

SHSP 2nd Edition (Dec. 21, 2011)
Chapter 1 (Text Version**)**
Introduction and Overview

What is a Strategic Highway Safety Plan?

A Strategic Highway Safety Plan (SHSP) is a “statewide-coordinated safety plan that provides a comprehensive framework for reducing highway fatalities and serious injuries on all public roads” (Federal Highway Administration, December 2010). Preparation of a SHSP is an intensive process that develops strategies and implements projects that can mitigate safety hazards on all public roads. It is developed cooperatively by a coalition of stakeholders using crash data to consider appropriate strategies for integrating the 4E concepts (Engineering, Education, Enforcement, and Emergency medical services) into the plan. The goal of reducing crash-related fatalities and injuries is a common feature of SHSPs.

History of the Alabama SHSP

In 2003 the Alabama Department of Transportation (ALDOT) initiated a project to develop a statewide comprehensive highway safety plan (CHSP). The University Transportation Center for Alabama (UTCA) was selected for this task and led a group of approximately 100 safety agency employees and volunteers in developing this plan, which was completed in late 2004. The group examined crash fatality data and selected five emphasis areas believed to be capable of providing the greatest traffic safety benefits. These areas are Emergency Medical Service, Legislation, Older and At-Risk Drivers, Risky Driving, and Run-Off-Road Crashes.

The Federal-Aid Highway legislation enacted in 2005, known as SAFETEA-LU, required each state to develop its own SHSP using guidelines developed by the Federal Highway Administration (FHWA). These guidelines and additional descriptions are included as Appendix A. ALDOT contracted with UTCA to convert the CHSP into Alabama’s initial SHSP to comply with this new federal requirement. Agency personnel and volunteers were again used for this task, and the five areas developed through the CHSP were retained.

The completed Alabama SHSP was signed by the Governor and seven state and federal agency directors/administrators, and was subsequently approved by the FHWA. The initial SHSP may be found on the UTCA website at: [http://utca.eng.ua.edu/projects/final_reports/06408\(2\).htm](http://utca.eng.ua.edu/projects/final_reports/06408(2).htm). The initial SHSP was introduced at a statewide Safety Summit attended by 300 representatives from various local, state, and federal stakeholders.

In late 2009 and early 2010 the SHSP goals and procedures were evaluated, and efforts were initiated to revise and upgrade the initial plan. These efforts culminated in establishing new goals and procedures, and development of the second edition of the plan (SHSP 2nd Ed.).

Special Recognition for ALDOT and the SHSP

The initial SHSP was well prepared, with participation and input from dozens of stakeholders, and was highly effective in establishing safety needs and a methodology for addressing those needs. This was evidenced by the American Association of State Highway and Transportation Officials (AASHTO) selecting ALDOT to receive its 2010 Safety Leadership Award “for committed leadership, aggressive initiatives and collaborative efforts toward the implementation of Alabama’s Strategic Highway Safety Plan.” Deservedly so, AASHTO recognized ALDOT’s SHSP as one of the best safety plans in the nation.

Preparation of the 2011 Alabama Strategic Highway Safety Plan

Crash Data Analysis

The basic strategy for the SHSP 2nd Ed. is to ensure the decisions are driven by the use of historical crash data. The initial Alabama SHSP relied on historical crash data, and that same approach has been adopted for the SHSP 2nd Ed. This portion of the report illustrates and advocates the importance of crash data analysis in the decision-making process.

The SHSP 2nd Ed. uses crash data to analyze the nature of crash-related fatalities and injuries. General trends are reflected by the following tables and figures. The effectiveness of the SHSP is strongly linked to the analysis and interpretation of the crash data. That is why the SHSP 2nd Ed. steering team and participating agencies and volunteers analyzed available crash data and developed program elements that will seek to reduce fatalities and injuries on Alabama’s highways.

Table 1-1 indicates there were 862 traffic fatalities in 2010 in Alabama. Although each fatality is truly a tragedy, the data show the annual numbers of crashes, fatalities, and injuries are decreasing. Aggressive implementation of the initial SHSP was a major factor in the dramatic decrease.

Fatalities decreased 29 percent between 2006 (year of maximum fatalities) and 2010, while injuries decreased by 11% during the same period. The *2010 AASHTO Highway Safety Manual* indicates the combining fatal and severe injuries usually provides a better basis for safety studies. This concept is embraced in the SHSP 2nd Ed. The combination of fatal and injury crashes is shown in the last row of Table 1-1. This combination of severe crash types decreased 11% from 2006 through 2010.

Table 1-1 Alabama Traffic Crash Statistics

Year	2006	2007	2008	2009	2010
Fatalities	1,208	1,110	967	849	862
Injuries	43,000	39,700	35,600	35,969	38,328
Crashes	139,800	135,300	124,000	123,731	128,348
Fatalities + Injuries	44,208	40,810	36,567	36,818	39,190

Crash data were also used to evaluate the frequency and rate of fatal crashes (number of fatalities per 100 million miles traveled). The total number of fatalities is shown in the top half of Table 1-2 as a comparison between Alabama data and similar national safety data. This table shows that over 10 years, 2.3% to 2.8% of national fatalities occurred in Alabama. The national average is 2% per state, but for the 10-year period Alabama was well above 2%. Thus Alabama was routinely above the national average for

the number of fatalities. As shown by the bottom half of Table 1-2, the Alabama fatal crash rate was also above the national rate for the entire 10-year period.

Table 1-2 Comparison of National and Alabama Traffic Crash Fatalities and Fatal Crash Rates

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
National	Fatalities	42,196	43,005	42,884	42,836	43,510	42,708	41,259	37,423	33,808	32,778
Alabama		998	1038	1001	1154	1148	1208	1110	967	848	862
Ala % Natl		2.4%	2.4%	2.3%	2.7%	2.6%	2.8%	2.7%	2.6%	2.5%	2.6%
National	Fatal Rate	1.51	1.51	1.48	1.44	1.46	1.42	1.36	1.26	1.13	1.09
Alabama		1.76	1.80	1.71	1.96	1.92	2.00	1.81	1.63	1.38	1.34
Ala % Natl		117%	119%	116%	136%	132%	141%	133%	129%	122%	123%

*Estimated value; the Alabama fatal rate was not available at the time this report was published.

Figure 1-1 compares trend lines for Alabama and national fatality crash rates. For the analysis period shown, Alabama’s fatal crash rate ranged from a high of 2.00 in 2004 to a low of 1.34 in 2010. Since 2006, the Alabama rate trend from year to year roughly parallels the national rate, but continually ranges from 22%-40% higher.

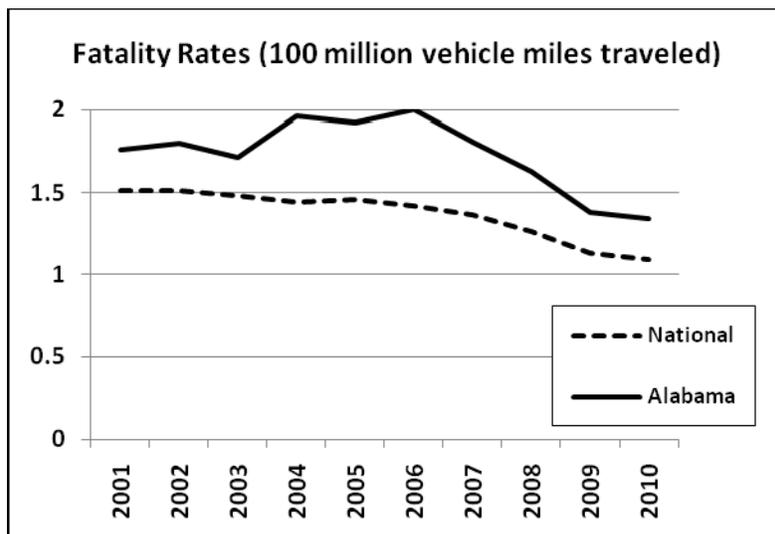


Figure 1-1 Ten-Year Comparison of National and Alabama Fatal Crash Rates

Previous research identified the primary contributing factors for the difference in Alabama and national crash rates. These factors are: (1) the high percentage of fatalities occurring on Alabama rural highways and (2) the traffic safety culture in the Southeastern United States. Knowledge of crash numbers and types is essential to understanding crash causes and establishing appropriate safety programs to mitigate crashes within Alabama.

During the analysis of crash data, a major task is to determine the most critical crash types and the factors that contribute to their occurrence. Table 1-3 summarizes crash types and percentages for the top ten crash types in 2010. They fall into three general categories: six were behavioral issues (human factors), three involved vulnerable users (motorcycle, pedal cycle/bicycle/bus, and pedestrian) and one involved striking roadside objects (obstacles).

UTCA researchers previously documented that there has been very little year-to-year change in the most prevalent crash types over recent years. “Restraint not used,” “speeding,” and “alcohol/drug use” have been the top three characteristics over the past decade, although they sometimes shift within the top three positions. Examining the Fatal crash column, these three characteristics occur far more frequently than other characteristics. Within the top three, “restraint not used” occurs almost twice as often as the second leading crash type. When comparing year-to-year crashes, the same general pattern exists. The top three characteristics dominate the number of fatal crashes, and there are few changes in the remainder of the table.

From this table, the most prevalent characteristics for high severity crashes are known, and countermeasures can be identified to mitigate these crashes. Table 1-3 provides critical information to develop an effective SHSP.

Table 1-3 Summary of 2010 Crash Data by Crash Type and Severity for Alabama

Crash Type (of vehicle of driver who caused crash)*	Fatal		Injury		Property Damage Only		Total	
	Number	%	Number	%	Number	%	Number	%
1. Restraint Not Used**	387	3.59%	4,267	39.60%	6,120	56.80%	10,774	100.0%
2. Speeding	212	5.07%	1,883	45.03%	2,087	49.90%	4,182	100.0%
3. Alcohol/Drug	210	3.03%	2,798	40.38%	3,921	56.59%	6,929	100.0%
4. Obstacle Removal	129	2.17%	2,061	34.60%	3,767	63.24%	5,957	100.0%
5. License Status Deficiency	104	1.67%	2,081	33.40%	4,045	64.93%	6,230	100.0%
6. Youth -- Age 16-20	98	0.44%	5,270	23.75%	16,819	75.81%	22,187	100.0%
7. Mature -- Age > 64	92	0.71%	2,769	21.29%	10,146	78.00%	13,007	100.0%
8. Motorcycle	82	4.85%	1,146	67.81%	462	27.34%	1,690	100.0%
9. Pedalcycle, Bicycle, School Bus	75	3.99%	964	51.22%	843	44.79%	1,882	100.0%
10. Pedestrian	63	8.37%	604	80.21%	86	11.42%	753	100.0%

* The numbers in this table are not mutually exclusive. For example, a driver might have been using alcohol, not wearing a restraint and speeding. The crash would be included in all three rows of the table.

** The numbers for “Restraint Not Used” are the total number of individuals killed, injured, or uninjured. For all other categories the values are the number of crashes (there may be multiple individuals involved in a crash).

Goals of the SHSP 2nd Ed.

Traffic safety programs in Alabama and across the nation have experienced great success in recent years using identifiable goals for reducing injuries and fatalities. Much of this success is due to enhanced safety programs, but the caveat is that the national recession played a role as well. Simply put, fewer miles were driven, with a corresponding reduction in the number of crashes. Also, motorists drove slower to reduce fuel consumption, thereby reducing crash severity. It is likely that as the economy recovers, drivers will revert to prior driving patterns that will result in more crashes, giving the appearance that the benefits of traffic safety programs may stall.

Looking into the future, it is clear that safety programs will not be able to maintain recent fatality reductions indefinitely. At some point, significant additional resources must be committed for safety programs to continue the reduction in fatalities. That is why AASHTO has shifted its focus to the Toward Zero Deaths (TZD) approach to safety. AASHTO originally built the TZD initiative on the foundation of its own SHSP efforts, which had a goal of reducing fatalities by 50% within a 20-year time period. More recently, AASHTO has expanded the TZD concept to a comprehensive approach that incorporates human elements and safety culture to minimize the long-term loss of lives.

Toward Zero Deaths (TZD)

TZD is a much different approach to highway safety that calls for a teamwork solution to a national problem and for a radical change in highway safety culture. This approach has attracted wide support from transportation agencies and highway safety organizations, including the following: American Association of State Highway and Transportation Officials (AASHTO), American Association of Motor Vehicle Administrators (AAMVA), Commercial Vehicle Safety Alliance (CVSA), Federal Highway Administration (FHWA), Governors Highway Safety Association (GHSA), National Association of State EMS Officials (NASEMSO), International Association of Chiefs of Police (IACP), National Association of County Engineers (NACE) and others.

TZD considers that factors like roadway engineering, materials, and design greatly impact safety, but decisions made by individual drivers have a larger impact and are more important in improving traffic safety. Typical drivers make continuous decisions while driving, all of which are influenced by the immediate context and the local safety culture. A strong safety culture yields safer driving decisions, while a weaker culture encourages risks. Establishment of a strong safety culture is an integral part of the TZD program.

TZD approaches safety using a multi-layered system perspective. It recognizes that multiple factors within the system are involved in a crash and that there is a need to address factors on every level. It also recognizes that the factors that trigger a crash sequence may well reside in the higher layers of the system including the vehicle, traffic, infrastructure, environment and culture to which society adheres.

No single safety treatment can have a positive effect across all of these factors. As a starting point, many states are now more fully embracing the 4E concepts (engineering, education, enforcement, and EMS) as a prominent part of their TZD efforts. Another feature of TZD is that it is a long-term endeavor, typically intended to operate over a period of 25 years or more. Consequently, states are moving away from their prior safety planning periods of a target of 5 to 10 years and refocusing on increased safety over the long term. Safety planning is a required first step in supporting these goals.

Changed Safety Culture

The chief element of the TZD program is establishing a strong safety culture. Culture relates to shared values, perceptions and attitudes about behavior. It is typically defined as the value shared by a community. It is context sensitive and manifests itself in a community's mutual perception of what is considered normal and what is considered abnormal, and consequently how the community reacts to situations.

Changing the U.S. safety culture will require major education programs and strong safety advocates. It will go far beyond changing the attitudes of drivers; it also includes changing the attitudes and focus of transportation professionals, managers of transportation organizations, governmental leaders, and eventually the general public. Basically, it includes changing the attitudes of communities. In the U.S., this will be a lengthy and difficult process. However, it has been achieved in other countries and should be done so in Alabama.

Strong safety cultures have been developed in Japan, Europe, Scandinavia, Australia, Canada and many other countries. From 1995 to 2009, fatalities dropped 52% in France, 38% in the United Kingdom, and

25% in Australia. The U.S. reduction was well above the average for 15 other high-income countries for which long-term fatality and traffic data are available (AASHTO, February 11, 2011). In general, citizens in these nations embrace driving courtesy and driving laws more fervently than U.S. drivers. Enforcement efforts are stern and are supported by the public. Automated enforcement is used by law enforcement agencies to ensure thorough and fair treatment of those who do not abide by established laws and adhere to norms of good driving behavior. Basically, the community attitude accepts and supports traffic enforcement as a way to improve safety.

Safe driving is the expected norm for these countries, and data indicate roadway travel is safer in those countries than in the U.S. This is illustrated by Figure 1-2, which shows the U.S. population-based road fatality rate lies between the rates of Argentina and Indonesia. The U.S. rate is 35% higher than the average for other comparable high-income nations. In other words, Americans die in highway crashes 35% more often than in nations that are similar to the U.S. This is a national health issue to which little attention has been called. It is time for a change in culture to make such a loss of lives unacceptable to the American public.

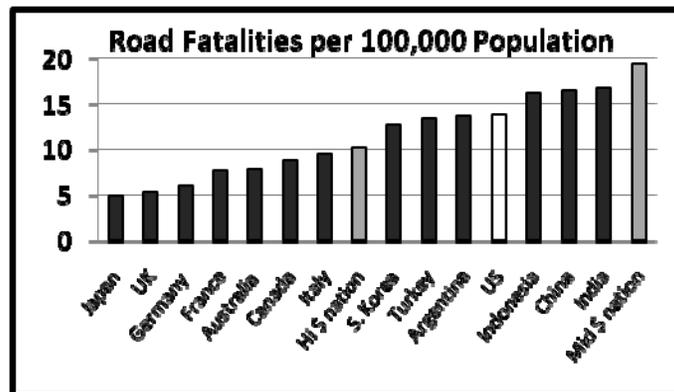


Figure 1-2 Population-Based Traffic Fatality Rates - U.S. vs. Various Nations (Fédération Internationale de l'Automobile (FIA) Foundation)

Numerical Goal of the Alabama SHSP

In recognition of the role safety culture plays in reducing traffic crashes, transportation agencies in Alabama have adopted a Toward Zero Deaths (TZD) goal for a designated time period of 25 years. A broad, multi-disciplinary effort will be needed to lower traffic fatalities by 50% over this period. Figure 1-3 was prepared to illustrate how much impact a successful SHSP program could have in Alabama. The figure uses 10 years of Alabama crash data (fatalities and injuries from 2000 through 2010) as the “before” portion of the figure.

Fatalities and injuries are projected to decrease from 39,190 in 2010 to 19,595 by 2035, sufficient to reach a 50% reduction over 25 years and sustain significant progress “Toward Zero Deaths.” A reduction of this magnitude can be achieved by strategic planning, hard work, and the creation of a safety culture that tolerates nothing less than meeting this challenge. Other nations have achieved such dramatic success, and Alabama can succeed as well.

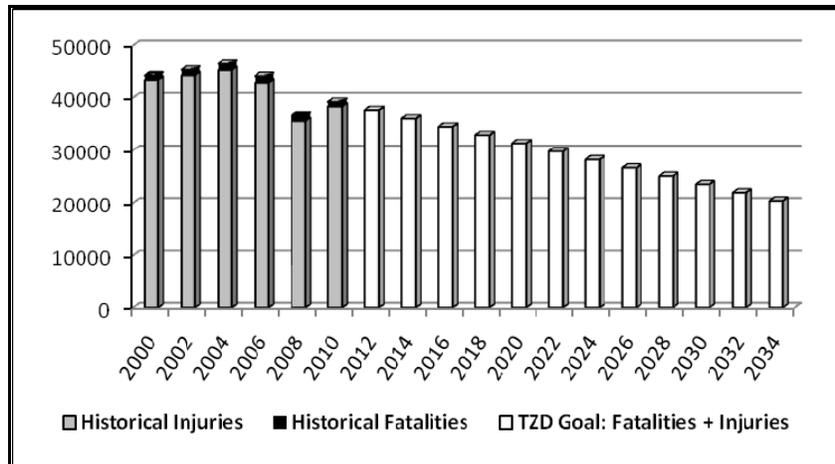


Figure 1-3 Long-term goal for fatality reduction

Content of the SHSP 2nd Ed.

The SHSP 2nd Ed. addresses five key elements selected through an examination of crash fatality and injury data. These key elements incorporate a broad, long-range approach and feature a well-rounded 4E approach: engineering, education, enforcement and emergency medical services (EMS). All four components are needed to produce substantial safety advances in Alabama.

Chapter 2 addresses *Driver Behavioral Programs* that are major factors in reducing traffic crashes. Changing behavior patterns is a key issue in strengthening traffic safety culture. Behavioral treatments primarily emphasize education and enforcement among the 4E countermeasures.

Chapter 3 describes *Infrastructure Countermeasures* for addressing traffic crashes. Engineering activities, the third leg of 4E countermeasures, are used primarily in this program. Initiatives include adoption of planning, design, rehabilitation and maintenance initiatives that have system-wide impacts, identification and treatment of sites and roads that are over-represented in crashes, and adoption of new tools like the *AASHTO Highway Safety Manual* to enhance the overall effects and benefits of safety programs.

Chapter 4 addresses *Legislative Initiatives*. This chapter identifies desirable safety legislation and a process for providing support, as requested, by the State Safety Coordinating Committee (SSCC). ALDOT staff involved with the SSCC will track safety issues in the legislative process and provide support and updates to safety stakeholders across the state.

Chapter 5 addresses *Traffic Safety Information Systems* that provide the crash data and supporting data systems for traffic safety efforts. The Traffic Records Coordinating Committee has been a driving force in this effort in recent years and will continue to serve in an action group role for safety data issues.

Chapter 6 outlines a plan for information dissemination and engagement of the transportation safety *Stakeholder Community*. The primary duties will involve educational programs as well as advocating and promoting a strong safety culture. Activities under this program will include a comprehensive data user's Web site, a newsletter, applicable press releases, safety-related articles, promotional flyers, and numerous other public education initiatives.

Data Availability

Alabama is fortunate to have a comprehensive crash data system. The Critical Analysis Reporting Environment (CARE) software and its supporting data elements perform as a premier crash data manipulation, analysis, data mining, and reporting system. It has been used successfully in state safety programs for over 20 years. Over 250 individuals have been trained to use CARE with online crash data and are able to develop routine safety studies. The SHSP 2nd Ed. was prepared with the most recent crash data available at that time. Tables and figures typically cite dates for the data used in their preparation.

Turning the SHSP 2nd Ed. into a Safety Success

Even the best of plans are not successful unless adequate resources are available, are actively implemented, and are properly evaluated. The 2011 version of the SHSP was designed with implementation in mind, counting on the comprehensive and coordinated efforts of multiple safety-related agencies and organizations.

Engineering

Engineering design of new roads includes built-in safety features by using extensive design criteria, codes and design manuals. These design manuals continue to improve by applying the best results of proven designs and empirical data combined with findings from applicable safety research. Similarly, traffic control devices are designed and installed using guidance documents that enhance traffic operations and safety using the latest state-of-the-practice methodologies and research.

The emergence of the *AASHTO Highway Safety Manual* is of particular interest for implementation of the SHSP 2nd Ed. This document is a significant advancement in roadway safety science, and its application should guide decision makers from here forward in all elements of highway development from planning through operations and maintenance.

Education

Changing the Alabama safety culture is a long-term endeavor. As an educational process, it likely will change gradually as the public begins to understand the true cost of lost lives and severe injuries and demands driving practices be controlled in terms of safety. Drivers must understand what they can and cannot do within safe driving practices. They must also understand the impacts of inappropriate driving actions on themselves and others.

The bottom line is that for the safety culture to change substantially in Alabama, individuals must change their expectations and habits when it comes to all types of roadway use. Again, this will require extensive educational programs.

Enforcement

Research has shown that extensive traffic enforcement with a certainty of punitive ramifications helps change driving behavior. The impact is even stronger when extensive media coverage focuses attention

on directed enforcement efforts. A good example is the “Click It or Ticket” initiative that focused on restraint use and similar campaigns coupled with special enforcement efforts.

It is impossible to provide enforcement on all roads all the time because of obvious financial resource shortcomings and manpower limitations. Instead, enforcement agencies have capitalized on an ability to analyze crash data to identify locations and times of day for specific enforcement activities to reduce the number of severe crashes. Using regular patrols and specialized mobilization efforts, a partnership between the Alabama Department of Public Safety (DPS), the Law Enforcement and Traffic Safety section of the Alabama Department of Economic and Community Affairs (LETS, ADECA), and ALDOT has helped make great strides in using this method to reduce crashes.

Emergency Medical Services

The time between the occurrence of a roadway crash and the arrival of the victim at an appropriate medical facility is known as the “golden hour” because of the importance of time. The sooner a patient can be transported to a medical facility, the greater the likelihood of saving a life or successfully treating an injury. Emergency Medical Services (EMS) can reduce delivery time, so it was one of the five emphasis areas in Alabama’s initial SHSP. The Office of EMS and Trauma of the Alabama Department of Public Health (Alabama EMS) was a key participant in preparing the initial SHSP. At that time, the ability to evaluate and enhance EMS responses was limited by the absence of appropriate data at the state and national levels.

When the National EMS Information System (NEMSIS) became operational, the Alabama EMS embraced it and became one of the first five states to implement this program. Next, the National Association of State EMS Officials developed a Model Inventory of Emergency Care Elements (MIECE) to provide assessment tools to help states determine the availability/readiness of emergency response for any roadway segment. The Alabama EMS served on the working group that helped develop these tools. The creation of NEMSIS and other tools, and the role of the Alabama EMS in producing those tools will provide long-term benefits to the public in the form of saved lives and diminished consequences of injuries.

Additional information about EMS challenges and opportunities may be found in Appendix B.

Implementation

Each element of the Alabama SHSP 2nd Ed. is designed to be implemented and have a direct impact on highway safety. The summary abstract for each element includes a list of the component activities of the element with each considered as an engineering, education, or enforcement task or program. In addition, the summary abstract indicates the agencies that will actively participate in implementation action items for the particular element.

Implementation of each element is intended to be a partner-sharing, system-wide interdisciplinary activity supported by several agencies. Individual agencies will take, or share, the lead for one particular initiative, but take a supporting role on other initiatives. Funding for implementation will largely come from existing highway safety funding sources. Some agencies and organizations will be able to adjust current priorities to consider favorable SHSP projects and functions. Some will be able to include major portions of an element for inclusion in an existing policy as part of routine efforts. For example, ALDOT will be able to accomplish some initiatives, like pavement widening and use of the Safety Edge feature,

during normal pavement maintenance and rehabilitation programs. It is probable that new policies and new practices will be developed during the implementation of the SHSP 2nd Ed.

In effect, the implementation process will build the safety culture dynamics and interaction among safety agencies. This will certainly give safety a greater role in policy making and program development so that agencies will coordinate with safety partners to achieve positive results.

Evaluation

An important component of safety programs is evaluation of the results. For the SHSP, the primary performance factor will be the reduction in the number of fatalities and Type "A" injuries as Alabama works "Toward Zero Deaths" in the next 25 years. Evaluations can begin after the countermeasures have been applied, which in some cases will not be for several years. Consequently, a reasonable approach may be to wait 3 to 5 years to evaluate the effect of the overall SHSP 2nd Ed., and to evaluate individual components and/or elements more frequently in the meantime.

Simplistic evaluations such as the annual decrease or increase in fatalities can be misleading. For example, the current recession has had a very positive impact on traffic safety. The number of lives saved is partially a function of fewer miles driven and slower speeds due to increased fuel costs. The effect of the recession on safety is not easy to identify because safety program enhancements were ongoing at the same time. However, it will be possible to track crash statistics over time and employ advanced methods to draw reasonable conclusions about the effectiveness of the five elements in the SHSP 2nd Ed.

References

"Strategic Highway Safety Plans," Federal Highway Administration, Washington, D.C., <http://safety.fhwa.dot.gov/safetealu/shspquick.cfm>, accessed December 18, 2010.

AASHTO Journal, <http://www.aashtojournal.org/Pages/Default.aspx>, February 11, 2011.

"Review 2010," FIA Foundation for the Automobile and Society, London, England, November 2010.

Chapter 2 (**Text Version**) Driver Behavioral Crashes

Abstract

Challenge

This chapter of the SHSP 2nd Ed. addresses driver behavioral crashes. A substantial portion of all traffic crash fatalities and severe injuries in the state of Alabama are attributable to three driver-decision based factors: speeding, alcohol use and a lack of proper seatbelt/restraint use. Focused crash reduction efforts in these areas can mitigate the number of crashes and crash severity typically associated with this type of driver behavior.

Between 2005 and 2010 in Alabama, the average yearly fatalities related to speeding behavior totaled 324 people. Similarly, the average yearly fatalities related to alcohol use totaled 230 people. Addressing these crashes requires focused efforts by the appropriate safety agencies and partners to change driver behavior and promote an improved safety culture.

Another aspect of behavioral crashes involves commercial motor vehicle safety. Driver actions, work hours, vehicle conditions and other commercial vehicle activities are strongly related to safety.

Direction

Focus efforts on education and awareness programs to improve overall driver behavior and habits, specifically in the areas of speeding, alcohol/drug use while driving and increasing seatbelt/restraint use. The Highway Safety Plan (HSP) developed by the Alabama Department of Economic and Community Affairs (ADECA) Law Enforcement and Traffic Section (LETS) specifically addresses those driver behavior issues. As a result, the SHSP 2nd Ed. embraces the ADECA HSP as the primary resource for focusing state expertise and programs to combat these issues.

Focus efforts on aggressive enforcement of commercial vehicles, improved commercial vehicle inspection and data collection processes, additional personnel, enhanced personnel training and continued public awareness/education to reduce the yearly commercial vehicle crash occurrences. The yearly Commercial Vehicle Safety Plan (CVSP) developed by the Alabama Department of Public Safety (DPS) Motor Carrier Safety Unit (MCSU) is incorporated into the SHSP 2nd Ed. to help address behavioral issues involved in highway safety.

Priority Strategies

1. Continue to participate in nationwide initiatives, such as the "Click It or Ticket" Campaign to enforce traffic safety laws.
2. Plan enforcement activities for locations identified as being over-represented in speeding and alcohol/drug related crashes. (Special Traffic Enforcement Program – STEP)
3. Plan monthly enforcement activities in counties identified as being over-represented in non-fatal commercial vehicle crashes.
4. Conduct more compliance reviews on interstates for high risk motor carriers.
5. Continue to promote the "Drive Sober or Get Pulled Over" Campaign which consists of signs displaying the Campaign slogan, roadblock checks, saturation and line patrols, and placing added emphasis on areas where a high number of alcohol-related crashes have occurred.

6. Continue to promote the "Take Back Our Highways Campaign" which uses increased enforcement and awareness to address speeding and alcohol use while driving.
7. Continue to conduct Safety Talks with the public, trucking industry and governmental agencies related to commercial vehicle safety.
8. Use Electronic Citation (eCite) and Electronic Crash Reporting (eCrash) to better manage traffic citations and crashes to allow more complete and accurate data to be readily available to law enforcement and traffic safety officials.
9. Continue to provide financial assistance to the Department of Public Safety (DPS) for increased police enforcement on the state highway system.
10. Continue Public Relations initiatives to improve safety culture.
11. Certify additional motor coach inspectors and supervisors and enhance training efforts for DPS Motor Carrier Safety Unit employees.

Leaders

Alabama Department of Economic and Community Affairs Law Enforcement and Traffic Section
Alabama Department of Public Safety
Alabama Department of Public Safety Motor Carrier Safety Unit
Alabama Department of Transportation
Local Law Enforcement Agencies
National Highway Traffic Safety Administration
University of Alabama's Center for Advanced Public Safety

Introduction

National highway safety officials now view traffic fatalities and injuries as a major public health issue. The approach to combat these tragic events is similar to those used in the public health sector. A shift is occurring toward establishing a stronger safety culture where “risky” driving is considered an abnormal behavior and high crash injury numbers are not acceptable.

This chapter outlines programs aimed at modifying driver behavior. A good illustration of the need for such modification may be found in the research work provided to NHTSA in the late 1970s (Treat), entitled “*Roles of Vehicle, Road and Driver in Causing a Crash*”. Human factors were found to be more influential in causing crashes than the road, the vehicle, or a combination of the road and vehicle as shown in Figure 2-1.

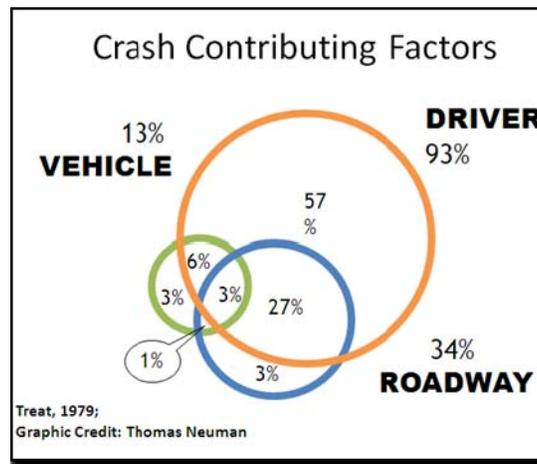


Figure 2-1 Roles of vehicle, road and driver in causing a crash (Treat, et al, 1979)

The figure shows the driver caused 57% of crashes, the combination of driver and road caused 27%, the combination of driver and vehicle caused 6%, and the combination of the three factors caused 3%. Overall, the driver influenced 93% of all crashes in the data set (i.e., 57% + 27% + 6% + 3% = 93%).

Although the crash data in Figure 2-1 is over 30 years old, traffic safety researchers agree it still accurately portrays the human factor aspects of crashes. It is clear the role of the driver cannot be overlooked in planning and developing traffic safety programs.

Driver Behavioral Crashes

The state of Alabama implements activities to support the national highway safety goal to reduce motor vehicle-related fatalities and to understand crash factors obtained from statewide crash data systems. Speeding, alcohol/drug use and a failure to use proper seatbelt/restraints are the largest driver decision-based factors resulting in crash fatalities and injuries in Alabama. Information from the 2011 Alabama Highway Safety Plan (HSP) and the Critical Analysis Reporting Environment (CARE) database concerning yearly fatalities is shown in Figure 2-2 Other data from the CARE database regarding Type “A” injuries (i.e., incapacitating injuries) for the same period is shown in Figure 2-3.

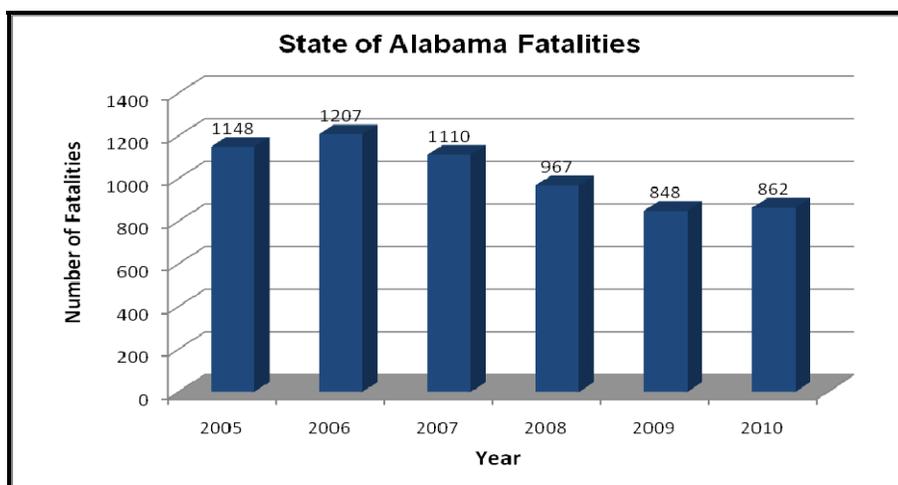


Figure 2-2 Alabama yearly fatality trends (2011 HSP, CARE)

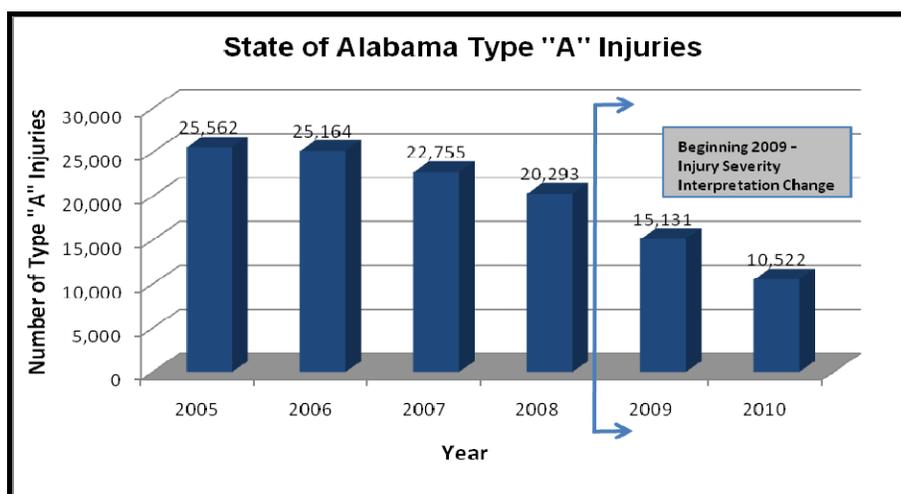


Figure 2-3 Alabama injury trends (CARE)

The reporting criteria for Type “A” crashes has been modified in recent years. This change contributed to the steep reductions in Type “A” injuries seen in Figure 2-3 from 2008 to 2009 and from 2009 to 2010. Simply put, there are a number of variations between the data collected within the eCrash format and data obtained from the paper report forms. The deployment of eCrash was June 1, 2009 for DPS and some city agencies. Additional cities were added throughout the remainder of 2009 and 2010.

Crashes associated with speeding, alcohol/drug use and failure to use proper seatbelt/restraints offer a large potential for safety improvement if driver behavior and habits can be changed. Specific countermeasures can be used to mitigate the approximately 130,000 traffic crashes occurring each year statewide, ultimately moving Alabama “Toward Zero Deaths” by continuing the successful trend of the past 10 years.

Simply put, driver behavioral related crashes address the major causes of fatal crashes within the state. In descending order, the top category is “restraint not used” followed by “speeding” and then

“alcohol/drug use.” These are followed by seven other crash types identified through analysis of Alabama data, most of which are to some extent driver-related.

Crash Overview from CARE

The University of Alabama is continually improving and streamlining the traffic crash analysis process through the Critical CARE software. The CARE system allows accurate yearly ranking of crash type categories and identifies the characteristics of these crashes. It incorporates crash data, spatial and location reference data, limited roadway features data and traffic citation data from which statistical analyses are possible.

Through yearly prioritization of crash types and other information, analysis by specific crash categories provides traffic safety professionals an overview of categories of notable concern. Table 2-1 summarizes crash severity statistics for the top three categories identified through calendar year 2010 data.

Table 2-1 Summary of crash severity by behavioral element – 2010 (CARE only)

Crash Type	Fatal	Injury	Property Damage	Total
Restraint Not Used	387	4,267	6,120	10,774
Speeding	212	1,883	2,087	4,182
Alcohol/Drug	210	2,798	3,921	6,929

Surveys are conducted annually by the Alabama Department of Public Health following the “Click It or Ticket” and Child Safety Seat Use campaigns in late summer. Figure 2-4 summarizes both general safety belt use and child safety belt use from data assembled between 2005 and 2010. Although restraint use appears to be trending upward in recent years, a concern remains that there is a 7% to 9% gap for reaching complete (100%) adherence to safety belt use requirements. The non-users have been identified as a small group of high-risk takers that continue to make the “restraint not used” category prominent among the factors contributing to fatality crashes.

The yearly trends for alcohol/drug and speed related fatal crashes are shown in Figure 2-5 and Figure 2-6. Data reflect current information available (through 2010) according to the HSP.

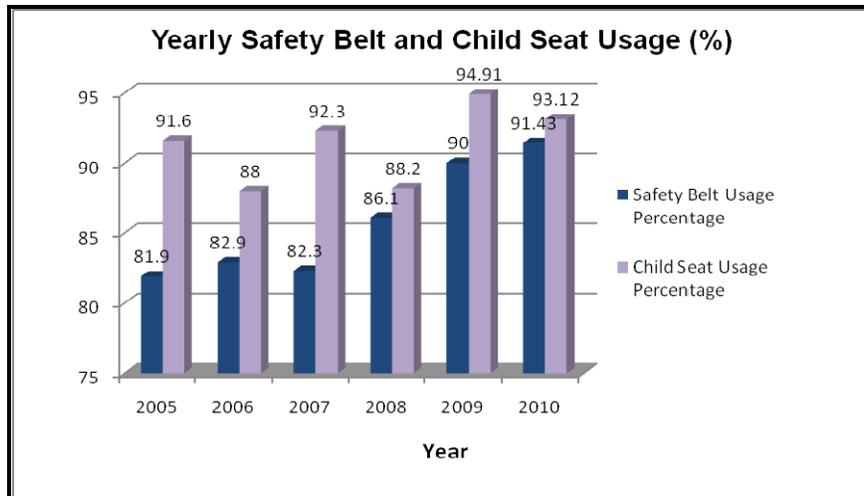


Figure 2-4 Restraint use yearly trends (2011 HSP)

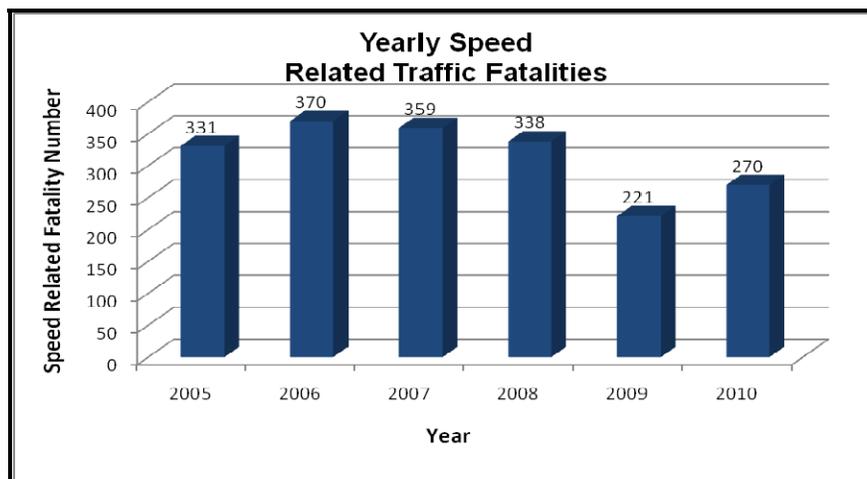


Figure 2-5 Speeding fatality yearly trends (2011 HSP)

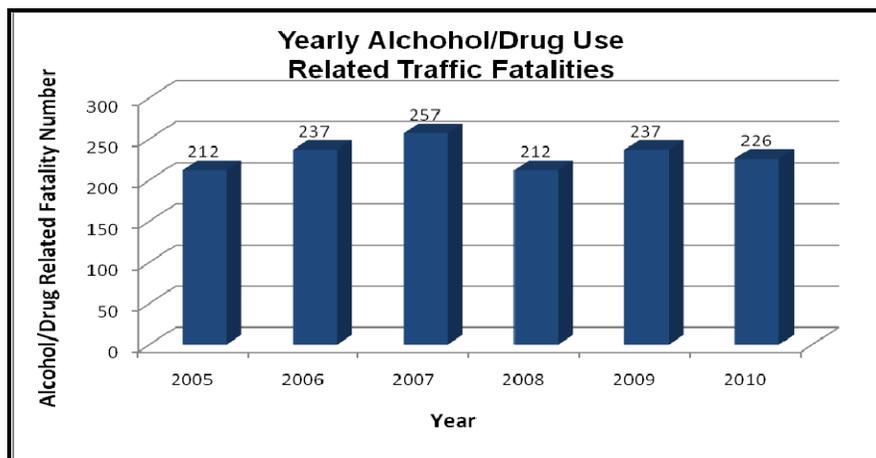


Figure 2-6 Alcohol/drug use fatality yearly trends (2011 HSP)

Crashes related to speeding and alcohol/drug use are important areas for focused crash reduction efforts due to the typical higher level crash severity associated with them. Speeding was associated with an average yearly total of 315 actual fatalities, and alcohol/drug use was associated with an average 230 actual fatalities during a six-year period. These values combined constitute approximately half of Alabama roadway fatalities per year, and focused efforts by the appropriate agencies are needed to reduce those numbers.

The ADECA HSP specifically addresses the issues of speeding, alcohol/drug use and lack of vehicle restraint use by applying methods that address undesirable driver behavior. As a result, this SHSP 2nd Ed. embraces the ADECA HSP as the primary resource for offering focused state expertise and programs for combating driver behavioral issues. Although the HSP changes annually as pressing issues change, the SHSP steering committee endorses that action and has elected to accept the annual changes because ADECA LETS is suitably equipped to revise and implement focused programs addressing the new issues.

Programs and Agencies Addressing Driver Behavioral Issues

Alabama Highway Safety Plan

The ADECA HSP primarily addresses behavioral traffic safety issues. The University of Alabama's CAPS Center helps produce the HSP, which is adjusted by focus areas from year-to-year as NHTSA changes national level, programmatic emphasis areas. CAPS develops and maintains the CARE program that is the primary search engine for roadway crash and safety analyses done in Alabama. CAPS provides crash data to ADECA LETS on a continual basis throughout the year to provide traffic safety professionals and decision makers the latest information on crucial issues affecting roadway safety.

The HSP identifies crash-type causes associated with the greatest potential for injuries and fatalities. This information allows the appropriate countermeasures and applications to be determined and resources allocated. Speeding, alcohol/drug use and the lack of proper seatbelt/restraint use are typically at the top of the list of crash types resulting in fatalities and serious crashes. The HSP aids ADECA LETS in optimum implementation of crash reduction strategies and optimum resource allocation. Additional details about the HSP can be found at <http://care.cs.ua.edu/outreach.aspx> under "Outreach".

There are a number of strategies employed in Alabama for combating speeding, alcohol/drug use while driving and lack of restraint use, some of which are specifically outlined in the HSP as detailed in the following strategies:

Special Traffic Enforcement Program (STEP)

Recently ADECA LETS has enhanced crash location identification as a major part of HSP implementation activities, concentrating on locations that are over-represented in speeding and alcohol/drug related crashes. Such locations are usually analyzed in five mile sections and illustrated on maps to make it simple for field officers to identify locations for selective enforcement. Community Traffic Safety Program (CTSP) coordinators are responsible for organizing and funding this type of enforcement activity within their regional area of responsibility.

“Drive Sober or Get Pulled Over” Campaign

In continuing efforts to prevent driving while under the influence, NHTSA and ADECA have relied on campaigns to focus on each individual’s personal responsibility to reduce impaired driving. Sign displays indicating the simple message “Drunk Driving, Over the Limit, Under Arrest” reinforce the thought that law enforcement will arrest those who drive impaired.

More than 200 state and local law enforcement officers typically participate in this campaign which includes roadblock checks, saturation and line patrols, and added emphasis on areas where a high number of alcohol-related crashes have occurred. This campaign typically occurs in the late summer each year around the Labor Day holiday.

“Take Back Our Highways” Campaign

Introduced in August 2007, this campaign uses increased enforcement and increased public awareness of traffic safety to address speeding and alcohol use while driving to reduce crashes and fatalities. Alabama studies in the past have determined that a 10 mph reduction in impact speed will reduce by half the probability of the crash resulting in a fatality. Thus, even a 5 mph reduction in travel speed can have a major impact on crashes and fatalities.

The “Take Back Our Highways” Campaign has been effective in reducing crashes and fatalities. Some enforcement periods went several days without a fatality, while on average two-to-three fatalities per day are the norm. The expanded enforcement for this program was made possible through grants by ALDOT and ADECA LETS. The most recent versions of this program have been known as the “Operation Safe Holiday” Campaign.

“Click It or Ticket” Campaign

As part of a nationwide initiative through NHTSA, ADECA actively participates in the “Click It or Ticket” Campaign. This is a high-visibility, massive enforcement effort to address violators of Alabama’s seat belt laws. Funding is provided through ADECA LETS and organized by the regional Community Traffic Safety (CTSP) coordinators during May and June each year.

Alabama Child Passenger Safety Program

The Alabama Child Passenger Safety (CPS) Program is focused on training and retraining coordinators to promote and demonstrate proper child passenger restraint use across the state. The CPS professionals are charged with distributing materials promoting car seat safety and proper booster seat use. The Alabama CPS program is building a structure that places a trained CPS professional within 50 miles of every community statewide.

Electronic Citation (eCite) and Electronic Crash Reporting (eCrash)

The official custodian of the statewide crash file is the Alabama Department of Public Safety Information Section. To improve overall traffic records resources, the state has implemented a system for electronic citation reporting, known as the eCite system. This system accounts for over 80 percent of the traffic citations written in Alabama. This system automates the ticket writing process and uploads them into a

case management system. It also provides police officers with background information on individuals with a documented history of speeding or alcohol/drug use while driving.

Prior to 2006, Alabama was using a handwritten, paper-based crash reporting system to collect data for entry into the statewide crash file. This produced about 130,000 reports annually. Similar to the e-Cite system, the state has transitioned to the eCrash system, with 90 percent of all crash reports now being submitted electronically. Only 14 of 400 agencies statewide still continue documenting crashes using paper forms.

The electronically submitted reports use the eCrash application developed by CAPS with the goal that reports will be 100% complete, 100% internally consistent and received within 48 hours of crash occurrence. This will aid enforcement agencies by reducing time to complete a crash report form by at least 50%, and by reducing the time for a report to be placed in the electronic data file from months to hours.

Highway Safety Improvement Program (HSIP) Flexible Funding

ALDOT has a mechanism to provide direct financial assistance to the DPS for increased law enforcement on the state highway system. Federal HSIP "Flex Funds" pay for DPS overtime hours to conduct enforcement activities in speed sensitive areas, such as highway work zones and areas associated with high occurrences of fatal and serious injury crashes. The source of the "Flex Funds" is FHWA. Since 2006, ALDOT has provided \$1.5 to \$2.8 million annually for this enforcement effort. DPS and ALDOT continually evaluate the success of this program for reducing undesirable "speeding" driver behavior.

Commercial Vehicle Safety Plan

Another aspect of behavioral crashes is associated with commercial motor vehicle safety. The Alabama Department of Public Safety (DPS) Motor Carrier Safety Unit (MCSU) is responsible for enforcement of and compliance with Federal Motor Carrier Safety Regulations (49CFR) in the 1998 Motor Carrier Safety Act. Funded by the Federal Motor Carrier Safety Administration (FMCSA) and the Alabama General Fund, the MCSU aims to reduce the number of commercial vehicle crashes through aggressive enforcement, improved vehicle inspection and data collection processes, additional personnel, enhanced personnel training and continued public awareness/education. To achieve such initiatives, the MCSU develops yearly Commercial Vehicle Safety Plans. Within the plans, measurable performance objectives are developed and tracked throughout the course of each fiscal year.

Because the Commercial Vehicle Safety Plan plays a role in behavioral safety, the CVSP (and subsequent editions in the following years) are incorporated into the SHSP 2nd Ed. A copy of the latest CVSP can be obtained upon written request to the DPS/MCSU.

Summary

Many of the items discussed in this chapter are summary excerpts from the FY2011 ADECA LETS Highway Safety Plan with supplemental information concerning Alabama statewide efforts. A detailed discussion of LETS provisions for addressing behavioral challenges in Alabama for issues like lack of restraint use, alcohol/drug use while driving and speeding can be found at www.nhtsa.gov. In addition, this chapter identified the CVSP as an important component of behavioral safety, and the 2011 CVSP (and subsequent

editions in the following years) are incorporated into the SHSP 2nd Ed.

References

Alabama Highway Safety Plan, Alabama Department of Economic and Community Affairs, Law Enforcement/Traffic Safety Section, 2011.

<http://www.adeca.state.al.us/Law%20Enforcement%20and%20Traffic%20Sa/default.aspx>, accessed June 10, 2011.

Critical Analysis Reporting Environment (CARE) software, Center for Advanced Public Safety, The University of Alabama, 2011 edition.

Treat, J.R., Tumbas, N.S., McDonald, S.T., Shinar, D., Hume, R.D., Mayer, R.E., Stansifer, R.L., and Castellan, N.J. Tri-Level Study of the Causes of Traffic Accidents – Executive Summary. DOT HS 805 099, May 1979.

Chapter 3 (**Text Version**) Infrastructure Countermeasures

Abstract

Challenge

This chapter of the SHSP 2nd Ed. addresses infrastructure crashes at intersections and on roadway segments, concentrating on features and situations over-represented in fatal and type “A” (incapacitating) crashes.

For Alabama in 2010, there were 128,384 traffic crashes. Slightly over 30% of them occurred at intersections and the remainder occurred on highway segments. In a typical year in Alabama, about 27% of all crashes occur on rural two-lane roads. Crashes on rural roads are more severe than those on urban roads, and account for 62% of all fatalities. The most frequently occurring fatal crash type involves some type of lane departure on a rural two-lane road, and most frequently on county roads.

Direction

For intersections, employ strategies for appropriate positive guidance of drivers and for traffic control. For segments, employ multiple types of lane departure countermeasures to reduce roadway departure crashes, and to minimize crash severity when these type crashes do occur.

Priority Strategies

Engineering

1. Categorically assess intersection safety issues
 - a. Signalized intersections
 - b. Atypical intersections
 - c. Intersections with stop control on state routes
 - d. Intersections without left and right turn lanes
 - e. Freeway ramps and ramp termini
 - f. Roundabouts
2. Segments – Implement programs to minimize roadway departure crashes
 - a. High risk rural roads
 - b. Median barriers, bridge rail and associated guardrail programs
 - c. Rumble strip/rumble stripe policy
 - d. Pavement widening
 - e. Safety Edge use
 - f. Wet weather crash remediation
3. Segments – Keeping drivers on the road and guiding their traffic movements
 - a. Roadway departure
 - b. Traffic control and channelization

Supporting Programs

- c. Methodology for optimization of all projects (site, system wide, policy, etc.)
- d. Training
- e. Road safety audits
- f. Speed management
- g. Pedestrians and bicyclists
- h. 10% Report
- i. Rail/Highway Grade Crossings

Education

1. Create a program to educate teenage drivers about the effect of roadway departure crashes
2. Provide training at all levels on the use of the *AASHTO Highway Safety Manual*
3. Educate local government traffic engineers and public works directors

Enforcement

1. Develop a speed management program
2. Utilize the enforcement programs outlined in Chapter 2

Leaders

Alabama Department of Transportation
Federal Highway Administration, Alabama Division
County Engineers
City Engineers
Emergency Medical Services

Introduction to Infrastructure Related Crashes

There are multiple classes of roadways that serve different purposes, have different traffic patterns, and experience different levels of crashes, injuries and fatalities. Understanding how various roadway features contribute to crashes and crash severities is a basic element of planning a safety program.

As an example, interstate highways are designed and built to very high standards. They are designed to carry heavy traffic volumes and minimize conflicts that lead to crashes. The Alabama Interstate System constitutes only 1% of the state's total mileage, but carries 25% of the traffic volume and experiences 11% of the traffic fatalities. It is considered the safest type of highway in the state based on the very high traffic volumes as compared to the number of fatalities. County roads have different crash characteristics. These highways carry low traffic volumes but have significant fatalities. Alabama county roads constitute about two-thirds of the state's highway mileage and experience about one-third of the total traffic fatalities.

ALDOT maintains the interstate, NHS and state route road systems, which carry the vast majority of traffic and experience about 55% of the roadway fatalities. In 2010, the public highway system in Alabama experienced 128,384 crashes. Of these, about 30% were reported to have occurred at intersections with approximately two-thirds of these crashes at signalized intersections. The remaining crashes occurred along roadway segments.

Urban roadways in Alabama had 73% of all highway crashes, but only 38% of fatal crashes; in other words, urban areas had most of the crashes, but crash severities were below average. On the other hand, rural areas accounted for 27% of all highway crashes, but 62% of fatal crashes. So rural crashes were not as frequent as urban crashes, but were more severe.

Roadway departures are one example of higher severity crash types. These crashes accounted for 458 fatalities in 2010 as indicated in Table 3-1. They constituted 25% of all reported crashes, but 42% of Type "A" (incapacitating) injuries and 53% of reported fatalities, as shown in Figure 3-1. This type of crash caused more than half of the state's fatalities and almost half of the most severe crashes. The SHSP concentrates on reducing fatalities and injuries, so the Infrastructure component of the SHSP 2nd Ed. addresses ways to reduce roadway departure crashes.

**Table 3-1 2010 Statewide
Roadway Departure Crashes**

Crash Severity	Roadway Departure Crashes	Percent Statewide Crashes
Fatalities	458	53%
<i>Type "A" Injuries (incapacitating)</i>	4,224	40%
Total injuries	12,298	32%
Property Damage Only	18,900	21%
Total Crashes	31,198	25%

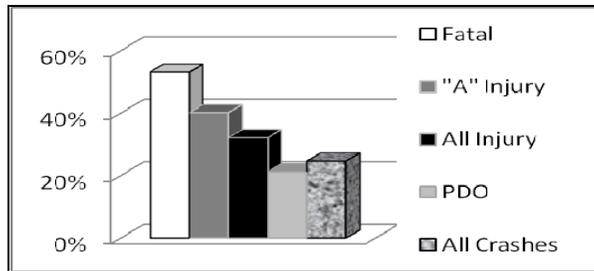


Figure 3-1 Roadway departure crashes as percentage of all crashes - 2010

A thorough understanding of the general roadway type, amount of vehicular travel, and number and types of crashes is important because of limited resources to address all crash sites. Resources need to be targeted at sites with the most crashes and highest severity crashes. If specific crash locations and crash characteristics are known, crash reductions are possible by applying proven countermeasures. The optimum countermeasure and the effectiveness of that countermeasure will vary from site-to-site depending on the dominant crash type and severity at each site.

As an example, countermeasures such as two-way left-turn lanes have produced crash reductions of more than 90% for certain crash types. Another example is ALDOT’s systematic rural pavement widening program, which has seen a 20% reduction in single vehicle roadway departure crashes. These countermeasures address infrastructure type, age and other related features, and are important in moving “toward zero deaths and severe injuries”. The remainder of this chapter provides a general overview and introduces countermeasures proposed to reduce crashes.

General Categories for Infrastructure Safety Programs

Infrastructure program elements are primarily focused on roadway facilities maintained and operated by ALDOT since these typically carry the highest traffic volumes and produce a large portion of the higher severity crashes in the state. Infrastructure specific projects are directly related to the physical features of the highway design and operating characteristics. Two primary types of roadway categories are being analyzed: highway intersections and highway segments. Addressing these categories includes the development of tools and procedures for enhanced analysis and identification of programs and projects from the infrastructure perspective.

Highway Intersections

Highway intersections account for approximately 56% of total crashes on Alabama highways. To help reduce the number of crashes at intersections, a series of crash reduction programs is proposed for implementation. These typically are identified by a visual field inventory and by categorization of intersection features that might be associated with certain types of crash characteristics.

Signalized Intersections

This program topic will identify possible treatments to address crashes occurring at signalized intersections. One particular treatment of interest is a review of yellow change intervals and the identification of clearance interval timings that are inconsistent with normal operating speeds. Another

treatment of interest is the potential safety implications of the Adaptive Traffic Control Systems concept and further investigation of operational elements.

Another focus in this area is an inventory of signalized intersections on the state highway system. This inventory will aid in the identification and prioritization of safety improvements related to both physical and operational improvements at intersections with disproportionate crash histories. This inventory will further provide data necessary for a study of traffic signal coordinated corridors, which will be used to determine the safety and operational effectiveness of the various coordinating systems throughout the state.

Comprehensive analysis of signalized intersections will involve a review of traffic signal phasing, timing characteristics and intersection geometry, to determine safety impacts of these elements. This information can be analyzed to provide design recommendations for specific improvements for each identified signalized intersection or corridor.

Atypical Intersections

Older intersections on Alabama's State highway system were often constructed with geometric designs that are atypical by today's standards. Many times these older intersections operate differently from other intersections even on the same type of roadway. This is typically reflected in the crash trends and crash frequencies.

An inventory will be used to identify atypical intersections and determine candidate locations for cost-effective safety treatments. Analysis of these intersections will focus on geometric design features and critical dimensions that may directly impact safety and traffic operations. The goal of the analysis is to formulate recommendations for specific improvements at each identified atypical intersection.

Intersections with Stop Sign Control on State Routes

Most of the time, state routes intersect other state or secondary roadways with stop sign control on the minor road approach. Since most of these locations facilitate traffic movement along principal arterials with moderate to high traffic volumes, the introduction of a stop condition on the state route after many miles of uninterrupted traffic flow may not be expected by all motorists. This unexpected condition may be reflected in identifiable crash trends.

Studies in this area will include an inventory to help identify candidate locations, document the traffic control features, and identify appropriate and cost-effective safety measures applicable to each situation.

Left- and Right-Turn Lanes

Left-turn lanes are auxiliary lanes for vehicle storage or for facilitating a speed change for vehicles making a left turn maneuver. Installation of left-turn lanes reduces crash potential and motorist inconvenience, and improves operational efficiency. Right-turn lanes provide a separation between right-turning traffic and adjacent through traffic at intersection approaches, reducing conflicts and improving intersection safety. Some current intersections do not provide turn lanes, or their existing lanes may not be adequate to accommodate speed reductions or volumes associated with turning

vehicles. Corrective efforts will include a field inventory to identify intersections that can be treated cost effectively. Analyses will be conducted on these intersections to determine safety impacts on geometry and other features associated with turn lanes to develop recommendations for countermeasures for each intersection in the inventory.

Freeway Ramps and Ramp Termini

Freeway ramps and ramp termini, including speed change lanes, are important features related to traffic operations and safety functions of interchanges. Some ramps, especially those on older freeways, have limited lengths for speed change lanes for entry to or exit from the freeway. These conditions may affect capacity, congestion, crash patterns and crash frequency.

Efforts will be made to identify interchange ramps where speed change can be treated cost effectively. Analysis of these interchanges will involve an investigation of the geometry and dimensions to determine impacts on crashes. This can lead to design recommendations for safety improvements at each identified interchange.

Roundabouts

The modern roundabout is a circular intersection defined by the basic operational principle of entering traffic yielding to vehicles on a circulatory roadway. It provides key design principles to achieve deflection of entering traffic by channelization at the entrance and deflection around a center island. Modern roundabouts have geometric features that reduce vehicle speeds on approaches, offer substantial safety advantages, reduce intersection crashes and provide excellent operational performance.

Although some Alabama local governments are beginning to use roundabouts, ALDOT has not developed a policy or guidance for their use. This may be due in part to a reluctance to implement a measure that often faces strong public objection when first proposed. In states that have programmatically deployed roundabouts, the public was concerned about traffic congestion and crashes, especially during the early stages of deployment. Typically such opposition dissipated once the roundabout was constructed and the public adapted to the concept.

Roundabouts have demonstrated substantial safety and operational benefits compared to other forms of intersection control. Research indicates reductions in fatal and injury crashes ranging from 60 to 87 percent can be obtained with conversion of intersections to roundabouts for certain traffic volumes and roadway widths. Although the safety of four-way stop sign control is comparable to roundabouts, roundabouts provide much greater vehicle capacity and operational benefits. Additionally, roundabouts can be an effective tool for managing speed and transitioning traffic from a high speed to a low speed environment.

Roundabouts have been shown to be a safe and efficient alternative intersection design, when designed for the local situation. It is anticipated that candidate Alabama sites will be evaluated to determine where roundabouts may be a cost effective alternative to other types of intersection operation. The analysis will involve investigation of the geometry and dimensions to determine safety impacts on geometry and crashes. This can lead to design recommendations for specific improvements for each identified intersection.

Highway Segments

Highway segments account for approximately 44% of total crashes on all public roads. To help facilitate a reduction in these crash numbers, a series of segment-related crash reduction programs have been proposed. These are briefly outlined in the following paragraphs.

Roadway Departure

The leading type of infrastructure-related fatal crash involves a travel lane departure, with a vehicle running off the road to the right or crossing the centerline to the left. This situation is especially prevalent on county roads, many of which were built many years ago with steeper hills and roadsides, narrower travel lanes and sharper curves. The countermeasures selected to address roadway departure crashes are briefly addressed in the following paragraphs.

High Risk Rural Roads Program (HRRRP) This program provides safety improvements on local roads by using procedures developed by ALDOT and consistent with FHWA criteria. ALDOT accepts proposals from counties and provides funding based upon estimated reductions of fatal and injury crashes through system-wide programs that address common crash patterns. Emphasis areas in this effort are horizontal curves, treatment of bridge ends and guardrails.

Median Barriers on Interstate Highways Median barriers are longitudinal barriers used to separate opposing traffic on a divided highway. ALDOT has an existing program of addressing cross-median crashes along the Interstate Highway System. These barriers have a proven history of reducing the occurrence of cross-median crashes, which resulted in a reduction in the number and overall severity of median-related crashes. A 2008 study looked at 108 miles of recently installed median barrier using three years of “before” and “after” data for run-off-road crashes. With 1,018 “before” crashes, the study found that total crashes increased 4.4% (less than the AADT growth rate), injury crashes decreased 15% and fatal crashes decreased 59%. In effect, the barrier likely converted some fatal crashes into injury crashes, and some injury crashes into Property Damage Only (PDO) crashes.

The median-barrier program will be continued and adjusted as needed to develop a detailed implementation program that concentrates on two principle areas: (1) interchange locations and (2) in-fill applications. As part of the program, an ALDOT *Guideline for Operation* will be developed to supply guidance for the installation of median barriers. Sites are proposed to be identified and prioritized using the *AASHTO Highway Safety Manual* and *Roadside Design Guide* concepts.

Bridge Rail and Associated Guardrail Bridge rail-related crashes are isolated and random events, which present a unique challenge to the use of data trends in anticipating or predicting crashes at specific sites. Such predictions are important in safety cost-effectiveness decisions necessary to develop priorities for systematic upgrades of bridge rails.

ALDOT’s current practice is to retrofit bridge rails, particularly for the National Highway System, as other work is performed along a given route. The latest methodology presented in the *AASHTO Highway Safety Manual*, cautions this practice may not be the most cost beneficial way to retrofit safety treatments, and it may not be the best use of limited funds.

An evaluation will be conducted to determine the safety effect of past retrofit projects. Additionally, HSM-type protocols will be developed to investigate and rank future sites that are possible candidates for bridge rail upgrades. It is anticipated that a HSM-based method will be utilized to rank all bridge sites along the state maintained highway system for possible bridge rail safety improvements. This ranking method will allow a more targeted, cost-beneficial method of improvements compared to the wholesale retrofit method currently utilized.

Rumble Strips/Rumble Stripes Rumble strip/rumble stripe countermeasures are grooved patterns of different widths, depending on application, on the roadway surface that provide both audible and vibratory warnings that alert drivers as they are leaving the travel lane. ALDOT has an extensive history of utilizing shoulder rumble devices along the state highway system, but limited history with the use of centerline rumble strips/rumble stripes.

The program will be expanded to develop warranting criteria and to identify potential treatment sites. An ALDOT *Guideline for Operation* will be refined and published to establish guidance for placement of shoulder rumble strip/rumble stripe treatments for all roadway classifications. About 1,000 miles of recent shoulder widening projects did not include rumble strips/stripes. They will be reviewed for possible retrofit of shoulder rumble strips/rumble stripes where deemed appropriate.

ALDOT has not developed a policy or guidance for the use of centerline rumble strips/rumble stripes. This concept has potential for reducing head-on and opposite direction sideswipe crashes. Investigation of this concept will be pursued to identify appropriate project test sites for centerline rumble strip/rumble stripe installations. Field data will be collected to develop criteria to identify locations where these measures can be applied cost effectively.

Highway Pavement Widening ALDOT has a statewide, systematic effort underway to widen pavements on rural roadways. Sites are identified on both two-lane and multilane highways for widening treatment during routine development of resurfacing projects. Roadways with a total pavement width less than 28 feet are selected for pavement widening. In conjunction with widening, shoulder rumble strips/rumble stripes are generally incorporated into each project as site conditions permit.

Safety Edge The Safety Edge is an asphalt paving technique that provides a safer roadway edge. The interface between the roadway and the graded shoulder is paved at a beveled angle for a more smooth sloped transition between surface types. This mitigates shoulder pavement edge drop-offs and improves pavement edge stability during the construction process and over the life of the pavement. Shoulders are maintained flush with the pavement to the extent possible.

ALDOT has not used this procedure in the construction process. As part of the SHSP effort, a study will be conducted to evaluate the Safety Edge procedure for various roadway classifications. Test applications will be conducted throughout the state to evaluate the effectiveness, constructability and potential maintenance issues over short and long term horizons.

Wet Weather Crash Remediation ALDOT annually evaluates the proportion of traffic crashes that occur on wet pavement. When the percentage of crashes at a location exceeds a wet pavement threshold, the location is identified for additional evaluation. The analysis considers many factors in addition to the wet weather crash percentage. Some are not related to the road, such as tire condition, rainfall intensity and driver behavioral factors like speed and inattention.

ALDOT has identified additional factors and conditions that affect wet weather crashes. These include concrete versus asphalt pavement, pavement patches, flat grades, bridges and other issues. Each of these could be a contributing factor or part of a complex condition related to crashes. Following analysis, a list of candidate roadway segments is provided to each ALDOT Division Office along with a list of potential countermeasures.

Traffic Control and Channelization

Traffic conflicts related to merging, diverging or crossing traffic streams increase the possibility for collisions. Providing positive guidance to drivers through signs, markings and channelization can reduce the potential for crashes. These enhance traffic operations and provide safety countermeasures to address crashes where current traffic volumes and operations are different from the design conditions.

Highway Signing and Markings Highway signing and markings are important elements for a safe driving environment. Signing and markings are effective at reducing the occurrence and severity of some types of crashes. The potential for crash reduction is greatest along horizontal curves, where a disproportionate number of fatal crashes occur.

ALDOT is currently developing a signing and marking program for the state highway system. It will contain a prioritized list of roadway segments that have the highest potential for reducing crashes through signing and marking upgrades. Intersections, horizontal curves and bridge approaches will be the primary focus of this program.

Undivided Four-Lane Highways ALDOT has developed an inventory of existing undivided four-lane highways and has done an extensive review of crash data and roadway geometry to determine the sites with the greatest needs. This includes identification of crash types and trends, and identification of countermeasures to address the crashes. The majority of the improvements identified from the crash data review will be implemented as part of routine maintenance activities related to re-marking and re-signing, or by lane conversion through use of Two-Way Left-Turn Lane (TWLTL) markings. Some locations may require some minimal widening to accommodate the addition of TWLTLs.

Some locations will need significant improvements as compared to other sites and will require further engineering analysis. As part of this effort, site analysis and implementation will be conducted by ALDOT Divisions as data is collected for construction, rehabilitation, reconstruction or maintenance projects along designated roadway segments.

Supporting Programs

Project Selection Methodology

Selection of Optimum Combination of Safety Projects It is possible to optimize results of SHSP efforts by developing a methodology to evaluate and compare the safety effectiveness of different types of safety projects (i.e., system wide applications, spot treatments, policy changes, various roadway classifications, education, enforcement, etc.). The proposed methodology would facilitate prioritization of safety programs for statewide implementation. This would allow development of the most cost-effective projects. Additionally, it could also increase safety awareness on projects currently under development.

It is conceivable that the methodologies in the new *AASHTO Highway Safety Manual* and additional tools being developed in current research could be used as the primary methodology for the safety cost-effectiveness for the SHSP 2nd Ed. and infrastructure elements.

Implementation of the AASHTO Highway Safety Manual The most significant change in highway safety procedures and analyses in decades has been the methodologies presented in the *AASHTO Highway Safety Manual*.... The level of statistical and mathematical modeling rigor is significant. In Alabama, it is anticipated that implementation will take three or more years for assimilating the required supporting processes and procedures. It will involve extensive training, development of safety prediction models and calibration procedures, screening programs, countermeasure selection for both system-oriented projects and site level projects, and installation or modification of applicable software and supporting hardware.

Training

ALDOT is in the early stages of a coordinated safety training program, with a goal of developing a strong safety-conscious workforce for ALDOT Bureaus and all cooperating agencies. A series of safety training activities have been proposed, utilizing FHWA, Local Transportation Assistance Program (LTAP) and National Highway Institute (NHI) resources. The training will be expanded and made available to all agencies responsible for highway systems.

Road Safety Assessments (RSAs)

A road safety assessment is a formal safety performance examination of existing and proposed roadways by an independent and multi-disciplinary team. The RSA team estimates and reports on potential safety issues and identifies opportunities for improvements. ALDOT can utilize RSAs as a tool to improve safety performance of new and existing roadway facilities. This program will apply to both state and local government projects.

Speed Management

Speeding is a significant factor in high-severity traffic crashes. Two types of speeding are addressed in the SHSP 2nd Ed.: (1) driving too fast for conditions and (2) exceeding the posted speed limit. Both types are covered in the Behavior and Legislative chapters of this document. Posting appropriate speed limits is considered a traffic engineering/infrastructure-related issue.

Posting or providing realistic, credible and safe travel speeds has been shown to reduce speed related traffic fatalities and injuries. A significant issue related to posted speeds versus operating speeds is the potential for speed differential, or the variance in vehicle speeds. This speed differential occurs when some drivers travel at a speed they feel is safe and reasonable (i.e., the 85th-percentile speed) and other drivers travel at the posted speed, which may be higher or lower than the 85th-percentile speed. As the difference in these two speeds increases, the likelihood of crashes often increases.

Speed zoning procedures are used to establish posted speed limits along highway segments. Factors like prevailing vehicle speeds, roadway physical features, traffic control characteristics, crash experience and conditions that are not readily apparent to the driver are considered. The primary measure used to establish posted speed limits is the 85th-percentile speed. It is considered the safest speed to traverse a

highway segment, and the safety implications of varying from this speed are documented extensively. Research has shown that appropriately posting a highway at the 85th-percentile speed results in an average reduction in crashes of nearly 10%.

A driver's choice of speed is influenced to some extent by the posted speed, but that is less important and less influential on the ultimate speed driven than other physical and visual cues. Drivers select speed based on their perception of the risk of operating a vehicle regardless of the posted speed. The character of the roadway (highway geometry, extent of roadside development, proximity of roadside objects, presence of traffic control devices, etc.) has a greater effect on driver speed than any other external factor.

Proposed Speed Management Program A speed management program will be conducted to investigate speed limits on state maintained routes. Specifically, it will review posted speed versus 85th-percentile speed and prepare recommendations for appropriate posted speed limits. For locations where there is a reason or desire to maintain a posted speed below the 85th-percentile speed, the site will be investigated for possible modifications of the highway geometry or traffic operations.

Speed in work zones will be investigated also, with a goal of developing protocols and management guidance to assist in reducing crashes in work zones, and facilitate traffic flow during construction.

Pedestrians and Bicycles

Normally, the most effective safety projects are those conducted at sites that experience multiple crashes, because treating one site can be highly cost effective and can prevent many future crashes. But pedestrian and bicycle (ped/bike) crashes are generally isolated incidents with few repeat locations identifiable through the traditional data analysis process.

Due to the limited number of existing sites that might have multiple pedestrian or bicycle crashes, alternative safety programs might return greater safety benefits. It appears that the method of addressing these infrastructure elements with highest cost effectiveness will be to incorporate the safety needs of these users in the early stages of project development. This may require the development of guidance documents emphasizing when and where these facilities are incorporated in the roadway environment.

One existing ALDOT program is a good example of provision for pedestrians and bicyclists. The "Safe Routes to School Program" addresses safe passage for students to and from school sites, typically including improvements to signing, marking and signals, and the addition of pedestrian facilities such as sidewalks.

Transportation planning efforts can have a major impact for implementation on pedestrian and bike crashes. Since most ped/bike crashes occur in metropolitan areas, metropolitan planning organizations (MPOs) can play a strong role in enhancing ped/bike safety by developing safety countermeasures for existing streets and incorporating enhanced ped/bike concepts into design of new streets.

Because pedestrians and cyclists are vulnerable users of the roadway (compared to individuals in cars and trucks), there is high national interest in developing criteria to improve roadway designs that

provide additional safety for peds/bikes. If such criteria become available in the near future, it will be evaluated for inclusion in SHSP programs.

Annual 10% Report

The FHWA HSIP requires preparation of an annual “5% report” composed of locations that exhibit the greatest numbers of fatalities and serious injuries. ALDOT expanded this list to include the top 10% of those locations. Countermeasures are being applied where they are cost effective. However, cost-effective countermeasures are not available for all identified locations. The 10% report includes state maintained routes and local and county routes. Those routes located off of the state system must be coordinated with the local agencies for implementation of selected measures.

Rail/Highway Grade Crossing Program

Rail/highway grade crossing safety is managed by ALDOT under the Section 130 program and uses dedicated funds for retrofitting and upgrading rail-highway grade crossings. This program is administered outside of the SHSP, but is included in the SHSP 2nd Ed. since it provides safety enhancements along the public roadway system.

Chapter 4 (**Text Version**) Legislative Initiative

Abstract

Challenge

This chapter of the SHSP 2nd Ed. addresses legislative efforts as a component to mitigate traffic crashes in Alabama. Focused and appropriate legislation is critical to reducing roadway crashes. Unfortunately, from the beginning to the midpoint of this decade, no traffic safety agency or organization was actively reviewing or tracking safety related legislation within the state.

Direction

The SHSP recommended reestablishing the State Safety Coordinating Committee (SSCC) which now provides comprehensive status reports regarding traffic safety legislation to the Alabama traffic safety community. This promotes better informed decisions by traffic safety professionals regarding appropriate program funding and direction. This effort can continue for the SHSP 2nd Ed.

Priority Strategies

1. Continue to review and update legislative work team membership and related tasks.
2. Provide list of traffic safety legislation and prioritize accordingly for crash reduction potential and conduct annual assessments of traffic data to analyze crashes and citations to identify traffic safety legislation needs.
3. Develop educational materials and provide to policy makers, legislators, media outlets, interested grass roots organizations, and the general public.

Leaders

Governor's Office, Deputy Legal Advisor
Alabama Department of Economics and Community Affairs
Alabama Department of Public Health
Alabama Department of Public Safety
Alabama Department of Transportation, Multimodal Bureau (Safety)
Alabama SAFE KIDS/Southeastern Child Safety Institute
Alabama Section of the Institute of Transportation Engineers
Alabama Trucking Association
Children's Hospital
State Safety Coordinating Committee
Montgomery Highway Safety Office (2 representatives)
West Alabama Highway Safety Office (2 representatives)
VOICES for Alabama's Children, Coordinator of Policy and Programs/Kids Count Director

Introduction – Safety Legislation

Safety legislation is a key component in the effort to reduce traffic fatalities and injuries. Unfortunately, since the midpoint of this decade, no safety agency or organization has assumed responsibility for tracking traffic safety-related legislation in Alabama. The initial Alabama SHSP encouraged the re-establishment of the State Safety Coordinating Committee (SSCC). This was accomplished, and the SSCC now identifies and proposes legislation to address Alabama's most crucial traffic safety needs. The SSCC also provides comprehensive status reports on applicable traffic safety legislation to Alabama traffic safety agencies and the safety community. This information allows traffic safety professionals to make more informed decisions regarding appropriate program funding and directed action. Cooperative and coordinated efforts with the SSCC and legislature will be a significant component in reaching the goals of the SHSP.

Coordinated Legislation Work Team

Representatives of the agencies and organizations listed below were appointed to the initial SHSP legislation work team, and those agencies will continue as members of the team for SHSP 2nd Ed. Representatives of other traffic safety interests or groups will be included as members when a specific need arises. The following positions or agencies are members of this work team:

- Governor's Office, Deputy Legal Advisor
- Alabama Department of Economics and Community Affairs
- Alabama Department of Public Health
- Alabama Department of Public Safety
- Alabama Department of Transportation, Multimodal Bureau (Safety)
- Alabama SAFE KIDS/Southeastern Child Safety Institute
- Alabama Section of the Institute of Transportation Engineers
- Alabama Trucking Association
- Children's Hospital
- State Safety Coordinating Committee
- Montgomery Highway Safety Office (2 representatives)
- West Alabama Highway Safety Office (2 representatives)
- VOICES for Alabama's Children, Coordinator of Policy and Programs/Kids Count Director

The primary goal of the work team will be to provide information and data related to specific safety matters to help reduce the number and severity of crashes on Alabama's roadways. Additionally, the work team will review and track any legislation that affects Alabama contained in federal and highway legislation. The secondary goal of the work team will be to develop fact sheets and educational materials for policy makers, legislators, the media, grassroots organizations and the general public regarding Alabama's most critical traffic safety needs.

Legislation Work Plan Advocating Safety Programs

The work plan reflects the primary and secondary goals of the work team and consists of several main functions:

- (1) Review and update the work team membership and related tasks;

(2) Examine proposed traffic safety legislation that will focus on the potential to reduce fatalities and injuries on Alabama roadways; and

(3) Develop and provide fact sheets and educational materials to policy makers, legislators, the media, grassroots organizations, and the general public to facilitate an understanding of Alabama's critical traffic safety needs. The work team will track safety legislation to maintain a current list and to develop supporting materials as needed.

Detailed task elements and sub-tasks for each of the three primary function areas of the work plan include the following:

1. Legislation Work Team
 - a. Identify members of the work team:
 - i. Identify a chair and co-chair to ensure accountability.
 - ii. The work team will include representatives from ALDOT, the Governor's Highway Safety Office, DPS, and other individuals and representatives of traffic safety-related agencies and advocacy groups.
 - b. Set pre-SSCC meeting:
 - i. Schedule to meet approximately four weeks prior to the beginning of legislative sessions or as needed.
 - ii. Agenda
 1. Review proposed legislation and create a single prioritized list
 2. Develop and plan a procedure to track safety legislation
2. Traffic Safety Legislation – (the lists below are not exclusive or prioritized).
 - a. Proposed New Traffic Safety Legislation:
 - i. Strengthen the Graduated Drivers License (GDL) Law – Four changes are necessary to comply with NHTSA requirements for full funding:
 1. Provision 2: 30-50 hrs of supervised driving in learner stage (age 15)
 2. Provision 3: Nighttime restrictions for intermediate stage (age 16 to 18)
 3. Provision 4: Passenger restrictions for intermediate stage (age 16 to 18)
 4. Amend to add restriction for "older driver"
 - ii. Booster Seat Law – Require booster seats for children ages 4-8 and weighing 40-80 pounds.
 - iii. Statewide Red Light Camera Law – Allow local governments to operate red light running photo enforcement programs for safety purposes. Develop public education materials that explain the safety benefits of the program and address rampant rumors about negative aspects of the cameras.
 - iv. Child Restraint Law (No Gaps) – Ensure there are no gaps in Alabama child restraint laws by having all occupants under the age of 16 covered by either a child restraint law or a safety belt law.
 - v. Unattended Children Law – Ensure a person responsible for a child who is eight years of age or younger shall not leave that child in a motor vehicle without being supervised in the motor vehicle by a person who is at least 14 years of age.

- vi. Aggressive Driving – Prohibit acts of aggressive driving (including excessive speeding, tailgating, unsafe lane changes, failing to yield right of way, ignoring traffic control devices, etc.).
 - vii. Distracted Driving – Prohibit use of wireless communication devices while driving
 - viii. Allow Enforcement Of Interstates By Municipalities – Since the DPS has limited staff, allow the enforcement of Interstate highways by local law enforcement municipalities.
 - ix. Review Distribution Of Funds On Citations Issued – Provide a portion of the proceeds of citations to local law enforcement agencies (i.e., Sheriffs).
 - x. School Bus Occupant Protection – Require all vehicles carrying more than 10 passengers (buses) and transporting children to and from school or related activities to meet the school bus structural standards.
 - xi. Primary Seatbelt Law for all Passengers – Require all passengers to wear safety restraints.
 - xii. Restrict Passengers in Rear of Pickup – Allow passengers to ride only in seating areas equipped with safety belts.
 - xiii. Increase the Monetary Threshold Required for Reporting Crashes – Crashes with fatalities, injuries or property damage in excess of \$500 are now reported. Increase this value to \$1000 or \$2000 to reflect the effects of inflation over time.
 - xiv. ATV – Restrict the use of all terrain vehicles by under-aged children.
- b. Legislation Recommended by the initial SHSP Task Teams:
- i. Max Alcohol Violations – Adopt ordinances which close businesses after 3 violations.
 - ii. Underage Alcohol Violations – Adopt stronger penalties for any underage alcohol conviction.
 - iii. Discourage DUI – Require color coded tags for violators and those convicted of DUI.
 - iv. Distinguish Underage Individuals – Require color codes /changes of drivers' licenses to denote those under age 21.
 - v. Diminished Driving Skills – Require vision, cognitive, and physical testing for driver's license renewal.
 - vi. Physician Reporting – Require physicians to report certain impairments for driver's license renewal.
 - vii. Driver's License restrictions – Mandate license restrictions for certain health conditions.
 - viii. Age-Related Driving Restrictions – Revise licensing renewal time frame.
 - ix. Older Driver Designation – Use a universal symbol on vehicles to identify older drivers.
- c. Legislation Affecting Alabama Federal-Aid Safety Funds
- i. Section 410 Impaired Driving – The existing Graduated Drivers License law must be modified to include all provisions recommended by NHTSA to ensure Federal funding is available to Alabama.
 - ii. Section 2010 Motorcycle Safety – Requires States to meet certain criteria regarding the reduction of motorcycle crashes, and to provide an effective public awareness training program.

3. Educational Materials and Outreach

- a. Develop fact sheets and educational materials related to the top legislative initiatives.
- b. Develop a distribution list of policy makers, legislators, media and safety agencies or safety interested groups.
- c. Identify funding sources for implementation costs.

Implementation Plan and Safety Data Evaluation for Supporting Legislation

During implementation, the SHSP 2nd Ed. work team will assist the SSCC by providing pertinent safety statistics and other supportive information prior to each legislative session. Proposing legislation to address Alabama's most critical traffic safety needs is essential. Proposed action items for the work team as part of the SHSP 2nd Edition effort are as outlined below:

- a. Identify Alabama legislation gaps
- b. Identify model legislation
- c. Identify legislation that can be incorporated into Alabama Code to prevent loss of Federal funds
- d. Prioritize legislation proposals
 - Those with the greatest potential to reduce fatalities and serious injuries
 - Those with greatest probability of enactment
- e. As legislation is proposed or introduced, reviews will be made to determine if it is adequate to address specific traffic safety in an particular area of need
- f. Educate and inform policy makers, legislators, the media, grassroots organizations, and the general public regarding Alabama's most critical traffic safety needs related to the SSCC/work team list of prioritized potential legislation

To evaluate traffic safety legislation, an annual assessment of traffic information and data will be performed to propose needed legislation. Additionally, the work team will monitor safety legislation in other states and review proposals from recognized traffic safety organizations to determine the information or data applicable to Alabama.

Chapter 5 (**Text Version**)

Traffic Safety Information Systems (TSIS)

Abstract

Challenge

This chapter of the SHSP 2nd Ed. addresses the accessibility and usability of safety-related data and the associated computer hardware and software. The development of a comprehensive safety data collection and management system would promote progress in the area of roadway safety. Current data systems can be reviewed, improved and integrated to address data gaps as the state moves forward with this effort. Ultimately, all agencies with responsibilities for traffic safety will have timely access and appropriate information to identify problems, select optimal countermeasures and evaluate implemented improvements.

Direction

Coordinate inter-departmental TSIS agency efforts and assess current safety data systems to determine needs for improvement based on the latest Traffic Records Assessment (TRA) for state data processes and implement recommendations. The State Traffic Records Coordinating Committee (TRCC) is serving as the action group for safety data issues. This group oversees planning and improvement of the key safety data systems within the state. TRCC is charged with ensuring the effort moves forward in identified component focus areas (i.e., citation and adjudication data, crash data, driver data, EMS-medical information, roadway data, vehicle-specific data, etc.). Ultimately, information integration and access will be possible through one source data portal, the SafeHomeAlabama.gov Website.

Priority Strategies

1. Continue to perform Traffic Record Assessments for the state safety data processes to develop recommendations for improving traffic information in accordance with NHTSA formalized processes.
2. Continue to improve existing electronic data systems and provide data exchange mechanisms between the different components using tools such as eCITE, eCRASH, CARE crash database, and roadway GIS and mapping.
3. Assist ALDOT in improving infrastructure information systems.
4. Support the Traffic Records Coordinating Committee (TRCC) efforts in developing and implementing a strategic plan for TSIS.
5. Encourage TRCC to meet regularly to work toward a comprehensive data collection and management system.
6. Continue initiative for implementation of *AASHTO Highway Safety Manual* for Alabama.
7. Promote SafeHomeAlabama.gov as primary source for distributing traffic safety information.

Leaders

Alabama Administrative Office of Courts
Alabama Department of Public Health
Alabama Department of Public Safety
Alabama Department of Revenue
Alabama Department of Transportation
Alabama Traffic Records Coordinating Committee
Federal Highway Administration
Federal Motor Carrier Safety Administration
Local Law Enforcement
National Highway Traffic Safety Administration

Introduction

Alabama's Traffic Safety Information System (TSIS) includes all of the hardware, software and data needed to generate information used to address the frequency and severity of traffic crashes. The large number of safety-related agencies and members of the traffic safety community at the state and local levels are involved in a wide range of collecting, editing, forwarding, entering databases, processing and distributing safety data. It is Alabama's goal to ensure all agencies with responsibility for traffic safety have timely access and complete information needed to identify problems, select optimal countermeasures and evaluate implemented improvements to continually advance highway safety.

In 1994, the state began to coordinate and facilitate better safety data through creation of a strategic plan for traffic information systems. A critical component of this effort was performance of a Traffic Records Assessment (TRA) for state safety data processes. To date there have been three TRAs, with the most recent completed in February 2011. The result of this most recent assessment was more than 50 recommendations for improving traffic information. These recommendations provide direction to enhance current activities and continually advance traffic safety data reliability and availability around the state.

TSIS Programs

TSIS coordination and strategic planning activities are required in the areas of crash records, emergency response records (including trauma registry and other medical records), traffic citations, roadway characteristics (construction, maintenance, traffic volumes, etc.), driver history, vehicle history and other demographic data. Coordination of these elements is required to allow state agencies to effectively apply information technology to their transportation systems.

Areas of focus for improving coordination among the agencies include making information readily available electronically and promoting electronic data exchange for the following component areas, including some example activities:

- Citation and Adjudication ("eCite" replacement of paper citations),
- Crash ("eCrash" with GIS capabilities and CARE database upgrades),
- Driver ("eCite" with capability to show driver's previous offense history),
- EMS-Medical (information systems for linking crash, EMS and trauma data),
- Roadway Component, especially for the *AASHTO Highway Safety Manual*, using statewide roadway data inventory,
- Vehicle Component (streamlined vehicle registration data availability), and
- Integration (advancing SafeHomeAlabama.gov as primary safety resource).

Focused efforts in each of the above categories will provide a mechanism for coordination that is essential to the goal of optimal traffic safety resource allocation. However, within the individual categories are notable gaps for particular data needs. As an example, for high-level crash analysis the minimum necessary data can include specifics on crash frequency, crash location (i.e., location-coded), roadway inventory and traffic volume data. Other data needs include information regarding driver receipt of citation, driving history and occupant restraint use. Currently, the DPS Informational Services Section is responsible for maintaining the official statewide crash file. The file is provided to the CAPS

center at The University of Alabama which conducts supporting analyses, highway safety-related research and associated studies. ALDOT receives a monthly update of the file to add location and other roadway-specific data to ultimately provide comprehensive information in support of its traffic safety improvement activities.

It is obvious that a comprehensive database is needed to allow effective evaluation of safety data to identify emerging issues or trends, determining appropriate countermeasures, and understand and evaluate related programs for effectiveness in reducing crash occurrences. Furthermore, ALDOT is aware that many additional data items are needed to support safety analyses including the implementation of the HSM.

An important component of a comprehensive safety database is accurate roadway inventory information. Currently, the roadway information portion of the database is limited for global data uses or external agencies concerned with transportation safety. Ideally, the roadway information portion of the database should service all levels of information needs for leaders and for technical programs concerning infrastructure safety and operations.

A basic road inventory database would ideally be organized as homogeneous roadway sections with beginning and ending mileposts along a route. Crashes documented by route and milepost numbers can be linked to the roadway file. These various associated data elements can be geocoded with coordinates so they can be used in GIS for locating the section, or pinpointing an intersection or interchange. Geocoding will eliminate the need for investigating officers to provide link-node data for electronically submitted crash reports.

Agencies Addressing Data Improvement Needs

Several initiatives were directed at crash data improvement during the past decade. For example, the Alabama Traffic Information System Council (ATISC) was created in 1994 as a prerequisite to obtaining funding from NHTSA for the original Strategic Planning Project. Similarly, the TRCC was created with policy level representatives from agencies with the key safety data systems within the state. TRCC is responsible for coordinating inter-departmental development efforts. This is a monumental task as few inter-departmental interfaces exist although there are many member agencies. A TSIS five-year plan was developed in 2006 and updated in 2007. With only slight modifications, this planning document provided direction during the past five years for TSIS efforts.

TRCC provides opportunities for member agencies to coordinate traffic records and to learn elements and data sets available within a traffic records system. The TRCC is now the action group for safety data issues and has been active in expanding and converting crash data to meet new federal requirements for standard reporting.

Committee structure is two-tiered, with executive level and technical level membership. The executive level establishes policies and goals, approves projects and authorizes funding. The technical level includes representatives from various stakeholder agencies which provide technical support, implement associated projects and collaborate with other members. Associated agencies that share coordination responsibilities for traffic safety and their corresponding information systems are provided in Table 5-1, along with brief descriptions of agencies' responsibilities.

Table 5-1 Summary of Alabama safety agencies and focus responsibilities

Safety Agency	Focus Responsibilities
Alabama Administrative Office of Courts	Coordination responsibilities for all of the courts, including information of violations, adjudication, criminal and driver histories
Alabama Department of Public Safety	Responsible for the collection of violations and crash data; custodian of several databases
Alabama Department of Transportation	Responsible for Alabama's state, U.S. and interstate highways
Alabama Department of Public Health	Has jurisdiction over all Emergency Medical Services, hospital and trauma registry data
Alabama Department of Revenue	Handles vehicle registration functions
Local Police, DOTs, Hospitals and Emergency Services	-----
National Highway Traffic Safety Administration	General responsibility for driver and vehicle countermeasures
Federal Highway Administration	Focused on roadway engineering countermeasures and recently given flexibility by Federal legislation for distribution of other countermeasure funding
Federal Motor Carriers Safety Administration	Interest in commercial vehicle and driver safety

Section 408 and TRCC

The Section 408 program, authorized under SAFETEA-LU and administered by NHTSA and ADECA within Alabama, is an incentive grant program used by the state to improve collection of traffic safety data. Section 408 establishes data standards that TRCC must follow. The TRCC has ultimate authority for overseeing the planning and improvement of the key safety data systems within the state and is charged with ensuring this effort moves forward.

The Section 408 incentive grant program encourages states to adopt and implement effective programs for timely, accurate, complete, uniform, integrated and highly accessible safety data. The goal is to provide data to identify priorities for national, state and local highway traffic safety programs.

NHTSA and TRA Process

NHTSA, in coordination with states, determines model data elements necessary to observe trends for crash occurrence, crash rates and crash characteristics. NHTSA has published a Highway Safety Program Advisory for Traffic Records which establishes criteria to guide state advancement and proper use of highway safety information resources. Through a formalized TRA process, NHTSA determines whether Alabama's traffic records system is capable of supporting staff needs and appropriately identifying the state's safety problems. The TRA assessment covers all of the components of the existing traffic records system. Alabama addresses and adopts the TRA recommendations for detailed traffic safety data advancement in multiple programs. Several of these topics are described in detail in the following paragraphs.

Alabama Electronic Citation System (eCite) The eCite system is a client-based application that uses the Internet to transmit electronic tickets. If there is no connectivity, the tickets are stored to be transmitted later. This program will eliminate paper citations statewide.

Software development on eCite began in 2002. Phase 1 of eCite ticketing was piloted in January 2003 in Heflin, Alabama, at a fixed-base location truck weigh station. Phase 2 was a mobile pilot that used cellular air cards inserted in the laptops for Internet connectivity. This was the first system within Alabama to utilize license scanners, GPS devices and laptop computers to enable officers to write traffic citations quickly and easily from their vehicles. This approach led to a successful pilot, which was

followed by a statewide rollout to all state troopers assigned to the Department of Public Safety's Motor Carrier Safety Unit. The product was so popular and successful that by the end of July 2007, all Alabama state troopers were using eCite and a municipal rollout was underway, starting with the Tuscaloosa Police Department. About 315 agencies have now deployed eCite, involving more than 3,000 individual users. Agencies are now expanding their eCite user base. By summer 2011, more than 2.75 million eCite citations have been written (3.25 million if warnings are included), and statewide citations are about 90% paperless.

It is important to achieve 100% participation in the eCite system. As long as there are agencies reporting on paper forms there will be a dual-reporting system that is expensive for the state to maintain. This cost is incurred at the local law enforcement level, the court system, the DPS in maintaining driver history records and the state's point system, and accounting and other systems that are updated by new citations. Additional cost is incurred anytime citations are summarized, because they must be hand-assembled from two separate citation systems. The goal is to have the entire state totally on eCite by the end of 2013.

eCrash Prior to 2006, a paper based crash reporting system was used for data entry into the statewide crash file, for about 130,000 reports annually. A transition to the eCrash system has resulted in approximately 83 percent of all reports being submitted electronically. Only 14 of the 400 law enforcement agencies statewide still continue documenting crashes using paper forms. The electronically submitted reports use the eCrash application developed by CAPS with a goal of the reports being 100% complete, 100% internally consistent and received within 48 hours of crash occurrence. This enhances enforcement agency capabilities by reducing time to complete a crash report form by more than 50%.

In 2009, a major change was made to the crash investigation form, resulting in changes to crash data collection across the state. The change facilitated compatibility with Model Minimum Uniform Crash Criteria (MMUCC) requirements and provided better data for future analysis. With the change, a number of new variables and codes were introduced to the crash form which allowed more accuracy and completeness when documenting crash information in the field. Making the reporting forms compliant with the MMUCC was a major goal and met the requirement that Alabama's crash information match national safety database formatting. The eCrash better facilitates use of the MMUCC-compatible crash form.

CARE The University of Alabama is continually improving and streamlining the traffic crash problem identification process for the state through use of the Critical Analysis Reporting Environment (CARE) system. CAPS maintains the CARE program, which is the primary search engine for traffic crash and safety analyses performed in Alabama. The CARE database incorporates crash data, spatial and location reference data, limited roadway features data and traffic citation data to allow advanced statistical analyses.

Roadway GIS and Mapping ALDOT is currently expanding its efforts of GIS mapping related to traffic safety. This includes contacting municipalities and counties to obtain available GIS data support files. Currently, data from TSIS overlaps data available for CAPS. ALDOT's goal is to have seamless access to CAPS information which includes Internet access to drivers' records. An informational portal is currently available for ALDOT, DPS and the Courts system for shared database access.

Ultimately, GPS and GIS technologies will enable officers and EMS personnel to automatically enter accurate locations into their respective crash, citation, EMS run and other records, and to map optimal routes to crash sites and to the closest available medical facility. This technology will also compute alternate routes around congestion to improve time to site and time to a medical facility.

GIS technology has many capabilities and benefits related to traffic safety. From a broader perspective, GIS has been recognized among state officials as an important tool in the overall economic development and advancement of the state. Great strides have been made in recent years by federal, state and other governmental agencies, educational institutions and private industry to develop powerful systems, definitive processes and useful information to promote and further the GIS technology for the betterment of the citizens of Alabama.

Executive Order Number 16, issued by the Governor on June 2, 2011, established the Alabama Geographic Information Program Office and the Alabama Geographic Information Executive Council. The establishment of the Alabama Geographic Information Program Office ensures a more consolidated effort in GIS advancement for the state. Additionally, the purpose of the Alabama Geographic Information Executive Council was to appoint an executive body responsible for overseeing all the GIS efforts throughout the state and establishing policies to guide the technology's future development. The Council consists of directors and commissioners of state institutions with a vested interest in the progression of the state's GIS systems. The issuance of this executive order signifies that GIS advancement is a priority of the state and, in turn, should have a positive effect on GIS efforts in relation to traffic safety.

ALDOT HSM Initiative ALDOT is implementing the HSM which uses safety analysis models and processes, including computer software, to evaluate traffic crash issues and sites, and to evaluate safety countermeasures. Achieving optimum treatments is possible using accurate traffic safety data to calculate the benefits of a countermeasure. Three categories of data are needed to apply HSM analysis procedures: crash characteristics, traffic volume data and roadway characteristics. Ultimately, progress in providing a centralized index of all roadway data will maximize the potential for reducing crash frequency and severity through the new HSM initiative.

SafeHomeAlabama.gov This Web portal includes all state agencies, the SSCC and service groups known to be active in roadway safety. The Website's goal is to provide a comprehensive overview of current national and Alabama activities in the traffic safety community. Much of the information is provided by the TSIS. The rationale behind this Web portal is that it is of no use to gather data unless it can be translated into useful information for countermeasure development. While the portal is currently in place and being updated by about 30 Safe Home Alabama (SHA) associates, the site will be undergoing further enhancement and continued efforts to maintain it with up-to-date information.

In summary, the items discussed in the previous paragraphs are summary excerpts of the TRCC's five-year plan. Detailed discussions of the TSIS five-year plan, which identifies planned research for future strengthening of data and data systems as well as information on recent TRCC activities, can be found at <http://www.safehomealabama.gov/category.aspx?cat=62>.

Enhanced TSIS and Applications

The outcomes of implementing improvements in TSIS component areas are easily identified and specific to advancing electronic information usability for real world applications. Simplified TSIS information for traffic safety, law enforcement, health and general information applications are summarized in the following paragraphs, along with recent developments and future directions.

Citation and Adjudication Component

The completed roll out of eCite will advance the Citation and Adjudication component. When completed, this will result in elimination of all paper citations statewide. Making this information completely electronic demonstrates the state's dedication to implementing technological advances to traffic enforcement and safety management. Another excellent example of the outcome of these efforts is the way that eCite will provide immediate information to officers in the field regarding a driver's history of citations such as DUI offenses.

Crash Component

The plans for the crash component include the complete roll out of eCrash, and a number of upgrades to eCrash; namely: (1) Implementing the MapClick project, which will provide a much quicker and automated way of locating crashes; (2) Upgrading CARE to handle the changes within eCrash, and to produce a more user-friendly interface; and (3) Bringing eCrash up to the revised standards that have recently come out as far as the MMUCC codes are concerned. CARE will also be upgraded to provide scripting capabilities so that standardized reports, such as the annual Crash Facts Book, can be run in a more efficient and uniform way. It is also expected that an update will be forthcoming for the Crash Facts Book. The system will also be upgraded to support unreported crash incident reports and special location type exception reports. These upgrades include the various infrastructure innovations that will be required to support them.

Driver Component

The driver component will be upgraded to enable officers in the field to be able to access information currently in the DUI-centric MIDAS and the incident-centric ULTRA systems. It will also include an upgrade to the widely used Law Enforcement Tactical System (LETS) to provide citation and DUI information through LETS queries. This will be supported by modifications to the Mobile Officers' Virtual Environment, which is an umbrella system that supports all mobile law enforcement applications.

EMS and Medical Component

The EMS-Medical component includes continued support for the implementation of the National Emergency Medical Services Information System (NEMSIS), an ambulance stationing research project, the development of a spinal injury database, and a pilot project to reduce EMS delay time through identifying crash locations with a moving map display. This will be accomplished by the installation of the Mobile Officers' Virtual Environment (MOVE) in EMS vehicles and the processing of trauma center and EMS-run-time data through CARE and Alabama Dashboards for Visualization, Analysis and Coordinated Enforcement (ADVANCE).

Roadway Component

The Roadway component involves a diversity of projects in support of ALDOT's HSM implementation initiatives. This includes the integration of roadway features into CARE and the integration of crash modification factors (CMFs) into the CORRECT system using information in the FHWA's CMF Clearinghouse. Roadway crash location data can be enhanced through supplemental ALDOT data about various projects that can be integrated into eCrash and used by CARE to fully utilize its GIS displays capabilities.

Vehicle Component

The Vehicle component includes a statewide distribution network that will make vehicle information immediately available to all consumers of this data in the state, including the ADECA LETS system. A prototype project has been completed that, when fully implemented, will reduce the time to receive vehicle registration updates from its current average of 45 days to under 72 hours, and it will also produce more accurate and timely vehicle information. A vehicle registration card is as important as a driver's license when it comes to collecting accurate data. Currently, a driver's license is swiped to provide data for eCite and eCrash. A vehicle registration card would pay its way very quickly in terms of saved officer time and nearly perfect data accuracy, and would help counter vehicle theft. Work is underway on the re-engineering the title and registration systems (MVTRIP project) and implementing the new Online Insurance Verification System (OIVS). Systems will be developed to support the mandatory liability insurance and financial responsibility programs. Efforts within the Department of Revenue in partnership with the Alabama Criminal Justice Information Center will continue and accelerate their efforts within the CVISN and PRISM programs, which are both CMV safety related programs. Efforts will continue to complete the non-UTC e-citation program that extends eCite and MOVE capabilities to offenses that are not covered by the Uniform Traffic Citation. Finally, vehicle data will be integrated into LETS such that data obtained from the statewide vehicle data network is readily available to all officers in the field on a timely basis.

Integration Component

An Integration component was added to the other functionally-oriented categories for projects that transcend a single database and have a goal of integrating several databases. A major effort is proposed to populate the current Safe Home Alabama Web portal so it will integrate all of the information generated by roadway safety agencies and present it in one unified source to the traffic safety community. General TSIS management activities are also included in this component. Ultimately, SafeHomeAlabama.gov will be the go-to resource for everything concerning traffic safety for the state of Alabama.

Summary

The presence of accurate, pertinent and available data is necessary for effective roadway crash mitigation programs. This chapter has overviewed traffic safety data collection and use in Alabama, and has illustrated the complexity of the project. Fortunately, the TRCC developed an excellent plan to enhance traffic safety information, is following that plan and is getting good support from the involved agencies.

Chapter 6 (**Text Version**) Safety Stakeholder Community

Abstract

Challenge

Alabama has adopted a goal to work Toward Zero Deaths (TZD). To make progress toward that goal, it is imperative that a significant change be achieved in the prevailing safety culture. Safety stakeholders must be actively engaged in informing motorists about the importance of traffic safety. Creating among Alabama citizens a stronger value for traffic safety will require that compelling and timely safety messages are frequently communicated to the general public and to specific target audiences. The safety stakeholder community must be a strong voice to motivate motorists to accept these safety messages. The task that emerges from the SHSP 2nd Ed. is for the Alabama Department of Transportation (ALDOT) to unify its public information and awareness efforts to initiate, in cooperation with others, a campaign that starts a revolution to make Alabama safer... a “Drive Safe Revolution.”

Direction

Undertake a “Drive Safe Revolution” campaign to communicate the need for a paradigm shift in the way drivers think and behave. This strategy will seek to achieve a stronger safety culture in Alabama where safe driving behavior has a greater value across all segments of the population. As part of this effort, ALDOT will take a role that engages safety stakeholders and members of the public to be activists and agents of change within the traffic safety movement.

Priority Strategies

1. Conduct a public information and awareness campaign using strategic outreach methods as part of an effort coordinated across the safety stakeholder community.
2. Activate safety stakeholders through a Traffic Safety Summit, periodic stakeholder meetings, e-newsletters, printed safety materials and a Speaker’s Bureau.

Leaders

Alabama Department of Transportation
University of Alabama’s Center for Advanced Public Safety
Federal Highway Administration
Safety Stakeholders

Introduction

Many agencies, organizations and individuals across Alabama work diligently to improve traffic safety and reduce highway fatalities and injuries. The efforts of these dedicated professionals, identified as the safety stakeholder community, include advocacy, education, engineering, emergency medical service and enforcement activities. The SHSP 2nd Ed. has been developed with broad participation from the safety stakeholder community, and implementation of the plan hinges on their continued involvement and commitment by all participants.

The safety stakeholder community includes a broad mix of individuals with varied perspectives and duties related to traffic safety. The following groups and agencies participated in the preparation of the initial SHSP and are considered stakeholders for the SHSP 2nd Ed.:

- AAA Traffic Safety Foundation
- AARP
- Administrative Office of Courts
- ABC Board
- Alabama Department of Economics and Community Affairs
- Alabama Department of Education
- Alabama Department of Public Health
- Alabama Department of Public Safety
- Alabama Department of Transportation
- Alabama Governor's Office
- Alabama Highway Safety Office
- Alabama Legislature
- Alabama Optometric Association
- Alabama Section Institute of Transportation Engineers
- Alabama Safe Kids
- Alabama Traffic Safety Center
- Alabama Trucking Association
- Auburn University
- Children's Hospital
- City/County Engineers
- Emergency Medical Services
- Federal Highway Administration, Alabama Division
- Federal Motor Carrier Safety Administration
- Insurance Industry
- Jefferson State Community College
- City, County and State Law Enforcement Agencies
- MADD
- Metropolitan Planning Organizations/Regional Planning Commissions
- National Highway Traffic Safety Administration
- National Safety Council, Alabama Chapter
- Operation Lifesaver
- SADD
- Southeast Alabama Medical Center
- State Safety Coordinating Committee

- The University of Alabama
- University of Alabama at Birmingham
- University of South Alabama
- Voices for Alabama’s Children

Prior Role of the Safety Stakeholder Community

Safety stakeholders have a history of working effectively together to reduce fatalities and injuries in Alabama. Several examples are cited in this chapter to illustrate the synergy from multiple agencies and groups working together. The Alabama Office of Highway Safety (AOHS), a division of Alabama Department of Economic and Community Affairs (ADECA), has for many years contracted with The University of Alabama for assistance in improving and streamlining behavioral crash problem identification. The coordinated efforts of these two agencies have resulted in enforcement programs conducted by the Alabama Department of Public Safety (DPS) and local law enforcement agencies targeted at specific crash types (such as speeding and alcohol-related crashes).

Another example of past safety stakeholder cooperation is the formation in 2001 of the Safety Management Action Resources Taskforce (SMART), a group formed to enhance communication and working relationships among various agencies involved with traffic safety. The group was based on a cooperative agreement signed by the heads of ADECA, ALDOT, DPS, ADPH, Alabama Administrative Office of Courts (AOC), Federal Motor Carrier Safety Administration (FMCSA) and FHWA. Participation in SMART was open to other agencies on a voluntary basis. SMART was established with a primary goal to more effectively allocate resources to address statewide safety issues.

Alabama’s original SHSP identified the need for a broader engagement of the safety stakeholder community. In 2005, during the development of the initial SHSP, the Safe Home Alabama Traffic Safety Summit was held. This one-day conference was devoted to promoting and discussing highway safety issues. The Traffic Safety Summit attracted professionals from public and private sector organizations. To complement the conference and extend its outreach, a companion Website was developed (www.SafeHomeAlabama.gov). Its mission and purpose is to promote greater awareness of traffic safety issues, and to provide a resource for traffic safety professionals, as well as the general public.

Vision for the Safety Stakeholder Community

Continued cooperation among safety stakeholders is critical to meeting the SHSP’s goal of moving Toward Zero Deaths in traffic crashes. Safety stakeholders must be advocates for changing the culture and educating motorists about the importance of traffic safety. Creation of a strong safety culture in Alabama will require that compelling safety messages are frequently communicated to the public-at-large and to specific constituencies. The safety stakeholder community will be a strong voice for these safety messages.

The vision for Alabama is a revolution of our traffic safety culture, a “Drive Safe Revolution.” The “Drive Safe Revolution” public information and awareness campaign will focus on the need for a paradigm shift in the way drivers think and behave, thus empowering all drivers to be activists and agents of change within the traffic safety movement. This outreach campaign will emphasize the idea that “safe driving starts with you.”

Strategic Goals

Alabama's SHSP 2nd Ed. envisions continued and active engagement of the safety stakeholder community to most effectively leverage the knowledge, energies and resources of agencies and individuals committed to improving traffic safety. The SHSP 2nd Ed. vision for stakeholder involvement includes several goals:

1. Clear communication of safety goals and performance benchmarking,
2. Cooperation between agencies with overlapping responsibilities,
3. A public information and awareness campaign that targets the general public, certain groups identified by crash data and safety stakeholders,
4. Advocacy for improving Alabama's safety culture, and
5. Sharing of resources toward common goals.

Communication will be the key to success with each of these strategic goals.

Public Information and Awareness Campaign

Transformation of Alabama's safety culture will require continued engagement of the general public. Citizens of all ages must be reached with positive safety messages, with crash data being used to target the high risk groups. Various safety messages will be directed to the general public and specific target audiences through a strategic campaign conducted by ALDOT and coordinated with the programs or activities of other safety stakeholders.

Drive Safe Revolution: 'Branding' the SHSP 2nd Ed.

As part of the process of writing the SHSP 2nd Ed., an effort has been made to develop a "brand identity" for the safety efforts that would emerge from the plan. These efforts would be implemented under the auspices of ALDOT, but with close coordination with other safety stakeholders – particularly the other state agencies independently involved in various safety outreach and public information campaigns. This "branding" effort starts with the SHSP 2nd Ed., which incorporates a logo, tagline and Website as part of ALDOT's efforts to change and strengthen Alabama's highway safety culture. The brand "Drive Safe Revolution" will be used in conjunction with a tagline "Start Something Alabama," that encourages people to become activists and agents of change to foster a stronger highway safety culture. AASHTO's "Toward Zero Deaths" concept will be reflected in various aspects of the "Drive Safe Revolution" campaign.

drivesafealabama.org

A cornerstone of ALDOT's public information and awareness efforts will come through the creation and launch of the Website drivesafealabama.org. This Website will be a key part of ALDOT's campaign to strengthen Alabama's highway safety culture by encouraging Alabama drivers and citizens to join a "Drive Safe Revolution."

Recurring Safety Initiatives

ALDOT's public information and awareness campaign will identify and give priority to the national safety campaigns that recur during specific weeks or months each year. Many of these programs are supported by more than one safety stakeholder, so ALDOT will identify those programs for which ALDOT is the main stakeholder and give priority to those in its outreach efforts. ALDOT will coordinate with secondary stakeholders on the recurring programs targeted as ALDOT priorities, and likewise will coordinate with and offer support to relevant stakeholders on programs for which they are the main stakeholder. Examples of these programs are National Work Zone Awareness Week, Motorcycle Safety Awareness Month and National School Bus Safety Week.

Other ALDOT Safety Initiatives and Behavioral Issues

Extensive coordination is needed between ALDOT's Media and Community Relations Bureau and the safety personnel in Modal Programs to identify behavioral issues and engineering-related initiatives that can be supported by public information and awareness efforts. Many of those programs are identified in the SHSP 2nd Ed. A series of planning sessions in late summer 2011 began combining the resources of the Media and Community Relations Bureau and the Modal Programs safety team to collaborate on specific outreach strategies that focus on addressing behavioral issues and gaining public appreciation for some of ALDOT's safety initiatives. As these planning sessions become a routine part of ALDOT's internal planning process, a wide assortment of behavioral issues, safety initiatives and programs will be considered and adopted as priorities based on emerging and evolving needs. ALDOT safety priorities will be addressed in a variety of methods, including, but not limited to those discussed in the following paragraphs.

Outreach Tools and Options

A combination of strategies featuring earned news media placement, paid media placement using a variety of approaches and direct outreach/community relations will help disseminate the "Drive Safe Revolution" and other messages throughout the state. Messaging could be conveyed in the following ways:

- Radio and Television (Network and Cable) – Budget permitting, television is recommended as the primary medium within the paid media tier. Television can be targeted by network and by program to ensure the desired demographic is reached. Television also serves larger, multi-county geographic areas reaching most of the state's population. Radio is recommended as a supplemental medium, and can be a more cost-effective strategy in certain markets or regions and with certain target audiences. Opportunities for Radio and TV can be maximized by working with the Alabama Broadcasters Association, radio networks and smart market stations.
- Outdoor Media – Outdoor media is recommended as a companion medium for certain aspects of a public information and awareness campaign.
- Print – Traditional print can be used as a supplemental medium to markets or regions where television and outdoor are limited. Possible partnership opportunities could be established with the Alabama Press Association.
- Targeted Digital/Online Media – Digital online news media vehicles have proliferated. A short-term pilot banner ad campaign could direct traffic to the "Drive Safe Revolution" parent Website. Messaging should be consistent across all media vehicles. Analytics tracking click-through rates can determine effectiveness and long-term viability.

- Highway Signage/Construction Area Signage – Consideration should be given to using highway signage to establish the “Drive Safe Revolution” campaign along highways and roadways throughout the state. If pursued, both the logo and target-specific messages should be incorporated into the overall plan. “Drive Safe Revolution” messaging and a short-version URL should be developed for digital signage used in construction or work zone areas.
- Rest Areas – Rest Areas are ideal locations for linking drivers in Alabama with the state’s commitment to making Alabama’s highways safer. Signage, pavement stamping, door clings and banner stands can be used to promote the message.
- Social Media – A social media plan will be critical to success, especially in building awareness among younger audiences. Social media provides an additional avenue to distribute public service announcements and other campaign messages.
- Slogans – The “Drive Safe Revolution” can be easily promoted by adding the logo or other safety slogans to ALDOT vehicles.

Methods for Engaging the Stakeholder Community

The SHSP Steering Committee identified six action items targeted to strengthen communication, cooperation, education, advocacy and sharing of resources among the safety stakeholder community.

Traffic Safety Summit

Alabama DOT and FHWA will sponsor a Traffic Safety Summit on a bi-annual basis. The conference should be modeled on the 2005 Safe Home Alabama Traffic Safety Summit. Attendance will be open to anyone interested in traffic safety, with advertisement targeted especially to members of the safety stakeholder community. The safety summit should include a keynote address on the current state of traffic safety efforts in Alabama. Breakout sessions on technical subjects related to engineering, enforcement, emergency response or related topics may be provided. Above all, the traffic safety summit will strive to encourage and facilitate dialogue between safety stakeholders, present the SHSP 2nd Ed. and provide the attendees with information to help spread the safety message throughout Alabama.

Safety Roundtables

Safety stakeholders will meet on a periodic basis, between bi-annual traffic safety summits, to maintain energy and focus for combined safety initiatives. ALDOT should host at least two meetings per year for safety stakeholders. The meetings could be described as Safety Roundtables, and used to highlight various safety programs by ALDOT, ADECA and other groups, and then provide stakeholders with information they can use to promote the programs through their own organizations, possibly through co-branding.

E-Newsletter

Stakeholders should remain enthusiastic and actively engaged if they are informed about the program activities and results. As a companion to www.drivesafealabama.org, an e-newsletter should be produced on a quarterly or semi-annual basis for distribution to members of the safety stakeholder community. The primary purpose of the e-newsletter is to provide timely updates on traffic safety

activities in Alabama. It may also include educational information, safety data updates, announcements, and recognition of stakeholder participation and accomplishments.

Alabama DOT will be the lead agency in producing and distributing the e-newsletter and will have flexibility to coordinate it with other ALDOT publications. The format should be limited to one page with hot links to full version articles. Distribution of the e-newsletter should be by e-mail to a subscriber list with additional posting on the www.drivesafealabama.org Website.

Targeted Safety Education Pamphlets

The SHSP Steering Committee identified a need for producing occasional printed material containing various safety messages for specific stakeholders and target audiences. These groups often include individuals with little or no formal training in traffic safety but with a high level of interest in promoting or responding to traffic safety concerns. In response to this identified need, the SHSP Steering Committee will prepare SHSP summary brochures for three key stakeholder groups:

- State legislators,
- Local elected officials/Metropolitan Planning Organizations/Regional Planning Commissions, and
- Engineering professionals.

These summary brochures will be co-branded companion documents to the SHSP 2nd Ed. and should be posted on the www.drivesafealabama.org Website. Further promotion of the SHSP 2nd Ed. safety education pamphlets can be done through targeted associations or group meetings such as the Alabama League of Municipalities, Association of County Engineers of Alabama and State Legislator's orientation.

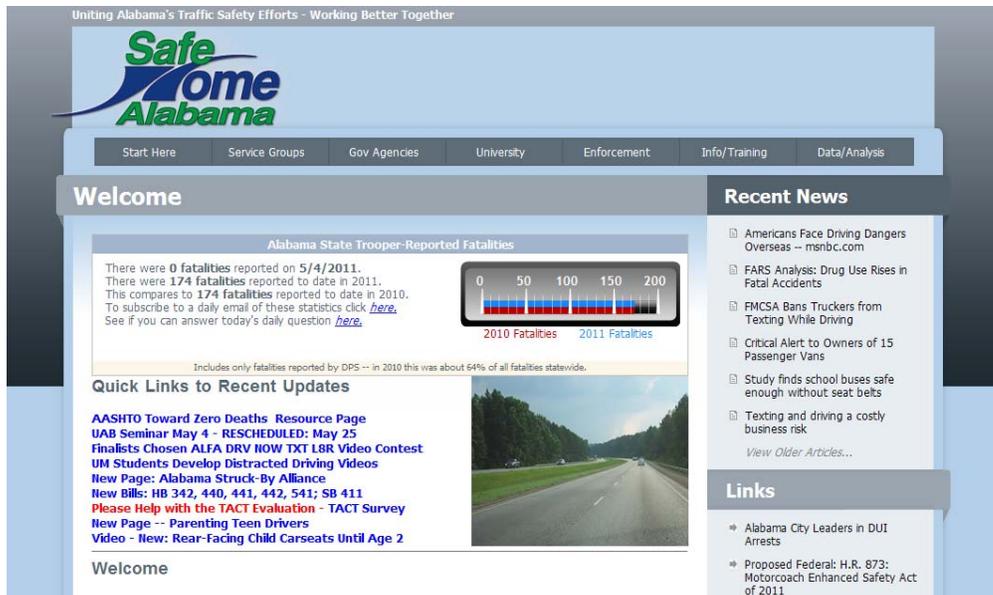
As part of ALDOT's broader outreach efforts, other materials will be printed on an as-needed basis for distribution at Rest Areas and through community relations initiatives with civic clubs, schools and safety stakeholders.

Speakers Bureau

To further facilitate the dissemination of key safety messages in Alabama, a Speakers Bureau is proposed to be organized and managed by ALDOT. The Speakers Bureau would enlist volunteer speakers and prepare model presentations.

Safe Home Alabama

The Website www.safehomealabama.gov was designed to be the first state-level traffic safety site to be inclusive of all safety efforts within Alabama. Originally created as an output of the 2005 Safe Home Alabama Traffic Safety Summit, the Website received a major update in early 2011. The site includes all safety stakeholders and provides an extensive amount of safety data and educational materials for traffic safety professionals and the general public. The Website is organized by the following sections: Start Here, Service Groups, Government Agencies, University, Enforcement, Information/Training and Data/Analysis. Information on the Website is updated on a continuous basis by approximately 30 stakeholder associates. Oversight for the Website is provided by staff of the Center for Advanced Public Safety (CAPS) at The University of Alabama. The SafeHomeAlabama Website is an excellent resource for promoting understanding of traffic safety issues.



While www.safehomealabama.gov is an excellent, comprehensive site for traffic safety information, it is not the appropriate forum for a single targeted message like the “Drive Safe Revolution” campaign. It is recommended that SafeHomeAlabama be maintained as an independent Website in its current form. As a support for the “Drive Safe Revolution” campaign, the following should be included on www.safehomealabama.gov:

- Create a prominent graphic and/or window for the home page that will serve as a focal point for tracking Alabama’s progress Toward Zero Deaths,
- Post all SHSP 2nd Ed. companion documents on the Website,
- Provide a link to drivesafealabama.org, and
- Maintain a subscriber list on the Website and share it with www.drivesafealabama.org.

Summary

For Alabama to make significant progress Toward Zero Deaths, it is imperative that Alabama’s safety community serve as a catalyst to create a change in the prevailing safety culture. Engagement of stakeholders is the first step toward improving the safety culture in Alabama. As noted in the introduction to this report, improving our safety culture involves changing the attitudes of transportation professionals, managers of transportation organizations, governmental leaders, legislative bodies and the public. In a strong safety culture, safe driving is the expected norm. Compelling and continued engagement of safety stakeholders in Alabama should result in strong advocates for traffic safety and communities that are intolerant of unsafe driving behavior.

APPENDIX A (**Text Version**) – Requirements of an SHSP

The Safe, Accountable, Flexible and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) requires state departments of transportation (DOTs) to develop Strategic Highway Safety Plans (SHSPs). The requirement may be found in 23 U.S. Code, § 148. The following overview of SHSPs was adapted from the FHWA website, and may be found at <http://safety.fhwa.dot.gov/safetealu/shspquick.cfm>.

What is an SHSP?

An SHSP is a statewide-coordinated safety plan that provides a comprehensive framework for reducing highway fatalities and serious injuries on all public roads. It must be developed by state DOTs as required by SAFETEA-LU, 23 U.S. Code, § 148. The SHSP establishes statewide goals, objectives and key emphasis areas developed in consultation with federal, state, local and private-sector safety stakeholders.

What are the Requirements for an SHSP?

The detailed requirements for SHSPs are described in Section 1401 of SAFETEA-LU. In general, DOTs are required to develop an SHSP that:

- Includes consultation from a variety of stakeholders during the development process,
- Analyzes and makes effective use of crash data,
- Addresses the 4Es (engineering, education, enforcement and emergency medical services),
- Considers the safety needs of all public roads,
- Describes programs or strategies to reduce fatalities and serious injuries, and
- Is developed, implemented and evaluated.

Consultation - SAFETEA-LU requires the state DOTs to develop an SHSP in consultation with:

- Governor's Highway Safety Representative,
- Regional and metropolitan transportation planning organizations,
- Representatives of major modes of transportation,
- Persons responsible for administering 23 U.S. Code, § 130, Rail Safety Program,
- State and local traffic enforcement officials,
- Representatives from Operation Lifesaver,
- Representatives from the Federal Motor Carrier Safety Administration,
- Motor Vehicle Administration agencies, and
- Other major state and local safety stakeholders.

Data - SAFETEA-LU requires each state to have in place a crash data system with the ability to identify safety problems and develop countermeasures. The states will seek to improve the traffic records data collection, analysis and integrate with other sources of safety data.

Examples include, but are not limited to:

- State traffic record systems,
- Highway maintenance information,
- Applicable transit data,
- Crash data research,
- Motor vehicle enforcement /administration citations,
- Motor carrier data,
- Driver license records,
- Medical records,
- Highway inventory data input from emergency service providers, and
- Highway-railroad grade crossings inventory data.

4Es Plus Management and Operations - SAFETEA-LU requires each state to develop an SHSP that addresses engineering, management, operation, education, enforcement and emergency services elements (including integrated, interoperable emergency communications) of highway safety as key factors in evaluating highway projects. This comprehensive approach allows safety problems to be addressed through both behavioral and infrastructure related strategies and countermeasures.

Safety Needs of all Public Roads - The ultimate goal of the SHSP is to reduce fatalities and serious injuries throughout the state for all functional highway systems. SAFETEA-LU requires the state to develop an SHSP that considers the safety needs of all public roads.

Implementation - A multitude of funding sources will be used to implement both the infrastructure and behavioral strategies and programs contained in the SHSP, including funding sources associated with FMSCA, NHTSA and FHWA. Safety projects are eligible for federal-aid funding through FHWA. The strategies and projects included in the annual Motor Carrier Safety Assistance Program Commercial Vehicle Safety Plan (CVSP), the State Section 402 Highway Safety Plan and Annual Performance Plan (HSP), the Highway Safety Improvement Program (HSIP), and metropolitan and statewide transportation plans with safety improvements should be considered and appropriately included or referenced in implementing a state's SHSP. Yet, implementation of the SHSP goes beyond federal grant programs and planning processes. Each safety partner involved indicates that the emphasis areas and strategies outlined in the SHSP are the best way to reduce fatalities and serious injuries from crashes.

Evaluation - SAFETEA-LU requires each state to establish an evaluation process to analyze and assess results achieved by highway safety improvement projects carried out in accordance with procedures and criteria established in 23 U.S. Code, § 148. Evaluation of the SHSP should include a process for determining the effect the safety elements implemented have met the goals established to reduce the number of fatalities and serious injuries.

Relationship between the SHSP and other safety plans and programs

To effectively develop and implement the strategies outlined in an SHSP, it is important to understand the SHSP's links to other safety plans and programs. Statewide Transportation Plans and metropolitan planning efforts, Transportation Improvement Programs (TIP), Statewide Transportation Improvement Programs (STIP), as well as the HSIP, CVSP, HSP and other state

and local plans are all critical to the success of an SHSP and vice-versa, as is the developmental process involved in selecting the most significant elements to achieve the defined goals.

Additional Information

A Governor-designated person and/or responsible state agencies must approve the SHSP.

The SHSP guidance “Strategic Highway Safety Plans: A Champion’s Guide to Saving Lives” is available at: <http://safety.fhwa.dot.gov/safetealu/shspguidance.cfm>.

APPENDIX B (**Text Version**) – The Alabama EMS and EMS Data Systems

The Alabama EMS

Emergency Medical Services (EMS) was one of the five emphasis areas in the initial Alabama SHSP due to the potential to provide rapid response and delivery of appropriate medical treatment for victims of high severity crashes. This helped reduce the number of fatalities and serious long term health issues. The Office of EMS and Trauma of the Alabama Department of Public Health (Alabama EMS) was a member of the steering team. While working on the SHSP, the Alabama EMS determined that additional data was needed to develop plans to optimize its operation. At the time, very few states possessed sufficient EMS data to prepare such optimization plans, and there was no national EMS database to support such planning efforts.

Consequently the Alabama EMS moved rapidly to adopt and implement the new National Emergency Medical Services Information System (NEMSIS), which was developed to standardize data collection and data coding by EMS agencies. Alabama was one of the first five states in the nation to fully implement NEMSIS. As NEMSIS data is accumulated, it will allow analysis of key issues like the best locations for EMS providers, types of service most needed, time profiles of EMS responses to medical emergencies and other significant issues.

The Importance of Response Time

The time between a high-severity crash and the arrival of the victim at an appropriate trauma center is strongly related to crash morbidity. This time can be broken into several components: from the time of crash until the EMS receives notice, from the time of notice until the EMS unit arrives at the scene and from the arrival on scene until the victims are transported to the nearest trauma unit. Extensive delays can occur in any of these components.

EMS providers are aware of the critical value of time through training. Study after study has shown that the sooner critically injured victims arrive at an appropriate trauma center, the better the likelihood of a good outcome. The “golden hour” is especially important to rural crash victims. Seriously injured victims can experience significant delays (sometimes hours) before they reach definitive care at a trauma center.

In Alabama, as in other rural states, EMS response is more challenging for rural crashes (Table B-1). The table shows that in 2010 it took more than twice as long to get a rural crash victim to a hospital than an urban crash victim. In addition, Alabama crash data show that, on average, rural crashes are more severe than urban crashes. This is supported by national data showing the national fatality rate per 100 million vehicle miles traveled in 2008 was 2.6 times higher in rural areas than in urban areas (NHTSA, 2010). This is due to higher speeds on rural roads (compared to urban roads), and because many of the existing highways are older and have steeper hills and sharper curves.

Table B-1 Average Alabama EMS response times for 2010

Time (minutes) between major events	Rural	Unknown	Urban	Unknown
EMS notification until EMS arrival at scene	6	0.05%	6	0.03%
EMS arrival at scene until hospital arrival	26	11%	12	13%
Crash until hospital arrival	29	11%	12	13%

Data source: Alabama EMS, NEMSIS Server Database.

The Importance of the Appropriate Medical Facility

A key issue for EMS response is getting the victim to the best available medical facility. Both the Institute of Medicine (2006) and the Centers for Disease Control and Prevention (CDC, 2009) have emphasized the relationship between patient recovery and EMS delivery to the appropriate medical facility (trauma center, if possible one that specializes in the type injury of the patient). EMS supports regionalized systems of trauma care, “where death rates among severely injured patients are significantly lower when they receive treatment at a center.” The CDC has found that seriously injured trauma victims are 25% less likely to die if they are treated at a trauma center.

The second part of getting victims to the appropriate facility involves how long they must wait for treatment once they arrive at a facility (i.e., how busy the facility is at the moment the victim arrives). This requires a communication link between the EMS vehicle and available treatment facilities, with someone able to appropriately triage the situation and direct the victim to the appropriate medical facility with the least probable delay before treatment.

Using EMS Data to Enhance EMS Response

A significant national issue in the development of emergency medical services has been the lack of sufficient data. Until recently, there was no national data system to track the availability of trained EMS professionals, equipment, control systems, communications systems, medical facility capabilities/availabilities, victim injury type, etc. Some service providers have developed their own data systems, which differed from one provider to another. In other instances states or municipalities developed data systems. Rarely did any of these systems interface with each other, or more importantly, with the data systems of medical facilities that received and treated roadway crash victims. Alabama is a good example. When NEMSIS implementation began, there were five different data systems, each operating in a different portion of the state.

Insufficient data for EMS patient care has been a significant challenge in the evaluation of existing EMS systems and the development of enhanced EMS systems. NHTSA and the Health Resources and Services Administration (HRSA) started the initiative to develop NEMSIS to address this challenge. It provides a uniform national EMS dataset, with standard terms, definitions and values, as well as a national EMS database, with aggregated data from all states on a limited number of data elements. NHTSA has agreed to house the National EMS Database at its National Center for Statistics and Analysis.

A second major initiative is being conducted for NHTSA and HRSA by the National Association of State EMS Officials (NASEMSO) to enhance the capabilities of EMS systems. It is intended for use in rural areas where EMS response times are longer and EMS resources are more limited than those in urban settings. It is called the Model Inventory of Emergency Care Elements (MIECE) and it provides a measurement of the capability of EMS and other emergency care resources to respond to a highway mass casualty incident at any geographic location.

The MIECE inventory includes only EMS characteristics that can be measured. Examples include the availability and readiness of EMS ground agencies, EMS helicopter agencies, rescue services for extraction from vehicles, hospitals, designated trauma centers, etc. MIECE allows these capabilities to be measured and scored for segments of Alabama roadways. The scores can be plotted on roadway maps and color coded as a visual representation of the EMS system’s capabilities to respond. A dispatcher or

an individual at the scene of an incident can review the map to determine the closest location for the desired EMS service or the desired medical service. Even better, the map can be GIS based and available electronically to any EMS person anywhere in a state.

The Alabama EMS Role in National EMS Initiatives

As discussed in the introductory paragraph of this appendix, the Alabama EMS embraced the concept of a national EMS database because collection of that data in Alabama would allow analysis of EMS services statewide, leading to more efficient operations and enhanced services. Consequently, Alabama EMS was among the first five states in the nation to implement NEMSIS.

The Alabama EMS has continued to work at the national level in the development of the MIECE concept and the methodologies and tools that utilize MIECE data. For example, the director of the Office of EMS and Trauma for the Alabama Department of Public Health is a member of the NASEMSO Working Group for its Highway Mass Casualty Readiness Project. This project has completed two important steps and has published two reports:

- 1) EMS Incident Response and Readiness Assessment – This project produced a self-assessment tool that uses MIECE data items and data scoring scales to measure the EMS response preparedness for specific locations. It is intended for use during a highway mass casualty incident or a similar large scale emergency (NASEMSO, 2011a).
- 2) Proof of Concept for a Nationwide Highway Mass Casualty Readiness Project: Model Inventory of Emergency Care Elements – This was a case study application of EMS Incident Response and Readiness Assessment for a charter bus roll over in a remote rural location (NTSB, 2009). There were overwhelming complications for responders, but if the EMS Incident Response and Readiness Assessment tool could have been applied, it would have been very helpful to crash site responders (NASEMSO, 2011b).

Summary

EMS is important in diminishing long term effects of roadway crashes by reducing the time between a crash and the transport of the victims to an appropriate medical facility. Until recently the ability to measure and analyze EMS response has been limited by the virtual absence of appropriate data at the state and national levels. Fortunately, ongoing initiatives are helping to mitigate the absence of data by the creation of a national database (NEMSIS) and to provide tools to assess the availability and readiness of providers for any location along a rural roadway through the NASEMSO Highway Mass Casualty Readiness Project. The Alabama EMS has been deeply involved in these national initiatives. NEMSIS is in place, and the next step is to gather data and apply the EMS Incident Response and Readiness Assessment tool so maps can be produced to indicate the readiness condition of Alabama roadway segments. ALDOT is participating with Alabama EMS in the effort to produce these maps.

In summary, the EMS data collection and application outlook appears very progressive and much better than just a few years ago. This will be an important factor in reducing fatalities and helping reach the SHSP goals.

References

“Access to Trauma Centers in the United States,” Centers for Disease Control and Prevention (CDC), <http://www.cdc.gov/Traumacare/pdfs/TraumaCentersFactsheet20090921-a.pdf>. 2009, accessed March 2011.

Emergency Medical Services: At the Crossroads,” Institute of Medicine (IOM), National Academy Press, Washington, D.C., 2006.

“EMS Incident Response and Readiness Assessment (EIRRA),” National Association of State EMS Officials (NASEMSO), Falls Church, Virginia, March 2011.

“Motorcoach Run-Off-the-Road and Rollover, US Route 163, Mexican Hat, Utah, January 6, 2008,” Highway Accident Report NTSB/HAR-09/01, National Transportation Safety Board (NTSB), <http://www.nts.gov/publictn/2009/HAR0901.pdf>, Washington, DC, 2009, accessed March 2011.

“Proof of Concept for a Nationwide Highway Mass Casualty Readiness Measurement Project: Model Inventory of Emergency Care Elements (MIECE),” National Association of State EMS Officials (NASEMSO), Falls Church, Virginia, March 2011.

“2008 Rural/Urban Comparison – Traffic Safety Fact Sheet,” National Highway Traffic Safety Administration (NHTSA) National Center for Statistics and Analysis, <http://www-nrd.nhtsa.dot.gov/Pubs/811164.pdf>, accessed March 2011.