# NCHRP

REPORT 500

Guidance for Implementation of the
AASHTO Strategic Highway Safety Plan

Volume 1: A Guide for Addressing
Aggressive-Driving Collisions

**TRANSPORTATION RESEARCH BOARD EXECUTIVE COMMITTEE 2003 (Membership as of March 2003)**

## NCHRP REPORT 500

# Guidance for Implementation of the AASHTO Strategic Highway Safety Plan

## *Volume 1: A Guide for Addressing Aggressive-Driving Collisions*

TIMOTHY R. NEUMAN
CH2M HILL
Chicago, IL

RONALD PFEFER
Maron Engineering, Ltd.
Zikhron Yaacov, Israel

KEVIN L. SLACK
KELLY KENNEDY HARDY
CH2M HILL
Herndon, VA

RICHARD RAUB
ROY LUCKE
Northwestern University Center for Public Safety
Evanston, IL

RICHARD WARK
University of Maryland
College Park, MD

SUBJECT AREAS
Safety and Human Performance

TRANSPORTATION RESEARCH BOARD

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## NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Systematic, well-designed research provides the most effective approach to the solution of many problems facing highway administrators and engineers. Often, highway problems are of local interest and can best be studied by highway departments individually or in cooperation with their state universities and others. However, the accelerating growth of highway transportation develops increasingly complex problems of wide interest to highway authorities. These problems are best studied through a coordinated program of cooperative research.

In recognition of these needs, the highway administrators of the American Association of State Highway and Transportation Officials initiated in 1962 an objective national highway research program employing modern scientific techniques. This program is supported on a continuing basis by funds from participating member states of the Association and it receives the full cooperation and support of the Federal Highway Administration, United States Department of Transportation.

The Transportation Research Board of the National Academies was requested by the Association to administer the research program because of the Board's recognized objectivity and understanding of modern research practices. The Board is uniquely suited for this purpose as it maintains an extensive committee structure from which authorities on any highway transportation subject may be drawn; it possesses avenues of communications and cooperation with federal, state and local governmental agencies, universities, and industry; its relationship to the National Research Council is an insurance of objectivity; it maintains a full-time research correlation staff of specialists in highway transportation matters to bring the findings of research directly to those who are in a position to use them.

The program is developed on the basis of research needs identified by chief administrators of the highway and transportation departments and by committees of AASHTO. Each year, specific areas of research needs to be included in the program are proposed to the National Research Council and the Board by the American Association of State Highway and Transportation Officials. Research projects to fulfill these needs are defined by the Board, and qualified research agencies are selected from those that have submitted proposals. Administration and surveillance of research contracts are the responsibilities of the National Research Council and the Transportation Research Board.

The needs for highway research are many, and the National Cooperative Highway Research Program can make significant contributions to the solution of highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement rather than to substitute for or duplicate other highway research programs.

## NOTICE

The project that is the subject of this report was a part of the National Cooperative Highway Research Program conducted by the Transportation Research Board with the approval of the Governing Board of the National Research Council. Such approval reflects the Governing Board's judgment that the program concerned is of national importance and appropriate with respect to both the purposes and resources of the National Research Council.

The members of the technical committee selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and, while they have been accepted as appropriate by the technical committee, they are not necessarily those of the Transportation Research Board, the National Research Council, the American Association of State Highway and Transportation Officials, or the Federal Highway Administration, U.S. Department of Transportation.

Each report is reviewed and accepted for publication by the technical committee according to procedures established and monitored by the Transportation Research Board Executive Committee and the Governing Board of the National Research Council.

# THE NATIONAL ACADEMIES
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# FOREWORD

*By Charles W. Niessner*
*Staff Officer*
*Transportation Research*
*Board*

The goal of the AASHTO Strategic Highway Safety Plan is to reduce annual highway fatalities by 5,000 to 7,000. This goal can be achieved through the widespread application of low-cost, proven countermeasures that reduce the number of crashes on the nation's highways. This first volume of *NCHRP Report 500: Guidance for Implementation of the AASHTO Strategic Highway Safety Plan* provides strategies that can be employed to reduce the number of crashes due to aggressive driving behavior. The report will be of particular interest to safety practitioners with responsibility for implementing programs to reduce injuries and fatalities on the highway system.

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In 1998, AASHTO approved its Strategic Highway Safety Plan, which was developed by the AASHTO Standing Committee for Highway Traffic Safety with the assistance of the Federal Highway Administration, the National Highway Traffic Safety Administration, and the Transportation Research Board Committee on Transportation Safety Management. The plan includes strategies in 22 key emphasis areas that affect highway safety. The plan's goal is to reduce the annual number of highway deaths by 5,000 to 7,000. Each of the 22 emphasis areas includes strategies and an outline of what is needed to implement each strategy.

NCHRP Project 17-18(3) is developing a series of guides to assist state and local agencies in reducing injuries and fatalities in targeted areas. The guides correspond to the emphasis areas outlined in the AASHTO Strategic Highway Safety Plan. Each guide includes a brief introduction, a general description of the problem, the strategies/countermeasures to address the problem, and a model implementation process.

This is the first volume of *NCHRP Report 500: Guidance for Implementation of the AASHTO Strategic Highway Safety Plan*, a series in which relevant information is assembled into single concise volumes, each pertaining to specific types of highway crashes (e.g., run-off-the-road, head-on) or contributing factors (e.g., aggressive driving). An expanded version of each volume, with additional reference material and links to other information sources, is available on the AASHTO Web site at http://transportation1.org/safetyplan. Future volumes of the report will be published and linked to the Web site as they are completed.

While each volume includes countermeasures for dealing with particular crash emphasis areas, *NCHRP Report 501: Integrated Management Process to Reduce Highway Injuries and Fatalities Statewide* provides an overall framework for coordinating a safety program. The integrated management process comprises the necessary steps for advancing from crash data to integrated action plans. The process includes methodologies to aid the practitioner in problem identification, resource optimization, and performance measurements. Together, the management process and the guides provide a comprehensive set of tools for managing a coordinated highway safety program.

# Contents

# Acknowledgments

**A Guide for Addressing Aggressive-Driving Collisions**

# Summary

## Introduction

"Aggressive driving" is operating a motor vehicle in a selfish, pushy, or impatient manner, often unsafely, that directly affects other drivers. In many cases, the behavior results from interaction between the driver and the driving environment. For this reason, resolving the problem lies not only with enforcement but also with education and engineering. This guide encourages a multidisciplinary approach that seeks solutions to the causes of aggressive driving and not just the addressing of its symptoms.

To be successful, programs aimed at reducing aggressive driving should

1. Concentrate on enforcing all traffic laws, regardless of whether the violator's actions affect other road users or have been linked to crashes at the enforcement location.
2. Address traffic-operations factors that affect driving and that apparently contribute to aggressive driving (e.g., badly coordinated traffic signals).
3. Have in place a method for evaluating any reduced aggressive driving and related crashes.

Effective programs

1. Require a champion, a person within an organization who can both provide leadership and obtain support from others.
2. Need to involve many disciplines representing interests outside the primarily involved organization.
3. Need to link aggressive driving to crashes and to measure outcomes in terms of reductions in crashes or correlative measures.

## Statement of the Problem

While estimates of the problem vary, perceptions among both law enforcement and drivers are that aggressive driving is becoming more prevalent. According to a National Highway Transportation Safety Administration (NHTSA) survey about aggressive driving attitudes and behaviors, more than 60 percent of drivers see unsafe driving by others, including speeding, as a major personal threat to themselves and their families. More than half admitted to driving aggressively on occasion. The Surface Transportation Policy Project estimated that aggressive actions contributed to 56 percent of all fatal crashes. However, without a clear definition of aggressive driving, these broad assertions are difficult to support.

Traffic safety experts suggest that any or all of the following elements have to be in place for an incident to be considered aggressive driving:

- Driving or attempting to drive at a speed different than the prevailing speed and maneuvering so that others are directly affected.
- Directing verbal or nonverbal expressions of anger toward other drivers designed to encourage retaliation on the part of other drivers.
- Deliberately ignoring traffic controls, especially by increasing speed or failing to slow for the controls.
- Driving in a way that attempts to gain an advantage over other drivers (e.g., appearing to be taking an unfair advantage or breaking notions of equity such as violating ramp meters and driving on the shoulder).

One important contributor to aggressive driving is frustration, which has been found to lead to aggression in other situations. The frustration-aggression approach suggested by researchers such as David Shinar of Ben Gurion University in Israel has the advantage of allowing for a conceptual relationship between the driving situation and the expression of anger by the individual driver. The basic assumption here is that drivers, when exposed to congestion and other frustrating situations, will experience increasing levels of aggression. This concept is important because addressing driver behavior may not be effective unless external frustration-causing elements are also addressed.

Aggressive driving is a "contextual" violation. The two major components of the context are the driver's psychological state (background and current condition) and the driver's traveling environment. Therefore, the application of aggressive driving programs must address the context in which the behavior is exhibited.

# Programs and Strategies

Most programs referenced to date appear in NHTSA's *Aggressive Driving Enforcement Strategies for Implementing Best Practices* (June 2000).[1] These cited efforts generally have addressed aggressive driving through specific traffic-enforcement programs. A few agencies have reported success measured by a reduction of crashes, but their programs usually applied intensive traffic law enforcement aimed at all violations. Pennsylvania and Milwaukee, Wisconsin, have reported favorable results with programs aimed specifically at well-defined acts of aggressive driving.

No effort has addressed the treatment of engineering elements as a means of mitigating aggressive driving, even though traffic safety professionals recognize that the driving environment plays a role in driver behavior. Moreover, because there is an apparent link between aggression and frustration—and the driving environment often is a frustrating one—there remains a need to identify and correct, where possible, those elements that can lead to frustration (e.g., uncoordinated traffic signals and lack of accurate information regarding causes of traffic delays).

This guide suggests several strategies for addressing the problems. These strategies combine the elements of enforcement, education, and engineering. The strategies are suggested recognizing that, with few exceptions, programs that depend upon only one of these elements are not likely to be successful. The table below identifies the strategies, organized according to their underlying objectives.

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[1] http://www.nhtsa.dot.gov/people/injury/enforce/aggressdrivers/aggenforce/index.html

**EXHIBIT I-1**
Objectives and Strategies for Addressing Aggressive Driving

| Objectives | Strategies |
| --- | --- |
| 4.1 A—Deter aggressive driving in specific populations, including those with a history of such behavior, and at specific locations | 4.1 A1—Target enforcement |
| | 4.1 A2—Conduct educational and public information campaigns |
| | 4.1 A3—Educate and impose sanctions against repeat offenders |
| 4.1 B—Improve the driving environment to eliminate or minimize the external "triggers" of aggressive driving | 4.1 B1—Change or mitigate the effects of identified elements in the environment |
| | 4.1 B2—Reduce nonrecurring delays and provide better information about these delays |

**Target enforcement.** This strategy has been the one most commonly employed in the field so far. However, many of the programs either concentrate on speeding or respond to a state law that determines that aggressive driving is the violation of multiple traffic laws, regardless of whether the driving affects others.

**Conduct educational and public information campaigns.** Public information and education (PI&E) need to be a part of targeted enforcement. The programs should employ multimedia, multiaudience approaches.

**Educate and impose sanctions against repeat offenders.** The National Safety Council has developed an Attitudinal Defensive Driver Education course that is intended to reach the habitual traffic violator. The habitually aggressive driver also may benefit from this approach. However, this program has not been evaluated for effectiveness either generally or specifically for aggressive drivers.

**Change or mitigate the impact of identified elements in the environment that can trigger aggressive driving.** While there is agreement that this strategy is an integral part of addressing aggressive driving, no program has been found that includes this element. What is required is a broadening of the approach to correcting aggressive driving, one that recognizes that a team of traffic safety experts needs to address all facets of driving.

**Reduce nonrecurring delays and provide better information about these delays.** Numerous examples of providing traffic information exist throughout the country. What is needed is a better assessment of what methods work. An integral part of providing information is keeping traffic moving. The Federal Highway Administration has been actively involved with their programs to improve incident management and provide for better traffic control.

# Introduction

"Aggressive driving" is operating a motor vehicle in a selfish, pushy, or impatient manner, often unsafely, that directly affects other drivers. This description arose from a consensus among traffic safety experts after they reviewed driving scenarios. They also concluded that aggressive driving, in most cases, results from interaction between the driver and the driving environment. For this reason, resolving the problem lies not only with enforcement but also with modifying or eliminating, where possible, those external triggers in the driving environment. Education, engineering, and enforcement must be combined in a multidisciplinary approach that seeks solutions to the causes and not just the symptoms.

Several difficulties arise with most recent or current programs intended to address aggressive driving. First, they tend to enforce many traffic laws regardless of whether the violator's actions affect other road users or have been linked to crashes at the enforcement location. Second, few programs have been properly evaluated. Often, success is measured by the number of tickets written, or hours of enforcement patrol. Finally, factors that affect driving and that may have contributed to aggressive driving, such as badly coordinated traffic signals, are not addressed.

Media portrayals and political responses to the problem have sometimes created confusion as to what aggressive driving really is. There is a difference between aggressive driving and "road rage." The latter is criminal behavior employing a car as a weapon, or involving assault arising from driving confrontations. Moreover, many of the documented cases of road rage may not have arisen from earlier acts of aggressive behavior on the road.

In addition to providing objectives and strategies for dealing with the problem, this guide provides assistance with developing, enacting, and evaluating programs.

Effective programs

1. Require a champion, a person within an organization who can both provide leadership and obtain support from others.
2. Need to involve many disciplines representing interests outside the primarily involved organization.
3. Need to link aggressive driving to crashes and to measure outcomes in terms of reductions in crashes or correlative measures.

A more comprehensive discussion of aggressive driving is found in <u>Appendix 6</u>. This appendix examines the literature that addresses definitions and research. It also examines the subject from a psychological perspective, especially the link between frustration and aggression. This appendix established the basis for this guide.

Because the topic of aggressive driving is a relatively new one, and because arriving at an operational definition has not been easy, there is a lack of data available about the nature of crashes involving aggressive driving. In trying to determine whether a problem exists, it will be difficult to locate these crashes using current data sources. Although some crash reports provide for indication of driver-contributing circumstances, such categories do not allow one

to identify all truly aggressive driving actions. Narratives provided on the form by reporting officers may be the key source of information on current forms.

New definitions and new coding options are needed. At least one state has placed a check box on its crash report form to identify aggressive driving. Officers have been given an official definition to use. This type of modification may ultimately be necessary in any jurisdiction that desires to document the problem in an accurate manner.

# Type of Problem Being Addressed

## General Description of the Problem

The problem of aggressive driving appears to be increasing in seriousness. While there is great variance in the estimates of the problem's extent, perceptions of both law enforcement and drivers is that the phenomenon is becoming more prevalent. As a result, people are experiencing driving as an increasingly dangerous activity:

> According to a NHTSA survey on aggressive driving attitudes and behaviors, more than 60 percent of drivers see unsafe driving by others, including speeding, as a major personal threat to themselves and their families. More than half admitted themselves to driving aggressively on occasion. Some common characteristics of the aggressive driver include the following:
>
> - They are high-risk drivers, more likely to drink and drive, speed, or drive unbelted.
> - Their vehicle provides anonymity, allowing them to take out their frustrations on other drivers.
> - Their frustration levels are high, concern for other motorists, low.
> - They run stop signs, disobey red lights, speed, tailgate, weave in and out of traffic, pass on the right, make unsafe lane changes, flash their lights, blow their horns, or make hand and facial gestures.[1]

In the United States, the Surface Transportation Policy Project found that "aggressive driving is a factor in about 56 percent of all fatal crashes."[2] The data were extracted from the Fatality Analysis Reporting System (FARS) records using a broad set of contributing factors, excluding drinking and driving but including most traffic violations without further interpretation. A more careful analysis of the data elements suggests that the percentage is substantially overstated (e.g., less than 25 percent of cases coded as speeding showed a speed in excess of the speed limit, and more than 60 percent of those involved only one vehicle).

On the other hand, traffic safety experts at a workshop on aggressive driving held in Washington, D.C., in November 2000, and later various committees of the Transportation Research Board, arrived at a consensus as to what constitutes the problem. The elements included the following:

- Driving or attempting to drive at a speed different than the prevailing speed and doing any of the following:

    - Maneuvering to cause other drivers to react or take evasive action,
    - Flashing lights or blowing the horn,
    - Following others too closely, or
    - Preventing faster drivers from passing.

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[1] Aggressive Driving and the Law: A Symposium. 1999.
[2] "Aggressive Driving: Are You At Risk?" p. 1.

- Directing at other drivers verbal or nonverbal expressions of anger designed to encourage retaliation on the part of other drivers.
- Deliberately ignoring traffic controls, especially by increasing speed or failing to slow for the controls.
- Driving in a way that attempts to gain an advantage over other drivers (e.g., appearing to be taking an unfair advantage or breaking notions of equity such as violating ramp meters and driving on the shoulder).

## Specific Attributes of the Problem

Two studies were conducted in the United Kingdom and published by the AAA Foundation for Traffic Safety (Connell and Joint, 1997). In one study, conducted by the Automobile Association in Great Britain in March 1995, British motorists indicated that the following actions, committed by both others and the surveyed motorists themselves, were considered to be aggressive driving:

- Aggressive tailgating;
- Headlight flashing out of annoyance with a motorist;
- Aggressive, rude gestures or verbal abuse; and
- Deliberately obstructing or preventing a driver from moving his or her vehicle.

In addition to the results reported above, this study also found that

- Congested roadways and pent-up frustration lead to aggressive driving and
- One's mood prior to driving prefigures one's level of stress while driving.

The clear association between levels of anger and displays of aggressive driving suggests that younger drivers and male drivers would have a higher probability of displaying the above behaviors. Experience gained from focus groups and driver-improvement classes operated by the Northwestern University Center for Public Safety (Wark, 2000) indicates an especially high probability for younger male drivers to express feelings of anger related to driving. Additionally, their enrollment in driver-improvement classes indicates that young male drivers have the highest probability of being cited for aggression-related offenses.

The frustration-aggression approach suggested by researchers such as Shinar (1998) has the advantage of allowing for a conceptual relationship between the driving situation and the expression of anger by the individual driver. The basic assumption here is that drivers, when exposed to congestion and other frustrating situations, will experience increasing levels of aggression. The approach has received much support (Hauber, 1980; McDonald and Wooten, 1988; Kenrick and MacFarlane, 1986; Deffenbacher et al., 1994; Novaco 1992). Therefore, addressing drivers without correcting underlying driving-related environmental issues also may not be effective.

Another important attribute of the problem is the specific characteristics of the type of driving done by the individual. Ultimately, the likelihood that a given individual will display aggressive driving is a joint probability of their personal characteristics and the characteristics of a particular driving situation. Thus, there could exist a driving situation so nonstressful that it would likely engender aggressive driving only in a person with a great amount of personal anger, and another that could be so stressful that even the calmest person could begin to display aggression.

Aggressive driving is a contextual violation. The two major components of the context are the driver's (1) physical and psychological state (background and current condition) and (2) roadway environment. The type of aggressive driving displayed in a given area will in part also be a function of the setting. Most approaches to aggressive driving have occurred on controlled access roads. Perhaps this is why the role of speeding in aggressive driving has been emphasized. However, the most commonly noted aggressive behaviors involve drivers traveling faster than others, traveling well below the posted limit, or frequently changing lanes or tailgating. An extension of the concept to driving on surface streets is required. Urban areas with high periodic traffic and heterogeneous mixes of vehicle sizes, pedestrians, and bicycles are especially important to address. In such an environment, the operational definition of aggressive driving would change from something focused upon speed to violations involving turning, yielding, traffic control devices, and lane maintenance.

## Efforts to Address the Problem

Most driver-directed programs referenced to date appear in NHTSA's *Aggressive Driving Enforcement Strategies for Implementing Best Practices* (2000).[3] These programs generally have addressed aggressive driving through specific traffic-enforcement programs. Some agencies have reported program success measured by a reduction of crashes. With few exceptions, programs reporting success also have applied intensive traffic law enforcement aimed at *all* traffic law violations. Past literature has indicated that such programs can be effective (selective traffic enforcement programs—or STEPs—remain a recommended approach to reducing crashes at targeted locations). However, other research, such as that by B. J. Campbell in North Carolina (1978) and that by Dart and Hunter (1976), had examined enforcement's halo effect and found it limited in time and space. Moreover, duration of these programs is limited because most police agencies do not have sufficient personnel for long-term maintenance. One of the few agencies reporting success through other outcome measures was Milwaukee,[4] where education and enforcement are combined and the effort directed toward specific targeted violations.

No effort has explicitly addressed the engineering elements related to aggressive driving, even though traffic safety professionals recognize that the driving environment plays a role in driver behavior. There is an apparent link between aggression and frustration, and the driving environment often is a frustrating one. There remains a need to identify and correct, where possible, elements that can lead to frustration (e.g., uncoordinated traffic signals or lack of accurate information regarding the causes of traffic delays).

This guide suggests several strategies to address the problems. These strategies combine the elements of enforcement, education, and engineering. With few exceptions, programs depending only on one of these elements are not likely to be successful.

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[3] http://www.nhtsa.dot.gov/people/injury/enforce/aggressdrivers/aggenforce/index.html
[4] http://www.nhtsa.dot.gov/people/injury/enforce/aggressdrivers/aggenforce/demo_projects.html

# Index of Strategies by Implementation Timeframe and Relative Cost

Exhibit IV-1 provides a classification of strategies according to the expected timeframe and relative cost for this emphasis area.

**EXHIBIT IV-1**
Classification of Strategies According to Expected Timeframe and Relative Cost

| Timeframe for Implementation | Strategy | Relative Cost to Implement and Operate | | | |
|---|---|---|---|---|---|
| | | Low | Moderate | Moderate to High | High |
| Short (< 1 year) | 4.1 A1—Target enforcement | **XXX** | | | |
| | 4.1 A2—Conduct educational and public information campaigns | | **XXX** | | |
| Medium (1–2 years) | 4.1 B1—Change or mitigate the effects of identified elements in the environment[a] | | | **XXX** | |
| | 4.1 B2—Reduce nonrecurring delays and provide better information about these delays[b] | | | **XXX** | |
| | 4.1 A3—Educate and impose sanctions against repeat offenders | **XXX** | | | |
| Long (> 2 years) | | | | | |

[a] There are a number of actions that may be taken under this strategy. The degree of reconstruction required is normally assumed to be relatively small. There will be cases, however, where more costly investment in reconstruction will be necessary, even involving additional right-of-way, and thus requiring a longer timeframe, as well.

[b] There are a number of actions that may be taken under this strategy. The classification of this strategy is based upon the assumption that the agency is seeking those that avoid major investments, such as new right-of-way, or major reconstruction.

In several cases, the implementation time will depend upon such factors as

- Agency procedures,
- Scope of the proposed program,
- Level of reconstruction required,
- Number of stakeholders involved, and
- Presence of any controversial situations.

The range of costs may also be somewhat variable for some of these strategies because of many of the same factors. Placement in the table above is meant to reflect costs relative to the other strategies listed for this emphasis area only. The estimated level of cost is (1) for the commonly expected application of the strategy or (2) in accordance with the additional specific assumptions recorded in the footnotes.

Note: Strategies involving changes to external elements and to reducing delays range from very low cost and short range (e.g., restriping turn lanes) to relatively high cost and longer range (e.g., centrally controlling a set of traffic signals now under individual controllers). A midpoint in that range has been used in the table.

# Description of Strategies

## Objectives

Two objectives have been identified for addressing aggressive driving:

1. Deter aggressive driving in specific populations and at specific locations (this includes those with a history of such behavior).
2. Improve the driving environment to eliminate or minimize the external "triggers" of aggressive driving.

Both populations and specific individuals among whom aggressive driving appears to be over-represented are to be identified. In addition, geographical areas where such events most frequently occur are to be identified. The approach uses three components:

- Crash records and observations to identify populations and geographical areas,
- Driver records to identify individuals displaying a propensity toward aggressive driving, and
- Observations to examine the driving environment to identify "triggers" that could set off aggressive driving.

Where populations or geographical areas are over-represented, two approaches are appropriate for taking corrective action:

- Identify means of reaching the populations through targeted education, public information, and sanctions.
- Reinforce education and public information through enforcement.

Where "triggers" in the roadway environment are identified, efforts are to be directed at eliminating or modifying the problems in the driving environment. Two key approaches are proposed:

- Make changes in roadways and traffic control devices to improve the flow of traffic.
- Reduce the frustrations arising from delays.

For all of these approaches, the law enforcement community plays a key role. They are in a position to stop acts of aggressive driving when they occur, as well as help identify contributing environmental factors. However, with the exception of repeat offenders, laws and enforcement represent an intermediate step that alone will not solve aggressive driving. Achieving the objectives requires cooperation among multiple stakeholders, including legislative, education, law enforcement, the courts, and the community.

Exhibit V-1 summarizes the objectives and associated strategies. Each strategy is described in detail below.

**EXHIBIT V-1**
Objectives and Strategies for Addressing Aggressive Driving

| Objectives | Strategies |
|---|---|
| 4.1 A—Deter aggressive driving in specific populations, including those with a history of such behavior, and at specific locations | 4.1 A1—Target enforcement |
| | 4.1 A2—Conduct educational and public information campaigns |
| | 4.1 A3—Educate and impose sanctions against repeat offenders |
| 4.1 B—Improve the driving environment to eliminate or minimize the external "triggers" of aggressive driving | 4.1 B1—Change or mitigate the effects of identified elements in the environment |
| | 4.1 B2—Reduce nonrecurring delays and provide better information about these delays |

# Explanation of Strategy Types

The strategies listed above and described in detail below are those considered unique to the aggressive-driving emphasis area. These strategies fall into one of two categories, either "tried" (T) or "experimental" (E), relative to how the strategy will impact aggressive driving. (A third strategy category, "proven" [P], is not used because although the strategy may have been effective in other applications—e.g., occupant restraint—it has not been evaluated and found effective for aggressive driving. Therefore, the reader should be prepared to exercise caution in many cases before adopting a particular strategy for implementation.)

The definitions are as follows:

- Tried (T): Those strategies that have been implemented in a number of locations, and may even be accepted as standards or standard approaches, but for which there have not been found valid evaluations. Such strategies—while in frequent, or even general, use—should be applied with caution, carefully considering the attributes cited in the guide, and considering that while they may have been tried for other purposes, the application to aggressive driving is relatively new and not well evaluated as yet. Implementation can proceed with some degree of assurance that there is not likely to be a negative impact on safety and very likely to be a positive one. As the experiences of implementation of these strategies continues under the AASHTO Strategic Highway Safety Plan initiative, appropriate evaluations should be conducted, so that effectiveness information can be accumulated to provide better estimating power for the user, and the strategy can be upgraded to a "proven" one.

- Experimental (E): Those strategies that are ideas that have been suggested, and at least one agency has considered sufficiently promising to try on a small scale in at least one

location. While this definition generally applies in the set of guides for implementing the AASHTO Strategic Highway Safety Plan, it must be understood in a slightly different manner here. The strategies that are classified as experimental in this guide are ones that have been tried to a good degree. However, they have not been applied in the context of mitigating aggressive driving. Therefore, they are considered experimental. Where they are considered, their implementation should initially occur using a very controlled and limited pilot study that includes a properly designed evaluation component. Only after careful testing and evaluations show the strategy to be effective should broader implementation be considered. As the experiences of such pilot tests are accumulated from various state and local agencies, the aggregate experience can be used to further detail the attributes of this type of strategy so that the strategy can ultimately be upgraded to a "proven" one.

# Specific Objectives

## 4.1 A—Deter Aggressive Driving by Specific Populations, Including Those with a History of Such Behavior, and at Specific Locations

The objective here is one of general deterrence, but in a targeted manner. Treating specific age groups is one example. The procedure consists of identifying a series of violations exemplifying the specific problem of aggressive driving in a particular area, or of a specific subset of drivers, and then instituting an intensive program aimed at changing the undesirable behaviors. This type of analysis also provides useful input for Objective 4.1 B by helping to identify triggers for the aggressive behavior that may be present in the roadway environment. In order to meet this objective, any program needs to be directed by a multidisciplinary group. It can involve the use of educational and public information techniques, along with coordinated enforcement.

Addressing aggressive driving at specific locations may require a top-down approach to help focus efforts, especially where state funds are being made available. In this process, a problem should be recognized first at the state level, by identifying political jurisdictions within which there seems to be overrepresentation. The local jurisdiction is then consulted to help target specific locations or populations. This is the approach that the Florida Department of Transportation (see Appendix 2) has taken. However, this process may also be conducted starting at the local level.

In addition, there are drivers that habitually drive aggressively. The objective here is to intervene in a way that minimizes or eliminates aggressive driving behaviors. Methods of education and behavior modification are needed to help the habitual offender invoke self-discipline. Additionally, a perception must be created that repetition of violations will bring sanctions. In some cases, sanctions such as licensing actions may be part of the behavior modification. However, research elsewhere questions the overall value of license sanctions in behavior modification (for more information, see Volume 2 of this report).

The key stakeholders to be involved in achieving this objective are law enforcement, courts, driver services, and the media. Others are shown in Appendix 7.

## 4.1 B—Improve the Driving Environment to Eliminate or Minimize the External "Triggers" of Aggressive Driving

This objective targets conditions on the highway that have been identified as causing frustration to the level that aggressive acts of driving are committed. This is a topic about which little has been written, except by Shinar (1998), who observed behavior at traffic signals that provided minimal green times for certain phases. However, a large body of psychological literature links frustration to aggression.

To meet the objective, aspects of the driving environment need to be identified that create a significant probability that the targeted behaviors will occur. This is an uncharted area that currently requires a large degree of judgment on the part of those planning the program. Observation of behavior at candidate sites is likely to be the best indicator, given current knowledge. Programs can be put in place to modify, where possible, or at least minimize, these external elements. A key outcome from this objective is minimizing frustrations caused by elements not within the driver's control.

The key stakeholders in this objective are law enforcement agencies, departments of transportation, and citizen public action organizations. Others are shown in <u>Appendix 7</u>.

## Related Strategies for Creating a Truly Comprehensive Approach

To create a truly comprehensive approach to the highway safety problems associated with this emphasis area, four types of related strategies should be included as candidates in any program planning process. The first two involve public information and education and traffic law enforcement. Specific strategies of these two types are explicitly described in the next section.

- <u>Public Information and Education (PI&E) Programs:</u> The primary experience with PI&E campaigns in highway safety is to reach an audience across an entire jurisdiction or a significant part of it. However, there is evidence that suggests that public information by itself will not be effective.[1] While programs related to aggressive driving are too new to have been adequately evaluated, seatbelt and occupant restraint programs have been operational for many years. Examples of how to conduct enforcement and education programs for seatbelt usage can be found in the NHTSA document "Occupant Protection Special Traffic Enforcement Program Evaluation."[2]

- <u>Enforcement of Traffic Laws:</u> When traffic laws are vigorously enforced, with well-trained officers supported by the courts, the frequency and severity of highway crashes or injuries linked to their violation can be significantly reduced. NHTSA's "Aggressive Driving Enforcement: Strategies for Implementing Best Practices,"[3] focuses on programs as well as processes used by law enforcement throughout the United States. Most programs cited, however, are essentially examples of intensive traffic law enforcement. In only a few cases have they been directed toward well-defined aggressive driving behaviors. Moreover, most have not been evaluated for effectiveness.

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[1] http://www.ctre.iastate.edu/reports/chs.pdf
[2] http://www.nhtsa.dot.gov/people/injury/research/occup-final-report.html
[3] http://www.nhtsa.dot.gov/people/injury/enforce/aggressdrivers/aggenforce/index.html

- <u>Strategies to Improve Emergency Medical and Trauma System Services:</u> Treatment of injured parties at highway crashes can have a significant impact on the level of severity and length of time during which an individual spends treatment. This is especially true when it comes to timely and appropriate treatment of severely injured persons. Thus, a basic part of a highway safety infrastructure is a well-based and comprehensive emergency care program. While the types of strategies that are included here are often thought of as simply support services, they can be critical to the success of a comprehensive highway safety program. Therefore, for this emphasis area, an effort should be made to determine if there are improvements that can be made to this aspect of the system, especially for programs that are focused upon location-specific (e.g., corridors) or area-specific (e.g., rural area) issues. As additional guides are completed for the AASHTO plan, they may address the details regarding the design and implementation of emergency medical system strategies.

- <u>Strategies Directed at Improving the Safety Management System:</u> The management of the highway safety system is foundational to its success. There should be in place a sound organizational structure, as well as an infrastructure of laws, policies, etc., to monitor, control, direct, and administer a comprehensive approach to highway safety. For aggressive driving, the roles of driver services administration, law enforcement, courts, and traffic engineering are critical. Driver services need to be able to identify drivers who consistently appear on the records for violations that can indicate aggressive driving. The police need to enforce laws of which the violation has been shown to lead to aggressive driving crashes. Courts need to treat cases of aggressive driving as a serious driving violation, ensuring appropriate outcomes that will act as a future deterrent. Finally, traffic engineers need to act in minimizing elements of the driving environment, such as uncoordinated traffic signals, which may trigger aggressive driving.

- <u>Strategies that Are Detailed in Other Emphasis Area Guides:</u> Any program targeted at the safety problem covered in this emphasis area should be created having given due consideration to the inclusion of other applicable strategies covered in other guides. For aggressive driving, <u>Volume 2</u> of this report is important because aggressive drivers who often commit traffic violations also are likely to have had their driver's licenses suspended or revoked.

# Objective 4.1 A—Deter Aggressive Driving by Specific Populations, Including Those with a History of Such Behavior, and at Specific Locations

## Strategy 4.1 A1—Target Enforcement (T)

Process: Law enforcement targeted to specific aggressive driving behaviors that have been shown to contribute to crashes, as well as identifying possible external contributing factors.

Expected Outcome: Reduction in ongoing acts of aggressive driving and resulting crashes.

Evaluation: Comparison of crashes that have been caused by aggressive driving at the targeted areas and measures of change in aggressive driving behavior.

This approach is most frequently employed for addressing aggressive driving. The intent is to target locations rather than habitually aggressive drivers. It begins by selecting a site identified as having a problem with aggressive driving. This is often based on observations or on the frequency of certain types of crashes. A highly visible and intensive enforcement effort is designed and implemented. To be effective, this effort must concentrate on a set of driving actions and violations thought to have specific relevance to aggressive driving at the selected area.

It is important that candidate locations for this strategy first be screened to determine (1) if there might be factors present in the roadway environment that would trigger aggressive driving and (2) which of these factors can be readily fixed. Unless the enforcement were vigorous and continuous, these locations are not likely to be effectively controlled by an enforcement effort, as long as the environmental triggers remain. In such cases, strategies under Objective 4.1 B should be considered for addressing the problem.

Research in the area suggests the importance of enforcing in such a way that those who drive aggressively have a high expectation of being apprehended. A coordinated publicity campaign needs to accompany the program.

Evaluation of this strategy can be conducted by both observation of driving behavior and longer-term efforts to assess changes in crash frequency. Effectiveness of enforcement targeted only to aggressive driving generally has not been measured. The exceptions are for some programs in Milwaukee, Wisconsin (see Appendix 1). The Pennsylvania Department of Transportation has been partnering with local communities to conduct aggressive driving programs based on analysis of crash data.[4]

This strategy is not likely to interfere with most others and may be performed in combination with other enforcement-oriented efforts, where appropriate. When combined with other strategies, especially other enforcement strategies, evaluation of effectiveness of the specific strategy may not be feasible unless special methods of research design are employed. Most importantly, intensive enforcement programs generally have been found to

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[4] http://www.roadwaysafety.org/RSF%20Reporter/1st_Qtr_03/penndot.htm

be effective in other areas of traffic law enforcement. However, because they require extensive resources, they are not usually sustained.

**EXHIBIT V-2**
Strategy Attributes for Targeted Enforcement Aimed at Aggressive Driving (T)

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| Target | General population of drivers at a defined location characterized by observed aggressive driving behavior or high crash rates where aggressive driving appears to be a principal contributor. |
| Expected Effectiveness | This strategy has been tried as a means of reducing crashes resulting from aggressive driving. While some agencies have reported success, there is not adequate published evidence of the effectiveness of the strategy for controlling aggressive driving, or reducing crashes involving aggressive driving. |
| | Examples of agencies that have recently operated aggressive driving programs include the following: |
| | • Florida Department of Transportation has examined fatal crash reports and identified counties in which such crashes appear over-represented (see Appendix 2). <br> • Washington State Patrol operates an Aggressive Driver Apprehension Team (ADAT) (see Appendix 3). In addition to program specifications, they have produced a video for public presentation. <br> • Pennsylvania DOT. <br> • Milwaukee, Wisconsin (see Appendix 1). |
| Keys to Success | Concentration of actions that meet the definition. |
| | Cooperative venture with courts and judicial system (see the Halt Aggressive Driving - H.A.D. program in Lubbock, Texas, Appendix 4). |
| | Need for good publicity, with the cooperation of both print and broadcast media, is very important, as noted in Strategy 4.1 A2. |
| | Public support (Lubbock, Texas, Citizens' Traffic Commission, see Appendix 4). |
| | Close working relationship with traffic engineers to identify operational factors potentially influencing behavior. |
| Potential Difficulties | Failure to involve the public in planning the program. |
| | Arriving at a clear, operational definition for locating aggressive driving sites. |
| | Enforcement that is not related to the stated problems. An ongoing problem with most of the current efforts has been that |
| | 1) They have concentrated on speeding, rather than the sort of driving behaviors unique to aggressive driving and <br> 2) They aggressively enforce all violations for a short period, then change their operations, thereby not likely affecting aggressive driving. |
| Appropriate Measures and Data | Process measures: <br> • Numbers and types of citations. <br> • Numbers of officers on special patrol. <br> • Officer time on special patrol. |

**EXHIBIT V-2 (Continued)**
Strategy Attributes for Targeted Enforcement Aimed at Aggressive Driving (T)

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|  | • Ratio of time to the frequency of issuance of citations for aggressive activities. <br> • Disposition of the aggressive driving citations. <br><br> Performance measures: <br><br> • Before and after assessment of frequency and severity of crashes, by type. <br> • Observed changes in aggressive driving behavior. <br><br> Filming could be used to both acquire traffic operations data and observe driver behavior. |
| Associated Needs | If the enforcement involves the use of automated equipment, such as red-light running cameras, then vendors and others with technical expertise would need to become involved in the project. Calibration of the equipment may significantly impact the outcomes of the strategy. <br><br> The data needed to perform appropriate assessments may not be available from existing sources. Special arrangements may be needed for the appropriate agencies to establish additional data-collection protocols prior to implementation, during the program, and for a period after it has ended. In some cases, it may be necessary to hire additional personnel, or a private organization to supplement the limited resources at a particular agency. |
| Organizational, Institutional, and Policy Issues | Agreement must be reached on a common definition of "aggressive driving." The introduction to this guide provides suggestions. <br><br> Close working arrangements among traffic law enforcement, courts, and traffic engineering need to be in place. In many areas, cooperation between different police agencies will be required. An active joint task force is being conducted in Lee County, Florida (see Appendix 5). The courts need a judge with a strong commitment to the program (e.g., Lubbock, Texas; see Appendix 4). <br><br> With the exception of automated enforcement approaches, this sort of program is labor intensive. Therefore, issues involving the allocation of personnel will arise. This would be the case even if overtime for officers were funded from grants. Where police personnel shortages exist, traffic enforcement functions are usually affected more than areas such as violent crime prevention, due to priorities. <br><br> Early involvement of all stakeholders is a must. They should have input at the beginning of the planning for a program. |
| Issues Affecting Implementation Time | A program "champion" is needed, who has the position and time to spend on facilitating the implementation of a program. <br><br> Given the need for inter-organizational cooperation, development of enforcement strategies, measuring the "before" conditions, and gaining public cooperation, a minimum period of six months is likely to be needed prior to starting enforcement. |
| Costs | While the costs of a given program will be quite specific to local conditions, a number of elements of that cost can be identified. These include pay/overtime for police officers, training expenses, marketing efforts, supplies, and evaluation expenses. |
| Training and Other Personnel Needs | Because it is essential that the program target a predetermined set of aggressive driving behaviors, training of police officers, prosecutors, and judges will be required. This will focus upon what is meant by aggressive driving at both the conceptual and operational levels. For police it is most likely that this will require roll-call training techniques such as a videotape. |

**EXHIBIT V-2 (Continued)**
Strategy Attributes for Targeted Enforcement Aimed at Aggressive Driving (T)

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| Legislative Needs | Although a number of jurisdictions have passed a specific law aimed at aggressive driving (e.g., Arizona, Delaware, and Colorado), these laws concentrate on commission of multiple traffic violations. This approach can include many instances where aggressive driving is not occurring. It is more appropriate to institute a means for indicating when a citation was issued for aggressive driving and to obtain appropriate support from prosecuting attorneys and judges using current driving statutes. |
| | If automated enforcement approaches are employed, it is highly likely that legislation would be required. Most state laws require that the driver of a vehicle be cited rather than the owner. Automated enforcement works best when identifying the vehicle and thus the registered owner. |

## Strategy 4.1 A2—Conduct Educational and Public Information Campaigns (T)

Process: Convey two basic types of information about aggressive driving to the public.

1. Learning to cope with situations where other drivers are displaying aggressive driving behaviors.
2. Helping drivers recognize and modify their own tendencies toward aggressive driving.

Expected Outcome: Educational programs that reach the targeted audiences and generate widespread media exposure.

Evaluation: Surveys to determine media penetration and public knowledge of the message.

Effective public education and information campaigns need to be run in conjunction with intensive enforcement. Studies elsewhere[5] suggest that by themselves, the effectiveness of public information and education programs on changing driving behavior is limited. The public information and education (PI&E) agenda will include details of the enforcement program and chart its progress. The city of Milwaukee, Wisconsin's, program (see Appendix 1) is a good example of coordinating public information with targeted enforcement.

Other examples from programs to reduce driving under the influence (Verschuur, 1993) and increase occupant restraint usage (Smith, 1987) have pointed to programs of public information and education that have acted in concert with enforcement. The outcomes from both suggest that combing the two strategies has a better likelihood of success than either alone.

The campaign should concentrate on communicating specific information and examples in a way that would be easily understandable and attractive to the intended audience of drivers in the selected area. While the actual mix of media selected for the campaign ultimately will be a local decision, it is expected that the bulk of the campaign would be conducted on radio and television. Lee County, Florida, provides an excellent example of cooperation with the broadcast media (see Appendix 5).

Radio, especially during morning and afternoon drive times, seems the best-suited medium. Being able to communicate with drivers while they are driving has the potential for immediately affecting behavior. Another advantage of employing radio is that the known demographics of various shows allow for an effort to be targeted at a particular group, such as younger males who appear to play a disproportionate role in the aggressive driving problem. Television provides highly visual approaches for dramatizing aggressive-driving incidents.

The campaign must be carefully planned, and the spots should be professionally produced.

Consumers will tend to discount anything that appears amateurish or simplistic. (For an example of a professional approach to material by Washington State Patrol, see Appendix 3). Efforts should also be made to secure news coverage of the campaign, affording greater

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[5] http://www.ctre.iastate.edu/reports/chs.pdf

exposure without increasing costs. Lubbock, Texas, has achieved substantial results at minimal costs (see Appendix 4).

Evaluation of the campaign consists mainly of attempts to determine drivers' exposure and responses to the messages. General assessment of public information programs has shown them to have limited effect on actual behavior except where they are paired with enforcement. While it would be desirable to assess the effect on actual driving behavior through changes in violations and crashes, the difficulty of isolating such effects probably makes this infeasible.

Education needs to be directed toward newer drivers and needs to stress how they can better control their behavior. Current approaches often tend to stress how to prevent escalation of aggressive driving rather than eliminating the original behavior. Lubbock, Texas, has found some success in addressing aggressive driving in the middle schools, before the students become drivers, and at the college level.

**EXHIBIT V-3**
Strategy Attributes for Conducting Educational and Public Information Campaigns (Aimed at Aggressive Driving) (T)

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| Target | All drivers in a given geographic area. This would be an area that is experiencing a high level of aggressive driving, as determined by such indicators as crashes seemingly related to aggressive driving, observations by law enforcement or other highway safety agencies, or a number of credible complaints from road users indicating the existence of perceived aggressive driving. |
| Expected Effectiveness | This strategy has been tried as a means of reducing crashes resulting from aggressive driving. While some agencies have reported successful public information campaigns and linked those campaigns to targeted enforcement, there is little published evidence of effectiveness of this strategy. Good public information (PI) campaigns heighten awareness of a problem and garner high approval ratings. On the other hand, assessing the effectiveness of a large-scale PI program on actual driving behavior is almost impossible. |
| | Testing students for awareness of the problem and for knowledge may be the only available evaluation tool. |
| Keys to Success | The program materials must be professionally done and aimed at the designated target audiences. The materials must focus on specific driving behaviors rather than general appeals to not drive in an aggressive manner. Those running the program must cultivate and maintain good contacts with both print and broadcast media. Drivers must be given suggestions on specific skills to help them cope with anger both in other drivers and in themselves. Campaigns should center on local conditions and situations familiar to the intended target population. |
| | Education must be geared to the specific audience. It must concentrate on eliminating behaviors that lead to aggressive driving. |
| | Some examples of these key elements include |
| | • Using donated unsold billboard inventory (Lubbock, Texas; see Appendix 4).<br>• Television donating production facilities; local sports heroes donating time (Lubbock, Texas; see Appendix 4).<br>• Establishing positive, ongoing relationships with both radio and television stations, especially their news departments (Lee County, Florida; see Appendix 5). |

*(continued on next page)*

**EXHIBIT V-3 (Continued)**
Strategy Attributes for Conducting Educational and Public Information Campaigns (Aimed at Aggressive Driving) (T)

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| | • Professionally produced material such as videos for public presentation (Washington State Patrol – see <u>Appendix 3</u>). <br> • Educating younger (middle school) and older students (college) (Lubbock, Texas; see <u>Appendix 4</u>). |
| Potential Difficulties | Because production and air time for advertising are a high cost, a program must be able to garner a significant amount of interest from the media to secure a maximum amount of air time for the cost. Educational efforts in the schools face competition for students' time. PI&E efforts need to <br><br> • Avoid banal slogans, <br> • Focus on skills and attitudes that will help drivers cope with the difficulties they encounter while driving, and <br> • Make the material understandable and attractive to the potential audience (e.g., translate material into the dominant language of the target audience). |
| Appropriate Measures and Data | For process analysis, the frequency, time and market of each of the messages should be documented. In addition, approaches are needed for determining the number of people who are exposed to, and become aware of, the messages; characteristics of the people being exposed; and their reactions to the campaign. This testing should be done periodically throughout the campaign so that changes can be made in response to specific findings. <br><br> The impact analysis for a program such as this can be performed by assessing a sample of people in the target area regarding their attitudes and knowledge relating to aggressive driving. This assessment would require a pretest at the start of the program and another at the conclusion so that comparisons could be made. This approach also is of value for educational efforts. |
| Associated Needs | The active support of "gatekeepers" in the media is essential. Skilled professionals are needed to create the materials employed in the campaign. Use of those with expertise in listener and viewer characteristics will allow for optimal targeting of messages. |
| Organizational, Institutional, and Policy Issues | Assuming a commitment on the part of the agency sponsoring the campaign, there do not appear to be significant issues on this level. One potential issue that was mentioned by the director of the PI&E program run by the California Highway Patrol was difficulties stemming from state contracting laws in using professional talent for the creation of materials. |
| Issues Affecting Implementation Time | Time required to start the program will depend upon time needed to prepare media materials, perform pretests, and secure time and space for the actual dissemination of the materials. At least six months could be required to launch a successful program. Similarly, educational programs for schools can take 6 or more months to develop, test, schedule, and implement. |
| Costs | Most programs such as this are expensive. The largest costs are the professional talent required for the preparation of the materials, as well as costs for airtime and print media space. Creating newsworthy events to garner free time and space can reduce these costs. The Lubbock, Texas, program (see <u>Appendix 4</u>) has been able to sustain itself with very low costs, using creative approaches to producing and airing materials. |
| Training and Other Personnel Needs | For educational programs, there is a need to train the instructors in the material and its presentation. |
| Legislative Needs | None identified. |

## Strategy 4.1 A3—Educate and Impose Sanctions Against Repeat Offenders (E)

Processes: (1) Identify drivers with frequent crashes and citations resulting from aggressive driving. (2) Conduct courses using structured curricula that are designed to counter specific driving behaviors and teach anger management. (3) Institute driver sanctions, including license suspension/revocation and/or vehicle impoundment, especially for repeat offenders with serious offenses.

Expected Outcome: Reduction in ongoing acts of aggressive driving by targeted individuals.

Evaluation: Compare driver records before and after entry into the program or with drivers who have similar records but are not enrolled.

The general thrust of this program is to combat the problem of aggressive driving by modifying the behavior of those who frequently drive in an aggressive manner. The program would take a form quite similar to that employed in remedial defensive driving programs or those aimed at DUI offenders. The intent is to help these drivers understand the dangers inherent in aggressive driving and, most importantly, ways to recognize and change their negative driving behaviors.

This is an experimental strategy since, although similar programs exist, they have not been targeted at aggressive drivers. Use of this strategy should be made with caution and begun by using a pilot implementation that can be carefully evaluated.

The program would make use of classes having a structured curriculum that allows students to learn what constitutes aggressive driving in themselves and others and the best ways to counter it. In addition to specific driving behaviors, tactics aimed at anger management would be included. It is extremely important that the classes not be lecture based, but rather employ a facilitation model. The National Safety Council offers a course, "Defensive Driving Course—Attitudinal Dynamics of Driving (DDC-ADD)," http://www.nsc.org/psg/ddc/ddcchart.htm, that is an example (no product endorsement intended).

Because students will be selected on the basis of an aggressive driving record, it will be important to identify the types and combinations of violations that will be considered indicative. The drivers selected will have to be induced to take the class. In most cases this would come from either a court order or a motor vehicle agency allowing attendance as a substitute for a license action.

Evaluation of this strategy needs to be done at the individual level. Driving records for those completing the class would be tracked, and their pre- and post-class performance compared. Use of a treatment-control study may be done if carefully developed.

**EXHIBIT V-4**
Strategy Attributes for Educating and Imposing Sanctions Against Repeat Offenders (E)

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| Target | Those drivers showing a history of violations indicating a pattern of aggressive driving. |
| Expected Effectiveness | There are no valid evaluations of this strategy, especially where it is related to the habitual aggressive driver. The general finding from programs directed toward multiple traffic law offenders is that the programs show some effectiveness in reducing violations, but not a significant impact on crashes. However, because this proposed program would introduce new elements such as anger management, the issue of its effectiveness becomes an empirical question that can be answered only when the strategy is implemented in a number of places. |
| Keys to Success | The program must use materials aimed specifically at the issue of aggressive driving. They must derive directly from a detailed analysis of the specific driving attitudes and behaviors that the program is intended to modify. |
| | Legal steps should be in place, aimed at compelling participation by those designated. Driving sanctions, as options, need to be in place; therefore, the courts play a critical role. |
| | Highly skilled instructors are needed. They should be carefully trained and monitored. |
| Potential Difficulties | The cooperation of the judiciary is required to mandate that defendants, having a clear history of aggressive driving violations, take the course or be sanctioned as appropriate. |
| Appropriate Measures and Data | Process measures could include total number of aggressive driving citations issued in the jurisdiction(s), number of aggressive driving citations for which the driver was directed to a course, number of multiple offenders, etc. |
| | Performance measures include pre- and post-class assessments of knowledge, attitudes, and intended behavior relating to aggressive driving, time to next citation for aggressive driving (failure analysis), and crash reduction (crashes where the principal contributor was aggressive driving). |
| Associated Needs | Expertise in the design of educational approaches to eliciting behavior change would be required. |
| | Additional assistance is needed to acquire and process driver histories to select those who should be sent to courses. |
| Organizational, Institutional, and Policy Issues | Courts in the jurisdiction must be committed to ensuring that the drivers meet established entry thresholds to the program. A possibly complementary approach would be for drivers to be sent to the program through administrative actions of state driver licensing authorities. It will be necessary for the courts and law enforcement agencies to agree to provide data needed for program assessment. |
| | Alternative sanctions must also be employed to keep the sanctioned individuals from operating a vehicle if the offender continues to drive aggressively or does not enter the required program. Sanctions similar to those for driving without a license may be considered. For further details on this, see Volume 2 of this report. |
| Issues Affecting Implementation Time | The need to first create materials, and then train instructors, will be a major determinant of implementation time. Additionally, legislative and organizational changes might be required. It would appear that 12–18 months would be a minimum period required to implement a program such as this. |
| Costs | A major up-front cost for the program would be the development of materials and the training of instructors. One source could be NHTSA 402 Funds. (http://www.nhtsa.dot.gov/nhtsa/whatsup/tea21/tea21programs/index.html) |

**EXHIBIT V-4 (Continued)**
Strategy Attributes for Educating and Imposing Sanctions Against Repeat Offenders (E)

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| | Once the program was running, it could become user-funded and incur no additional costs and might even receive enough funds to pay back the materials development. |
| Training and Other Personnel Needs | Training would be required for the instructors teaching the course. Training would also be needed for judges and other court personnel in the procedures and requirements for enrolling drivers into the program. Personnel would also be required to administer and evaluate the program. |
| | Police need to be trained in detecting aggressive driving, giving special emphasis to identifying repeat offenders. |
| Legislative Needs | If the program were court-based, it would probably be possible to institute it without specific legislation. However, having legislation requiring the course for drivers would be helpful. If the program were based in a motor vehicle department, specific legislation probably would be required. Legislation may also be needed if administrative adjudication is desired but not yet authorized. |

# Objective 4.1 B—Improve the Driving Environment to Eliminate or Minimize "Triggers" of Aggressive Driving

## Strategy 4.1 B1—Change or Mitigate the Effects of Identified Elements in the Driving Environment (E)

Process: Identify factors in the driving environment that may contribute to aggressive driving and modify those factors.

Expected Outcome: Less aggressive driving triggered by factors external to the driver.

Evaluation: Measure instances of aggressive driving before and after implementing changes, as well as change in crash experience for those crashes involving aggressive driving.

While traffic engineers and highway designers have applied a whole variety of techniques for improving the operation and safety on roads, there is no documented evidence that such an approach will be effective in mitigating aggressive driving and the resultant crashes. The frustration-aggression model referred to above suggests that conditions may exist in the roadway environment that cause driver frustration and, therefore, aggressive driving. Thus, this strategy is considered experimental. It should be used with caution, beginning with small-scale trials in limited locations, using carefully designed evaluations.

Elements external to the driver can interact with, and significantly impact, the driver's behavior. This generally occurs when these elements send a negative message (i.e., appear to impede travel unnecessarily). One example is the posting of speed limits that are so low for the roadway environment that they are not obeyed. While speeding is not, when occurring by itself, considered to be aggressive driving, it can occur in combination with actions directed at other vehicles that are maintaining the legal speed. Controlling aggressive driving that is the result of these conditions may not be possible using only enforcement and PI&E. It may ultimately take removal of the environmental factor to mitigate the problem (i.e., establishing an appropriate speed limit for the conditions).

Responses to a survey of aggressive driving scenarios from safety experts indicated that three actions closely linked to environmental factors were representative of aggressive driving: driving on the shoulders or medians, running red traffic signals (see http://safety.fhwa.dot.gov/programs/srlr.htm and http://www.ite.org/library/redlight/index.asp), and aggressive behavior in work zones (see http://www.ops.fhwa.dot.gov/wz/workzone.htm).

The corresponding environmental elements for these scenarios were

- Insufficiently long exit ramps or left-turn lanes,
- Improperly coordinated traffic signals, and
- Unclear work zone traffic controls.

The respondents also indicated that while enforcement was necessary in these cases, corrective engineering actions could be the appropriate long-term solution.

As of mid-2002, there are no known or reported programs employing this specific strategy for mitigating aggressive driving. However, some potential influencing factors to consider are

- Uncoordinated signals or sequencing that encourages speeding and red-light running (the Federal Highway Administration estimates that 75 percent of the installed traffic signals need modernization, including signal coordination).
- Lack of signal optimization, encouraging red-light running, especially for turning movements.
- Lack of adequate turn bays or exit ramp length, encouraging shoulder or median driving.
- Lack of adequate entrance ramps, encouraging improper merging.
- Speed limits not representative of road design and external factors that encourage their disregard.
- Ineffective or undesirable traffic control in work zones.

The ITE *A Toolbox for Alleviating Traffic Congestion and Enhancing Mobility* (http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE/8C301!.PDF, 1997) provides a comprehensive coverage of the variety of actions that may be taken to reduce congestion. Some key excerpts from this document appear in Appendix 8. Whereas some of the actions involve significant expense, a number of candidates can be accomplished at low to moderate cost and over a relatively short timeframe (e.g., traffic signal retiming). While the document provides estimates of safety effectiveness, the specific demonstrated ability of these strategies to mitigate aggressive driving is not addressed.

**EXHIBIT V-5**
Strategy Attributes for Changing or Mitigating the Effects of Identified Elements in the Driving Environment (E)

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| Target | Localized aggressive driving sites or corridors that may benefit from changes to traffic controls or roadway design, especially where those changes should alleviate the need for extensive traffic enforcement. |
| Expected Effectiveness | There are no valid evaluations of this strategy, especially where it is related to aggressive driving. Quantitative estimates are not available because of a lack of exemplary programs. However, the ITE Toolbox (http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE/8C301!.PDF) advocates programs such as traffic signal coordination as a means of reducing congestion and its associated frustrations. |
| Keys to Success | Careful identification of target sites is important. A "team" approach is needed to draw upon engineering and enforcement specialists, as well as highway safety personnel. Usually, aggravating conditions are apparent. However, if driving behavior changes when enforcement is present, but reverts to its original condition as soon as enforcement is removed, the location may be a likely candidate for engineering intervention. Once aggressive driving sites are identified (see discussion about Strategy 4.1 A1), enforcement and engineering specialists need to identify possible contributors to the behavior. A pilot study may be appropriate to establish effectiveness quantitatively. |
| Potential Difficulties | Traffic engineering and highway design offices may not be willing to get involved with what they believe is a "law enforcement" problem. This becomes a distinct possibility when aggressive driving is defined in terms of violations of *traffic laws.* |

**EXHIBIT V-5 (Continued)**
Strategy Attributes for Changing or Mitigating the Effects of Identified Elements in the Driving Environment (E)

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|  | Where local political decisions may have resulted in misapplication of traffic control devices or other aspects of road operation that contribute to the problem, it may be difficult to make the desired changes. |
| Appropriate Measures and Data | The process measure for this strategy is that recommended corrective action is appropriate and that the action was implemented properly. |
|  | Performance can be measured in the short term by the change in frequency and rate of observed aggressive actions after improvements are made. Ultimately, impact is measured by the change in crashes whose contributing factors include elements that are defined as aggressive driving. |
| Associated Needs | The joint involvement of different disciplines in determining the underlying contributing factors and then recommending and implementing corrective actions is critical. This step must be taken as part of targeted enforcement. Appendix G provides a list of stakeholders to consider as candidates to be involved. |
| Organizational, Institutional, and Policy Issues | Engineers and law enforcement personnel often view each other as distinct entities whose work does not overlap. This strategy requires that these views be replaced with an understanding that a team approach is needed. However, since the two operations are usually in separate agencies, there will be institutional issues to be dealt with. |
| Issues Affecting Implementation Time | The stakeholder team will require data and time to analyze conditions at sites. This may involve observations at locations. The scope of the effort, and the nature of the actions being considered, will determine the time required to implement a program. This will vary widely. |
| Costs | Costs can vary widely, depending upon the scope of the effort and specific action to be taken. For short-term actions, such as extending a painted turn median, the costs are relatively low. Implementing a coordinated signal system, especially one using demand-responsive programming, can have relatively high costs. Funding may be available through sources such as NHTSA 402 (http://www.nhtsa.dot.gov/nhtsa/whatsup/tea21/tea21programs/index.html) or Congestion Mitigation for Air Quality (CMAQ) funds. |
| Training and Other Personnel Needs | Police need to receive more training in traffic engineering basics to help them recognize when effective enforcement might be limited because of roadway factors. |
| Legislative Needs | None identified. |

## Strategy 4.1 B2—Reduce Nonrecurring Delays and Provide Better Information about These Delays (E)

Process: Reduce or rapidly clear impediments to traffic flow, and provide accurate, timely information to travelers.

Expected Outcome: Less congestion, shorter delays resulting from incidents, and better traveler information concerning delays.

Evaluation: Reduction in travel time, reduction in time lanes are blocked, and assurance that information provided to motorists is timely and accurate.

Those whose responsibility it is to manage the highway system on a daily basis are constantly faced with challenges to keep traffic moving at a reasonable level of service. These challenges can arise from both planned events and unplanned incidents that occur. There are a variety of techniques available for managing traffic so as to both minimize the size of delay experienced by individual drivers, and the length of time over which roadways are affected. Minimizing delay will minimize frustration. Applying the frustration-aggression model discussed above, these efforts should reduce aggressive driving *theoretically* resulting from this nonrecurring periods of excessive delay. Furthermore, if information is provided to a driver who is in the midst of nonrecurring congestion, which helps reduce the driver's level of frustration, it may also reduce the probability that the driver will act aggressively.

The term *theoretical* is used in the previous paragraph to emphasize that this is another experimental strategy. That is because the relationship between the presence of excessive nonrecurring delay and aggressive driving is not well documented. Therefore, efforts to minimize its impact are not proven to minimize aggressive driving. The relationships are logical, however, especially in the light of the underlying psychological theory. Thus, while the strategy is included here, it is with the caution to the potential user that it is not tested. Those who may wish to implement such a program are advised to start with a pilot implementation that is accompanied by a carefully designed evaluation before proceeding on any significant scale.

Recommendations for managing nonrecurring (incident) events have numerous references: for general use, by the Federal Highway Administration (1991); for freeways, by Mannering et al. (1992); and for arterial roadways, by Raub and Schofer (1997); in addition to the National Highway Institute (NHI) incident management course (http://www.nhi.fhwa. dot.gov/courseoth.asp?coursenum=285).

Accurate and timely traffic information is critical for motorists. This can be achieved through changes in procedures and training, especially for public safety personnel. In terms of incidents, the motorist needs to know what happened, where it is located, and how long it may remain a problem. Preferably, the motorist should know the travel conditions on alternate routes. Getting this information to the public can be done through better cooperation between the broadcast media and the information providers (e.g., public safety agencies) and through Web sites.

There are few examples in operation. However,

- The NHI Incident Management course stresses the need for responders to provide critical information.
- "Must Move" legislation (requiring drivers involved in minor crashes to move their vehicles off the roadway prior to calling the police) is in effect in a number of states (e.g., Texas, http://www.dot.state.tx.us/trafficsafety/road_tips/collisions.htm).
- FHWA provides a site self-assessment tool for agencies that want to see how their incident management program rates. See Appendix 9.
- Additional information on incident management can be found at the site of the FHWA Office of Travel Management (http://www.ops.fhwa.dot.gov/site_map.htm).
- The NYSDOT incident management system is described at http://www.dot.state.ny.us/reg/r11/iims/proj_desc.html.
- Some key references on incident management, including a couple of guides produced by FHWA, are provided in Appendix 10.

For a more general reference on efforts directed toward reducing the effects of incidents, go to the ITE Traffic Incident Management (TIM) Committee site, http://www.trafficincident.org/.

**EXHIBIT V-6**
Strategy Attributes for Reducing Nonrecurring Delays and Providing Better Information about These Delays (E)

| | |
|---|---|
| Target | Both planned events and unplanned incidents that can be managed to minimize their impact and reduce the level of frustration in the affected drivers. |
| Expected Effectiveness | There has been limited research examining the effectiveness of demand management and none documenting the specific impact on aggressive driving. Although this strategy relates specifically to nonrecurring delay, it is well documented that incidents occur regularly (even several times daily) in heavily traveled corridors. Therefore, limiting these nonrecurring, but regular, delays even in one corridor may reduce significantly the level of daily frustration in travel for a significant subset of the driving population. |
| | Careful planning and coordination of nonrecurring events, especially where multiple events may be planned in an urban center, can greatly reduce the potential for delay, which may mean that there will be reduced aggression exhibited by drivers. However, there is no documented evidence of this connection. |
| | Tools such as the *Highway Capacity Manual* and related computer simulation programs may be used for predicting operational impacts of both planned events and unplanned incidents (e.g., testing alternative incident-response plans). However, the performance of strategies vis-à-vis crash reduction has generally not been established. |
| Keys to Success | • Achieving a coordinated system of agencies for the region.<br>• Training police and fire personnel to limit the time that an incident or event affects travel and provide for flow past the incident.<br>• Establishing connection with, and involvement of, the media in incident and event management.<br>• The success of the program will also depend upon public awareness and use of information sources. |

**EXHIBIT V-6 (Continued)**
Strategy Attributes for Reducing Nonrecurring Delays and Providing Better Information about These Delays (E)

| | |
|---|---|
| Potential Difficulties | • Changing the focus of police and fire personnel from solely that of handling the incident to reducing the effect of the incident on traffic movement.<br>• Achieving cooperation and coordination of agencies across multiple jurisdictions in a region. |
| Appropriate Measures and Data | Process measures could include the existence of a coordinated system, number of coordination meetings, and number of incidents and events handled properly.<br><br>Performance measures oriented to operations could include average trip time, average vehicle delay, vehicle-hours of delay, average speed, and density. Other types of measures can include the number of road users experiencing changed operational conditions, the number of persons taking advantage of travel information, and accuracy and timeliness of traveler information. Ultimately, the performance measure sought for this strategy is the change in crashes involving aggressive driving. A surrogate using changes in aggressive driving may also be considered.<br><br>The difficulty of measuring performance is complicated by the fact that analysis of operations and crashes should not be limited to the site or the roads directly affected by an incident. Alternative routes and corridors should also be measured. |
| Associated Needs | The media play a crucial role in information dissemination. Special public information and education campaigns may be appropriate supplements to an improvement program. Ultimately, dedicated travel-information data sites may be needed. |
| Organizational, Institutional, and Policy Issues | The introduction of freeway patrols and multiagency traffic-operations committees are two changes in organizational thinking that have facilitated implementing programs for reduction in elements leading to aggressive driving. Freeway service patrols, publicly and privately operated, are being embraced by an increasing number of agencies because their work has been shown to have a high benefits-to-cost ratio.<br><br>The Traffic Incident Management Enhancement (TIME) Committee serving southeastern Wisconsin is an example of an organization comprising multiple agencies concerned with traffic operations and safety, http://danenet.wicip.org/wisms/orgs/ttimefsw.htm.<br><br>Providing accurate incident information requires that public safety agencies be able and willing to share such data. The data include what happened and an estimation of how long the event will affect travel. |
| Issues Affecting Implementation Time | • Changing the focus of incident responders.<br>• Training personnel.<br>• More advanced systems may require installation and testing of communications infrastructure. |
| Costs | Most of the efforts involve few if any costs, unless new communications infrastructure is required. Photogrammetry for crash sites, which could speed crash investigation, requires purchase of cameras and software. Providing a Web site for traffic information is expensive but usually can be underwritten, in part, with federal or state funds. |
| Training and Other Personnel Needs | Training is also needed on appropriate reporting of incidents, both for the call takers and by public safety personnel. Better training is also needed in handling traffic as part of incident management. |
| Legislative Needs | "Must Move" legislation may be considered. It requires motorists involved in minor crashes to move their vehicles off the roadway before calling the police. In addition, liability protection must be extended to public safety agencies to relieve them of tort liability for moving, or directing movement of, vehicles and debris from the roadway. |

# Guidance for Implementation of the AASHTO Strategic Highway Safety Plan

## Outline for a Model Implementation Process

Exhibit VI-1 gives an overview of an 11-step model process for implementing a program of strategies for any given emphasis area of the AASHTO Strategic Highway Safety Plan. After a short introduction, each of the steps is outlined in further detail.

**EXHIBIT VI-1**

```
                          1. Identify and Define
                               the Problem
    11. Assess and
    Transition the                              2. Recruit Appropriate
      Program                                   Participants for the
                                                     Program

 10. Carry Out the
   Action Plan                                    3. Establish Crash
                                                  Reduction Goals

                  AASHTO Strategic Highway Safety Plan
 9. Establish the      Model Implementation Process
 Foundations for                                  4. Develop Program
 Implementing the                                 Policies, Guidelines
    Program                                        and Specifications

                                                 5. Develop Alternative
  8. Develop a Plan of                              Approaches to
        Action                                      Addressing the
                                                       Problem

              7. Submit
          Recommendations         6. Evaluate the
           for Action by          Alternatives and
          Top Management           Select a Plan
```

# Purpose of the Model Process

The process described in this section is provided as a model rather than a standard. Many users of this guide will already be working within a process established by their agency or working group. It is not suggested that their process be modified to conform to this one. However, the model process may provide a useful checklist. For those not having a standard process to follow, it is recommended that the model process be used to help establish an appropriate one for their initiative. Not all steps in the model process need to be performed at the level of detail indicated in the outlines below. The degree of detail and the amount of work required to complete some of these steps will vary widely, depending upon the situation.

It is important to understand that the process being presented here is assumed to be conducted only as a part of a broader, strategic-level safety management process. The details of that process, and its relation to this one, may be found in a companion guide. (The companion guide is a work in progress at this writing. When it is available, it will be posted online at http://transportation1.org/safetyplan.)

# Overview of the Model Process

The process (see Exhibit VI-1, above) must be started at top levels in the lead agency's organization. This would, for example, include the CEO, DOT secretary, or chief engineer, as appropriate. Here, decisions will have been made to focus the agency's attention and resources on specific safety problems based upon the particular conditions and characteristics of the organization's roadway system. This is usually, but not always, documented as a result of the strategic-level process mentioned above. It often is publicized in the form of a "highway safety plan." Examples of what states produce include Wisconsin DOT's Strategic Highway Safety Plan (see Appendix A) and Iowa's Safety Plan (available at http://www. iowasms.org/toolbox.htm).

Once a "high-level" decision has been made to proceed with a particular emphasis area, the first step is to describe, in as much detail as possible, the problem that has been identified in the high-level analysis. The additional detail helps confirm to management that the problem identified in the strategic-level analysis is real and significant and that it is possible to do something about it. The added detail that this step provides to the understanding of the problem will also play an important part in identifying alternative approaches for dealing with it.

Step 1 should produce endorsement and commitments from management to proceed, at least through a planning process. With such an endorsement, it is then necessary to identify the stakeholders and define their role in the effort (Step 2). It is important at this step to identify a range of participants in the process who will be able to help formulate a comprehensive approach to the problem. The group will want to consider how it can draw upon potential actions directed at

- Driver behavior (legislation, enforcement, education, and licensing),
- Engineering,

- Emergency medical systems, and
- System management.

With the establishment of a working group, it is then possible to finalize an understanding of the nature and limitations of what needs to be done in the form of a set of program policies, guidelines, and specifications (Steps 3 and 4). An important aspect of this is establishing targets for crash reduction in the particular emphasis area (Step 3). Identifying stakeholders, defining their roles, and forming guidelines and policies are all elements of what is often referred to as "chartering the team." In many cases, and in particular where only one or two agencies are to be involved and the issues are not complex, it may be possible to complete Steps 1 through 4 concurrently.

Having received management endorsement and chartered a project team—the foundation for the work—it is now possible to proceed with project planning. The first step in this phase (Step 5 in the overall process) is to identify alternative strategies for addressing the safety problems that have been identified while remaining faithful to the conditions established in Steps 2 through 4.

With the alternative strategies sufficiently defined, they must be evaluated against one another (Step 6) and as groups of compatible strategies (i.e., a total program). The results of the evaluation will form the recommended plan. The plan is normally submitted to the appropriate levels of management for review and input, resulting ultimately in a decision on whether and how to proceed (Step 7). Once the working group has been given approval to proceed, along with any further guidelines that may have come from management, the group can develop a detailed plan of action (Step 8). This is sometimes referred to as an "implementation" or "business" plan.

Plan implementation is covered in Steps 9 and 10. There often are underlying activities that must take place prior to implementing the action plan to form a foundation for what needs to be done (Step 9). This usually involves creating the organizational, operational, and physical infrastructure needed to succeed. The major step (Step 10) in this process involves doing what was planned. This step will in most cases require the greatest resource commitment of the agency. An important aspect of implementation involves maintaining appropriate records of costs and effectiveness to allow the plan to be evaluated after-the-fact.

Evaluating the program, after it is underway, is an important activity that is often overlooked. Management has the right to require information about costs, resources, and effectiveness. It is also likely that management will request that the development team provide recommendations about whether the program should be continued and, if so, what revisions should be made. Note that management will be deciding on the future for any single emphasis area in the context of the entire range of possible uses of the agency's resources. Step 11 involves activities that will give the desired information to management for each emphasis area.

To summarize, the implementation of a program of strategies for an emphasis area can be characterized as an 11-step process. The steps in the process correspond closely to a 4-phase approach commonly followed by many transportation agencies:

- Endorsement and chartering of the team and project (Steps 1 through 4),
- Project planning (Steps 5 through 8),
- Plan implementation (Steps 9 and 10), and
- Plan evaluation (Step 11).

Details about each step follow. The Web-based version of this description is accompanied by a set of supplementary material to enhance and illustrate the points.

The model process is intended to provide a framework for those who need it. It is not intended to be a how-to manual. There are other documents that provide extensive detail regarding how to conduct this type of process. Some general ones are covered in Appendix B and Appendix C. Others, which relate to specific aspects of the process, are referenced within the specific sections to which they apply.

# Implementation Step 1: Identify and Define the Problem

## General Description

Program development begins with gathering data and creating and analyzing information. The implementation process being described in this guide is one that will be done in the context of a larger strategic process. It is expected that this guide will be used when the strategic process, or a project-level analysis, has identified a potentially significant problem in this emphasis area.

Data analyses done at the strategic level normally are done with a limited amount of detail. They are usually the top layer in a "drill-down" process. Therefore, while those previous analyses should be reviewed and used as appropriate, it will often be the case that further studies are needed to completely define the issues.

It is also often the case that a core technical working group will have been formed by the lead agency to direct and carry out the process. This group can conduct the analyses required in this step, but should seek, as soon as possible, to involve any other stakeholders who may desire to provide input to this process. Step 2 deals further with the organization of the working group.

The objectives of this first step are as follows:

1. Confirm that a problem exists in this emphasis area.

2. Detail the characteristics of the problem to allow identification of likely approaches for eliminating or reducing it.

3. Confirm with management, given the new information, that the planning and implementation process should proceed.

The objectives will entail locating the best available data and analyzing them to highlight either geographic concentrations of the problem or over-representation of the problem within the population being studied.

Identification of existing problems is *a responsive approach*. This can be complemented by a *proactive approach* that seeks to identify potentially hazardous conditions or populations.

For the responsive type of analyses, one generally begins with basic crash records that are maintained by agencies within the jurisdiction. This is usually combined, where feasible, with other safety data maintained by one or more agencies. The other data could include

- Roadway inventory,

- Driver records (enforcement, licensing, courts), or

- Emergency medical service and trauma center data.

To have the desired level of impact on highway safety, it is important to consider the highway system as a whole. Where multiple jurisdictions are responsible for various parts of the system, they should all be included in the analysis, wherever possible. The best example of this is a state plan for highway safety that includes consideration of the extensive

mileage administered by local agencies. To accomplish problem identification in this manner will require a cooperative, coordinated process. For further discussion on the problem identification process, see Appendix D and the further references contained therein.

In some cases, very limited data are available for a portion of the roads in the jurisdiction. This can occur for a local road maintained by a state or with a local agency that has very limited resources for maintaining major databases. Lack of data is a serious limitation to this process, but must be dealt with. It may be that for a specific study, special data collection efforts can be included as part of the project funding. While crash records may be maintained for most of the roads in the system, the level of detail, such as good location information, may be quite limited. It is useful to draw upon local knowledge to supplement data, including

- Local law enforcement,

- State district and maintenance engineers,

- Local engineering staff, and

- Local residents and road users.

These sources of information may provide useful insights for identifying hazardous locations. In addition, local transportation agencies may be able to provide supplementary data from their archives. Finally, some of the proactive approaches mentioned below may be used where good records are not available.

Maximum effectiveness often calls for going beyond data in the files to include special supplemental data collected on crashes, behavioral data, site inventories, and citizen input. Analyses should reflect the use of statistical methods that are currently recognized as valid within the profession.

Proactive elements could include

- Changes to policies, design guides, design criteria, and specifications based upon research and experience;

- Retrofitting existing sites or highway elements to conform to updated criteria (perhaps with an appropriate priority scheme);

- Taking advantage of lessons learned from previous projects;

- Road safety audits, including on-site visits;

- Safety management based on roadway inventories;

- Input from police officers and road users; and

- Input from experts through such programs as the NHTSA traffic records assessment team.

The result of this step is normally a report that includes tables and graphs that clearly demonstrate the types of problems and detail some of their key characteristics. Such reports

should be presented in a manner to allow top management to quickly grasp the key findings and help them decide which of the emphasis areas should be pursued further, and at what level of funding. However, the report must also document the detailed work that has been done, so that those who do the later stages of work will have the necessary background.

## Specific Elements

1. Define the scope of the analysis
   1.1. All crashes in the entire jurisdiction
   1.2. A subset of crash types (whose characteristics suggest they are treatable, using strategies from the emphasis area)
   1.3. A portion of the jurisdiction
   1.4. A portion of the population (whose attributes suggest they are treatable using strategies from the emphasis area)
2. Define safety measures to be used for responsive analyses
   2.1. Crash measures
      2.1.1. Frequency (all crashes or by crash type)
      2.1.2. Measures of exposure
      2.1.3. Decide on role of frequency versus rates
   2.2. Behavioral measures
      2.2.1. Conflicts
      2.2.2. Erratic maneuvers
      2.2.3. Illegal maneuvers
      2.2.4. Aggressive actions
      2.2.5. Speed
   2.3. Other measures
      2.3.1. Citizen complaints
      2.3.2. Marks or damage on roadway and appurtenances, as well as crash debris
3. Define measures for proactive analyses
   3.1. Comparison with updated and changed policies, design guides, design criteria, and specifications
   3.2. Conditions related to lessons learned from previous projects
   3.3. Hazard indices or risk analyses calculated using data from roadway inventories to input to risk-based models
   3.4. Input from police officers and road users
4. Collect data
   4.1. Data on record (e.g., crash records, roadway inventory, medical data, driver-licensing data, citations, other)
   4.2. Field data (e.g., supplementary crash and inventory data, behavioral observations, operational data)
   4.3. Use of road safety audits, or adaptations
5. Analyze data
   5.1. Data plots (charts, tables, and maps) to identify possible patterns, and concentrations (See Appendixes Y, Z and AA for examples of what some states are doing)

      5.2.    Statistical analysis (high-hazard locations, over-representation of contributing circumstances, crash types, conditions, and populations)

      5.3.    Use expertise, through road safety audits or program assessment teams

      5.4.    Focus upon key attributes for which action is feasible:

            5.4.1.   Factors potentially contributing to the problems

            5.4.2.   Specific populations contributing to, and affected by, the problems

            5.4.3.   Those parts of the system contributing to a large portion of the problem

6.   Report results and receive approval to pursue solutions to identified problems (*approvals being sought here are primarily a confirmation of the need to proceed and likely levels of resources required*)

      6.1.    Sort problems by type

            6.1.1.   Portion of the total problem

            6.1.2.   Vehicle, highway/environment, enforcement, education, other driver actions, emergency medical system, legislation, and system management

            6.1.3.   According to applicable funding programs

            6.1.4.   According to political jurisdictions

      6.2.    Preliminary listing of the types of strategies that might be applicable

      6.3.    Order-of-magnitude estimates of time and cost to prepare implementation plan

      6.4.    Listing of agencies that should be involved, and their potential roles (including an outline of the organizational framework intended for the working group). Go to Step 2 for more on this.

# Implementation Step 2: Recruit Appropriate Participants for the Program

## General Description

A critical early step in the implementation process is to engage all the stakeholders that may be encompassed within the scope of the planned program. The stakeholders may be from outside agencies (e.g., state patrol, county governments, or citizen groups). One criterion for participation is if the agency or individual will help ensure a comprehensive view of the problem and potential strategies for its resolution. If there is an existing structure (e.g., a State Safety Management System Committee) of stakeholders for conducting strategic planning, it is important to relate to this, and build on it, for addressing the detailed considerations of the particular emphasis area.

There may be some situations within the emphasis area for which no other stakeholders may be involved other than the lead agency and the road users. However, in most cases, careful consideration of the issues will reveal a number of potential stakeholders to possibly be involved. Furthermore, it is usually the case that a potential program will proceed better in the organizational and institutional setting if a high-level "champion" is found in the lead agency to support the effort and act as a key liaison with other stakeholders.

Stakeholders should already have been identified in the previous step, at least at a level to allow decision makers to know whose cooperation is needed, and what their potential level of involvement might be. During this step, the lead agency should contact the key individuals in each of the external agencies to elicit their participation and cooperation. This will require identifying the right office or organizational unit, and the appropriate people in each case. It will include providing them with a brief overview document and outlining for them the type of involvement envisioned. This may typically involve developing interagency agreements. The participation and cooperation of each agency should be secured to ensure program success.

Lists of appropriate candidates for the stakeholder groups are recorded in Appendix K. In addition, reference may be made to the NHTSA document at http://www.nhtsa.dot.gov/safecommunities/SAFE%20COMM%20Html/index.html, which provides guidance on building coalitions.

## Specific Elements

1. Identify internal "champions" for the program
2. Identify the suitable contact in each of the agencies or private organizations who is appropriate to participate in the program
3. Develop a brief document that helps sell the program and the contact's role in it by
    3.1. Defining the problem
    3.2. Outlining possible solutions
    3.3. Aligning the agency or group mission by resolving the problem
    3.4. Emphasizing the importance the agency has to the success of the effort

      3.5.     Outlining the organizational framework for the working group and other stakeholders cooperating on this effort

      3.6.     Outlining the rest of the process in which agency staff or group members are being asked to participate

      3.7.     Outlining the nature of commitments desired from the agency or group for the program

      3.8.     Establishing program management responsibilities, including communication protocols, agency roles, and responsibilities

      3.9.     Listing the purpose for an initial meeting

4. Meet with the appropriate representative

      4.1.     Identify the key individual(s) in the agency or group whose approval is needed to get the desired cooperation

      4.2.     Clarify any questions or concepts

      4.3.     Outline the next steps to get the agency or group onboard and participating

5. Establish an organizational framework for the group

      5.1.     Roles

      5.2.     Responsibilities

# Implementation Step 3: Establish Crash Reduction Goals

## General Description

The AASHTO Strategic Highway Safety Plan established a national goal of saving 5,000 to 7,000 lives annually by the year 2003 to 2005. Some states have established statewide goals for the reduction of fatalities or crashes of a certain degree of severity. Establishing an explicit goal for crash reduction can place an agency "on the spot," but it usually provides an impetus to action and builds a support for funding programs for its achievement. Therefore, it is desirable to establish, within each emphasis area, one or more crash reduction targets.

These may be dictated by strategic-level planning for the agency, or it may be left to the stakeholders to determine. (The summary of the Wisconsin DOT Highway Safety Plan in Appendix A has more information.) For example, Pennsylvania adopted a goal of 10 percent reduction in fatalities by 2002,[1] while California established a goal of 40 percent reduction in fatalities and 15 percent reduction in injury crashes, as well as a 10 percent reduction in work zone crashes, in 1 year.[2] At the municipal level, Toledo, Ohio, is cited by the U.S. Conference of Mayors as having an exemplary program. This included establishing specific crash reduction goals (http://www.usmayors.org/uscm/uscm_projects_services/health/traffic/best_traffic_initiative_toledo.htm). When working within an emphasis area, it may be desirable to specify certain types of crashes, as well as the severity level, being targeted.

There are a few key considerations for establishing a quantitative goal. The stakeholders should achieve consensus on this issue. The goal should be challenging, but achievable. Its feasibility depends in part on available funding, the timeframe in which the goal is to be achieved, the degree of complexity of the program, and the degree of controversy the program may experience. To a certain extent, the quantification of the goal will be an iterative process. If the effort is directed at a particular location, then this becomes a relatively straightforward action.

## Specific Elements

1. Identify the type of crashes to be targeted
    1.1.    Subset of all crash types
    1.2.    Level of severity
2. Identify existing statewide or other potentially related crash reduction goals
3. Conduct a process with stakeholders to arrive at a consensus on a crash reduction goal
    3.1.    Identify key considerations
    3.2.    Identify past goals used in the jurisdiction
    3.3.    Identify what other jurisdictions are using as crash reduction goals
    3.4.    Use consensus-seeking methods, as needed

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[1] Draft State Highway Safety Plan, State of Pennsylvania, July 22, 1999
[2] Operations Program Business Plan, FY 1999/2000, State of California, Caltrans, July 1999

# Implementation Step 4: Develop Program Policies, Guidelines, and Specifications

## General Description

A foundation and framework are needed for solving the identified safety problems. The implementation process will need to be guided and evaluated according to a set of goals, objectives, and related performance measures. These will formalize what the intended result is and how success will be measured. The overlying crash reduction goal, established in Step 3, will provide the context for the more specific goals established in this step. The goals, objectives, and performance measures will be used much later to evaluate what is implemented. Therefore, they should be jointly outlined at this point and agreed to by all program stakeholders. It is important to recognize that evaluating any actions is an important part of the process. Even though evaluation is not finished until some time after the strategies have been implemented, it begins at this step.

The elements of this step may be simpler for a specific project or location than for a comprehensive program. However, even in the simpler case, policies, guidelines, and specifications are usually needed. Furthermore, some programs or projects may require that some guidelines or specifications be in the form of limits on directions taken and types of strategies considered acceptable.

## Specific Elements

1. Identify high-level policy actions required and implement them (legislative and administrative)
2. Develop goals, objectives, and performance measures to guide the program and use for assessing its effect
    2.1. Hold joint meetings of stakeholders
    2.2. Use consensus-seeking methods
    2.3. Carefully define terms and measures
    2.4. Develop report documenting results and validate them
3. Identify specifications or constraints to be used throughout the project
    3.1. Budget constraints
    3.2. Time constraints
    3.3. Personnel training
    3.4. Capacity to install or construct
    3.5. Types of strategies not to be considered or that must be included
    3.6. Other

# Implementation Step 5: Develop Alternative Approaches to Addressing the Problem

## General Description

Having defined the problem and established a foundation, the next step is to find ways to address the identified problems. If the problem identification stage has been done effectively (see Appendix D for further details on identifying road safety problems), the characteristics of the problems should suggest one or more alternative ways for dealing with the problem. It is important that a full range of options be considered, drawing from areas dealing with enforcement, engineering, education, emergency medical services, and system management actions.

Alternative strategies should be sought for both location-specific and systemic problems that have been identified. Location-specific strategies should pertain equally well to addressing high-hazard locations and to solving safety problems identified within projects that are being studied for reasons other than safety.

Where site-specific strategies are being considered, visits to selected sites may be in order if detailed data and pictures are not available. In some cases, the emphasis area guides will provide tables that help connect the attributes of the problem with one or more appropriate strategies to use as countermeasures.

Strategies should also be considered for application on a systemic basis. Examples include

1.  Low-cost improvements targeted at problems that have been identified as significant in the overall highway safety picture, but not concentrated in a given location.

2.  Action focused upon a specific driver population, but carried out throughout the jurisdiction.

3.  Response to a change in policy, including modified design standards.

4.  Response to a change in law, such as adoption of a new definition for DUI.

In some cases, a strategy may be considered that is relatively untried or is an innovative variation from past approaches to treatment of a similar problem. Special care is needed to ensure that such strategies are found to be sound enough to implement on a wide-scale basis. Rather than ignoring this type of candidate strategy in favor of the more "tried-and-proven" approaches, consideration should be given to including a pilot-test component to the strategy.

The primary purpose of this guide is to provide a set of strategies to consider for eliminating or lessening the particular road safety problem upon which the user is focusing. As pointed out in the first step of this process, the identification of the problem, and the selection of strategies, is a complex step that will be different for each case. Therefore, it is not feasible to provide a "formula" to follow. However, guidelines are available. There are a number of texts to which the reader can refer. Some of these are listed in Appendix B and Appendix D.

In addition, the tables referenced in <u>Appendix G</u> provide examples for linking identified problems with candidate strategies.

The second part of this step is to assemble sets of strategies into alternative "program packages." Some strategies are complementary to others, while some are more effective when combined with others. In addition, some strategies are mutually exclusive. Finally, strategies may be needed to address roads across multiple jurisdictions. For instance, a package of strategies may need to address both the state and local highway system to have the desired level of impact. The result of this part of the activity will be a set of alternative "program packages" for the emphasis area.

It may be desirable to prepare a technical memorandum at the end of this step. It would document the results, both for input into the next step and for internal reviews. The latter is likely to occur, since this is the point at which specific actions are being seriously considered.

## Specific Elements

1. Review problem characteristics and compare them with individual strategies, considering both their objectives and their attributes
    1.1. Road-user behavior (law enforcement, licensing, adjudication)
    1.2. Engineering
    1.3. Emergency medical services
    1.4. System management elements
2. Select individual strategies that do the following:
    2.1. Address the problem
    2.2. Are within the policies and constraints established
    2.3. Are likely to help achieve the goals and objectives established for the program
3. Assemble individual strategies into alternative program packages expected to optimize achievement of goals and objectives
    3.1. Cumulative effect to achieve crash reduction goal
    3.2. Eliminate strategies that can be identified as inappropriate, or likely to be ineffective, even at this early stage of planning
4. Summarize the plan in a technical memorandum, describing attributes of individual strategies, how they will be combined, and why they are likely to meet the established goals and objectives

# Implementation Step 6: Evaluate Alternatives and Select a Plan

## General Description

This step is needed to arrive at a logical basis for prioritizing and selecting among the alternative strategies or program packages that have been developed. There are several activities that need to be performed. One proposed list is shown in Appendix P.

The process involves making estimates for each of the established performance measures for the program and comparing them, both individually and in total. To do this in a quantitative manner requires some basis for estimating the effectiveness of each strategy. Where solid evidence has been found on effectiveness, it has been presented for each strategy in the guide. In some cases, agencies have a set of crash reduction factors that are used to arrive at effectiveness estimates. Where a high degree of uncertainty exists, it is wise to use sensitivity analyses to test the validity of any conclusions that may be made regarding which is the best strategy or set of strategies to use. Further discussion of this may be found in Appendix O.

Cost-benefit and cost-effectiveness analyses are usually used to help identify inefficient or inappropriate strategies, as well as to establish priorities. For further definition of the two terms, see Appendix Q. For a comparison of the two techniques, see Appendix S. Aspects of feasibility, other than economic, must also be considered at this point. An excellent set of references is provided within online benefit-cost guides:

- One is under development at the following site, maintained by the American Society of Civil Engineers: http://ceenve.calpoly.edu/sullivan/cutep/cutep_bc_outline_main.htm

- The other is *Guide to Benefit-Cost Analysis in Transport Canada*, September 1994, http://www.tc.gc.ca/finance/bca/en/TOC_e.htm. An overall summary of this document is given in Appendix V.

In some cases, a strategy or program may look promising, but no evidence may be available as to its likely effectiveness. This would be especially true for innovative methods or use of emerging technologies. In such cases, it may be advisable to plan a pilot study to arrive at a minimum level of confidence in its effectiveness, before large-scale investment is made or a large segment of the public is involved in something untested.

It is at this stage of detailed analysis that the crash reduction goals, set in Step 3, may be revisited, with the possibility of modification.

It is important that this step be conducted with the full participation of the stakeholders. If the previous steps were followed, the working group will have the appropriate representation. Technical assistance from more than one discipline may be necessary to go through more complex issues. Group consensus will be important on areas such as estimates of effectiveness, as well as the rating and ranking of alternatives. Techniques are available to assist in arriving at consensus. For example, see the following Web site for an overview: http://web.mit.edu/publicdisputes/practices/cbh_ch1.html.

## Specific Elements

1. Assess feasibility
    1.1.   Human resources
    1.2.   Special constraints
    1.3.   Legislative requirements
    1.4.   Other
    1.5.   This is often done in a qualitative way, to narrow the list of choices to be studied in more detail (see, for example, Appendix BB)
2. Estimate values for each of the performance measures for each strategy and plan
    2.1.   Estimate costs and impacts
        2.1.1.   Consider guidelines provided in the detailed description of strategies in this material
        2.1.2.   Adjust as necessary to reflect local knowledge or practice
        2.1.3.   Where a plan or program is being considered that includes more than one strategy, combine individual estimates
    2.2.   Prepare results for cost-benefit and/or cost-effectiveness analyses
    2.3.   Summarize the estimates in both disaggregate (by individual strategy) and aggregate (total for the program) form
3. Conduct a cost-benefit and/or cost-effectiveness analysis to identify inefficient, as well as dominant, strategies and programs and to establish a priority for the alternatives
    3.1.   Test for dominance (both lower cost and higher effectiveness than others)
    3.2.   Estimate relative cost-benefit and/or cost-effectiveness
    3.3.   Test productivity
4. Develop a report that documents the effort, summarizing the alternatives considered and presenting a preferred program, as devised by the working group (for suggestions on a report of a benefit-cost analysis, see Appendix U).
    4.1.   Designed for high-level decision makers, as well as technical personnel who would be involved in the implementation
    4.2.   Extensive use of graphics and layout techniques to facilitate understanding and capture interest
    4.3.   Recommendations regarding meeting or altering the crash reduction goals established in Step 3.

# Implementation Step 7: Submit Recommendations for Action by Top Management

## General Description

The working group has completed the important planning tasks and must now submit the results and conclusions to those who will make the decision on whether to proceed further. Top management, at this step, will primarily be determining if an investment will be made in this area. As a result, the plan will not only be considered on the basis of its merits for solving the particular problems identified in this emphasis area (say, vis-à-vis other approaches that could be taken to deal with the specific problems identified), but also its relative value in relation to investments in other aspects of the road safety program.

This aspect of the process involves using the best available communication skills to adequately inform top management. The degree of effort and extent of use of media should be proportionate to the size and complexity of the problem being addressed, as well as the degree to which there is competition for funds.

The material that is submitted should receive careful review by those with knowledge in report design and layout. In addition, today's technology allows for the development of automated presentations, using animation and multimedia in a cost-effective manner. Therefore, programs involving significant investments that are competing strongly for implementation resources should be backed by such supplementary means for communicating efficiently and effectively with top management.

## Specific Elements

1. Submit recommendations for action by management
    1.1. "Go/no-go" decision
    1.2. Reconsideration of policies, guidelines, and specifications (see Step 3)
    1.3. Modification of the plan to accommodate any revisions to the program framework made by the decision makers
2. Working group to make presentations to decision makers and other groups, as needed and requested
3. Working group to provide technical assistance with the review of the plan, as requested
    3.1. Availability to answer questions and provide further detail
    3.2. Assistance in conducting formal assessments

# Implementation Step 8: Develop a Plan of Action

## General Description

At this stage, the working group will usually detail the program that has been selected for implementation. This step translates the program into an action plan, with all the details needed by both decision makers, who will have to commit to the investment of resources, and those charged with carrying it out. The effort involves defining resource requirements, organizational and institutional arrangements needed, schedules, etc. This is usually done in the form of a business plan, or plan of action. An example of a plan developed by a local community is shown in Appendix X.

An evaluation plan should be designed at this point. It is an important part of the plan. This is something that should be in place before Step 9 is finished. It is not acceptable to wait until after the program is completed to begin designing an evaluation of it. This is because data are needed about conditions before the program starts, to allow comparison with conditions during its operation and after its completion. It also should be designed at this point, to achieve consensus among the stakeholders on what constitutes "success." The evaluation is used to determine just how well things were carried out and what effect the program had. Knowing this helps maintain the validity of what is being done, encourages future support from management, and provides good intelligence on how to proceed after the program is completed. For further details on performing evaluations, see Appendix L, Appendix M, and Appendix W.

The plan of action should be developed jointly with the involvement of all desired participants in the program. It should be completed to the detail necessary to receive formal approval of each agency during the next step. The degree of detail and complexity required for this step will be a function of the size and scope of the program, as well as the number of independent agencies involved.

## Specific Elements

1. Translation of the selected program into key resource requirements
   - 1.1. Agencies from which cooperation and coordination is required
   - 1.2. Funding
   - 1.3. Personnel
   - 1.4. Data and information
   - 1.5. Time
   - 1.6. Equipment
   - 1.7. Materials
   - 1.8. Training
   - 1.9. Legislation
2. Define organizational and institutional framework for implementing the program
   - 2.1. Include high-level oversight group
   - 2.2. Provide for involvement in planning at working levels
   - 2.3. Provide mechanisms for resolution of issues that may arise and disagreements that may occur
   - 2.4. Secure human and financial resources required

3. Detail a program evaluation plan
    3.1. Goals and objectives
    3.2. Process measures
    3.3. Performance measures
        3.3.1. Short-term, including surrogates, to allow early reporting of results
        3.3.2. Long-term
    3.4. Type of evaluation
    3.5. Data needed
    3.6. Personnel needed
    3.7. Budget and time estimates
4. Definition of tasks to conduct the work
    4.1. Develop diagram of tasks (e.g., PERT chart)
    4.2. Develop schedule (e.g., Gantt chart)
    4.3. For each task, define
        4.3.1. Inputs
        4.3.2. Outputs
        4.3.3. Resource requirements
        4.3.4. Agency roles
        4.3.5. Sequence and dependency of tasks
5. Develop detailed budget
    5.1. By task
    5.2. Separate by source and agency/office (i.e., cost center)
6. Produce program action plan, or business plan document

# Implementation Step 9: Establish Foundations for Implementing the Program

## General Description

Once approved, some "groundwork" is often necessary to establish a foundation for carrying out the selected program. This is somewhat similar to what was done in Step 4. It must now be done in greater detail and scope for the specific program being implemented. As in Step 4, specific policies and guidelines must be developed, organizational and institutional arrangements must be initiated, and an infrastructure must be created for the program. The business plan or action plan provides the basis (Step 7) for this. Once again, the degree of complexity required will vary with the scope and size of the program, as well as the number of agencies involved.

## Specific Elements

1. Refine policies and guidelines (from Step 4)
2. Effect required legislation or regulations
3. Allocate budget
4. Reorganize implementation working group
5. Develop program infrastructure
    5.1. Facilities and equipment for program staff
    5.2. Information systems
    5.3. Communications
    5.4. Assignment of personnel
    5.5. Administrative systems (monitoring and reporting)
6. Set up program assessment system
    6.1. Define/refine/revise performance and process measures
    6.2. Establish data collection and reporting protocols
    6.3. Develop data collection and reporting instruments
    6.4. Measure baseline conditions

# Implementation Step 10: Carry Out the Action Plan

## General Description

Conditions have been established to allow the program to be started. The activities of implementation may be divided into activities associated with field preparation for whatever actions are planned and the actual field implementation of the plan. The activities can involve design and development of program actions, actual construction or installation of program elements, training, and the actual operation of the program. This step also includes monitoring for the purpose of maintaining control and carrying out mid- and post-program evaluation of the effort.

## Specific Elements

1. Conduct detailed design of program elements
    1.1. Physical design elements
    1.2. PI&E materials
    1.3. Enforcement protocols
    1.4. Etc.
2. Conduct program training
3. Develop and acquire program materials
4. Develop and acquire program equipment
5. Conduct pilot tests of untested strategies, as needed
6. Program operation
    6.1. Conduct program "kickoff"
    6.2. Carry out monitoring and management of ongoing operation
        6.2.1 Periodic measurement (process and performance measures)
        6.2.2 Adjustments as required
    6.3 Perform interim and final reporting

# Implementation Step 11: Assess and Transition the Program

## General Description

The AASHTO Strategic Highway Safety Plan includes improvement in highway safety management. A key element of that is the conduct of properly designed program evaluations. The program evaluation will have been first designed in Step 8, which occurs prior to any field implementation. For details on designing an evaluation, please refer to Step 8. For an example of how the New Zealand Transport Authority takes this step as an important part of the process, see Appendix N.

The program will usually have a specified operational period. An evaluation of both the process and performance will have begun prior to the start of implementation. It may also continue during the course of the implementation, and it will be completed after the operational period of the program.

The overall effectiveness of the effort should be measured to determine if the investment was worthwhile and to guide top management on how to proceed into the post-program period. This often means that there is a need to quickly measure program effectiveness in order to provide a preliminary idea of the success or need for immediate modification. This will be particularly important early in development of the AASHTO Strategic Highway Safety Plan, as agencies learn what works best. Therefore, surrogates for safety impact may have to be used to arrive at early/interim conclusions. These usually include behavioral measures. This particular need for interim surrogate measures should be dealt with when the evaluation is designed, back in Step 8. However, a certain period, usually a minimum of a couple of years, will be required to properly measure the effectiveness and draw valid conclusions about programs designed to reduce highway fatalities when using direct safety performance measures.

The results of the work is usually reported back to those who authorized it and the stakeholders, as well as any others in management who will be involved in determining the future of the program. Decisions must be made on how to continue or expand the effort, if at all. If a program is to be continued or expanded (as in the case of a pilot study), the results of its assessment may suggest modifications. In some cases, a decision may be needed to remove what has been placed in the highway environment as part of the program because of a negative impact being measured. Even a "permanent" installation (e.g., rumble strips) requires a decision regarding investment for future maintenance if it is to continue to be effective.

Finally, the results of the evaluation using performance measures should be fed back into a knowledge base to improve future estimates of effectiveness.

## Specific Elements

1. Analysis
   - 1.1 Summarize assessment data reported during the course of the program
   - 1.2 Analyze both process and performance measures (both quantitative and qualitative)

        1.3      Evaluate the degree to which goals and objectives were achieved (using performance measures)

        1.4      Estimate costs (especially vis-à-vis pre-implementation estimates)

        1.5      Document anecdotal material that may provide insight for improving future programs and implementation efforts

        1.6      Conduct and document debriefing sessions with persons involved in the program (including anecdotal evidence of effectiveness and recommended revisions)

2. Report results
3. Decide how to transition the program
        3.1      Stop
        3.2      Continue as is
        3.3      Continue with revisions
        3.4      Expand as is
        3.5      Expand with revisions
        3.6      Reverse some actions
4. Document data for creating or updating database of effectiveness estimates

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# Glossary

| Acronym or Term | Meaning | Comments |
|---|---|---|
| 3R | Rehabilitation, Resurfacing, and Restoration | Refers to type of project that is intended to be less comprehensive than complete reconstruction |
| AAA | American Automobile Association | |
| AAAM | Association for the Advancement of Automotive Medicine | |
| AAMVA | American Association of Motor Vehicle Administrators | |
| AASHTO | American Association of State Highway and Transportation Officials | |
| ADAT | Aggressive Driving Apprehension Team | Washington State Patrol |
| ADT | Average Daily Traffic | |
| AG | Aggressive Driving | |
| AMA | American Medical Association | |
| AMF (or CMF) | Accident Modification Factor | Also may be referred to as Crash Modification Factor |
| ARTBA | American Road and Transportation Builders Association | |
| ASCE | American Society of Civil Engineers | |
| AWS | Accident Warning System | |
| B/C | Benefit-Cost Ratio | |
| BCT | Breakaway Cable Terminal | End treatment for guardrail |
| CAE | Computer Aided Engineering | |
| CCS | Collision Countermeasure System | |
| CDL | Commercial Driver's License | |
| CHSIM | Comprehensive Highway Safety Improvement Model | Recently changed name to *The SafetyAnalyst* |
| CSD | Context-Sensitive Design | |
| DDC-ADD | Defensive Driving Course—Attitudinal Dynamics of Driving | |

| Acronym or Term | Meaning | Comments |
|---|---|---|
| DDSS | Design Decision Support System | |
| DES | Detailed Engineering Studies | |
| DMV | Department of Motor Vehicles | |
| DOT | Department of Transportation | |
| DUI/DWI | Driving Under the Influence (of alcohol or drugs)/Driving While Impaired | |
| DUS | Driving Under Suspension (of driver's license) | |
| DWR | Driving While Revoked | |
| DWS | Driving While Suspended | |
| EM | Electronic Monitoring | |
| FARS | Fatality Analysis Reporting System | Formerly referred to as Fatal Accident Reporting System |
| FHWA | Federal Highway Administration | Division of the U.S. Department of Transportation |
| F+I | Fatal Plus Injury (crash) | |
| GHSA | Governors Highway Safety Association | Formerly NAGHSR (National Association of Governors' Highway Safety Representatives) |
| Green Book | AASHTO Policy on Geometric Design of Highways | |
| H.A.D. | Halt Aggressive Driving | Lubbock, Texas |
| HAL | High Accident Location | |
| HCM | Highway Capacity Manual | TRB publication |
| HES | Hazard Elimination Study | |
| HO | Head On (accident) | |
| HOS | Hours of Service | For commercial vehicle drivers |
| HRR | Highway Research Record | TRB publication |
| HSIS | Highway Safety Information System | |
| HSM | Highway Safety Manual | |
| IES | Illumination Engineering Society | |
| IHSDM | Interactive Highway Safety Design Model | |
| IID | Ignition Interlock Device | |
| ISD | Intersection Sight Distance | |

| Acronym or Term | Meaning | Comments |
|---|---|---|
| ITE | Institute of Transportation Engineers | |
| LCCA | Life Cycle Cost Analysis | |
| MAB | Medical Advisory Board | State-level organization |
| MADD | Mothers Against Drunk Driving | |
| MUTCD | Manual of Uniform Traffic Control Devices | FHWA publication |
| NCHRP | National Cooperative Highway Research Program | |
| NHI | National Highway Institute | FHWA training office |
| NHTSA | National Highway Traffic Safety Administration | Division of the U.S. Department of Transportation |
| NSC | National Safety Council | |
| NTSB | National Transportation Safety Board | |
| NYSTA | New York State Thruway Authority | |
| PCR | Police Crash Report | |
| PDO | Property Damage Only (accident) | |
| PI&E | Public Information & Education | |
| RDG | Roadside Design Guide | AASHTO publication |
| RID | Remove Intoxicated Drivers | Citizen group |
| ROR | Run-Off-Road (accident) | |
| ROW | Right-of-Way | |
| RPM | Raised Pavement Marker | |
| RSA | Road Safety Audit | |
| RSPM | Raised Snowplowable Pavement Marker | |
| SADD | Students Against Destructive Decisions | |
| SBPD | Santa Barbara Police Department (California) | |
| SHSP | Strategic Highway Safety Plan | |
| SKARP | Skid Accident Reduction Program | |
| SPF | Safety Performance Function | |
| SSD | Stopping Sight Distance | |
| SUV | Sports Utility Vehicle | |
| SV | Single Vehicle (accident) | |

| Acronym or Term | Meaning | Comments |
|---|---|---|
| TCD | Traffic Control Device | |
| TRB | Transportation Research Board | |
| TRR | Transportation Research Record | TRB Publication |
| TRRL | Transport and Road Research Laboratory | United Kingdom organization |
| TSIMS | Transportation Safety Information Management System | Developed by AASHTO |
| TTI | Texas Transportation Institute | |
| TWLTL | Two-Way, Left-Turn Lane | |
| U/S/R | Unlicensed/Suspended/Revoked | Drivers without licenses, or whose licenses have been suspended or revoked |
| UVC | Uniform Vehicle Code | Model national traffic law |
| WSP | Washington State Patrol | |

See also: Glossary of Transportation Terms online
http://transweb.sjsu.edu/comglos2.htm#P

# Appendixes

The following appendixes are not published in this report. However, they are available online at http://transportation1.org/safetyplan.

1       Profiles of State and Local Agency Implementation Efforts: Strategy 4.1 A1 (Milwaukee Police Department)
2       Profiles of State and Local Agency Implementation Efforts: Strategy 4.1 A1 (Florida Department of Transportation)
3       Profiles of State and Local Agency Implementation Efforts: Strategy 4.1 A1 (Washington State Patrol)
4       Profiles of State and Local Agency Implementation Efforts: Strategy 4.1 A2 (Lubbock, Texas)
5       Profiles of State and Local Agency Implementation Efforts: Strategy 4.1 A2 (Lee County, Florida)
6       Toward Developing Strategies to Control Aggressive Driving: An Introduction
7       Stakeholders: Aggressive Driving
8       Excerpts from "A Toolbox for Alleviating Traffic Congestion and Enhancing Mobility"
9       Incident Management Self-Assessment
10      Incident Management References

A       Wisconsin Department of Transportation 2001 Strategic Highway Safety Plan
B       Resources for the Planning and Implementation of Highway Safety Programs
C       South African Road Safety Manual
D       Comments on Problem Definition
E       Issues Associated with Use of Safety Information in Highway Design: Role of Safety in Decision Making
F       Comprehensive Highway Safety Improvement Model
G       Table Relating Candidate Strategies to Safety Data Elements
H       What is a Road Safety Audit?
I       Illustration of Regression to the Mean
J       Fault Tree Analysis
K       Lists of Potential Stakeholders
L       Conducting an Evaluation
M       Designs for a Program Evaluation
N       Joint Crash Reduction Programme: Outcome Monitoring
O       Estimating the Effectiveness of a Program During the Planning Stages
P       Key Activities for Evaluating Alternative Program
Q       Definitions of Cost-Benefit and Cost-Effectiveness
R       FHWA Policy on Life Cycle Costing
S       Comparisons of Benefit-Cost and Cost-Effectiveness Analysis
T       Issues in Cost-Benefit and Cost-Effectiveness Analyses
U       Transport Canada Recommended Structure for a Benefit-Cost Analysis Report
V       Overall Summary of Benefit-Cost Analysis Guide from Transport Canada
W       Program Evaluation—Its Purpose and Nature
X       Traffic Safety Plan for a Small Department

Y     Sample District-Level Crash Statistical Summary
Z     Sample Intersection Crash Summaries
AA   Sample Intersection Collision Diagram
BB   Example Application of the Unsignalized Intersection Guide