control device meanings, better understanding of laws, better recognition and safer evasive maneuvers, safer driving with tractor-trailers, and better understanding of driver, highway, and vehicle limitations.)
- o Development of specific strategies for each characteristic. The strategies must include special emphasis on the young, senior, commercial, and high risk drivers. Substantial improvement in desired driving characteristics require the development of effective and convincing materials, an effective delivery system including the use of paid advertisements and complementary selective enforcement.



- o Development and implementation of a strategic plan which will reach every American highway user with meaningful and frequent information that results in measurable long term reduced risk taking and safer driver performance.

#### Control of Irresponsible Drivers and Actions

- o Develop and implement a mechanism for the effective early detection and mitigation of high risk drivers with special emphasis on alcohol/drug impaired driving.
- o Promote uniform effective state laws that reduce, a) crashes and/or severity potential, and (b) increase enforcement efficiency and effectiveness.
- o Implement effective licensing strategies particularly for the young, older, and commercial driver which will reduce crash potential.
- o Nurture the development of new technology and methods which will increase the effectiveness and efficiency of the enforcement function, increase the effectiveness, efficiency, and acceptability of assessing the driving function, and prevent any driver who had been drinking from starting any vehicle without intrusion to sober drivers.
- o Continue emphasizing truck safety by increasing motor carrier safety inspections both in the field and at the carrier's record base.

#### Action Plan

- o Establish multi-disciplinary safety teams to assess driver performance issues and make recommendations for appropriate implementation strategies in the established areas; alcohol/drug impaired driving; occupant restraint and driver improvement programs.
- o Develop and implement specific strategies in the established areas. Strategies are presented in two categories; Expansion of known successful initiatives and programs, and initiatives requiring further research and development.
- o Develop and implement a project management system to provide oversight

and assure appropriate scheduling, implementation and evaluation of all program components.

#### Safe Driving Performance Strategies

##### Alcohol/Drug Impaired Driving Initiatives

Implement strategies to address impaired driving. Strategies should include the following:

- o Create zero alcohol programs for younger drivers which are tied to driver license sanctions;
- o Implement programs to address repeat DUI offenders;
- o Develop prevention strategies and appropriate sanctions to minimize minors' use of fraudulent identification such as drivers' licenses to obtain alcoholic beverages.

Assess state laws pertaining to alcohol/drug impaired driving enforcement. Propose modifications as needed to implement innovative programs.

Programs should include the following:

- o Well publicized alcohol enforcement, such as sobriety checkpoints; and
- o Effective countermeasure programs (e.g., administrative per se, and reducing the legal intoxication level from .10 to .08 BAC).

Implement community based education and awareness campaigns which address alcohol/drug impairment and driving.

These should include the following:

- o Education and awareness targeted to specific subgroups (e.g., younger drivers, older drivers and repeat offenders);
- o Public information and education campaign emphasizing driver performance improvement strategies and increasing road user awareness of traffic control devices, highway and vehicular characteristics;
- o Disseminate information and implement programs using materials developed at the national level (or successfully used by other states and disseminated by Federal agencies)

pertaining to alcohol/drug impaired driving.

### Occupant Protection Initiatives

Assess state laws pertaining to enforcement of occupant protection laws. Propose modifications as needed to implement effective programs. This should include passage of mandatory belt use law, strengthen existing laws (i.e., change from secondary to primary offense).

Publicize enforcement efforts.

- o Use media efforts to alert the public to targeted enforcement programs (e.g., belt use checks and appropriate use of child restraints).

Implement community based education and awareness campaigns. These should include the following:

- o Education and awareness about occupant protection to specific subgroups (e.g., younger drivers, older drivers and parents);
- o Disseminate information and implement programs pertaining to occupant protection using materials developed at the national level or successfully used by other states (e.g., Elmira, NY program);
- o Integrate campaigns with other agency and community information programs such as corporate seat belt programs and school safety programs.

Work with industry to jointly pursue an evaluation of the effectiveness of automated restraint systems. Ascertain levels of use and effectiveness and recommend enhancements as needed.

### Driver Improvement Initiatives

Enhance existing state examination and licensing programs to include initiatives such as limited licensing strategies, provisional licensing of new and young drivers, and gradual de-licensing of older drivers.

Implement strategies to address known driver improvement concerns. Strategies would include the following:

- o Implement an older driver improvement program, based on Federal model;

- o Implement programs to identify and detect high risk drivers, including repeat DUI offenders.

Establish a national committee on driver improvement including state highway safety and driver licensing agencies to develop model improvement and control programs and manage their evaluation. These programs, targeted to all driver groups, should include mechanisms to detect drivers with significant medical impairments, identification of problem drivers and specific improvement activities and/or sanctions.

Implement community based education and awareness campaigns.

- o Publicize enforcement efforts and use media efforts to alert the public to targeted enforcement programs (e.g., speed surveillance).
- o Integrate campaigns with other agency and community information programs such as disseminating driver performance information at school safety programs and driver education classes for younger drivers. For older drivers, disseminate information at senior center programs and driver training programs such as 55 Alive.

### Initiatives Requiring Further Research and Development

Develop a national standard for the examination of drivers with respect to knowledge of the driving task, laws, highway environment and vehicle safety components and the skills necessary to safely maneuver a motor vehicle. American Association of Motor Vehicle Administration's (AAMVA's) recently established National Driver Test Committee should be used to manage this effort.

Implement a more rigorous driver examination and licensing program.

- o Use new standards developed at the Federal level.
- o Implement multi-step progressive licensing processes tied into demonstration of safe driving skills and abilities.
- o Integrate findings and techniques emerging from driving simulation research for testing driver skills.

Assess driving performance of different groups of drivers particularly younger, older and high risk drivers and develop driver programs with specific components. Sample strategies would include the following:

#### Younger Drivers

- o Assess driving performance of younger drivers and identify specific driver control concerns. Typical concerns would include frequency of alcohol related fatalities and injuries, speed related crashes and injuries, and risk taking.
- o Develop and implement comprehensive driver education programs throughout high school (grades 9-12);
- o Monitor and track performance using multiple characteristics to more accurately target different types of high risk offenders;
- o Use progressive sanctioning;
- o Synthesize young driver research data and identify existing knowledge gaps requiring further research.

#### Older Drivers

- o Identify driver performance failures of older drivers such as medical impairment, diminishing skills and capabilities, selective attention, and specific crash patterns of older drivers.
- o Develop sensitive screening programs to detect impairment;
- o Use medical advisory boards to set standards;
- o Use limited license programs addresses diminishing driving skills yet allow maximum mobility (e.g., gradual de-licensing); and
- o Implement signing, roadway markings, traffic standards etc. sensitive to the needs of older drivers.

#### High Risk Drivers

- o Perform a thorough study of identified high risk drivers to determine behavior

and violation patterns such as recidivism, habitual offenders and types of offenses committed.

- o Improve detection of high risk drivers using analysis of multi-dimensional data including driver history data such as violations, crashes and sanctions as well as demographic/geographic and vehicular data.
- o Develop early intervention programs emphasizing education and counseling. Focus on eliminating problem driver behavior patterns and identifying future consequences of further problem behavior.
- o Review of current driver improvement efforts and laws to identify needed enhancements.

Develop community based education and awareness campaigns targeted to specific driver performance concerns. These should include the following:

- o Education and awareness targeted to specific subgroups (e.g., Younger drivers - alcohol, drug impaired driving, speeding, and risk taking; Older drivers - night driving and alternate transportation information; High risk drivers - driving while license is suspended);
- o Specific problem awareness (e.g., alcohol related motorcycle fatalities, drowsiness, risk taking and tailgating crashes);
- o Disseminate information and implement programs using materials developed at the national level (or successfully used by other states and disseminated by Federal agencies) for common safety problems such as impaired driving, speeding, night driving, understanding laws, signs, symbols, etc.;
- o Use media efforts to alert the public to targeted enforcement programs (e.g., sobriety checkpoints, safety belt checks, and speed surveillance);
- o Integrate campaigns with other agency and community information programs.

Develop national guidelines for model traffic laws, regulations and ordinances to enhance safety, and establish guidelines to provide consistent, effective enforcement practices and appropriate policies.

Conduct research about the use of intelligent (automated) enforcement systems to expand the impact of enforcement. Systems should be designed to enhance enforcement without compromise to individual rights.

Establish a multi-disciplinary group to manage the development of new model performance standards for highway and street signing, highway design, roadway markings and traffic control management based on needs and capabilities of all drivers with emphasis on needs of older population. The group should include representatives from state and local highway, highway safety, driver licensing and enforcement and health agencies.

## IMPROVED PEDESTRIAN SAFETY

### Goal

Implement comprehensive pedestrian safety programs in all urbanized areas, the Interstate system, and other selected rural and urban areas with concentrations of pedestrian fatalities.

### Objective

A minimum 10 percent reduction in pedestrian deaths and injuries in targeted areas.

### Description

A long range comprehensive program including education, engineering, and enforcement components targeted to high risk groups, geographical areas, drivers, and highways is needed to reduce the potential for pedestrian deaths. This comprehensive program should begin with the development of effective materials, delivery systems and enforcement strategies targeted to high risk pedestrian groups, drivers, and specific problem areas.

Location analysis and specific education and enforcement strategies are needed to address the pedestrian fatalities on the interstate and similar high speed freeways.

### Action Plan

Establish a multi-disciplinary safety team to assess pedestrian issues (including bicycle) and define appropriate implementation strategies.

- o Identify and analyze locations with high frequency of pedestrian crashes. This would include urban and urbanized areas, corridors, expressways and other specific problem locations.
- o Select and prioritize locations. Prioritization should consider the relative magnitude of the crash problem together with other constraints such as available funding and human resource constraints.

Develop and implement specific engineering, educational, and enforcement improvements at selected locations.

Engineering: Select and implement appropriate highway improvements. Selection should be based on expected crash reduction. Typical highway improvements would include the following:

- o Improving visibility at intersections;
- o Constructing barriers and refuge islands;
- o Addressing problems at intersections attributable to allowing turn-on-red;
- o Installing lighting to illuminate problem areas;
- o Upgrading traffic signals, markings, and signs;
- o Constructing sidewalks.

Educational Program: Implement pedestrian safety education programs. A typical program would include the following components:

- o Pedestrian safety programs targeted to young children (particularly in grades K-3) and senior citizens;
- o Safe night walking practices;
- o Driver/pedestrian awareness initiatives. Elicit full community involvement by supplementing programs with non-profit and civic organization efforts. Also, media coverage and special media events should be used to increase public awareness.

**Enforcement Component:** Develop initiatives to strengthen enforcement of pedestrian activities. Typical enforcement countermeasures would include the following types of activities:

- o Assessment of existing laws and ordinances to determine adequacy;
- o Targeted efforts to address specific areas with high frequencies of pedestrian violations and/or crashes;
- o Specific strategies to address areas with frequent drunk pedestrian crashes;
- o Media campaigns to increase driver and pedestrian awareness of enforcement activities.

#### Controlled Access Highways

Develop strategies to improve pedestrian safety on controlled access highways. Typical countermeasures would include:

- o Adequate motorist assistance program particularly at night;
- o Education and awareness campaigns promoting safe evacuation at crash sites;
- o Targeted enforcement and engineering initiatives to reduce illegal use of controlled access highways at problem locations.

**Vehicle Research:** Increase vehicle research (front-end vehicle safety enhancements) to reduce the severity of pedestrian injuries.

- o Develop and implement a project management system to provide oversight and assure appropriate scheduling, implementation, and evaluation.

#### SAFE COMMERCIAL MOTOR VEHICLE OPERATIONS

##### Goals

- o Improve the safety of commercial motor vehicle operations by implementing an enhanced enforcement program.

- o Ensure the quality of commercial drivers through the implementation of the Commercial Drivers License (CDL) Program.
- o Reduce the potential for spills or catastrophic events involving hazardous materials transportation by developing and implementing comprehensive risk reduction strategies.

##### Objective

Reduce commercial motor vehicle fatalities by a minimum of 5 percent.

##### Description

A concise tabulation of the key components within each goal follows:

#### Improve Safety of Commercial Motor Vehicle Operations

- o Assess effectiveness of existing efforts, identify opportunities for improvement and uniform application, and develop strategies to improve effectiveness.
- o Implement enhanced enforcement and education efforts which will result in safer commercial motor vehicle operations.
- o Continue funding for the Motor Carrier Safety Assistance Program (MCSAP) as part of post-1991 highway program and, if appropriate, increase funding to improve effectiveness of existing efforts and possibly expand eligibility for size and weight enforcement.

#### Ensure the Quality of Commercial Drivers

- o Implement the CDL Program in all states in accordance with the Commercial Motor Vehicle Safety Act of 1986.
- o Assess the effectiveness of the CDL Program and develop enhancements

to improve the quality of commercial drivers including the feasibility of:

- Integrating driver medical and physical qualifications into the driver licensing standards.
- Improving techniques for training commercial drivers through the use of simulators.

#### Reduce the Risks Resulting from Hazardous Materials Incidents

- o Perform a comprehensive, critical evaluation of existing program efforts for hazardous materials to identify opportunities for improvement and uniform application, and develop strategies to improve effectiveness. Elements to be included in the assessment include:
  - Regulations
  - Federal and state mitigation measures
  - Enforcement strategies
- o Implement comprehensive strategies to reduce the potential for hazardous materials transportation spills or catastrophic events.

#### Action Plan

Establish a multi-disciplinary safety team(s) to define appropriate implementation strategies.

- o Identify and analyze safety problems associated with operations, drivers, and the transportation of hazardous materials.
- o Prioritize problems based upon their relative relationship to crash potential, implementability and effectiveness of solutions, and availability of funding and human resources.
- o Develop an implementation plan which addresses the following areas; safer commercial vehicle operations, improved commercial vehicle operators, and reduced potential for hazardous material spills and catastrophic events.

Implement plans with specific strategies to address each area.

#### Commercial Vehicle Operations

Typical improvements would include the following: Motor Carrier Safety Assistance Program (MCSAP)

- o Target inspection efforts to coincide routes and times of heavy truck volumes and areas of greater crash potential.
- o Improve uniformity and effectiveness of inspectors by instituting standard levels of performance criteria, training, and quality control programs.
- o Initiate drug and alcohol recognition enforcement component.
- o Implement mobile enforcement strategies.
- o Increase effort by providing training and direction for non-MCSAP officers.
- o Institute efforts to enforce the out-of-service requirements.
- o Establish safe inspection sites on all major and interstate arterials.

#### Industry Safety Practices

- o Upgrade the SAFETYNET data system to target problem carriers for Safety Reviews.
- o Encourage carriers to adopt a model safe vehicle maintenance/driver plan.
- o Make carriers aware of the MCSAP inspection criteria.
- o Encourage carriers to actively pursue a drug testing program.
- o Encourage shippers to adopt policies which are supportive of MCSAP regulations.

#### Laws and Regulations

- o Assure compatibility between intra-state regulations and interstate regulations.

- o Assess out-of-service penalties, increase as appropriate to assure compliance and safety.
- o Modify existing state laws to adopt the .04 percent blood alcohol concentration level for driving under the influence by commercial drivers.
- o Assess existing laws for speeding and tailgating to determine enforceability and fine level. Recommend appropriate enhancements.
- o Assess existing laws for parking on controlled access highways to determine rapidity of removal, enforceability and fine level. Recommend appropriate enhancements.

#### Data System

- o Enhance the SAFETYNET and CDLIS data systems to assure use and improve reliability, e.g., coordinate truck crash data collection requirements to eliminate duplicate data entry requirements between the SAFETYNET and state accident record systems.

#### Selective Truck Safety Enhancements

#### Highway Countermeasures

- o Construct arrestor beds and pull-offs on long steep grades.
- o Improve signing and pavement banking on critical loop ramps.
- o Increase safe truck parking areas where needed.
- o Improve information systems for adverse weather conditions.
- o Identify and implement appropriate highway improvements at locations which exhibit a high potential for truck crashes.

#### Vehicle Enhancements

Intensify commercial vehicle safety research and regulatory efforts to expedite the introduction of

improved safety features in the commercial vehicle fleets. Emphasis should be given to the following:

- o Improved braking systems including anti-lock brakes;
- o Compatible front bumper systems;
- o Improved conspicuity of trucks;
- o Improved rear-end arrestor systems;
- o Reassessment of anti-splash and spray systems; and
- o Installation of automated, tamper-proof driver and vehicle recording instruments.

Assess the safety and operational concerns of tractor-trailer configurations.

#### Driver Education and Awareness

- o Develop and implement a safety campaign targeting truck and passenger car drivers to promote safer travel.
- o Improve techniques for training drivers; assess feasibility of simulators.

#### Additional Truck Enforcement Strategies

- o Target speed, tailgating enforcement and other serious moving violations at locations which have high truck crash potential.
- o Implement an aggressive parking removal program on controlled access highways.
- o Increase alcohol detection enforcement, i.e., sobriety checkpoint programs.
- o Target drug recognition initiatives.
- o Identify and take action against shippers who repeatedly promote violations of regulations or laws to satisfy time constraints.

#### Commercial Vehicle Operators



### Uniformly implement the Commercial Driver License Program

- o Test and license all commercial drivers by April 1, 1992.
- o Participate in the Commercial Driver License Information System (CDLIS).
- o Enforce .04 percent blood alcohol concentration for commercial drivers.

### Address High Risk Drivers

- o Identify high risk drivers (drivers with history of frequent violations and/or crashes).
- o Integrate information systems to identify high risk drivers and motor carriers that employ high risk drivers.
- o Develop and implement strategies to eliminate inappropriate actions by high risk drivers.

### Commercial Vehicle Educational and Informational Programs

- o Provide education and information to industry and drivers on safe operations and practices.
- o Encourage carriers to institute policies, practices, and training programs which emphasize safety.

### Hazardous Material Spills and Catastrophic Events

- o Develop a comprehensive risk reduction program which includes the following: A definition for a catastrophic event; identification of areas which have high potential for catastrophic events; identification of a range of solutions; and prioritization of risk reduction strategies.
- o Upgrade emergency and incident response plans.
- o Strengthen existing hazardous materials laws and regulations as appropriate.
- o Insure that a core group of inspectors is trained and proficient in conducting detailed hazardous materials inspections.

- o Institute a targeted hazardous materials inspection effort either by location, carrier, or material.
- o Emphasize Safety Reviews of carriers transporting either large quantities or the more dangerous hazardous materials.
- o Coordinate enforcement/data sharing programs between states.
- o Identify common failures that contribute to hazardous materials spills and encourage carriers to initiate preventative measures to reduce risk of spillage.

Develop and implement a project management system to provide oversight and assure appropriate scheduling, implementation, and evaluation.

### ENHANCED VEHICLE SAFETY

#### Goal

Incorporate improved cost-effective safety features which are affordable and acceptable to the general public, into the new vehicle fleet by 1996.

#### Objective

By 1996, reduce the rate of deaths per 10,000 registered vehicles by at least 20 percent compared to 1990 rates, attributable directly to vehicle safety enhancements.

#### Description

The consequences of crashes can be significantly reduced by improved safety features in vehicles. Enhancement of features such as safety belt performance and mechanisms to increase usage, passenger compartment integrity, side impact protection, truck braking performance, and overturn reduction and protection are needed. Particular emphasis should be given to small cars and light trucks which have fatality rates substantially higher than other types of vehicles and have an increasing portion of the market share. Government and industry must work together as partners to insure the timely development of improved safety features. To achieve this, sufficient financial resources are needed to support the technical breakthroughs to bring these advances to the public as soon as possible at an affordable price.



Attention should be addressed to potential legal barriers which would preclude a participative joint government/industry initiative to achieve the necessary advances. Where such barriers exist, they need to be removed expeditiously to allow joint participation in this important area.

The FHWA and NHTSA are developing a joint vehicle safety research effort to reduce the heavy vehicle fatality rate by 1992.

#### Action Plan

Create and maintain a system to ensure compliance with vehicle safety standards including establishing highway enforcement strategies which target unsafe vehicle features.

Develop guidelines and/or regulations which identify unsafe vehicle modifications. Encourage adoption of regulations or use Federal guidelines in the development of state regulations, which prohibit the operation of unsafe modified vehicles.

Develop and use educational activities (e.g., pamphlets, brochures, components of driver education programs) to increase awareness of proper vehicle maintenance.

Incorporate proposed vehicle safety standards into the vehicle fleet including interior head protection, improved occupant rollover survivability, door retention, light truck rollover prevention, and truck safety enhancements (i.e., stopping distance, conspicuity, under-ride protection and anti-lock brakes).

Research, develop and prioritize vehicle safety needs. Expand the existing vehicle research and testing program to address these needs and identify additional vehicle safety features.

- o Direct research efforts in vehicle and highway design to achieve greater compatibility of vehicles and highway operating characteristics. Special emphasis should be given to vehicle size and weight, including disparity between vehicles (e.g., larger commercial vehicles and smaller passenger vehicles) and highway appurtenances.
- o Increase funding for bio-mechanics research in the program to assure that knowledge and features of human injury tolerance (particularly age and sex differences) are incorporated into the standards.

- o Strengthen the partnership between auto manufacturers and the public sector and involve these working partners in the research and testing phase.
- o Expedite the research and testing phase to ensure the quick movement of enhancements through the rulemaking process and provide sufficient funding to support this effort.

Continue to actively monitor the integration of new safety standards into vehicle fleets and evaluate safety systems designed by auto manufacturers in response to new standards.

#### VEHICLE CRASH AVOIDANCE

##### Goal

In partnership with industry, conduct a major automated intelligent vehicle highway technology research effort designed to dramatically improve mobility, congestion, and safety.

##### Objective

Introduce intelligent vehicle highway technology into the new vehicle fleet and highway system by the year 2000.

##### Description

U.S. DOT and several segments of the private sector have already exhibited a strong interest in forging ahead with the advancement of Intelligent Vehicle Highway System technology (IVHS). Implementation of this concept has the potential to have a profound impact on both mobility and safety. A report released by the General Accounting Office (GAO) in 1991 predicts that the success of the IVHS program will depend on how well barriers of cost, institution and technology are overcome.

##### Action Plan

A preliminary long range IVHS Plan has been developed by US DOT based on initial IVHS work emphasizing congestion management and mobility. An assessment of this plan is currently underway to identify the full range of opportunities to improve safety. Safety considerations should be incorporated into the work plan.

The plan should also include specific goals for improvements in congestion, safety, the economy, energy and the environment; selection and evaluation of high priority field tests; and an analysis of optimal funding

options for achieving IVHS benefits as recommended in the 1991 GAO report on smart highways.

## CORRIDOR SAFETY IMPROVEMENTS

### Goal

Implement comprehensive and coordinated driver, vehicle, and highway safety improvements on highway corridors which have crash and fatality rates substantially higher than similar facilities.

### Objective

A minimum 20 percent reduction in crash, injury, and fatality rates on identified corridors.

### Description

Many high volume older arterials ten to thirty miles in length have experienced more than fifty highway deaths over the past ten years and a death rate substantially higher than the expected rate. The comprehensive corridor safety improvement concept is an approach which applies cost-effective highway safety improvements (left-turn lanes, anti-skid overlays, improved signing) in addition to improved safe driver performance publicized enforcement blitzes, targeted education efforts) in the areas of safety belt usage, drinking and driving, speeding and tailgating, improved truck safety through intensified MCSAP inspections, and improved survivability of severe crashes through EMS enhancements.

### Action Plan

Establish a multi-disciplinary safety team to define problems and identify appropriate implementation strategies.

- o Identify corridors with high frequencies of severe crashes;
- o Assess and prioritize corridors considering the relative magnitude of the crash problem, and other constraints such as available funding and human resources; and
- o Field view each priority corridor, assess needs, and identify needed improvements.

Develop and implement strategies for each priority corridor which would include the areas of Highway, Enforcement, and Education and Awareness Campaigns.

### Highway

Implement roadway enhancements to improve the overall safety and operational characteristics of each corridor. Typical improvements include the following:

- o Construct left turn lanes or dual center turn lanes at congested intersections;
- o Upgrade traffic signals, markings, and signs;
- o Increase skid resistance;
- o Install median barriers;
- o Establish MCSAP (truck) inspection sites;
- o Remove/protect fixed objects.

Integrate needed congestion and pavement management improvements as appropriate to maximize benefits.

### Enforcement

Implement publicized enforcement campaigns to address driver performance problems.

- o Identify and meet with the enforcement agencies that have enforcement authority on the corridor;
- o Use analysis of crash data and information from police and public to determine driver performance concerns on the corridor that could be impacted by enforcement, (e.g., non-use of safety belts, drinking and driving, speeding, inappropriate pedestrian actions, and other unsafe driving practices); a
- o Identify adjudication concerns and cooperation necessary to effectively implement an enhanced enforcement program.

Develop a coordinated enforcement countermeasure program for the corridor. Typical enforcement countermeasures include:

- o Sobriety checkpoints;
- o High profile safety belt warning and enforcement campaigns;

- o Coordinated enforcement blitzes during peak crash hours;
- o Targeted safe walking campaigns.

Work with the media to inform the public of the targeted enforcement when it commences.

Define resources needed to implement the countermeasures. Resources would include human resources (voluntary and paid), equipment, police training, and funding.

Develop political and community support for the targeted enforcement.

#### Education and Awareness Campaign

Implement a community based education and awareness countermeasure program based on analysis of crash data, police reports, etc. The program should be coordinated among all communities, involve major businesses, and target specific driver performance concerns on the corridor.

Elicit support and involvement from the communities and major businesses which are adjacent to the corridor. Typical countermeasures on the corridor include:

- o Major campaign kick-offs that involve elected officials, agency administrators, chiefs of police, emergency medical services providers and private sector people;
- o Business sponsored programs for employees, (e.g., anti-drinking and driving and safety belt use campaigns);
- o Safety belt incentive programs for customers of commercial establishments;
- o Targeted education programs in schools, senior citizen centers, and social organizations.

Create awareness of driver performance concern through education and awareness campaigns. Typical activities would include:

- o Development and distribution of corridor brochures which identify driver performance concerns and safe driving actions;
- o Installation of corridor safety billboards including changeable message signs;

- o Newspaper, radio and television coverage of driver performance problems.

#### Emergency Medical Services

##### Assess Emergency Medical Services (EMS) on Corridors

- o Identify EMS response units and organizational structures, hospital capabilities, and police departments servicing the corridor.
- o Analyze crash and EMS data to identify specific EMS concerns on the corridor. Typical EMS concerns would include inadequate communication systems between EMS, police, and hospitals, absence of patient triage system, ineffective use of trauma centers, and insufficiently trained and equipped EMS response teams.

Develop and implement EMS enhancements. Typical EMS enhancements include the following:

- o Upgraded communication systems to reduce total response time;
- o Improved integration of police and EMS communication systems;
- o Improved transportation plan for most effective use of ground and air ambulance services;
- o Targeted training and equipment upgrades;
- o Improved emergency response plans including improved utilization of Trauma Centers.

Assign Program Coordinators to assure effective implementation of corridor strategies.

Develop and implement a project management system to provide project oversight and assure appropriate scheduling, implementation and evaluation of strategies.

#### IMPROVED HIGHWAY SAFETY

##### Goal

Improve priority highway locations and conditions, which experience significantly higher crash rates or have the potential for severe crash occurrence.

#### Objective

Implementing safety improvements at priority highway locations.

#### Description

While driver errors are the major failure mechanism associated with crashes, deficient highway conditions can increase the probability that a crash will happen or increase the severity of a crash.

A broad-based effort to identify and correct locations in which highway deficiencies substantially increase the crash potential or severity should be implemented.

Currently, over \$300 million of Federal-aid categorical funds (Elimination of Hazards and Railroad Highway Crossing) are provided in the existing Highway Act. These categories should be combined into a single safety categorical fund in order that the objectives can be achieved. Further existing safety initiatives funded with regular Federal-aid funds and state and local funds should continue at or above existing levels.

The following improvements should be accomplished to achieve this goal.

- o Insure that all public highways have traffic control devices in virtual conformance with the MUTCD.
- o Identify and correct all major crash locations including locations with substantial driver confusion and inadequate highway information systems both on and off the federal-aid system.
- o Insure that all rail-highway crossings are equipped with regulatory and warning devices in conformance with the MUTCD and a level of protection commensurate with the crash potential of the site.
- o Implement a major safety initiative which will substantially reduce the potential for and severity of collisions with roadside obstacles.
- o Insure that safety is considered a priority emphasis in all types of highway construction projects.

#### Action Plan

Establish a multi-disciplinary safety team to identify issues and develop strategies.

- o Establish a broad base effort to identify and correct locations where highway deficiencies substantially increase the potential and/or severity of crash occurrence. The effort should include initiatives such as the following:
- o Identify and assess hazardous locations (locations with high frequency or rate of crashes);
- o Establish a process to systematically upgrade specific features (e.g., traffic control devices, roadside recovery areas and rail-highway crossings);
- o Include safety enhancements in highway construction projects; and
- o Incorporate driver performance countermeasures such as targeted education and enforcement enhancements at problem locations; specifically when driver performance failures cannot be resolved using conventional highway safety improvements.

Develop implementation plans for highway countermeasures.

- o Identify and analyze locations with high frequency of crashes or potential crashes. In the analysis, use data from crash systems, police, and the public.
- o Assign priority to locations selected. Prioritization should include consideration of the magnitude of the problem, estimated cost, effectiveness of solutions, and constraints such as funding and human resources.
- o Implement improvements based on priority assigned. Typical highway improvements include increased super elevation on curves, increased skid resistance, improving sight distance at intersections, upgrading traffic control devices, constructing left turn lanes and correcting shoulder drop offs.

- o Implement driver performance improvements as necessary to correct driver performance failures. Typical improvements include:
- o Use or increase of high visibility enforcement and enforcement targeted specifically to predominant driver performance failures (e.g., speeding watch, sobriety checkpoints);
- o Development and distribution of driver performance information that can be adapted to specific sites; and
- o Use of media to emphasize and publicize driver performance problems.

The following identifies specific features and the types of additional issues to be included to address these features.

#### Traffic Control Devices

Implement systematic inventories, based on current standards, to identify deficiencies and establish priorities. Supplement inventory with information received about problem locations (e.g., police, road users and traffic engineers). Roadside Recovery Areas Assess highway corridors and locations with high frequencies of severe hit fixed object crashes and identify the types of fixed objects involved. Analyze problem and determine improvements which reduce the potential for future fixed object crashes.

Typical highway improvements include pavement, shoulder and traffic control device improvements, which decrease the potential for driver loss of control, clear roadside recovery area and selective fixed object removal.

#### Rail-Highway Crossings

Problem assessment should include a review of traffic, train and highway systems and the application of a hazard index formula. Sample improvements in this area would include use of active crossing protection, construction of grade separation and targeted enforcement at locations where disregard or violation of devices occurs.

Develop a strategy to integrate safety initiative into highway construction plans and projects.

- o Identify safety needs, analyze potential enhancements, and allocate resources in the pre-design phase.

- o Provide consistent and effective application of safety enhancements in the design phase including the establishment of safety standards and policies for geometric and roadside design criteria, and traffic control standards.
- o Assess safety design features and assure that safety improvements are properly constructed while providing safety to motorists, pedestrians, and workers during construction.

Develop and implement a project management system to provide oversight and assure appropriate scheduling, implementation and evaluation.

#### ENHANCED RURAL EMERGENCY MEDICAL SERVICES

##### Goal

Improve the emergency health care system to substantially improve survivability of severe crashes on rural interstate and arterial systems.

##### Objective

A minimum 10 percent reduction in fatalities on the rural Interstate and arterial system attributed to enhancements in the emergency health care and response system.

##### Description

During the next 10 years, it is estimated that fatalities on the Interstate and principal arterial network will occur at the rate of one death for each 1.5 miles of highway. In nearly 30 percent of these fatalities, emergency care will not reach the victims within one half hour after the crash occurs. The emergency service rendered is normally at a much lower level than that in urban areas, and can be followed by a lengthy trip to the hospital unless air travel is used. This initiative will develop and implement a comprehensive emergency trauma system targeted specifically to the rural interstate and principal arterial systems and other rural arterials with high numbers of highway deaths per mile of highway. Enhancements include improvements to communication systems and formation of response teams to reduce response times, substantial upgrading of capabilities of servicing EMS teams, development and implementation of strategies to use Trauma Centers, and more rapid delivery to hospitals.

##### Action Plan

Establish a multi-disciplinary safety team to select highways and define appropriate implementation strategies.

- o Identify rural highways with high frequency of severe crashes. Typical highways include the interstate system and high volume expressways, major rural arterials, and rural highways with a past crash record of frequent severe crashes.
- o Segment each highway into sections (approximately 25 miles in length) and set in priority order according to frequency of severe crashes.

Assess the emergency medical services (EMS) on each highway section. The following is a sample of the type of concerns that should be addressed in the assessment.

#### Laws and Policies

Determine whether existing legislation and/or regulations are adequate. Also, evaluate operational policies and procedures of the emergency medical care systems. Implement enhancements as needed.

#### Providers

Identify the major EMS providers and sections of highway they serve. Assess their level of training and capabilities. Identify response system protocol used. Determine if the highway section uses helicopter service. For each highway section, assess availability of helicopter use, range of service, and protocol for hospital dispatch. Assess each section pertaining to the availability and use of Trauma Centers including policies pertaining to the selection of facility to be used.

#### Communication Systems

Assess the policies for EMS notification of crash, dispatching and communication between dispatch units, ambulances, and hospitals.

#### Develop implementation plans.

Create a plan for each highway section (or according to EMS region, if more appropriate). Typical improvements would include the following:

- o Identify and draft any new legislation, regulations, policies, and/or procedures needed to implement an effective emergency medical service;

- o Provide training as needed for providers, particularly those providers who service severely injured patients;
- o Upgrade Emergency Medical Technician (EMT) capabilities (Basic Life Support through Advance Life Support);
- o Train and equip police to be First Responders or Emergency Medical Technicians;
- o Expand the use of helicopter service to additional highway sections and fully integrate into the EMS system;
- o Establish and enforce a protocol compliance system including routine audits to assure appropriate use of Trauma Centers and helicopter service;
- o Expand "911" to all regions and develop a cellular telephone "911" system (where feasible);
- o Upgrade hardware to improve communications between dispatchers, ambulances, and hospitals; and
- o Establish emergency medical service care providers and hospital and Trauma Center service in critical sections, where service is currently unavailable.

#### Prioritize and implement improvements.

- o Assign priority to improvements based on assessment of magnitude of the problem, cost of improvement and resources available.

Develop and implement a project management system to provide oversight and assure appropriate scheduling, implementation, and evaluation.

#### SAFETY MANAGEMENT

##### Goal

Develop and implement a national highway safety management program which encompasses all levels of government and private sector.

##### Objective



A well managed national highway safety program must be in place to realize the expectancies of the other recommendations. Some of the major tasks to be accomplished include:

- o By 1992, using input from the public and private sector, establish national uniform performance goals and standards pertaining to the interaction of human factors, vehicles, and highways, to be used in the design of new highways and vehicles, upgrading of existing highways, and licensing of drivers, all of which improve the safe movement of traffic.
- o By 1992, insure that all safety programs administered by both NHTSA and FHWA fully consider and integrate the effects of all elements (highway, driver, and vehicle) in pursuing safety strategies.
- o By 1994, establish a uniform system of reporting accident data within each state that is compatible and transferable to a national records system at the federal level.
- o Insure that the Commercial Driver Licensing System (CDLIS), a modernized National Driver's Register (NDR), and AAMVANET are operational and used throughout the Nation.
- o Define a needs assessment and an overall strategy to upgrade the expertise and capabilities of personnel in the traffic safety field by 1992.
- o Emphasize technology transfer in training and educating safety managers, so that technological advances can be utilized in safety actions at all levels of decision-making.

#### Action Plan

Develop a comprehensive national safety management program. This program should provide a framework and guidance to states in developing integrated safety plans and programs and a framework for a safety management system to coordinate safety programs and activities.

The program should address the following:

- o Establish a multi-disciplinary team to steer program development.
- o Identify areas to be addressed via a safety management system. Program areas would encompass all safety countermeasure programs related to highway, vehicles, and drivers. These include safe driving performance, improved pedestrian safety, corridor safety improvements, improved highway safety, enhanced vehicle safety, safe commercial motor vehicle operations, vehicle crash avoidance, and enhanced emergency medical services.
- o Establish performance goals and standards pertaining to the interaction of human factors, vehicle, and highway components to be used in designing highways and vehicles, licensing drivers, developing new programs and enhancing existing programs.
- o Provide a framework for developing goals and strategies for efficient allocation and use of resources to maximize safety benefits.
- o Develop implementation plans for integrated safety programs. Elements of the plan would include identifying safety problems, assessing resources, prioritizing needs, short and long term goals, establishing performance standards, and strategies to assure project management and evaluation.
- o Establish a uniform system for reporting critical crash data within each state that is compatible with and transferable to a national records system. Upgrade state accident reporting systems and other data management systems to assure both the ability to capture critical data and compatibility with the national record system.
- o Establish mechanisms to monitor progress and evaluate safety system components.
- o Create multi-disciplinary professional development programs and on-the-job training opportunities for highway

safety program personnel. Also, encourage colleges and universities to develop and enhance transportation safety courses and continuing education programs.

- o Establish a national network of safety research centers to foster safety research and accelerate the development and testing of new technology and to facilitate the use of technology transfer and sharing of technical expertise throughout the transportation community. The centers would also be used to develop interdisciplinary training and development programs for transportation safety specialists.

## **STRATEGIC TRANSPORTATION RESEARCH STUDY FOR SAFETY**

### **Goal**

Fully implement a strategic transportation research study (STRS) for Safety and implement resultant strategies to substantially reduce the frequency and severity of highway crashes.

### **Objective**

To undertake a STRS for Safety major research agenda beginning in 1991 and begin to implement research findings as soon as possible.

### **Description**

The first step of a STRS for Safety Program is already underway. TRB released Special Report 229, Safety Research for a Changing Highway Environment, which identifies areas of safety research with the highest potential for improving safety effectiveness. The performance of safety research in the highest payoff areas is expected to be a major endeavor similar in magnitude to the original Strategic Highway Research Plan (SHRP) now underway. Action Plan

- o Implement a thorough long range safety research plan based on the recently completed STRS for Safety initiative (TRB).
- o Establish a new national cooperative highway safety research program to foster joint state sponsored highway safety research, particularly for driver and vehicle related issues

## **APPENDIX A**

### **SUGGESTED MULTI-DISCIPLINARY TEAMS \***

#### **DRIVER PERFORMANCE**

Disciplines: Educators, law enforcement officials, public relations professionals, licensing personnel, and safety engineers.

Agencies Involved: Department of Transportation, Governor's Highway Safety Office, Highway Patrol, Department of Education, Driver Licensing, FHWA, and NHTSA.

#### **IMPROVED PEDESTRIAN SAFETY**

Disciplines: Traffic and safety engineers, educators, law enforcement officials, public relations professionals, health officials, and other safety professionals.

Agencies Involved: Department of Transportation, Highway Patrol, Governor's Highway Safety Office, Department of Aging, Department of Education, local police, local public work office, FHWA, and NHTSA.

#### **CORRIDOR SAFETY IMPROVEMENTS**

Disciplines: Safety engineers, traffic engineers, educators, law enforcement, health and public relations professionals.

Agencies Involved: Department of Transportation, Highway Patrol, Governor's Highway Safety Office, Department of Education, Department of Health, FHWA, and NHTSA).

#### **IMPROVED HIGHWAY SAFETY**

Disciplines: Safety engineers, maintenance and design engineers, state police, educators, and public relations personnel.

Agencies Involved: Department of Transportation, Governor's Highway Safety Office, Highway Patrol and Department of Education.

#### **SAFE COMMERCIAL MOTOR VEHICLE OPERATIONS**

Disciplines: Safety engineers, MCSAP inspection personnel, law enforcement, public relations and health professionals, licensing personnel, carrier and driver representatives.



Agencies Involved: Department of Transportation, Highway Patrol, Governor's Highway Safety Office, Driver Licensing, carrier associations, and driver associations.

#### ENHANCED RURAL EMS

Disciplines: Safety engineers, police, health professionals, emergency medical technicians, and physicians.

Agencies Involved: Department of Transportation, Governor's Highway Safety Office, Highway Patrol, Department of Health, and Trauma Center Hospital.

#### SAFETY MANAGEMENT

Disciplines: Safety functions which involve the driver, vehicle, highway, and post-crash conditions.

Agencies Involved: Department of Transportation, Governor's Highway Safety Office, Department of Health, Department of Education, Motor Vehicles, Driver Licensing, and Highway Patrol.

\* These are suggested teams. The team composition should reflect individual state/jurisdiction population and needs.

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