NCHRP

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

REPORT 500

Guidance for Implementation of the AASHTO Strategic Highway Safety Plan

Volume 2: A Guide for Addressing Collisions Involving Unlicensed Drivers and Drivers with Suspended or Revoked Licenses

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WASHINGTON, D.C.
2003
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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.

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NCHRP REPORT 500: Volume 2

Project G17-18(3) FY'00

ISSN 0077-5614

ISBN 0-309-06809-6

Library of Congress Control Number 2003104149

Price $20.00

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Published reports of the

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

are available from:

Transportation Research Board
Business Office
500 Fifth Street, NW
Washington, DC 20001

and can be ordered through the Internet at:

http://www.national-academies.org/trb/bookstore

Printed in the United States of America

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FOREWORD

By Charles W. Niessner
Staff Officer
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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 second 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 unlicensed drivers and drivers with suspended or revoked licenses. The report will be of particular interest to safety practitioners with responsibility for implementing programs to reduce injuries and fatalities on the highway system.

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 second 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

This series of six implementation guides was developed under NCHRP Project 17-18(3). The project was managed by CH2M Hill. The co-principal investigators were Ron Pfefer of Maron Engineering and Kevin Slack of CH2M Hill. Timothy Neuman of CH2M Hill served as the overall project director for the CH2M HILL team. Kelly Kennedy Hardy, also of CH2M Hill, participated in development of the guides.

This phase of the project involved the development of guide books addressing six different emphasis areas of AASHTO's Strategic Highway Safety Plan. The project team was organized around the specialized technical content contained in each guide. The CH2M HILL team included nationally recognized experts from many organizations. The following team of experts, selected based on their knowledge and expertise in a particular emphasis area, served as lead authors for each of the guides.

- Forrest Council of BMI led the development of "A Guide for Addressing Run-Off-Road Collisions"
- Doug Harwood of Midwest Research Institute led the development of "A Guide for Addressing Unsignalized Intersection Collisions"
- Hugh McGee of BMI led the development of "A Guide for Addressing Head-On Collisions"
- Richard Raub of Northwestern University Center for Public Safety led the development of "A Guide for Addressing Aggressive-Driving Collisions"
- Patricia Waller led the development of "A Guide for Addressing Collisions Involving Unlicensed Drivers and Drivers with Suspended or Revoked Licenses"
- Charlie Zegeer and Kevin Lacey of University of North Carolina Highway Safety Research Center led the development of "A Guide for Addressing Collisions Involving Trees in Hazardous Locations"

Development of the guides utilized the resources and expertise of many professionals from around the country and overseas. Through research, workshops, and actual demonstration of the guides by agencies, the resulting document represents best practices in each emphasis area. The project team is grateful to the following list of people and their agencies for their input on the guides and their support of the project:

American Association of State Highway and Transportation Officials
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Bastrop, Texas, Police Department
Bill Anderson

Ben Gurion University of the Negev
David Shinar

California Department of Motor Vehicles
Dave DeYoung

California Department of Transportation
Roy Peterson

City of Lubbock, Texas
Jeryl Hart

City of Winston-Salem, North Carolina
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Consultant
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SECTION I

Summary

The Problem

No matter how well our highways and vehicles are designed and maintained, ultimately highway safety depends upon the behavior of users, especially drivers. Every state has a driver-licensing program that is charged with ensuring that drivers who are issued a license are competent to operate on the roadway system. There are strong pressures on licensing programs to limit imposition, including costs, on renewal applicants. At the same time, licensing agencies have a legal responsibility to the greater public to license only qualified drivers and to keep unqualified drivers off the road.

There are two groups of drivers who continue to drive without proper licensure. First, there is a small number of drivers who appear immune to countermeasures that have proved effective for most highway users. These "hard-core offenders" continue to drive even after losing a license and are overrepresented in subsequent violations and crashes. It is estimated that as many as three-fourths of suspended and revoked (S/R) drivers continue to drive, although they apparently drive less often and more carefully (van Oldenbeek and Coppin, 1965; Hagen et al., 1980; Ross and Gonzales, 1988; DeYoung, 1990). Even so, they are overrepresented in subsequent violations and crashes and, based on estimated exposure, are greatly overrepresented in fatal crashes (DeYoung et al., 1997). In California, based on an analysis of two-vehicle fatal crashes in which only one driver was judged to be at fault, compared with validly licensed drivers, S/R drivers were found to be overinvolved by a factor of 3.7:1.

A second group of drivers is those who have never held proper licensure. In at least some regions of the country, these are often illegal aliens who fear detection if licensure is sought. In the same California study, this driver group is reported to be even more overrepresented in crashes than S/R drivers by a factor of 4.9:1 (DeYoung et al., 1997). The threat of detection and deportation are believed to be a major reason this group avoids seeking licensure, and often their driving provides transportation for other illegal alien workers (DeYoung, personal communication, 2000). Because of the increasing numbers of these workers, as well as the dependence of significant segments of the economy on their labor, this issue is one that cries out for innovative solutions.

A recent report (Griffin and DeLaZerda, 2000) analyzing 5 years of Fatality Analysis Reporting System (FARS) data found that one out of five fatal crashes involves at least one driver who is not properly licensed (unlicensed, S/R, expired, canceled or denied, unknown). Because exposure data were not available, mileage rates of involvement could not be calculated for each category or for validly licensed drivers.

Exhibit I-1 shows the proportion of unlicensed or improperly licensed drivers in fatal crashes for the year 2000, the most recent year for which data are available. Here about 17 percent of drivers in fatal crashes are not properly licensed, a proportion far higher than

estimated for all drivers. It should be noted that this table is based on drivers, not on number of crashes.

EXHIBIT I-1
Proportion of Drivers Not Licensed or Holding No Valid License for this Class of Vehicle, Fatal Crashes, 2000

First Harmful Event in Crash	Unlicensed/No Valid License, Percent
Overturn	18
Pedestrian	10
Pedal cycle	8
Motor vehicle in transport	17
Parked motor vehicle	24
Bridge abutment, rail; guardrail; concrete barrier	20
Sign, post, pole	22
Culvert, curb, ditch, embankment	22
Fence, wall	21
Tree, other fixed object	19
Involvement in any crash type listed above*	**17**

* Not every first harmful event is included, but for all events in original table, 17% of the total drivers were unlicensed or held no valid license for the class of vehicle operated.

Based on the Fatality Analysis Reporting System (FARS) Web-based encyclopedia, available at http://www-fars.nhtsa.dot.gov/ (Accessed August 12, 2002).

Despite the marked over-involvement of improperly licensed drivers in fatal crashes, traffic violations are often not treated seriously in the court system, where prosecutors and others consider burglaries, assaults, and other crimes of greater import (even though people are at much greater risk of a crash injury than of being the victim of a crime). The use of separate traffic courts that handle only traffic offenses will increase the likelihood of appropriate sanctions.

These unlicensed/suspended/revoked (U/S/R) drivers are especially difficult to reach and to influence. However, there are some interventions that have shown promise and are worthy of further implementation.

The most severe sanctions have been evaluated primarily on the basis of driving-under-the-influence (DUI)[1] offenders, not drivers who are S/R for other reasons. However, DUI offenders have proved to be some of the most intractable, so that measures showing impact on this group are likely to be effective with other U/S/R drivers.

[1] Some jurisdictions use DWI, for driving while intoxicated, instead, and some states use both DUI and DWI, relating the terms to level of intoxication. In this document, DUI is used, even when a particular state may use DWI. The use of DUI in this report does not imply a particular level of alcohol intoxication.

Applicable Countermeasures

Exhibit I-2 shows the objectives and strategies identified for keeping U/S/R drivers off the road. Five major objectives are identified.

EXHIBIT I-2
Objectives and Strategies for Ensuring Drivers Are Fully Licensed and Competent by Keeping Unlicensed Drivers and Drivers with Suspended and Revoked Licenses Off the Road

Objectives	Strategies
2.1 A—Apply special enforcement practices	2.1 A1—Increase enforcement in selected areas
	2.1 A2—Routinely link citations to driver record
	2.1 A3—Create and distribute “hot sheets”
2.1 B—Restrict mobility through license plate modification or removal	2.1 B1—“Stripe” license plate
	2.1 B2—Impound license plate
2.1 C—Restrict mobility through vehicle modification	2.1 C1—Immobilize/impound/seize vehicle
	2.1 C2—Install ignition interlock device (IID)
2.1 D—Restrict mobility through direct intervention with offender	2.1 D1—Monitor electronically
	2.1 D2—Incarcerate
2.1 E—Eliminate need to drive	2.1 E1—Provide alternative transportation service

Explanation of the Objectives

The strategies in this guide were identified from a number of sources, including the literature, contact with state and local agencies throughout the United States, and federal programs. Some of the strategies are widely used, while others are used at a state or even a local level. Some have been subjected to well-designed evaluations to prove their effectiveness. On the other hand, it was found that many strategies, including some that are widely used, have not been adequately evaluated.

The implication of the widely varying experiences with these strategies, as well as the range of knowledge about their effectiveness, is that the reader should be prepared to exercise caution in many cases before adopting a particular strategy for implementation.

Apply special enforcement practices. As can be seen in Exhibit I-2, reducing U/S/R driving can be addressed by a range of strategies. Enforcement is generally part of the intervention, and some interventions can be handled almost entirely by enforcement. These strategies include increasing enforcement in areas with previously detected high rates of improperly licensed drivers (e.g., crashes, high number of committed violations, or in routine license checks); and routine checking of citations against driver license file to identify drivers who have lost licensure but who may still carry a license that appears valid. A third enforcement

practice is to create and distribute to law enforcement "hot sheets" that list the U/S/R drivers living in the area.

Restrict mobility through license plate modification. Public identification of the license plate has been achieved through "zebra" striping of the plate, a measure that is readily identifiable by enforcement but is not usually noticed by the public at large. Vehicles displaying these plates alert officers to the possibility of an offending driver, although a validly licensed driver may drive the vehicle. Nevertheless, such striping makes the vehicle more likely to be checked. Another measure shown to be effective is impoundment of the license plate itself.

Restrict mobility of offender through vehicle modification. Restricting mobility by modifying the vehicle can be achieved by immobilizing or impounding the vehicle (and in extreme cases, seizing and disposing of the vehicle), modifying the vehicle with an ignition interlock device (IID) that ensures operation by a sober driver, and modifying the vehicle so that ignition requires a valid electronic drivers license. This latter strategy cannot be widely implemented until there is widespread development of vehicles and systems that are compatible with electronic licenses.

Restrict mobility of offender through direct intervention with the offender. Restricting mobility through direct intervention with the offender can take the form of electronic monitoring ("house arrest") or incarceration. While the latter has long been used, it has not been shown to be highly effective by itself (although one cannot commit traffic offenses while incarcerated). Still, incarceration remains an important strategy to motivate compliance with other strategies, such as electronic monitoring. Interestingly, electronic monitoring has been used successfully since 1984 in at least one jurisdiction and generates sufficient income to make the program self-supporting. Incarceration, although used, is recommended primarily as an option to ensure compliance with other strategies.

Eliminate the need to drive. In areas where alternative transportation is available, it may be possible to enforce its use. Even if public transit is not readily available, as is the case in most communities, other forms of transportation exist, such as car-pooling, taking a taxi, using a dial-a-ride service, using a hired driver, or using other forms of paratransit. However, it could be difficult to ensure that convicted offenders restrict their mobility to such alternatives. Providing alternative transportation has been shown to be effective in at least one (affluent) community, but it is a potentially expensive strategy. At this time, it is unlikely to be a viable strategy in many communities, but where applicable, it should be seriously considered.

While some of these strategies require legislative authorization and must be implemented at the state level, others can be introduced at a local level by local enforcement agencies. Furthermore, legal authorization often exists for some of the strategies, but in the absence of local interest and commitment, implementation does not occur. For most strategies, whether national, state, or local, ultimately it is at the local level that implementation occurs (or does not occur). In trying to implement a strategy, it is often helpful to develop a coalition of key stakeholders to determine how best to proceed. Such a coalition can not only improve the quality of the program implemented but also generate broad support for the program.

One of the hallmarks of the AASHTO Strategic Highway Safety Plan is to approach safety problems in a comprehensive manner. The range of strategies available in the guides will

ultimately cover various aspects of the road user, the highway, the vehicle, the environment, and the management system. The guides strongly encourage the user to develop a program to tackle a particular emphasis area from each of these perspectives in a coordinated manner. To facilitate this program, the electronic form of the material uses hypertext linkages to enable seamless integration of various approaches to a given problem. As more guides are developed for other emphasis areas, the extent and usefulness of this form of implementation will become ever more apparent.

The goal is to move away from *independent* activities of engineers, law enforcement, educators, judges, and other highway-safety specialists. The implementation process outlined in the guides promotes the formation of working groups and alliances that represent all of the elements of the safety system. In so doing, highway-safety specialists can draw upon their combined expertise to reach the bottom-line goal of reducing crashes and fatalities associated with a particular emphasis area.

SECTION II

Introduction

No matter how well our highways and vehicles are designed and maintained, ultimately highway safety depends upon the behavior of users, especially drivers. Every state has a driver-licensing program that is charged with ensuring that drivers who are issued a license are competent to operate on the roadway system. However, states generally require re-licensure only once every several years (usually four or five; Insurance Institute for Highway Safety, 2002)[1], and this interval has been lengthened by many states in an effort to cut costs and reduce delays at license-issuing facilities. Some states do not even require in-person renewal, and those that do usually administer only perfunctory evaluation. There are also strong pressures on licensing programs to limit imposition, including costs, on renewal applicants. At the same time, licensing agencies have a legal responsibility to the greater public to license only qualified drivers and to keep unqualified drivers off the road.

Most drivers respond appropriately to enforcement measures aimed at reducing unsafe driving, and most drivers generally refrain from illegal driving in order to avoid legal sanctions (general deterrence). If they should be apprehended for a traffic violation, it is likely that the consequences will have the desired effect and discourage them from repeat offenses. However, there remain two groups of drivers who continue to drive without proper licensure: those whose license privilege has been taken away by suspension or revocation (S/R) and those driving without having ever received a license.

A recent report (Griffin and DeLaZerda, 2000) analyzing 5 years of Fatality Analysis Reporting System (FARS) data found that one out of five fatal crashes involves at least one driver who is not properly licensed (unlicensed, S/R, expired, canceled or denied, unknown). Because exposure data were not available, mileage rates of involvement could not be calculated for each category or for validly licensed drivers.

Exhibit II-1 shows the proportion of unlicensed or improperly licensed drivers in fatal crashes for the year 2000, the most recent year for which data are available. Here about 17 percent of drivers in fatal crashes are not properly licensed, a proportion far higher than that estimated for all drivers. It should be noted that this table is based on drivers, not on number of crashes.

[1] Insurance Institute for Highway Safety. U.S. Driver Licensing Renewal Procedures for Older Drivers as of May 2002. http://www.highwaysafety.org/safety_facts/state_laws/older_drivers.htm (Accessed July 19, 2002).

EXHIBIT II-1
Proportion of Drivers Not Licensed or Holding No Valid License for this Class of Vehicle, Fatal Crashes, 2000

First Harmful Event in Crash	Unlicensed/No Valid License, Percent
Overturn	18
Pedestrian	10
Pedal cycle	8
Motor vehicle in transport	17
Parked motor vehicle	24
Bridge abutment, rail; guardrail; concrete barrier	20
Sign, post, pole	22
Culvert, curb, ditch, embankment	22
Fence, wall	21
Tree, other fixed object	19
Involvement in any crash type listed above*	**17**

* Not every first harmful event is included, but for all events in original table, 17% of the total drivers were unlicensed or held no valid license for the class of vehicle operated.

Based on the Fatality Analysis Reporting System (FARS) Web-based encyclopedia, available at http://www-fars.nhtsa.dot.gov/ (Accessed August 12, 2002).

Despite the marked over-involvement of improperly licensed drivers in fatal crashes, traffic violations are often not treated seriously in the court system, where prosecutors and others consider burglaries, assaults, and other crimes of greater importance (even though people are at much greater risk of a crash injury than of being the victim of a crime). The use of separate traffic courts that handle only traffic offenses will increase the likelihood of appropriate sanctions.

These unlicensed/suspended/revoked (U/S/R) drivers are especially difficult to reach and to influence. However, there are some interventions that have shown promise and are worthy of further implementation.

The most severe sanctions have been evaluated primarily on the basis of DUI[2] offenders, not drivers who are S/R for other reasons. However, DUI offenders have proved to be some of the most intractable, so measures showing an impact on this group are likely to be effective with other U/S/R drivers.

[2] Some jurisdictions use DWI, for driving while intoxicated, instead, and some states use both DUI and DWI, relating the terms to level of intoxication. In this document, DUI is used, even when a particular state may use DWI. The use of DUI in this report does not imply a particular level of alcohol intoxication.

SECTION III

The Type of Problem Being Addressed

It is estimated that as many as three-fourths of S/R drivers continue to drive, although they apparently drive less often and more carefully (van Oldenbeek and Coppin, 1965; Hagen et al., 1980; Ross and Gonzales, 1988; DeYoung, 1990). Even so, S/R drivers who continue driving are overrepresented in subsequent violations and crashes.

In at least some regions of the country, drivers who have never held proper license are often illegal aliens who fear detection if licensure is sought. In a California study, this driver group is reported to be even more overrepresented in crashes than drivers with S/R licenses by a factor of 4.9:1 (DeYoung et al., 1997). The threat of detection and deportation are believed to be a major reason this group avoids seeking licensure, and often their driving provides transportation for other illegal alien workers (DeYoung, personal communication, 2000). Because of increasing numbers of these workers, as well as the dependence of significant segments of the economy on their labor, this issue is one that cries out for innovative solutions.

A recent report (Griffin and DeLaZerda, 2000) analyzing 5 years of FARS data found that one out of five fatal crashes involves at least one driver who is not properly licensed (U/S/R, expired, canceled or denied, unknown). Because exposure data were not available, mileage rates of involvement could not be calculated for each category or for validly licensed drivers.

Convicted drunken drivers (i.e., DUI or DWI offenders) probably represent the group of U/S/R drivers of greatest concern. These drivers are overrepresented in serious and fatal crashes. For all crashes, the risk is about sevenfold for drivers at 0.10 percent blood alcohol content (BAC) compared with drivers with zero alcohol, and for drivers at 0.15 percent BAC, the risk is twenty-five-fold (see Exhibit III-1). This is also the group that has been the focus of major interventions, so that there is solid evidence concerning the effectiveness of countermeasures. It should be noted that the most severe sanctions have been evaluated primarily on the basis of DUI offenders, not drivers who are U/S/R for other reasons. However, DUI offenders have proved to be some of the most intractable, so that measures effectively applied to that group are likely to be effective with other U/S/R drivers.

Based upon analyses of California data (DeYoung et al., 1997), and assuming these estimates are applicable to national data, of the 56,688 drivers in fatal crashes in 1998 (National Highway Traffic Safety Administration, 1999), 23.7 percent were driving with S/R licenses or none (see Exhibit III-2). Of drivers considered to be at fault in crashes, the percentage increases to 35.4. If all S/R and unlicensed drivers stayed off the road, there would have been 13,435 fewer drivers in fatal crashes. On average, there is 0.732 fatality per driver in fatal crashes, suggesting that there would have been about 9,834 fewer fatalities had these drivers not been on the road. (These figures are based on a number of assumptions and should be considered no more than rough estimates at best.)

EXHIBIT III-1
Fatal Crash Involvement: Increase in Risk for Two Blood Alcohol Contents (BACs)

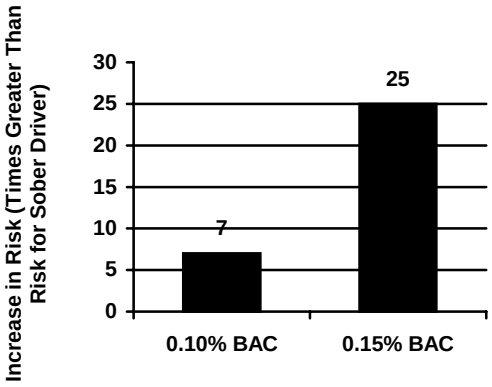
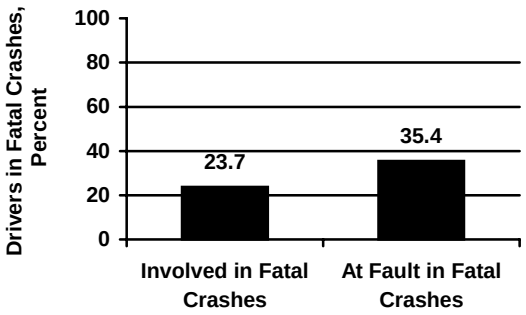


EXHIBIT III-2
Percent Risk of Fatal Crashes for U/S/R Drivers



Specific Attributes of the Problem

Magnitude

As noted above, about one in five fatal crashes involves at least one driver who is not properly licensed (Griffin and DeLaZerda, 2000). In California alone, it is estimated that about a million drivers are S/R, and even more than a million are unlicensed (DeYoung, personal communication, 2000).

Demographics

S/R drivers are predominantly male and younger than the average age of drivers (on average, over 8 years younger in a California study). They are also more likely to have convictions for nontraffic offenses, including violent offenses (De Young, 1990). Drivers who are S/R as a result of a DUI conviction exhibit even more deviant behavior (DeYoung, 1990). Clearly, S/R drivers have proven to be a difficult group to reach and influence.

It is more difficult to obtain valid information on unlicensed drivers. However, the analysis of FARS crashes found the average age to be much lower, about 13.5 years younger than the average age of drivers with valid licenses. According to California data, unlicensed drivers have an even higher rate of fatal crash involvement than do S/R drivers.

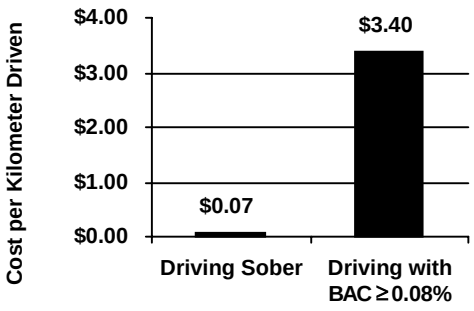
Lower Responsiveness to Sanctions

When unlicensed drivers are also undocumented aliens, it is not likely that traditional sanctions will keep them off the road. These drivers are often providing transportation for many other similarly undocumented aliens, and the transportation is essential for their employment. In the case of S/R drivers, traditional sanctions (warning letters, probation, license restriction) are less effective because they do not fully incapacitate the drivers (DeYoung, 1999). Something more is needed.

Although most drivers in fatal crashes hold a valid license (89 percent in 1998; National Highway Traffic Safety Administration, 1999), those who have been drinking are much more likely to be U/S/R (Simpson and Mayhew 1991). The rates for each of these categories increase with increasing BAC. The hard-core drinking driver is a significant part of the "driving while S/R" problem. Furthermore, when fatal crash involvement is related to estimates of exposure, drivers with S/R license are greatly overrepresented. In California it was found that, compared with validly licensed drivers, S/R drivers are overinvolved in fatal crashes by a factor of 3.7:1, while unlicensed drivers are even more overrepresented, by a factor of 4.9:1 (DeYoung et al., 1997) (see Exhibit III-3). Furthermore, Miller et al. (1999) report that, based on estimates of exposure compared with crash involvement, the cost per kilometer driven at a BAC greater than or equal to 0.08 percent was $3.40 compared with $0.07 per sober kilometer driven (see Exhibit III-4). Thus, driving at 0.08 percent BAC costs society nearly 50 times as much as driving sober (see also Miller et al., 1998).

EXHIBIT III-3
U/S/R Drivers' Overrepresentation in Fatal Crashes

EXHIBIT III-4
Cost to Society of Driving with BAC ≥0.08%

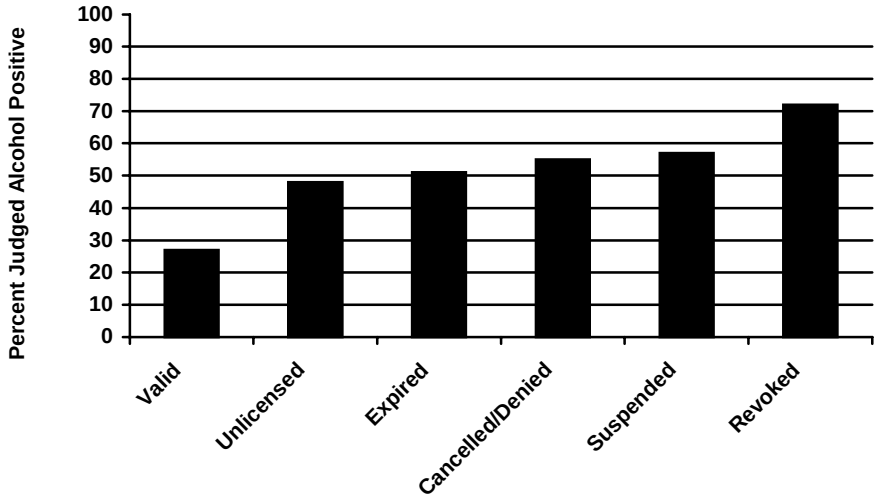


Analyses of FARS data show alcohol involvement to be much higher among drivers without valid license (see Exhibit III-5). These data are based on only those drivers for whom the investigating officer made a definite judgment (based on data from Griffin and DeLaZerda, 2000).

Multiple-DUI offenders have failed to respond to more conventional sanctions or to efforts to "rehabilitate" them, so the focus moves from changing the individual's behavior to modifying the environment so as to make it more difficult for the offender to operate a vehicle.

Despite the marked over-involvement of improperly licensed drivers in fatal crashes, traffic violations are often not treated seriously in the court system, where prosecutors and others consider burglaries, assaults, and other crimes of greater importance (even though people are at much greater risk of a crash injury than of being the victim of a crime). The use of separate traffic courts that handle only traffic offenses will increase the likelihood of appropriate sanctions.

Exhibit III-5
Percentage of Drivers Judged to be Alcohol Positive, by License Status
From Griffin and DeLaZerda, 2000



Ineffectiveness of Traditional Sanctions

Measures traditionally employed to make it more difficult for U/S/R drivers to obtain or retain a license are ineffective and may even be counterproductive. Because of the costs of reinstating licensure, including the cost of vehicle insurance after a conviction for DUI, many drivers choose to remain unlicensed but continue to drive. In California, there are about 1 million S/R drivers in the state at any given time and an additional estimated 1 million who are unlicensed (DeYoung, 1999, p. 46). When drivers are suspended or revoked, they are on the record system, and at least some level of control may be exerted over them. However, unlicensed drivers are more difficult to monitor, so that simply threatening to remove licensure for longer and longer periods of time does not solve the problem of hard-core offenders. Neither does education, jail sentences, or treatment programs. Something more is required.

SECTION IV

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. In several cases, a major factor affecting implementation time is whether legislative authority exists for the strategy of interest. Such authorization often exists even though it is not used. Other important factors affecting implementation time are the extent of support for the strategy and the cost of implementation. However, some strategies that will require funding to initiate (e.g., electronic monitoring) should be self-supporting once in place. Placement in the table below is meant to reflect the most common expected application of the strategy.

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

		Relative Cost to Implement and Operate			
Timeframe for Implementation	**Strategy**	**Low**	**Moderate**	**Moderate to High**	**High**
Short (< 1 year)	2.1 A1—Increase enforcement in selected areas	**XXX**			
	2.1 A2—Routinely link citations to driver record	**XXX**			
	2.1 A3—Create and distribute "hot sheets"	**XXX**			
Medium (1–2 years)	2.1 B1—"Stripe" license plates of offenders [a]		**XXX**		
	2.1 B2—Impound license plates of offenders [a]		**XXX**		
	2.1 C1—Immobilize/impound/seize vehicles of offenders [a]		**XXX**		
	2.1 C2—Install ignition interlock device [a]		**XXX**		
	2.1 D1—Monitor electronically [a]		**XXX**		
	2.1 E1—Provide alternative transportation service [b]			**XXX**	
Long (> 2 years)	2.1 D2—Incarcerate [c]			**XXX**	

[a] The actual time required will depend on whether legislative authority exists for these measures. If the authority exists, it should take no more than 1 to 2 years to implement. Absent such authority, the length of time will be affected by the time required to obtain such authority.

[b] The time required to implement this strategy will depend heavily upon the existing transportation infrastructure, the extent of local support for the strategy, and the availability of funding. Communities will vary in whether this strategy can be implemented relatively quickly or will require substantial time and investment.

[c] Incarceration is essential to some other strategies as a potential consequence of noncompliance, but incarceration by itself is costly and of limited effectiveness.

SECTION V

Description of Strategies

Objectives and Strategies

Exhibit V-1 shows the objectives and strategies identified for keeping U/S/R drivers off the road.

EXHIBIT V-1
Objectives and Strategies for Ensuring Drivers Are Fully Licensed and Competent by Keeping U/S/R Drivers Off the Road

Objectives	Strategies
2.1 A—Apply special enforcement practices	2.1 A1—Increase enforcement in selected areas
	2.1 A2—Routinely link citations to driver record
	2.1 A3—Create and distribute "hot sheets"
2.1 B—Restrict mobility through license plate modification or removal	2.1 B1—"Stripe" license plate
	2.1 B2—Impound license plate
2.1 C—Restrict mobility through vehicle modification	2.1 C1—Immobilize/impound/seize vehicle
	2.1 C2—Install ignition interlock device (IID)
2.1 D—Restrict mobility through direct intervention with offender	2.1 D1—Monitor electronically
	2.1 D2—Incarcerate
2.1 E—Eliminate need to drive	2.1 E1—Provide alternative transportation service

Explanation of Strategy Types

The strategies in this guide were identified from a number of sources, including the literature, contact with state and local agencies throughout the United States, and federal programs. Some of the strategies are widely used, while others are used at a state or even a local level. Some have been subjected to well-designed evaluations to prove their effectiveness. On the other hand, it was found that many strategies, including some that are widely used, have not been adequately evaluated.

The implication of the widely varying experience with these strategies, as well as the range of knowledge about their effectiveness, is that the reader should be prepared to exercise caution in many cases before adopting a particular strategy for implementation. To help the reader, the strategies have been classified into three types, each identified by letter symbol throughout the guide:

- Proven (P): Strategies that have been used in one or more locations and for which properly designed evaluations have been conducted that show the strategy to be

effective. These strategies may be employed with a good degree of confidence, but any application can lead to results that vary significantly from those found in previous evaluations. The attributes of the strategies that are provided will help the user judge which strategy is the most appropriate for the particular situation.

- 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. These strategies—while in frequent, or even general, use—should be applied with caution, carefully considering the attributes cited in the guide and relating them to the specific conditions for which they are being considered. 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. It is intended that as the experiences of implementation of these strategies continues under the AASHTO Strategic Highway Safety Plan initiative, appropriate evaluations will 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 that at least one agency has considered sufficiently promising to try on a small scale in at least one location. These strategies should be considered only after the others have proven not to be appropriate or feasible. Even 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. It is intended that 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 it can be upgraded to a "proven" one.

Specific Objectives

2.1 A—Apply Special Enforcement Practices

A range of strategies can address reducing U/S/R driving. Enforcement is generally part of the intervention, and some interventions can be handled almost entirely by enforcement. These strategies include increasing enforcement in areas with previously detected high rates of improperly licensed drivers (e.g., crashes, number of committed violations, and routine license checks) and routine checking of citations against driver license files to identify drivers who have lost licensure but who may still carry a license that appears valid. A third enforcement strategy is to create and distribute to enforcement "hot sheets" that list the U/S/R drivers living in the area.

2.1 B—Restrict Mobility through License Plate Modification

Public identification of the license plate has been achieved through "zebra" striping of the plate, a measure that alerts enforcement but is not usually noticed by the public at large. Vehicles displaying these plates alert officers to the possibility of an offending driver, although a validly licensed driver may drive the vehicle. Nevertheless, such striping makes the vehicle more likely to be checked. This strategy has been used successfully in at least one state, but is no longer in use. Another state impounds the license plate of a vehicle driven by

a U/S/R driver. This measure, simpler to implement than vehicle impoundment, has been shown to be effective in reducing U/S/R driving.

2.1 C—Restrict Mobility of Offender through Vehicle Modification

Restricting mobility through vehicle modification can be achieved through immobilizing or impounding the vehicle (and in extreme cases, seizing and disposing of the vehicle) and modifying the vehicle with an ignition interlock device (IID) that ensures operation by a sober driver. It is also possible to modify the vehicle so that ignition requires a valid electronic driver license. This latter strategy is not detailed since it cannot be widely implemented until there is widespread development of vehicles and systems that are compatible with electronic licenses. The strategy is mentioned here primarily to alert jurisdictions to a measure that is being seriously considered in Europe and may at some point be introduced in the United States.

2.1 D—Restrict Offender Mobility through Direct Intervention

Restricting offender mobility through direct intervention can take the form of electronic monitoring ("house arrest") or incarceration. While the latter has long been used, it has not been shown to be highly effective by itself (although traffic offenses cannot occur during incarceration). Still, incarceration remains an important strategy to motivate compliance with other strategies, such as electronic monitoring. Interestingly, electronic monitoring has been used successfully since 1984 in at least one jurisdiction and generates sufficient income to make the program self-supporting.

2.1 E—Eliminate the Need to Drive

In areas where alternative transportation is available, it may be possible to enforce its use. Even if public transit is not readily available, as is the case in most communities, other forms of transportation exist, such as car-pooling, taxi, dial-a-ride services, a hired driver, or other forms of paratransit. However, it could be difficult to ensure that convicted offenders restrict their mobility to such alternative use. Providing alternative transportation has been shown to be effective in at least one (affluent) community, but it is an expensive strategy. At this time, it is unlikely to be a viable strategy in many communities, but where applicable, it should be seriously considered.

Additional Information

While some of these strategies require legislative authorization and must be implemented at the state level, others can be introduced at a local level by local enforcement agencies. Furthermore, legal authorization often exists for some of the strategies, but in the absence of local interest and commitment, implementation does not occur.

It is useful to document the extent of the problem in one's own state. Potential sources of such data are provided in the appendixes of this guide. However, these data sources are useful primarily for compiling information at the national or state level. Local involvement is often reinforced by the use of local data. If possible, local jurisdictions should compile data on their own experience with U/S/R drivers. Large jurisdictions often maintain their own data systems and can readily compile useful statistics. On the other hand, small jurisdictions, which are the vast majority, are likely to need help in doing this. The State Office of Highway

Safety should be contacted for this assistance. Other possible sources of data are listed under Additional Materials Available Online. The State Office of Highway Safety is also a possible source of funding, should additional costs be required to implement strategies of interest. To locate the highway safety office in your state, visit the Governors Highway Safety Association (formerly the National Association of Governors' Highway Safety Representatives) Web page at http://www.statehighwaysafety.org/html/stateinfo_main.html.

For many, if not most, of the strategies, it is worthwhile to consider establishing a multi-jurisdictional task force, with membership from relevant agencies, organizations, and interests. Such a task force can provide information and assistance to develop more effective strategy implementation, and, in the case of some strategies, can extend the application to a wider community. Potential sources of membership for such a task force or coalition can be found in Appendix 8. In addition, reference should be made to the NHTSA document at http://www.nhtsa.dot.gov/safecommunities/SAFE%20COMM%20Html/index.html, which contains guidance on building coalitions.

Compatibility with Other Strategies

Although virtually all the strategies may be used in conjunction, some are especially suited to be used in combination with certain other strategies. The special enforcement strategies are readily combined, and of course they may be used in combination with any of the other strategies.

Incarceration, while not greatly successful by itself, is an essential part of effective use of an IID and of electronic monitoring or "house arrest." Incarceration can also be useful as a possible sanction for repeat violations of other lesser sanctions. However, it is a highly costly strategy and should be implemented sparingly.

Related Strategies for Creating a Truly Comprehensive Approach

The strategies listed above, and described in detail below, are those considered unique to this emphasis area. However, to create a truly comprehensive approach to the highway safety problems associated with this emphasis area, there are related strategies that should be included as candidates in any program planning process. These are of five types:

- Public Information and Education Programs (PI&E): Many highway safety programs can be effectively enhanced with a properly designed PI&E campaign. 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, it may be desired to focus a PI&E campaign on a location- or population-specific problem. While location-specific enforcement is a relatively untried approach, as compared with areawide campaigns, use of roadside signs and other experimental methods may be tried on a pilot basis. Within this guide, where the application of PI&E campaigns is deemed appropriate, it is usually in support of some other strategy. In such a case, the description for that strategy will suggest this possibility (see the attribute section for each strategy entitled "Associated Needs for, or Relation to, Support Services"). In some cases, where PI&E campaigns are deemed unique for the emphasis area, the strategy is explained in detail. As additional guides are completed for the AASHTO plan, they may address the details regarding PI&E strategy design and implementation. When that occurs, the appropriate links will be posted online at http://transportation1.org/safetyplan.

- Enforcement of Traffic Laws: Well-designed and well-operated law-enforcement programs can have a significant effect on highway safety. It is well established, for instance, that an effective way to reduce crashes and their severity is to have jurisdictionwide programs that enforce an effective law against driving under the influence (DUI) or driving without seatbelts. When that law is vigorously enforced, with well-trained officers, the frequency and severity of highway crashes can be significantly reduced. This should be an important element in any comprehensive highway safety program. Enforcement programs, by their nature, are conducted at specific locations. The effect (e.g., lower speeds, greater use of seat belts, and reduced impaired driving) may occur at or near the specific location where the enforcement is applied. This effect can often be enhanced by coordinating the effort with an appropriate PI&E program. However, in many cases (e.g., speeding and seat-belt usage) the impact is areawide or jurisdictionwide. The effect can be either positive (i.e., the desired reductions occur over a greater part of the system), or negative (i.e., the problem moves to another location as road users move to new routes where enforcement is not applied). Where it is not clear how the enforcement effort may impact behavior, or where it is desired to try an innovative and untried method, a pilot program is recommended. Within this guide, different types of enforcement programs are described in detail. Enforcement strategies may be targeted at either a whole highway system or a specific location and may be focused upon a specific part of the driver population. As additional guides are completed for the AASHTO plan, they may address the details regarding the design and implementation of enforcement strategies. When that occurs, the appropriate links will be posted online at http://transportation1.org/safetyplan.

- Strategies to Improve Emergency Medical and Trauma System Services: Treatment of injured parties at highway crashes can have a significant impact on the level of severity and length of time that an individual spends in 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 systems strategies. When that occurs, the appropriate links will be posted online at http://transportation1.org/safetyplan.

- Strategies Directed at Improving the Safety Management System: The management of the highway safety system is fundamental to success. There should be in place a sound organizational structure, as well as infrastructure of laws, policies, etc., to monitor, control, direct, and administer a comprehensive approach to highway safety. It is important that a comprehensive program not be limited to one jurisdiction, such as a state DOT. In most states, local agencies are responsible for the majority of the road system and its related safety problems. Local agencies also know, better than others, what the problems are. As additional guides are completed for the AASHTO plan, they may address the details regarding the design and implementation of strategies for

improving safety management systems. When that occurs, the appropriate links will be posted online at http://transportation1.org/safetyplan.

- Strategies that Are Detailed in Other Emphasis Area Guides: 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. Strategies directed at the U/S/R driver should be coordinated with the state's overall licensing strategy. Currently, there are no other guides relating to licensing. However, as these are added, they will be posted online at http://transportation1.org/safetyplan.

Authorization of Implementation

Before exploring specific strategies in more detail, something should be said about the authorization of strategy implementation. Legal authorization for action varies greatly from one state to another. Some states severely restrict local governments in how they may initiate new programs and practices, and in these states most local legislation must be approved by state legislatures before it becomes law. In other states, local jurisdictions have enormous independence and indeed may operate as if the state legislature has virtually no authority over them. Often, legislative authority exists for a strategy (e.g., seizing and impounding a vehicle), but it is not implemented at a local level for various reasons (e.g., lack of support from the local district attorney). In such situations, coordinated local effort may enable implementation of the strategy.

Precaution is required even when authority exists within an agency or a jurisdiction. State agencies are often reluctant to exercise existing authority. Express authorization is sought from state legislatures as a protection against potential criticism for new programs. This has been especially true in state driver-licensing agencies, when authority existed for imposing requirements on drivers but agency officials were unwilling to act in the absence of specific legislative direction.

If new or additional legislative authority is desired, it is important to enlist the active support of existing organizations and coalitions (e.g., the state office of highway safety), state professional organizations of affected personnel (e.g., law enforcement, the judiciary, state medical society), key legislators, the American Automobile Association (AAA), and citizen organizations such as Mothers Against Drunk Driving (MADD). Remember, some of the most widely accepted and effective programs and practices in highway safety began with local initiatives and even with a single individual.

This issue is raised because local jurisdictions will have to evaluate their own potential for strategy implementation based on whether enabling legislation is needed and whether local officials feel secure in exercising existing authority. Some highly successful programs have been implemented on the basis of county commissioner action and in the absence of knowledge or support of relevant state offices.

It is also important that there be backing from local prosecutors and the courts. In this regard, the use of traffic courts is strongly recommended. When traffic cases are mixed in with burglaries, assaults, and other crimes, they are often considered of minimal importance and not treated seriously. In addition to the use of traffic courts, good communication with clear information about the value of reducing U/S/R driving is essential for program success. In initiating a new program, especially one that may be viewed by some as

controversial, letters from key sources (e.g., the state office of highway safety) to appropriate persons (e.g., key legislators) may be helpful in gaining support.

In initiating a new program, it is usually helpful to have some additional funding, if only for evaluating the impact of the program. Obviously, different strategies will require more or less start-up funding. However, once strategies are in place, ideally they should be self-sustaining.

Each strategy is described below in relation to its technical and organizational/institutional attributes. Other key attributes specific to a certain strategy are also discussed.

Specific Strategies

Strategy 2.1 A1—Selective Enforcement in Areas Where U/S/R Driving Has Been Detected

This strategy is widely used, but there is no valid objective evaluation of this strategy, and hence it is classified as "tried" (see "Explanation of Strategy Types," above). Citations and crashes can be used to identify those times and places where U/S/R drivers appear to be over-represented. Once these "high-risk" locations have been identified, they can be targeted for license checkpoints. This strategy should be an ongoing activity, with times and places varying to enhance detection.

EXHIBIT V-2
Strategy Attributes for Increasing Enforcement in Selected Areas (T)

Technical Attributes	
Target	Drivers who are unlicensed or improperly licensed.
Expected Effectiveness	This strategy is widely used, and it should increase detection of U/S/R drivers. In one jurisdiction, the detection of U/S/R drivers jumped 35% immediately following implementation. With program continuation, the rate has decreased, indicating a general deterrent effect. However, other measures were also being implemented, and there is no known objective evaluation of this strategy in the absence of other enforcement activities. For more information, see Appendix 1.
Keys to Success	This strategy may be implemented administratively—that is, it should not require any new legislative authority. Rather, it requires the support and endorsement of those with primary responsibility for enforcement, with cooperation and support from other agencies identified below. The success of this strategy depends upon the extent to which those responsible for implementing it understand the value of detecting improperly licensed drivers. It would be advisable to meet with the personnel involved and describe the reasons for this approach (i.e., the high over-representation of such drivers in fatal crashes). The district attorney and the court system must be supportive of the effort. They should be included in the early planning, both to get their input on how to improve the program and to make sure they understand and endorse the effort. The driver licensing authority must also be a participant, in that driver records must be accessed on a routine basis. If illegal driving is identified, the driver licensing authority must be willing to take appropriate action.

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EXHIBIT V-2 (Continued)
Strategy Attributes for Increasing Enforcement in Selected Areas (T)

	Both driver licensing and judicial personnel should be informed of the major involvement of U/S/R drivers in fatal crashes nationwide. Ideally, data on the problem would be compiled to determine the extent of the problem locally. Good data (that is, accurate and timely data recording driver infractions and sanctions imposed) are essential for monitoring the program and evaluating its impact. Key political figures could also play a role, either supportive or otherwise. They should be well informed of the program and the reasons for it. The importance of mutual support and coordination across agencies (enforcement, driver licensing, judicial) cannot be over emphasized in achieving success with this strategy. Electronic linkage to the state driver file is essential for this strategy to succeed. Finally, it would be useful to chart enforcement agency data, showing high-risk areas (i.e., locations where several crashes have occurred involving these drivers), and monitor changes following program implementation.
Potential Difficulties	The backing and cooperation of key people in the court system and in driver licensing are essential. Without their support, the program could easily fail. While the overall program should be publicized to discourage unlawful driving, the specific times and places where road checks will occur should not be made public, since that would simply result in selection of alternative routes.
Appropriate Measures and Data	Prior to program implementation, it is essential that local data be compiled to identify those times and places where U/S/R driving is being detected. It would also be helpful to document the involvement of U/S/R drivers in crashes and how their records compare with those of validly licensed drivers. These initial measures will provide the baseline against which to measure the program's impact. Once the program is implemented, data should be compiled on the locations and extent to which special enforcement is deployed and the number of U/S/R drivers detected. These findings should be compared with the prior baseline. Data on crash involvement of U/S/R drivers should also be monitored and measured against baseline data. The findings should be shared with the court system and the licensing agency and of course with those involved in operating the program itself.
Associated Need for Support Services	The best outcome of such a program is the deterrence of the undesired behavior in the first place. For U/S/R drivers to be discouraged from driving, they have to know that the program is going into effect. For this to happen, there must be widespread publicity of the effort. Therefore, arrangements should be made for publicizing the program via radio, television, and newsprint. If there are non-English-speaking populations, the information should also be provided in other languages.
Organizational and Institutional Attributes	
Organizational, Institutional, and Policy Issues (including interagency participation)	In the case of unlicensed drivers, as opposed to suspended or revoked, a major goal is to get them properly licensed and into the records system. Some courts have found "deferred judgment" to be useful in this regard. Under deferred judgment, the court takes no action for a specified time period, during which the defendant is instructed to obtain proper licensure. If proper licensure is obtained, no further court action is taken. As indicated above, enforcement, judicial, licensing, and data personnel must be on board and fully appreciative of the importance of this effort. Others who may not be directly involved in program implementation and operation but who have an interest should also be fully informed (e.g., key legislators responsible for highway safety measures). The court system needs to be supportive of whatever enforcement and license actions are taken, and the licensing agency has to make available license status information.

EXHIBIT V-2 (Continued)
Strategy Attributes for Increasing Enforcement in Selected Areas (T)

	Whether interagency agreements are required is a function of the size and the working relationships of participating agencies. In a local jurisdiction (county, city), it may be that no formal agreements are required.
Issues Affecting Implementation Time	In the absence of clear opposition, the time required to implement this strategy can be brief. It should require no enabling legislation and can be accomplished simply by modifying deployment of existing personnel. Some time will be required for compiling baseline data to identify prime times and locations for traffic checks. Estimated implementation time in Santa Barbara was less than 6 months. Should the district attorney or key judicial personnel strongly oppose this strategy (an unlikely occurrence), implementation time could increase, or the implementation be discontinued.
Costs Involved	If the strategy involves simple re-deployment of existing enforcement, there should be no additional costs. However, if it is necessary to increase enforcement beyond existing resources, there will be additional costs. In Santa Barbara many personnel were conducting special checks for improper licenses, but there was no systematic program for detection of U/S/R driving. Now, each day one officer is assigned to this duty. However, this procedural change entailed no need for additional personnel.
Training and Other Personnel Needs	No special training should be required. Officers already check licensure of drivers, and road checks of licensure is common practice in most places. Systems are already in place to record infractions on driver histories.
Legislative Needs	No legislation should be required, since this strategy simply re-focuses existing procedures and personnel.
Other Key Attributes	
Identification of Undocumented Aliens	Undocumented aliens may be more likely to be driving without a license than U.S. citizens, because aliens have difficulty obtaining a valid driver's license. This strategy is likely to identify such drivers. States vary in their response to this issue. Realistically, major segments of our economy are heavily dependent on the participation of undocumented aliens in the workforce. One driver may provide transportation to many other workers. A legitimate debate may be had on whether it is preferable to license undocumented aliens (and thus require that they meet licensing standards) and have them in the records system, or to deny license and essentially guarantee unlicensed driving. Among those actively involved in this area, there is strong disagreement as to the appropriate role of the licensing agency. In some states, driver licensing works closely with the Immigration and Naturalization Service (INS), while elsewhere driver licensing refuses to provide information to INS. This guide makes no recommendation, but rather calls attention to this issue, so that jurisdictions may develop their own policy on this issue.

Strategy 2.1 A2—Routine Linkage of Citations to Driver Records

Like selective enforcement, this strategy has been used in many locations but has not been objectively evaluated. It is therefore categorized as "tried" (see "Explanation of Strategy Types," above). All citations should be regularly checked against driver records to determine license status. Ideally, this check should occur at the time of apprehension, but if technology is not available for such real-time access, linkage should occur when tallies are made on a daily basis. If it is found that a driver is U/S/R, appropriate citations should be added to whatever offense/crash is being recorded.

EXHIBIT V-3
Strategy Attributes for Routine Linkage of Citations to Driver Records (T)

Technical Attributes	
Target	Drivers who are unlicensed or who have lost licensure, but who still carry a license that appears valid.
Expected Effectiveness	The impact of this strategy, by itself, has not been evaluated. However, one jurisdiction reports that, for apprehended drivers with licenses that appear valid, about 30% are found to be U/S/R upon record check.
Keys to Success	As in the case of Strategy 2.1 A1, this strategy should not require any new legislative authority, but rather may be implemented administratively at the local level. Ideally, linkage to driver records would occur at the time of apprehension. If that cannot be done, linkage of citations to driver records should occur at least daily. Electronic linkage to the state driver history file is essential for this strategy to be effective.
Potential Difficulties	Accessing the driver history file at the time of apprehension requires officers to have appropriate equipment at the scene. If this is not the case, linkage may occur later at headquarters, ideally on the same day. Lack of support from driver records or the court system will render this strategy infeasible. After this strategy becomes an integral part of enforcement practices, it is likely that the detection of U/S/R driving will decrease, since drivers will become aware of the new program. This decrease should be considered an indication of success and not be grounds for discontinuing the strategy.
Appropriate Measures and Data	Before this strategy is implemented, reliable baseline data should be compiled on the number and proportion of improperly licensed drivers that are detected on the basis of routine enforcement. After implementation, these figures should be calculated on a regular basis to monitor the extent to which the new procedures increase detection of U/S/R driving. The use of this strategy alone may be expected to increase detection of U/S/R drivers, but, by itself, its impact on crashes and injuries has not been demonstrated.
Associated Need for Support Services	The major effort required falls on enforcement, and even here this strategy calls more for a redeployment of existing resources than for additional resources. Nevertheless, those responsible for driver records and relevant court personnel should be alerted to the new procedures, so that they will be aware of the changes in practice. They should also be informed of the reasons for the change (i.e., the inordinately high rate of involvement of U/S/R drivers in serious and fatal crashes).
Organizational and Institutional Attributes	
Organizational, Institutional, and Policy Issues (including interagency participation)	Because this strategy can actually be implemented by enforcement and does not require additional involvement of other agencies, there should be no need for formal arrangements across agencies. However, because both driver records and the judicial system are relevant to strategy success, key personnel in these areas should be fully informed about the program.
Issues Affecting Implementation Time	This strategy is straightforward and, if there is electronic linkage between enforcement headquarters and driver records, it can be implemented in minimal time (i.e., within 6 months). If additional equipment is needed (e.g., hand-held computers to be used by officers at the time of apprehension, or computer linkage at enforcement headquarters to driver records), then additional time may be required.

EXHIBIT V-3 (Continued)
Strategy Attributes for Routine Linkage of Citations to Driver Records (T)

Costs Involved	If no new computer equipment or computer programming is needed, costs should be minimal. If officers do not have computer access to driver records at the time of apprehension, such linkage can occur at headquarters on a daily basis, so that any appropriate additional charges may be entered prior to a citation being forwarded to the court system.
Training and Other Personnel Needs	Training needs should be minimal. In most jurisdictions, officers know how to access driver histories, and this strategy simply formalizes routine use of this practice.
Legislative Needs	This strategy should require no new legislation.
Other Key Attributes	
None	

Strategy 2.1 A3—Create and Distribute "Hot Sheets"

This strategy, too, is categorized as "tried" (see "Explanation of Strategy Types," above), because, although widely used, it has not been objectively evaluated. Still, some jurisdictions report having found the use of "hot sheets" useful in preventing U/S/R driving. "Hot sheets" are lists of drivers who live in the vicinity and whose license has been suspended or revoked. Such lists are created regularly (e.g., weekly or monthly) and distributed to enforcement agencies in the areas. Such lists alert enforcement to facilitate detection.

EXHIBIT V-4
Strategy Attributes for Creating and Distributing "Hot Sheets" (T)

Technical Attributes	
Target	Drivers who are unlicensed or who have lost licensure, but who may still carry a license that appears valid.
Expected Effectiveness	This strategy is widely used, but its effectiveness in reducing crashes has not been documented.
Keys to Success	As in the case of the two previous strategies, this strategy should not require any new legislative authority, but rather may be implemented administratively, ideally at the state level, with the lists distributed to local enforcement agencies. However, in the absence of state initiative, local agencies may request such lists. This strategy has been reported to be more effective if adjoining enforcement agencies work in cooperation with each other through cooperative agreements.
Potential Difficulties	Because driver history records are maintained at the state level, state support is essential for the success of this strategy. Absent such support, it would be difficult for local agencies to implement this strategy.
Appropriate Measures and Data	Before this strategy is implemented, it may be useful to compile data on the number of U/S/R drivers detected. This information will provide a baseline against which to measure the impact of using "hot sheets." In addition, data on crashes involving U/S/R drivers are needed to document the "bottom-line" effect.

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EXHIBIT V-4 (Continued)
Strategy Attributes for Creating and Distributing "Hot Sheets" (T)

Associated Need for Support Services	The success of this strategy requires cooperation among those responsible for driver records, the enforcement personnel, and the local judicial personnel. The state must provide the "hot sheets," but these are of no value unless local enforcement distributes and uses them. If the judicial does not follow through when U/S/R drivers are apprehended, the entire effort is to no avail.
Organizational and Institutional Attributes	
Organizational, Institutional, and Policy Issues (including interagency participation)	In addition to support and cooperation by the state licensing authority, local enforcement, and the local judiciary, it is worthwhile to consider interagency agreements that combine the efforts of adjoining enforcement agencies. Such cooperative agreements enhance the enforcement potential in high-risk areas.
Issues Affecting Implementation Time	If all participating agencies are supportive and there is no new legislation required, implementation might be achieved almost immediately.
Costs Involved	Costs are mainly those associated with creating and distributing the "hot sheets." Because in most states this can be accomplished electronically, once programming is achieved, costs should be minimal. There should be no additional costs to either enforcement or the judiciary.
Training and Other Personnel Needs	There should be no special training requirements, and this strategy may be implemented with existing personnel. Roll-call time may be required to introduce, and occasionally reinforce, the use of the hot sheet.
Legislative Needs	This strategy should require no new legislation, although it is always wise to keep key legislators informed of new initiatives.
Other Key Attributes	
None	

Strategy 2.1 B1—Striping License Plates of Offending U/S/R Drivers to Facilitate Enforcement

Because objective evaluation of this strategy has shown measurable reductions in moving violations, DUIs, and crashes in Oregon (Berg et al., 1993; Voas et al., 1997a; also see Appendix 2), it is categorized as "proven" (see "Explanation of Strategy Types," above). To discourage unlicensed driving, vehicle registration of a vehicle operated by a U/S/R driver may be cancelled and the annual renewal sticker covered with a striped "zebra" sticker. The driver is given a temporary registration good for 60 days. The original registration is mailed to the motor vehicle department, and if the registration is not cleared by the end of the 60 days, it is permanently cancelled. The legal owner of the vehicle, if not the offender, may clear the registration by paying a fee and purchasing a new annual renewal sticker to paste over the striped one, but only if the owner holds a valid driver's license. However, if the offender is the owner, registration may not be cleared until the offender's license is reinstated, and the zebra striping remains on the renewal sticker.

Display of the zebra striping is considered probable cause for an officer to stop a vehicle and check the license status of the driver. Zebra striping of owners' license plates, regardless of whether the offender is the owner, is more effective than restricting striping to vehicles owned by the offender. In Oregon almost half of the striped vehicles were not owned by the offender.

EXHIBIT V-5
Strategy Attributes for Striping the License Plate on Vehicle(s) of Offending Drivers to Facilitate Enforcement (P)

Technical Attributes	
Target	The primary target is U/S/R drivers, including those who continue to drive despite prior sanctions imposed. It should be noted that where this strategy has been applied (Washington State and Oregon), it was evaluated only for drivers convicted of DUI. However, findings for this group are likely to be relevant for other U/S/R drivers.
Expected Effectiveness	This strategy has been shown to be effective. In Oregon, suspended drivers who would be stickered if apprehended showed a 12.7% decrease in moving violations and a 10.9% decrease in crashes, indicating an overall general deterrent effect. Compared with drivers who should have been stickered but were not, drivers who were stickered showed a 40.5% lower rate of moving violations, a 34.5% lower rate of DUIs, and a 58.2% lower rate of driving while suspended (DWS). All these differences were significant (Berg et al., 1993). The strategy saved the state over $15 million per year in reduced crashes and injuries. However, there was no evidence of a specific deterrent effect on subsequent crashes. See Appendix 2 for more information.
Keys to Success	Oregon's program succeeded, while Washington's did not (Voas et al., 1997a). Key differences that led to success in Oregon were the following: • Oregon applied the law regardless of whether the vehicle was owned by the offender or by someone else, but in Washington the law applied only to drivers operating their own vehicles. • Oregon noted on the driver's record that the offender had been stickered, so that accessing the driver's record immediately informed an officer that the offender should not be driving. • Enforcement was apparently higher in Oregon in that, compared with Washington, Oregon had a higher rate of DWS citations in relation to the number of DUI offenders who were suspended. Oregon also showed a significant rise in DWS convictions following implementation of the sticker law, suggesting greater enforcement. • Finally, consequences for violating the sticker law should be handled administratively rather than through the courts. Otherwise, it is likely that consequences will be rare and sporadic.
Potential Difficulties	Perhaps the stickiest issue in this and related strategies concerns whether the strategy should apply to any vehicle operated by the offender or only to those owned by the offender. For maximum impact, the law must apply to all vehicles operated by the offender, regardless of ownership. There must also be an appeals process, so that legitimate owners, who can demonstrate that they were not aware of the license status of the offender, may retrieve their vehicles. However, subsequent apprehension in the vehicle would trigger application of the strategy. Limiting the law's application to only vehicles owned by the offender leads to transferal of ownership and other uses to avoid the law's effect. A second related potential pitfall concerns possible embarrassment by other family members who must operate a stickered vehicle. While this is a real concern, it should not be used to weaken application of the strategy. In Oregon, despite the testimony of officers that the law was "useful and effective," that it made it "easier to identify and cite unlicensed and suspended drivers," and despite testimony that the program prevented about 454 crashes per year, involving over 850 vehicles, 133 injuries, and 4 or 5 fatalities, at a cost savings of over $15 million, the law was rescinded. Reasons given were that it was not believed that it removed "unsafe vehicles off the road," that it took "vehicles away from traffic offenders," or that it provided "swift and sure punishment." Also, most officers did not believe that it got "uninsured drivers off the road."

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EXHIBIT V-5 (Continued)
Strategy Attributes for Striping the License Plate on Vehicle(s) of Offending Drivers to Facilitate Enforcement (P)

	Washington State, with a similar law but one that was not as well implemented or enforced, followed suit and rescinded the law as well. Oregon's experience with the sticker law clearly underscores the importance of having key stakeholders onboard and fully informed of the purpose of the program, as well as its effectiveness.
Appropriate Measures and Data	Reliable data are needed for both program operation and program evaluation. It is important that stickering activities be quickly communicated to and recorded by licensing personnel. Vehicle registration files should also incorporate this information. Information on the vehicle registration file is important to detect license plate substitution during program operation. Information on the driver history file is needed so that, if other family members must use the vehicle, then their right to legally drive will be apparent. Second, such information is important to know how many and which U/S/R drivers are affected by the countermeasure to determine the extent to which the program is being implemented. Data are also needed for program monitoring and evaluation. Data on the driver's file will show the extent to which the program is being implemented (that is, what proportion of eligible drivers are being stickered), as well as which U/S/R drivers are affected (are there biases where drivers are subjected to such stickering—e.g., drivers of older cars?). Driver file data will also enable evaluation of how effective such vehicle stickering is in reducing illegal driving by U/S/R drivers. If sufficient numbers are involved, it should also be possible to quantify the impact of the program on crashes. Data on both vehicle registration and driver history files should include the date the stickering went into effect, the date it is scheduled to be removed, and the date it is actually removed. The effect of the law should be measured for both general deterrence (its impact on drivers who are not apprehended but would be subject to the law if apprehended), and specific deterrence (its impact on drivers who are driving with a stickered license). General deterrence measures should include • Driving while U/S/R (DWS) citations for U/S/R drivers who have not been stickered • Other citations for U/S/R drivers • Crashes for U/S/R drivers Specific deterrence measures should include • Number of and time to subsequent U/S/R citations for stickered drivers • Other U/S/R citations for stickered drivers • Crashes for U/S/R for stickered drivers
Associated Need for Support Services	Success of this strategy requires that the driver history file include notation of drivers who have been apprehended and had their vehicles stickered. Without this information being readily available, it is virtually impossible to apply the law in a timely manner. Consequently, the support and involvement of those responsible for driver records is essential. Also essential is the support of enforcement at the highest levels. Based on Oregon's experience, key legislators should probably be involved, or at least kept well informed. Finally, as with any new enforcement activity, it is important that the public understands the program and appreciates its value. The message to get to the public (and to the legislature) is that U/S/R drivers are much less likely to respond to traditional sanctions (e.g., license revocation, fines) and are greatly over-represented in fatal crashes, and there is a legitimate public interest in keeping them off the road.

EXHIBIT V-5 (Continued)
Strategy Attributes for Striping the License Plate on Vehicle(s) of Offending Drivers to Facilitate Enforcement (P)

Organizational and Institutional Attributes	
Organizational, Institutional, and Policy Issues	Given enabling legislation, all key stakeholders should be involved in assessing the proposed implementation and operation of the program. Essential to success is the routine notation on driver records of offenders showing that they are restricted to driving stickered vehicles. Also essential is the ability to routinely check the driver's record, preferably at the time of apprehension, to determine license status. Consequently, those responsible for driver licensing and records must be part of the planning process. Likewise, those at the highest level of enforcement must be onboard and supportive of the program. They must be willing to commit enforcement time to implement the law. Finally, the judicial system must be supportive and willing to follow through. However, with enabling legislation, the consequences of violating the sticker requirement should be handled administratively, not through the courts.
Issues Affecting Implementation Time	Getting enabling legislation enacted will require a major amount of time. The time required depends upon the frequency and duration with which the state legislature meets, as well as the receptivity of key legislators responsible for traffic safety legislation. With enabling legislation in place, the time required for implementation should not have to exceed 1 year.
Costs Involved	There will be costs associated with the development of new forms, programming modifications to facilitate relevant entries on driver records, compilation of relevant baseline data, and monitoring of data after the program is in effect. Costs will also be incurred in training enforcement personnel on how to implement the program. Where in-service training of enforcement occurs routinely, this training can readily be incorporated. However, where no routine training occurs, additional training costs will be incurred. Once a program is operational, fines from convicted offenders could also be set at a level to cover any additional costs of enforcement.
Training and Other Personnel Needs	While training needs are minimal, they are also necessary for an effective program. Enforcement personnel must be trained in both the logic and the procedures of apprehending and stickering vehicle plates, and driver record personnel must know how to record relevant activities. Research personnel will also be required for program evaluation.
Legislative Needs	It is likely that enabling legislation will be required. As with any such measure, it is important to have a "champion" in the legislative body, ideally on the highway safety committee. However, it is also important that this champion be provided with all the supporting information required to shepherd the measure through the legislative process. In seeking traffic safety legislation, it is often useful to include a "sunset clause" that enacts a law for a specified period of time (e.g., 3 years; shorter time frames would make evaluation difficult). The legislation should also include a requirement that the program be independently evaluated, with a report back to the legislature prior to the end of the initial period. Depending on the outcome of the evaluation, the legislature could decide to extend the program or let it come to an end (or strengthen it, based on identified problems). Legislation that includes a sunset clause frequently facilitates passage, since it is generally agreed that if the program is not effective, there is no point in extending it, but if effectiveness is demonstrated, there should be broad-based support.
Other Key Attributes	
None	

Strategy 2.1 B2—Impoundment and Destruction of License Plates

This strategy has been applied only in Minnesota, but it has been shown to be effective in reducing recidivism rates. It has been subjected to careful ongoing evaluation, with revisions based on experience. In 1988 Minnesota implemented a law whereby violators arrested three or more times for DUI had the license plates of their vehicles impounded and destroyed. From August 1988 through December 1990, this law was administered through the court system. It was enforced in only about 5 percent of the cases in which it was required. Beginning in January 1991, the law was administered by enforcement and driver licensing offices. In addition, the law enforcement officer was to impound and destroy the license plate of the vehicle in which the offender was apprehended, regardless of ownership. This change from judicial to administrative enforcement led to a twelvefold increase in the imposition of the law. Still, it was imposed in only 64 percent of the cases calling for it. In the other cases, the officer failed to issue the order, and the violator had no vehicles registered, so that there could be no subsequent order issued.

While the law was enforced through the judicial system, it showed no effect, not surprising since it was rarely invoked. Once enforcement became administrative, there was a clear impact of the law. Based on survival analysis (the proportion of violators who have not had repeat offenses at specified points in time), offenders to whom the law was applied were less likely to recidivate. Those who experienced immediate license impoundment by the arresting officer did best, followed by those whose license plates were impounded subsequently by mail.

Three-time offenders (the level at which the law is triggered) did better than those with four or more offenses, but both groups performed better under the administrative imposition of the law, showing higher rates of "survival" (no repeat offenses) compared with similar offenders who did not experience license impoundment.

Once implemented, this strategy is relatively low-cost and can be a valuable part of a program to reduce U/S/R driving.

EXHIBIT V-6
Strategy Attributes for Seizure and Destruction of License Plates of Offending U/S/R Drivers (P)

Technical Attributes	
Target	While the offending driver is the ultimate target, the immediate focus is on the vehicle in which the offender is apprehended.
Expected Effectiveness	This strategy has been proven to be effective in Minnesota, where its impact was measured by length of time between offenses. For three-time offenders, at 12 and 24 months following the event, 16% and 26% of those whose plates were not seized had repeat offenses, compared with only 8% and 13% of those whose plates were seized by the arresting officer (the most effective intervention). For these offenders, this measure reduced recidivism by half, a highly significant difference. For offenders with 4 or more arrests, recidivism rates were again lower for those experiencing license seizure. At 12 and 24 months following the event, 10% and 17% of the officer-order group had repeat offenses, compared with 18% and 26% of the comparison group. Both these differences are highly significant. In contrast, judicial administration of the law was no different for offenders with no intervention (Rodgers, 1994).

EXHIBIT V-6 (Continued)
Strategy Attributes for Seizure and Destruction of License Plates of Offending U/S/R Drivers (P)

	The law appears to be more effective with three-time offenders than with offenders apprehended four times or more (although it is still effective with the latter). Because there are far more three-time offenders, the greater impact is particularly important. See Appendix 3 for additional information.
Keys to Success	It is essential that implementation is administrative, not judicial. When it was administered through the courts, it was applied to only about 5% of eligible offenders. When it was implemented administratively, this rate increased to 64%, a twelvefold increase but still far short of what it should be. A second key factor is application of the law regardless of vehicle ownership. Previously a validly licensed owner could re-register the vehicle at no charge but had to sign a statement promising not to make the vehicle available to the offender in the future. Recently the law was further revised, so that even if the vehicle is owned by someone else, the registration is cancelled and the vehicle must show a special license plate for a minimum of 1 year (plus the owner must pay for the entire process.) The only exception is if the owner has reported the vehicle missing prior to the driver being apprehended (Bowler, personal communication, 2002). Another key to success is having up-to-date information on license status readily available to arresting officers. In addition, plate impoundment should be recorded on the driver's history. Finally, because continuing enforcement support for this strategy is essential for its success, some provision should be made for giving feedback to participating enforcement agencies concerning the impact of the program.
Potential Difficulties	Probably the most critical key to success is ensuring that the law is implemented administratively, preferably by the arresting officer, rather than through the court system. When it was handled by mailed order from the licensing agency, it was still significantly effective, but implementation by the officer at the time of apprehension appears to have a somewhat stronger impact. Clearly, applying the law evenly can also be a problem. It may take time to get it fully implemented, but it appears to be a worthwhile strategy.
Appropriate Measures and Data	Prior to program implementation, baseline data should be compiled to determine the frequency of DUI offenses, as well as the frequency of repeat offenses. Once the program is implemented, specific deterrence measures should include • Number of prior DUI and DWS offenses on an offender's record. • Whether the offender or someone else owns the vehicle. • Proportion of eligible offenders who actually experience plate impoundment. • Whether plate impoundment is ordered by the arresting officer, or afterward by the licensing authority. • Proportion of repeat offenders in each group over time. • Number of U/S/R offenses by drivers experiencing plate impoundment. • Other subsequent offenses by this group. • Subsequent crashes by this group. Ideally, this program would have a deterrent effect on offenders who would be subject to the strategy should they drive illegally. To the extent that this occurs, they will not be included in the ranks of offenders, but their deterrence should be seen in overall decreases in their offense rates.

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EXHIBIT V-6 (Continued)
Strategy Attributes for Seizure and Destruction of License Plates of Offending U/S/R Drivers (P)

	General deterrence measures should include • U/S/R offenses by eligible drivers who have not experienced plate impoundment. • Other citations for this group. • Crashes for this group.
Associated Need for Support Services	The driver licensing authority must work closely with the law enforcement agency for this strategy to be optimally successful. Driver history information must be available, preferably in real time, to the arresting officer, and driver records must be updated to include data relevant to the implementation of this strategy (e.g., when an offender's plates have been impounded). Vehicle registration records must also be up-to-date and available to arresting officers.
Organizational and Institutional Attributes	
Organizational, Institutional, and Policy Issues	Whether legislative authority for this strategy already exists is crucial. In its absence, it will be important to work closely with enforcement, licensing, and vehicle registration to gain their support for seeking authorizing legislation. After enactment, these agencies still need to work closely together to ensure that all parts of the program are coordinated. Because much enforcement is conducted by local agencies (county, municipal), these groups will need to be included from the outset. Local enforcement can make or break the effectiveness of a strategy. There is no substitute for gaining their support.
Issues Affecting Implementation Time	Implementation time will be greatly affected by whether authorizing legislation exists or must be sought. In some jurisdictions, legislatures meet more frequently than others, so that opportunity for legislative enactment will vary.
Costs Involved	Both the public and key legislators will need to be "educated." Associated costs will include preparation of clear, concise materials that can be used by the media as well as by legislative staff. These materials should include some estimates of the anticipated impact on that state and the costs, economic and other, that may be avoided through implementation of the program. Implementation costs will include costs of developing and preparing forms; programming state records; and training personnel, including enforcement, traffic records, and judicial.
Training and Other Personnel Needs	Enforcement personnel will be on the "front line" for this strategy. They will need to be fully informed of how the law is to be implemented, what records will need to be accessed, what forms will need to be completed, and where information should be sent. Relevant personnel in driver records and vehicle registration will also need to be prepared to deal with the new program and ensure that records are regularly updated and easily accessed.
Legislative Needs	Whether existing laws authorize plate impoundment must be determined prior to any program implementation. If no authorizing legislation exists, then it will be necessary to seek it. In doing so, those responsible for highway safety should be fully informed as to the value of this strategy, as well as the societal costs of U/S/R driving.
Other Key Attributes	
None	

Strategy 2.1 C1—Immobilize/Impound/Seize the Vehicle Operated by the Offender

This strategy has been used in a number of places, and it has been shown to be effective in at least California and Ohio (DeYoung, 1999; DeYoung, 2000; Voas, 1992; Voas et al., 1997b and 1998). This strategy is generally applied to multiple offenders—that is, those who have not complied with license restriction. However, some implementations use legislation that allows immobilization/impoundment/seizure for a first offense. Rather than simply confiscating the license plate, the entire vehicle may be rendered unavailable to the offender through immobilizing the vehicle (e.g., "booting" a wheel or placing a "club" on the steering wheel to immobilize it), or actually removing it from the offender's possession, or even seizing it for sale by the state.

Immobilization/impoundment/seizure may be applied to the vehicle(s) owned by the offender and in which the offender is apprehended, or it may apply to any vehicle, regardless of ownership, in which the offender is apprehended. The latter approach appears to be more effective, although it is also more controversial.

EXHIBIT V-7
Strategy Attributes for Immobilizing/Impounding/Seizing Offender's Vehicle (P)

Technical Attributes	
Target	The direct target is the vehicle in which the offender is apprehended, but the ultimate target is the offender.
Expected Effectiveness	This strategy has been used in several locations and has been proven to be effective in reducing U/S/R driving, as well as crashes. Evaluations of programs in Ohio and California indicate that drivers experiencing vehicle immobilization/impoundment have significantly fewer subsequent offenses. In Ohio, reported reductions in subsequent DWS and/or DUI offenses during the period of impoundment ranged from 38% to 100%, compared with eligible drivers who did not experience immobilization/impoundment. Following the period of immobilization/impoundment, reductions in DWS were 15% and DUI, 24%. There were variations in reductions related to whether the offense was DWS or DUI and whether it was a first, second, or third offense. In California, significant decreases in DWS/DUI offenses were seen between eligible drivers who experienced impoundment and those who did not. Interestingly, the effect was greater for repeat offenders, 34% reduction versus 24% for first offenders. Subsequent rates of other traffic convictions also dropped, with decreases of about 18% to 22%. Crashes were also significantly lower, with a 25% reduction for first offenders and a 38% reduction for repeat offenders. See Appendix 4 for additional information on this strategy.
Keys to Success	There should be broad general support for an impoundment program, and particularly from key leadership of the responsible agencies. Seizing property can create loss of public support unless there is adequate preparation and education ahead of time. Interestingly, in Manitoba it was found that vehicle impoundment and forfeiture were no more effective than vehicle impoundment alone, suggesting that it may be wiser to limit a program to impoundment only (Voas et al., 1999). Perhaps most important is the extent to which enforcement is supportive of this strategy. It appears that the sanction is applied to only a portion of those eligible, and the basis for uneven application is not clear. Enforcement leadership should be involved from the beginning of any effort to use this strategy.

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EXHIBIT V-7 (Continued)
Strategy Attributes for Immobilizing/Impounding/Seizing Offender's Vehicle (P)

	Also important to success is to make the implementation of the sanction administrative, similar to administrative per se laws for drinking and driving. When the discretion is left to the courts, there is great variation in the extent to which the sanction is applied, and overall application is generally very low. When the sanction is applied administratively, it is more uniformly applied. The program should apply to any vehicle in which the offender is apprehended, regardless of ownership. If it applies only to offender-owned vehicles, it is likely that the title to the vehicle will be transferred to the spouse, some other family member, or friend, thus evading imposition of the sanction. Provision should be made for validly licensed owners who may not be aware of the driver's license status. Before a vehicle is released to such an owner, a signed statement should be obtained promising that the vehicle will not be made available again to the offender. Also important to success is careful coordination across agencies and timely and accurate recording of the measures taken. The agency responsible for driver records has to be involved, so that vehicle immobilization/impoundment/seizure is recorded on the offender's driving history. This information is essential to monitor the program to determine how widely it is being applied and to evaluate its impact on both apprehended and other S/R drivers.
Potential Difficulties	Lack of enforcement, or lack of uniform enforcement, is a major concern. If enforcement does not support the strategy, it will not be effective. Implementation must be administrative, not judicial. Failure to keep current and accessible driver history and vehicle registration records will compromise enforcement. When the vehicle is a "junker," the offender may not seek to reclaim it. Towing and impounding fees can exceed the vehicle value. This issue needs to be considered early on.
Appropriate Measures and Data	General deterrence measures should include • Driving while U/S/R (DWU/DWS/driving while revoked [DWR]) citations for U/S/R drivers who have not had vehicle immobilized/impounded/seized • Other citations for U/S/R drivers who have not had vehicle immobilized/impounded/seized • Crashes for U/S/R drivers who have not had vehicle immobilized/impounded/seized Specific deterrence measures should include • Subsequent U/S/R citations for U/S/R drivers who have had vehicle immobilized/impounded/seized • Other subsequent citations for U/S/R drivers who have had vehicle immobilized/impounded/seized • Subsequent crashes for U/S/R for drivers who have had vehicle immobilized/impounded/seized • For offenders whose vehicles were immobilized/impounded/seized, the following should also be examined:

EXHIBIT V-7 (Continued)
Strategy Attributes for Immobilizing/Impounding/Seizing Offender's Vehicle (P)

	– Comparison of driver records for offenders owning the immobilized/impounded/seized vehicle versus offenders who were not the owners of the immobilized/impounded/seized vehicle – Proportion that redeem vehicles at end of sanction period – Vehicle characteristics of redeemed versus forfeited vehicles Longer-term evaluation should examine citations and crashes following license reinstatement.
Associated Needs for Support Services	The public should be well informed about the strategy and the reasons for it. General deterrence will depend on the extent to which the public is knowledgeable about and supportive of the program. This will necessitate a carefully designed public information and education program, requiring the services of media professionals and the enlistment of media. Procedures should be developed for maintaining current driver license and vehicle registration records that are accessible in real time. If enforcement personnel can readily access these records, this strategy should be more effective. In turn, the vehicle registration and driver license records need to note when vehicles have been immobilized/impounded/seized. Additional software and hardware may be necessary to accomplish the desired data processing. Also essential for this strategy is a system for towing and impounding seized vehicles, as well as selling forfeited vehicles. This service can be handled by the private sector, a procedure that can avoid potential criticism of the enforcement agency.
Organizational and Institutional Attributes	
Organizational, Institutional, and Policy Issues	Even if legal authority exists for implementing this strategy, it will be most effective if it is supported by state legislative leaders, as well as the heads of state law enforcement associations. The judicial system, and especially the office of the district attorney, also needs to be supportive of this strategy if it is to succeed. Appropriate personnel from the court system should be included from the earliest planning stages. Also, those responsible for driver and vehicle registration systems should be part of the planning process.
Issues Affecting Implementation Time	Whether legislative authority already exists or must be sought will determine the time required for implementation. If legislative authority already exists, implementation time should be less than a year. In the absence of enabling legislation, the time required will depend on how long it takes to get the necessary authority.
Costs Involved	Funding will be required to generate both public and state support for the program. Costs will also involve training of enforcement, traffic records, and judicial personnel. Finally, there will be the cost of conducting a rigorous evaluation and report on the initial program. Vehicle impoundment can be costly, especially for older vehicles of relatively low value. The impounding authority may incur costs that exceed vehicle value. Vehicle immobilization is less costly, but it still entails the cost of the immobilizing equipment and the cost of moving the vehicle to the owner's place of residence or other designated location. Costs should be borne by the offender.

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EXHIBIT V-7 (Continued)
Strategy Attributes for Immobilizing/Impounding/Seizing Offender's Vehicle (P)

Training and Other Other Personnel Needs	Training enforcement will be the primary training need. However, some training will be required for relevant personnel in the judicial system and in driver and vehicle records systems. Private companies providing towing services will also need to be trained and monitored to ensure compliance with laws and statutes and accounting for vehicle condition and all vehicle contents. Once the program is in place, it should become an integral part of ongoing operation and should not require additional personnel, with the possible exception of very large jurisdictions where the volume of cases may require additional help.
Legislative Needs	Legislative authority may already exist for this strategy. Careful inquiry should determine the case in a particular jurisdiction. Most states have some provision for vehicle sanctions (including vehicle registration cancellation, special plates for DUI offenders, and vehicle impoundment and forfeiture), but they are rarely applied, and then only to the worst offenders. This reluctance to implement will need to be confronted and addressed (Peck and Voas, 2002).
Other Key Attributes	
None	

Strategy 2.1 C2—Install Ignition Interlock Device (IID) in Offender's Vehicle

Requiring use of the IID has been shown to be effective when properly implemented and monitored (Beck et al., 1997; Coben and Larkin, 1999; Voas et al., 1999). Usually applied only to repeat DUI offenders, the installation of an IID into the offender's vehicle enables only sober drivers to operate the vehicle. To be effective, the system must include a "rolling retest system" (i.e., the interlock requires a new "test" every x minutes of driving) that prevents someone other than the offender to start the vehicle and then allow the offender to take over. The system must also include a data-logging mechanism that records the date and time of all breath tests and vehicle operations, and also the BAC reading.

It is important to note that this strategy, in a strict sense, is not designed to keep S/R drivers off the road. Rather, it is to ensure that when a convicted driver, after license reinstatement, does drive, he or she is not intoxicated. Consequently, this strategy can be used to reduce hazardous driving by re-licensed U/S/R drivers. From a traffic safety standpoint, this would be a benefit and is consistent with the overall goal of ensuring that drivers are fully licensed and competent to drive.

For drivers whose driving is restricted for reasons other than alcohol, the same IID can be modified so as to identify the offender as the driver and record the time during which driving occurs. Thus, for an offender who is restricted to driving to and from work during work days, the record from the IID will record whether those were the only times the vehicle was in operation. IID records should be routinely reviewed by licensing personnel to ensure compliance with sanctions.

EXHIBIT V-8
Strategy Attributes for Installation of IID in Offender's Vehicle (P)

Technical Attributes	
Target	The target of this strategy has been the repeat DUI offender. However, it can also be used to monitor the driving of other offender types.
Expected Effectiveness	When properly implemented, this strategy has been shown to be effective. For drivers with multiple DUI offenses, use of the IID reduces recidivism in the first year by about 65%. However, once the IID is removed, there is no lasting beneficial effect. See Appendix 5 for additional information on the Maryland program.
Keys to Success	This strategy needs to be applied more broadly to realize its full potential. It should not be simply an option offered by the licensing authority. The courts need to impose the sanction on convicted DUI offenders as a condition of probation (as opposed to incarceration). When it is merely an option offered by the licensing agency, it is not widely used (Voas, 1999). Therefore, the judicial system has to be a willing participant in this strategy and require the use of an IID as a condition for resumption of driving. There must also be an adequate network of installers who are certified to monitor the system and ensure that it is working properly. These installers/monitors also periodically submit records to the DMV, providing a complete history of the driver's attempts to use the vehicle. Of critical importance is the availability of the expertise to install, service, and monitor the use of IIDs. State agencies are not likely to be able to provide this function and must arrange with a private organization for this service. This requirement for professional installation and monitoring cannot occur if there is only sporadic assignment to IID use. There must be a "critical mass" of users in order to warrant the involvement of a private contractor. Finally, program success requires that the service provider be monitored as well as the offender.
Potential Difficulties	If the use of the IID is not required but is only an option, its cost will prevent wide use. As a result, drivers are more likely to opt for full license suspension, which means there will be a higher risk of subsequent offenses. In California it was found that, even though the law required the installation of IIDs for all repeat offenders, this was occurring in less than 21% of the cases (as of 1997, most recent data available) (Tashima and Helander, 2000). The key problem appeared to be the incongruity of IID installation when the offender was not licensed to drive at all. Required use with appropriate follow-through to ensure application of the law will greatly increase use, bring down the cost, and increase the impact of the strategy.
Appropriate Measures and Data	Impact measures should focus on the offender and specific deterrence, in that there is no reason to anticipate that the IID would have any general deterrence effect. Because the sanction is not widely applied, it is possible to compare those using the IID with comparable drivers under full license suspension. Major outcome measures should include comparisons of drivers restricted to the IID with drivers under full license suspension/revocation on the following: • Subsequent citations for DUI • Subsequent citations for other offenses

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EXHIBIT V-8 (Continued)
Strategy Attributes for Installation of IID in Offender's Vehicle (P)

	• Subsequent crashes in which the driver has not been using alcohol • Subsequent crashes in which the driver has been using alcohol Because it is legal for drivers to drive with the IID, there would be no citations issued for interlock drivers who are driving but who have not committed any offense. Also of interest, particularly in the early stages of an IID program, would be monitoring of the extent to which it is being used (process evaluation). For this evaluation, the following data would be needed: • Number of drivers eligible for IID, or in some cases, required by law to have IID • Number of drivers for whom IID is required • Characteristics of the two groups (demographics, prior driving history) • Basis of IID assignment (by the court, by DMV, other relevant information)
Associated Need for Support Services	There must be an organization or agency, usually one or more private contractors, responsible for the installation, maintenance, and monitoring of the IID, both to ensure that the equipment is functioning properly and to ensure that the driver is complying with all requirements. There must also be a way for the licensing authority to oversee the entire process, routinely reviewing the records from the IID and working closely with the private providers to ensure quality control.
Organizational and Institutional Attributes	
Organizational, Institutional, and Policy Issues	An effective IID program requires close interagency cooperation and coordination. The program can be administered primarily through the courts or through the licensing authority, but on the basis of other studies, it is likely to be more evenly applied if it is through the licensing authority. The administering agency must work closely with enforcement and with the contractor providing, installing, and maintaining the equipment. There should be one office responsible for oversight of the entire program and with the authority to make necessary changes. It should be noted that medical advisory boards (MABs) may also require IIDs as part of driving restrictions. The MAB would probably monitor its own clients, in light of other medical information that is not publicly available. However, where there is overlap (monitoring the same driver), the administrative program must work closely with the MAB.
Issues Affecting Implementation Time	If this strategy is to be implemented administratively through the licensing authority (much preferred over judicial administration), enabling legislation may be required. The time required to secure this legislation will depend on legislative leadership, public support, and frequency with which the legislature convenes. Some time will also be required to identify and work with a private contractor who can provide, maintain, and monitor the necessary equipment. State contracting requirements will vary and will affect implementation time. Finally, some time will be required for training personnel, including those responsible for enforcement (including those who monitor the IID records) and for designing and producing monitoring and record-keeping systems.
Costs Involved	Offending drivers pay the costs of using the IID. They pay a monthly fee that covers the cost of the equipment, its maintenance and monitoring, and other associated expenses. Because some offenders will not be able to afford the full cost, the participating manufacturers are required to make special arrangements for such offenders and to provide the service for a reduced fee. Although in Maryland the fees do not pay for program administration, fees could be set to reimburse the state for its expenses.

EXHIBIT V-8 (Continued)
Strategy Attributes for Installation of IID in Offender's Vehicle (P)

Training and Other Personnel Needs	Additional personnel will be required to administer the program within the licensing authority. In Maryland there is one manager who oversees the entire program, plus two administrative assistants, and another person who works on a contractual basis. In 2-1/2 years the Maryland program grew from handling 800 clients to administering 3,700. The larger the program, the more personnel will be required to administer it. Maryland uses four manufacturer contractors that meet its requirements. The program manager meets with the manufacturers quarterly to review the program, identify any problems, and provide feedback. In one sense, training is considered an ongoing process. However, the bulk of personnel requirements are provided by the contractors who work directly with the equipment and the record production.
Legislative Needs	Enabling legislation may be required, depending on the degree to which administrative authority is delegated to the licensing agency and the court system. Courts usually are allowed considerable discretion in imposing sanctions, so that theoretically the IID could be required without enabling legislation. However, the experience in California indicates that even with a legislative mandate, courts have largely ignored the required use of IID for repeat offenders. Any state considering this sanction should pay close attention to the California experience. Although legislation requiring IID for repeat offenders was enacted in 1993, in actual practice IID was rarely imposed. In 1999, new legislation consisted of • Mandatory IID for DUI U/S/R drivers who are caught driving while U/S/R. • Early reinstatement (of license) for repeat DUI offenders who had received a post-conviction suspension/revocation, with installation of IID. • Permissive court orders for IID, with judges encouraged to require IID in cases of high BAC (0.20%), chemical test refusal, or a DUI offender with a record of traffic convictions (Helander, personal communication, 2000). These provisions are based on California Vehicle Code (CVC 23246).
Other Key Attributes	
None	

2.1 D1—Impose Electronic Monitoring (EM) or "House Arrest"

EM of repeat offenders has been shown to be effective in reducing DUI offenses. It is also an extremely cost-effective measure to reduce U/S/R driving. Considered as an alternative to incarceration, electronic monitoring, or EM (also referred to as "house arrest") can be an effective tool for restricting the activities of repeat offenders, including driving. It is appropriate only for offenders who are not considered hazardous to themselves or others. Repeat DUIs are the most likely traffic offenders to be assigned to EM, and for this group EM has been shown to be effective. However, for EM to succeed, it must be a condition of probation, with incarceration a potential consequence of violations of restrictions.

EM enables offenders to continue in regular employment and to maintain family and other personal relationships. In EM, the offender wears an anklet that sends signals to a host computer, relaying data on the whereabouts of the wearer. The times and places that an offender may legitimately be located are established at the outset, and violations of these restrictions may be detected. In this way, the activities of the offender are closely monitored.

EXHIBIT V-9
Strategy Attributes for EM or House Arrest (P)

Technical Attributes	
Target	Usually repeat DUI offenders, but any offender requiring close monitoring but not considered dangerous otherwise. Most participants in EM programs are there because of either DUI or DWS offenses (usually related to earlier DUI offenses).
Expected Effectiveness	This strategy has been shown to be highly effective in reducing repeat DUI offenses, as well as costing considerably less than incarceration. In Palm Beach County, Florida, over a 7-year period of evaluation, successful completion of the EM phase of probation was 97% or higher. However, successful completion of the entire period of probation, in which EM constituted only the first part, fell as low as 77.5% (Lilly et al., 1993). Additional information on the Palm Beach County program can be found in Appendixes 6.1, 6.2, and 6.3.
Keys to Success	Generate public support by emphasizing the cost savings over the alternative of incarceration. Where jails are overcrowded, jail sentences of these offenders may require the construction of expensive new facilities. Also, publicize the effectiveness of EM in reducing illegal driving by the offender.
Potential Difficulties	There may be objections to EM by those who consider it too lenient for repeat DUI or driving under suspension (DUS) offenders. Be prepared to deal with this opposition, emphasizing the greater length of EM sentences (estimated to be about three times those of incarceration), the close monitoring imposed, its effectiveness in preventing DUI offenses, and especially the cost savings to the public. A second potential problem is the possibility of unrealistic cost savings promised by eager equipment vendors. Too often they omit the real costs of program monitoring. They are also likely to calculate jail costs based on jail sentences as lengthy as EM sentences. In reality, jail sentences tend to be about one-third the length of EM sentences. A very real difficulty, and one not anticipated but experienced in Palm Beach County, is internal corruption in the program. Because some participants will be in positions of wealth and influence, they may offer incentives to program monitors in exchange for special considerations. There must be built-in checks and balances to preclude the possibility of such temptations.
Appropriate Measures and Data	Demographic characteristics of those assigned to EM compared with eligible participants who are not assigned need to be monitored to ensure there are no biases in who is assigned to the program. In Palm Beach County, they found no bias based on sex, age, race/ethnicity, family status, education, or employment. However, there was some indication that persons with lower annual incomes were less likely to be assigned to the program. Numbers and types of violations of EM need to be closely monitored. In Palm Beach County, violations were usually of other conditions of probation (e.g., failure to participate in a mandated alcohol/drug treatment program or failure to pay monitoring fees) rather than violations specific to home confinement itself. Measures of successful completion of the EM phase of probation, as well as the total probation period, need to be compiled. Also, post-probation records need to be followed to determine any long-term effects of EM probation. Finally, comparison needs to be made between EM participants and other comparable offenders not assigned to EM. These comparisons may come from the same jurisdiction or, if EM assignment is mandatory, either from prior time periods or from comparable jurisdiction(s) not employing EM. Appendix 6.2 provides more information on offender characteristics and outcomes.

EXHIBIT V-9 (Continued)
Strategy Attributes for EM or House Arrest (P)

Associated Need for Support Services	An EM program requires a qualified private contractor to provide the equipment and the technical support necessary to a successful program. When Palm Beach County initiated its program, it had to work closely with manufacturers to develop the necessary equipment and procedures. Jurisdictions considering an EM program should take advantage of what other jurisdictions have already learned about implementing and administering a successful EM program.
Organizational and Institutional Attributes	
Organizational, Institutional, and Policy Issues	A successful EM program requires coordination and cooperation between the court system and those actually administering the program. In Palm Beach County the program is administered through the sheriff's office, but it can be housed in any enforcement agency, as long as there is a qualified person with primary responsibility for overseeing the program. There must also be close coordination with one or more qualified manufacturer-providers to handle the equipment and much of the technology required for a successful program. Finally, there must be good relations with the public and with those responsible for the legislative or administrative authority for the program. In Palm Beach County the authority stems from the county commissioners, but this may vary from one jurisdiction to another.
Issues Affecting Implementation Time	The authority for initiating such a program needs to be clearly established at the outset. It is likely that in most jurisdictions such authority already exists, at least at the discretion of the court. However, the source of the authority, whether it is the court system, the legislators, the county commissioners, or others, needs to participate in the decision to implement such a program. The length of time required for establishing this authority may vary. The initial installation and implementation of a program is likely to take time. It is also likely to require many in-course corrections as new problems are detected. However, in this regard, contact with existing programs should greatly reduce implementation time.
Costs Involved	In the early stages of this program, during planning and initial implementation, it is likely that outside funds will be required. There will be initial start-up costs for equipment, personnel, and training. Based on the demonstrated success of this program where it has been implemented, a strong case may be made to the state office of highway safety for initial support. However, once the program is established, it should be self-sustaining, using fees paid by program participants. Fees based on a sliding scale, so that wealthier offenders subsidize lower-income offenders, were used successfully in Palm Beach County and in Los Angeles County. Appendix 6.3 provides more information on costs and savings. Although many offenders will gladly pay for avoiding incarceration, it is probably not wise to establish a fee structure that generates funds above program costs. The public may not look fondly on law enforcement agencies generating profits. However, the participating offenders should pay fees that cover total program costs, including equipment installation, monitoring offender activities, treatment/rehabilitation costs, and other associated expenses.
Training and Other Personnel Needs	Those responsible for monitoring the offenders, as well as the manufacturers/providers, will need to be trained and become familiar with the program. Here much can be gained by studying existing successful programs.
Legislative Needs	It is unlikely that specific legislation will be required for establishing an EM program. However, there are a few states in which local authority is limited, and enabling legislation will be required from the state. Interested jurisdictions will need to ascertain what can be done in the absence of specific legislative action.

Strategy 2.1 D2—Incarcerate Offenders

Incarceration is not a cost-effective strategy if used in isolation (Martin et al., 1993). However, it is an essential ingredient in the use of other strategies. When an offender is jailed, there is no opportunity for U/S/R driving, at least during the period of incarceration. Incarceration should be considered only as a last resort. Because EM or other sanctions are likely to be at least as effective and cost much less in both financial and human terms, they should be used in preference to incarceration whenever feasible. The greatest value of incarceration as a sanction may be its implied threat should offenders fail to comply with less severe sanctions. Without the real possibility of incarceration, other sanctions may lose their effectiveness. Therefore, incarceration should be retained as a potential sanction and imposed wherever appropriate (e.g., failure to comply with other sanction requirements) so that it remains a viable threat.

EXHIBIT V-10
Strategy Attributes for Incarceration of Offenders (P)

Technical Attributes	
Target	Usually repeat DUI and/or DUS offenders who fail to comply with other driving restrictions.
Expected Effectiveness	Incarceration is certainly effective during the period of confinement. However, subsequent performance is, if anything, worse than it would be in the absence of incarceration. By itself, incarceration has been shown to be ineffective or no more effective than less costly alternatives. However, the primary effectiveness of incarceration appears to be from its potential imposition to encourage compliance with less restrictive sanctions (e.g., IID or EM).
Keys to Success	The threat of incarceration must be real—that is, failure to comply with other sanctions must result in incarceration. However, this strategy is most effective when it is not imposed—that is, when it results in compliance with less restrictive (and less costly) alternatives.
Potential Difficulties	One of the major concerns about incarceration is its uneven application. If jail sentences are mandatory and the public views the sanction as unduly harsh, it is likely that there will be increased plea-bargaining and reduced convictions. It is not unusual for judges to vary in their use of the sanction. Such inequity weakens the overall effectiveness of this sanction. The greatest problem with incarceration is its cost. It is an extremely expensive sanction, and when it is widely mandated, it can require the release of more dangerous convicted felons in order to make room for traffic offenders or require new facility construction. It can also result in overcrowding and illegal conditions in the jails, inviting legal challenges. Although incarceration is favored by the public, it is not a highly desirable measure in its own right.
Appropriate Measures and Data	Since traffic offenses cannot occur during incarceration, evaluation of its effect must be based on performance following release. If the period of incarceration is short, the difference with nonincarceration options should not be great, but it should make a difference for extended periods of incarceration. Detailed data on number and types of traffic offenses, as well as demographics of the offenders, should be compiled. Similar data should be collected from comparable offenders not experiencing incarceration. Specific deterrence measures would include • Subsequent U/S/R citations for offenders who have been incarcerated, compared with U/S/R offenders who have not been incarcerated.

EXHIBIT V-10 (Continued)
Strategy Attributes for Incarceration of Offenders (P)

	• Other citations for U/S/R for offenders who have been incarcerated, compared with U/S/R offenders who have not been incarcerated. • Crashes for U/S/R for offenders who have been incarcerated, compared with U/S/R offenders who have not been incarcerated. These measures may be compiled for a given time period or used to calculate mean time to failure—that is, the average time until another crash or offense occurs. Any evaluation should recognize that effectiveness of incarceration probably stems more from the possibility of its imposition than from its actual imposition. Records and communication systems must be timely and complete. Infractions of probation must be reported immediately, and enforcement agencies must act to impose incarceration as a consequence.
Organizational and Institutional Attributes	
Organizational, Institutional, and Policy Issues	When incarceration is used as a potential sanction to increase compliance with less restrictive sanctions, there must be close communication and coordination between the sanctioning program and the judicial and penal systems. Infractions of probation requirements must have immediate consequences, including incarceration if warranted. Otherwise, the threat of incarceration will lose its effectiveness.
Issues Affecting Implementation Time	Obviously there must be sufficient jail capacity to make the threat of incarceration real. The crowded conditions in many facilities may weaken the potential effectiveness of this strategy. If time is required to bring additional housing capacity online before the strategy is employed, this could result in a lengthy wait for implementation. However, given sufficient jail space, the implementation of this strategy should be rapid. Once the alternative strategy is in place (e.g., IID or EM), the imposition of incarceration for probation violations should be immediate.
Costs Involved	Incarceration is costly to both the public and the incarcerated offender. During the period of incarceration, the offender is unable to function either in the workplace or in family life. Given its limited impact on subsequent driving behavior, it is probably best used as an incentive to comply with lesser penalties. Although some jurisdictions require incarcerated offenders to pay a daily fee to be applied to the costs of their keep, it is unlikely that costs can be recovered because incarceration removes an offender from gainful employment. From a monetary standpoint, this is not an attractive strategy.
Training and Other Personnel Needs	Personnel will be needed to implement and monitor this strategy. In most instances they will be primarily the people responsible for overseeing the other strategies, for which incarceration serves as a motivation for compliance.
Legislative Needs	In most jurisdictions the legislative authority already exists for imposing incarceration on multiple offenders. In the absence of explicit legislative authority, courts usually have the leeway to order it for the kinds of offenders to whom it would be applied.

Strategy 2.1 E1—Provide Alternative Transportation

The provision of alternative transportation for persons under the influence of alcohol has been shown to be effective. In Aspen, Colorado, it resulted in a 15 percent reduction in injury crashes (Lacey et al., 2000). Not all communities meet the requirements for using this strategy. Alternative transportation must be fairly readily available (e.g., at night and in locations where U/S/R drivers reside) and reasonably timely without lengthy waits. Also, it should not be too

costly, although if there were widespread recognition of all the costs associated with DUI convictions (e.g., attorney fees, court costs, license reinstatement costs, vehicle insurance costs, lost work time costs), then costs for alternative transportation may appear more attractive.

Most alternative transportation programs have not been carefully evaluated. Given their short duration and limited target groups, it would be difficult to detect significant changes. However, the program in Aspen, Colorado, initiated in 1983 and called Tipsy Taxi is comprehensive, in that it operates full time. This program is based on a partnership between law enforcement and the community to encourage both residents and tourists to make safe choices. Bar owners, managers, and bartenders are required to undergo training on such topics as laws governing liquor, service of alcohol, underage drinking, signs and symptoms of intoxication, diseases that can mimic intoxication, how to discontinue service to intoxicated people, and how to use alternative rides. Although the local bus service is part of the program, rides are available at any time of the day or night. No tax dollars go into the program. Rather, it is supported through fund-raising activities, grants, alcohol license fees, fees from DUI offenders, etc. The fact that the program is available and widely publicized makes it easier for enforcement to arrest offenders, in that there was a clear choice available. Appendix 7 gives more information about the Aspen program.

EXHIBIT V-11
Strategy Attributes for Providing Alternative Transportation (P)

Technical Attributes	
Target	The primary target would be U/S/R drivers (often repeat DUI offenders), although the existence of alternative transportation on a broader scale could have both general and specific deterrence.
Expected Effectiveness	Although not appropriate for every community, this strategy has been proven to be effective. Aspen, Colorado, found a 15% decrease in injury crashes that appeared attributable to their alternative transportation program. However, Aspen is an especially affluent community with an extensive mass transit system and strict enforcement. It is unlikely that most communities could provide the infrastructure that appears critical to the Aspen success.
Keys to Success	The Aspen program has the strong backing of the business community. Also, it does not use tax dollars and may not operate in the red, making it more acceptable to the public. A broad-based public transit system that operates throughout the day and night is probably a critical element of a successful alternative transportation program. Taxi service can cover late hours when buses are not operating. In Aspen, enforcement and the broader community work together to make the system work. Finally, Aspen has raised large sums of money to fund their program.
Potential Difficulties	It is possible that those simply seeking free transportation could abuse the service. The Aspen program tries to err in the direction of transporting inappropriate clients rather than refusing clients who need the service.
Appropriate Measures and Data	Process measures include the number of users, as well as the times and places use occurs. Ideally, information would also be collected on user license status, but this and other demographic measures are probably too difficult to obtain. Program costs should also be calculated to weigh against crash reductions. Impact measures include • Number of crashes • Severity of crashes

EXHIBIT V-11 (Continued)
Strategy Attributes for Providing Alternative Transportation (P)

	• Other crash characteristics (e.g., number of vehicles involved, types of violations, driver demographics) • Number of alcohol-related crashes • License status of crash-involved drivers • Times and places of crashes • Costs of crashes (including medical costs)
Associated Needs for Support Services	This strategy is best implemented as a community-wide effort with potential benefits accruing to the entire community. While the transportation systems need to be involved, public support is essential for success.
Organizational and Institutional Attributes	
Organizational, Institutional, and Policy Issues	The Aspen program has an advisory committee including a broad range of stakeholders. Over the years many changes have been made in the program on the basis of input from this committee.
Issues Affecting Implementation Time	Costs and public support are probably the two most important factors affecting implementation time. Both could require considerable time to obtain.
Costs Involved	Transportation systems, whether public or private, are costly. Ideally, offending drivers should incur the costs, but U/S/R drivers include some who are indigent. In the Aspen program, rides are provided free of charge, and if the rider is issued a parking ticket or towing fee, these are cancelled upon evidence of Tipsy Taxi use. However, program users are given information about the program and encouraged to make a donation. The program is funded by donations, grants, fund raising activities, fees, etc.
Training and Other Personnel Needs	In Aspen, those responsible for arranging alternative transportation (e.g., bar tenders) need to be trained in alcohol laws, recognition of signs of intoxication, and other relevant information. Only trained personnel may issue transportation vouchers. The program director, a deputy sheriff, spends about 1 half day a week on the program. The time required would vary as a function of the size and complexity of the program.
Legislative Needs	This strategy should not require legislative action. It can work only at a community level and must be created at that level using community resources, both public and private.
Other Key Attributes	
None	

Combining/Integrating Strategies

Strategies may be used in combination with each other to achieve greater impact. For example, Strategies 2.1 A1, 2.1 A2, and 2.1 A3 (increase enforcement in selected areas, routinely link citations to driver record, and create and distribute "hot sheets," respectively) may be used in conjunction with any of the other strategies. Likewise, strategies may be integrated for a more comprehensive approach. For example, in a vehicle-oriented approach, a first DWS could result in license plate striping, a second in license plate impoundment, and a third in vehicle seizure. A further infraction could result in EM. Of course, for maximum effect, it is essential that the imposition of sanctions be well publicized.

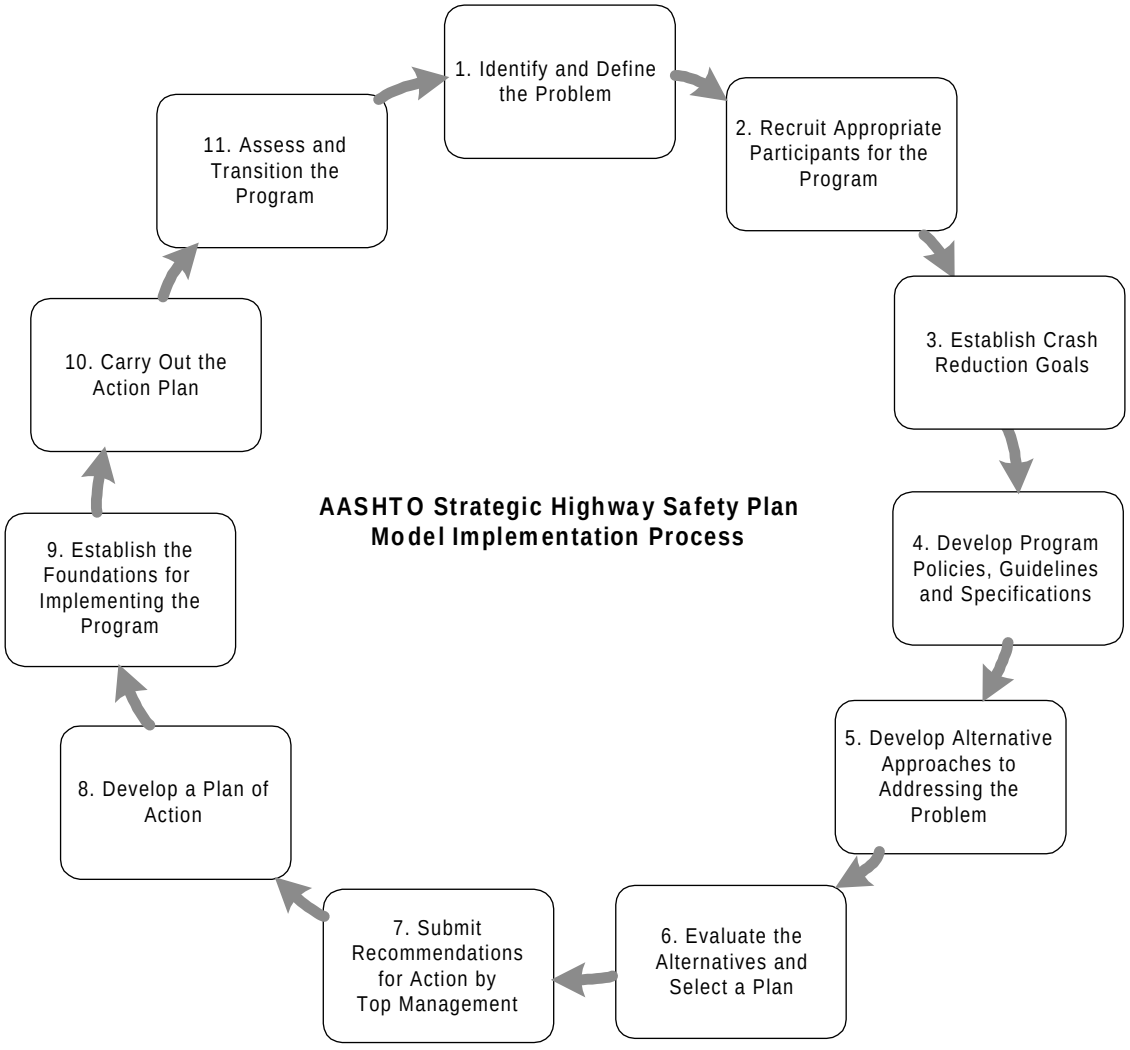
SECTION VI

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



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 (a*pprovals 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

[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 Appendix G 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

SECTION VII

Key References

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SECTION VIII

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	
BAC	Blood Alcohol Content	
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 Safety Analyst*
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 2.1 A1
2 Profiles of State and Local Agency Implementation Efforts: Strategy 2.1 B1
3 Profiles of State and Local Agency Implementation Efforts: Strategy 2.1 B2
4 Profiles of State and Local Agency Implementation Efforts: Strategy 2.1 C1
5 Profiles of State and Local Agency Implementation Efforts: Strategy 2.1 C2
6.1 Profiles of State and Local Agency Implementation Efforts: Strategy 2.1 D1
6.2 Performance Measures Used for Electronic Monitoring
6.3 Illustration of Estimated Costs of Incarceration versus Electronic Monitoring
7 Profiles of State and Local Agency Implementation Efforts: Strategy 2.1 E1
8 Potential Stakeholders

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

Abbreviations used without definitions in TRB publications:

AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ITE	Institute of Transportation Engineers
NCHRP	National Cooperative Highway Research Program
NCTRP	National Cooperative Transit Research and Development Program
NHTSA	National Highway Traffic Safety Administration
SAE	Society of Automotive Engineers
TCRP	Transit Cooperative Research Program
TRB	Transportation Research Board
U.S.DOT	United States Department of Transportation