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Final Report

Pedestrian and Bicyclist Safety: A Review of Key Program and Countermeasure Developments During the 1980's

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16. Abstract

According to National Highway Traffic Safety Administration estimates, approximately 6,500 pedestrians and 850 bicyclists are killed in motor vehicle crashes each year. Over 110,000 pedestrians and 75,000 bicyclists are injured. These "non-occupant" crash victims typically comprise 16 percent of motor vehicle fatalities overall, and up to half of motor vehicle fatalities in some urban areas.

This report was prepared to review key countermeasure developments and program activities impacting on pedestrian and bicyclist safety over the past decade. Key national level policies and trends pertaining to pedestrians and bicyclists are highlighted to set the stage for the review. The remainder of the report is organized according to educational, engineering, and enforcement/regulatory program areas, and within each, national, state and local activities.

Pedestrian safety activity has been led by the Federal Government and has concentrated on the development of comprehensive program guides and support materials, with some continued funding for facility design and engineering countermeasure development and evaluation. There have also been recent efforts to work with local law enforcement agencies and to incorporate pedestrian safety into community traffic safety programs.

Bicycle countermeasure development and program activities have followed a very different path, led by national, non-government organizations such as the Bicycle Federation of America, the National Safe Kids Campaign, the American Academy of Pediatrics, and others. In contrast to pedestrian safety activities which have tended to follow a "top down" hierarchy, bicycle activities during this period have primarily been "grass roots" efforts.

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Technical Summary

Overview

According to National Highway Traffic Safety Administration (NHTSA) estimates, approximately 6,500 pedestrians and 850 bicyclists are killed each year in collisions with motor vehicles. Over 110,000 pedestrians and 75,000 bicyclists are injured. These "non-occupant" crash victims typically comprise 16 percent of motor vehicle fatalities overall, and up to half of motor vehicle fatalities in some urban areas.

This report was prepared to review key countermeasure developments and program activities impacting on pedestrian and bicyclist safety over the past decade. The official time frame for the review is 1982-1989, although for continuity some summarizing of activities prior to 1982 is presented, and the upper end of the time frame has been extended slightly to incorporate current developments.

The report is organized according to educational, engineering, and enforcement/regulatory program areas, and within each, national, state and local activities. National activities have encompassed both Federal Government and private initiatives and have generally been better documented and publicized than state or local activities. However, the latter are critical to achieving an overall reduction in pedestrian and bicyclist casualties. Although this report certainly cannot document all of the many pedestrian and bicyclist safety activities that have transpired in communities and states across the country, it has sought to identify key programs and trends and those activities that have been particularly effective or innovative.

National Policies and Trends

To set the stage for the review of program and countermeasure developments, Chapter 2 of the report highlights key national level policies and trends impacting on pedestrians and bicyclists. In April 1980, just prior to the time period for this review, the Secretary of Transportation released the "Bicycle Transportation

for Energy Conservation" report. The report called for increased Federal support for bicyclist education and training in order to promote bicycle use for transportation. Over the next decade, however, support at the Federal level for bicycle as well as pedestrian safety research and programs diminished, as greater emphasis was directed at alcohol, seat belts, and other priority program areas.

Pedestrian and bicycle activities nonetheless continued, as a variety of organizations and interest groups evolved to fill the void. A key trend during the 1980's was the emergence of injury prevention as a strong focal area within the public health community. The Centers for Disease Control, in particular, elevated injury control to the forefront of the national health consciousness, funding a network of injury control centers across the country, as well as individual injury research projects. Organizations such as the National Safe Kids Campaign and the National Head Injury Foundation also helped to publicize the injury problem. At the local level, pedestrian and bicyclist safety were frequently incorporated into Community Traffic Safety Programs.

A parallel trend during this time was the increase in the popularity of bicycling and walking for recreation and fitness, and with it a demand for safer and more convenient places for these activities. Both bicycling and walking became associated with a trend toward healthier lifestyles, greater protection of the environment, mitigation of traffic congestion, and in general creating a friendlier and healthier urban environment.

By the end of the decade, bicycling and walking were again receiving increased attention from the Federal Government. Several reports were published referencing pedestrian and bicyclist safety needs; conferences were held; and legislation was passed elevating pedestrian and bicycle safety to priority status for Federal 402 funding. * Congress appropriated money for a "National Bicycling and Walking Study," and the U.S. Department of Transportation, FHWA, and NHTSA all re-established professional positions to focus on bicycle and pedestrian safety issues.

* Refers to Section 402, Highway Safety Program, of the Highway Safety Act of 1966, where provision is made for grant funding to the States, along with monitoring by NHTSA's regional offices.

Also, in December 1991, the Intermodal Surface Transportation Efficiency Act was passed which included several provisions favorable to bicycling and walking, including a requirement that all States establish bicycle and pedestrian program coordinator positions and develop bicycle and pedestrian safety plans.

Countermeasure and Program Developments

Although pedestrians and bicyclists share many common problems as non-motorized traffic participants, the solutions to these problems have taken very different forms. Also, the process of developing these solutions has followed different paths: pedestrian safety activities have generally been initiated at the national level, whereas bicycle safety activities have most often originated locally. Chapters 3 through 8 of the report review key program and countermeasure developments in the pedestrian and bicyclist safety areas during the past decade.

Pedestrian Safety

In the **pedestrian safety education** area, a key activity at the national level was the development of comprehensive program guides and planning documents, such as the "Model Pedestrian Safety Program" and the "Walk Alert" guides. These guides were based upon research carried out during the 1970's that had identified the principal types of pedestrian crashes and evaluated selected countermeasures. The guides generally included a full range of education, engineering, and enforcement/regulatory program elements.

Beyond these comprehensive program guides, most pedestrian safety education program and materials development at the national level targeted specific age groups, in particular young children (e.g., the "Willie Whistle" and "And Keep on Looking" programs developed by NHTSA) and the elderly (e.g., "Safety Steps for Pedestrians" developed by AARP with FHWA assistance).

At the state level, Florida continued to build a strong, comprehensive pedestrian safety program, and Pennsylvania and Virginia initiated new programs with the support of Federal 402 grant monies. Beginning in 1990, FHWA/NHTSA also

made available a number of $30,000 grant awards to cities to develop comprehensive community pedestrian safety programs. Also at the local level, pedestrian (as well as bicycle) safety became a major focus of the Harborview Injury Prevention and Research Center (HIPRC) in Seattle, Washington. Materials developed at HIPRC have extended far beyond the bounds of Seattle.

In the area of **pedestrian facility and engineering developments**, FHWA and the Transportation Research Board (TRB) continued to support research in areas such as pedestrian signalization, pedestrian safety at right-turn-on-red intersections, and the measurement of exposure to pedestrian crashes. A number of users' guides and synthesis reports were also published. Whereas virtually all states in the U.S. engage in engineering activities related to pedestrian safety, examples of states that were particularly active during this time include Florida and Pennsylvania (both as part of their comprehensive pedestrian safety programs already cited). A number of cities could also be cited for strong local pedestrian engineering programs, but any list would include Seattle, Philadelphia, Boulder, Denver, Milwaukee, and Phoenix.

Regarding **pedestrian law enforcement and regulatory activities**, a revised Uniform Vehicle Code and Model Traffic Ordinance were published during this time, providing a framework for standardization of laws across the U.S. Examples of innovative state and local activities include legislation adopted in Seattle and the State of Washington (and more recently Missoula and the State of Montana) requiring motorists to stop for pedestrians in marked or unmarked crosswalks, and recent Michigan legislation allowing a double fine to be applied to motorists cited for speeding in work zones. Other examples of local pedestrian enforcement activity simply involve more active enforcement of existing regulations applying to pedestrians. The Amercian Automobile Association regularly recognizes states and communities, such as Indiana and Milwaukee, that have strong pedestrian enforcement and safety programs.

Bicyclist Safety

Turning to the area of **bicycle safety education**, activity was centered on

national non-government organizations and at the state and local levels. As was the case with pedestrian countermeasure and program activity, much of the bicycle activity over the past decade benefited from NHTSA-sponsored research carried out in the mid-1970's that identified specific bicycle-motor vehicle crash problem types (the "Cross study"). During the 1980's, however, the Centers for Disease Control became the Government agency most directly involved in bicycle safety activities. The CDC-funded Harborview Injury Prevention and Research Center became a focal point for bicycle safety program development and countermeasure activities. Harborview was joined in its efforts by national non-government organizations such as the American Academy of Pediatrics, National Head Injury Foundation, and the National Safe Kids Campaign. Also during this time, the Bicycle Federation of America assumed a major role in supporting and coordinating bicycle safety activities at all levels -- national, state, and local.

Examples of bicycle safety education materials introduced during the 1980's include a number of films and videos, such as "I'm No Fool on a Bicycle" produced by Disney Studios and "Be Safe on Your Bike" produced by the Los Angeles Police Department and University of Southern California Film Department. In the area of school-based curriculums, emphasis shifted from "Officer Friendly" type safety programs to more comprehensive bicyclist education programs involving on-bike training and skills development. Examples of the latter include the "Complete Bicyclist Education Program" first produced in 1982, and the more recent "Basics of Bicycling" developed by the Bicycle Federation of America in 1991 for the North Carolina DOT Bicycle Program. Other bicycle safety materials developed were directed to parents of young children. Examples include the brochure, "Bicycle Safety: What Every Parent Should Know" and the film, "Children in Traffic - Why Are They Different?" Few new materials were introduced for adult bicyclists.

A major area of emphasis during the latter part of the decade was the promotion of bicycle helmet use. In 1984, the Snell Memorial Foundation and the American National Standards Institute (ANSI) each published standards for protective headgear for bicyclists, which were then quickly adopted by the bicycle helmet

industry. Lighter weight helmets, helmets for toddlers and children, and helmets designed to appeal to a wider audience of bicyclists (especially school-aged riders) also appeared on the market. The Washington (State) Children's Bicycle Helmet campaign begun in 1986 by the Harborview Injury Prevention and Research Center became a model for programs across the country, and research conducted at HIPRC offered strong evidence in support of helmet effectiveness in preventing head and facial injuries. The National Safe Kids Campaign, American Academy of Pediatrics, National Head Injury Foundation, and Bicycle Federation of America, along with helmet manufacturers, joined together to promote helmet use nationwide.

All of these bicyclist education and helmet promotion activities have had counterparts at the state and local levels. Although these have generally been poorly documented, this review has been able to highlight a wide range of activities in locations across the country, from a community helmet promotion campaign in an eastern North Carolina county, to a Virginia program targeting bicycle safety training for sales personnel at discount department stores, to the "Sprocketman" character adopted by the Cascade Bicycle Club in Seattle to deliver bicycle safety messages at school assemblies.

Bicycle facility and engineering developments, like their pedestrian counterparts, were heavily influenced by the publication of guidelines at the national level. Most important of these was the 1984 AASHTO Geometric Design of Highways and Streets ("Green Book") and the recently updated Guide for Development of Bicycle Facilities. FHWA's Manual on Uniform Traffic Control Devices and Traffic Control Devices Handbook also published during this time provided valuable guidance to state and local transportation engineers concerning bicycle facility planning, design, and construction. In contrast to pedestrian research, only a few FHWA-sponsored studies were conducted during the 1980's with a focus on bicycles.

At the state level, a major activity was the development of more detailed bicycle facility planning and design guides. Most states, however, have not allocated significant sums of money toward bicycle facility construction. Exceptions to this trend include Florida, North Carolina, Washington State, Oregon, and Illinois. At the

local level, interest in bicycle facility construction has been high, and numerous examples can be cited, ranging from the excellent off-road facilities in Arlington County (Virginia), Seattle, and San Diego, to the extensive network of shared road facilities found in Gainesville (Florida), Madison (Wisconsin), Eugene (Oregon) and Davis (California) . Other bicycle facility and engineering initiatives at the local level again include local (and regional) planning guides, and the interfacing of bicycles with mass transit.

Finally, concerning **bicycle law enforcement and regulation**, activity at the national level included modification of the Uniform Vehicle Code (UVC) so as to define or treat bicycles as "vehicles" having the same rights and responsibilities as motor vehicles when traveling on the roadway. All 50 states now include similar wording in their motor vehicle laws. The UVC was also modified to repeal the mandatory side path provision requiring bicyclists to ride on a bike path adjacent to a roadway rather than the roadway itself. A number of states have acted on this recommendation as well.

At state and local transportation departments, a major activity has been the establishment of bicycle (or pedestrian/ bicycle) coordinator positions. Another development has been the adoption of mandatory helmet use laws and ordinances, a process initiated by California in 1986 for young children carried as passengers on bicycles, but recently extended to older bicyclists in a number of communities and states across the U.S.

Summary

In summary, this report has documented a wide range of activities at the national, state and local levels impacting on pedestrian and bicyclist safety during the decade of the 1980's. In the case of pedestrians, this activity has primarily been initiated by the Federal Government; for bicycles, national non-government organizations have played a leading role, and considerable activity has been of the "grass roots" variety. All of these activities substantiate a strong and widespread interest in creating safer and friendlier environments for walking and bicycling.

Acknowledgments

The authors gratefully acknowledge the contributions of a number of NHTSA and FHWA staff who provided guidance and input to this project effort. In particular, we wish to acknowledge our contract technical monitor, Dr. Alfred Farina, along with Marvin Levy, Barbara Sauers, Leslie Heffner, John Fegan, and Sue Gorcowski. The considerable experience and expertise that each brought to the various project tasks, from the initial identification and listing of candidate activities and materials to the review of the final draft report, were immensely valuable to the overall effort, and we are grateful for their participation.

We also wish to thank the many individuals working in communities and with organizations throughout the country who provided us with information on their pedestrian and bicycle safety activities through face-to-face interviews, telephone conversations, and written correspondence. While too numerous to be identified here, a report of this nature would not have been possible without their input.

Finally, we wish to thank Jim Fremont who helped in the early stages of the project by reviewing information and materials from the Bicycle Federation of America, and Paula Hendricks and Wayne Pein at the Highway Safety Research Center, who provided valuable assistance in pulling together the final document.

Glossary

AAA	Automobile Association of America
AAP	American Academy of Pediatrics
AARP	American Association of Retired Persons
AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
BFA	Bicycle Federation of America
BHSI	Bicycle Helmet Safety Institute
BIA	Bicycle Institute of America
BMA	Bicycle Manufacturers of America
CBEP	Complete Bicycling Education Program
CTSP	Community Traffic Safety Program
EPA	Environmental Protection Agency
FARS	Fatal Accident Reporting System
FHWA	Federal Highway Administration
GES	General Estimates System
LAW	League of American Wheelmen
MTO	Model Traffic Ordinance
MUTCP	Manual on Uniform Traffic Laws and Ordinances
NAGHSR	National Association of Governor's Highway Safety Representatives
NAEYC	National Association for the Education of Young Children
NBEC	National Bicycle Education Consortium
NCUTLO	National Committee on Uniform Traffic Laws and Ordinances
NHTSA	National Highway Traffic Safety Administration
NGO	Non-Governmental Organization
NSC	National Safety Council
NTIS	National Technical Information Service
PFA	Pedestrian Federation of America

PI & E	Public Information and Education
PSA	Public Service Announcement
PTA	Parent Teacher Association
Snell	Snell Memorial Foundation
TRB	Transportation Research Board
USCF	United States Cycling Federation
UVC	Uniform Vehicle Code
WABA	Washington Area Bicyclists Association

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Chapter 1. Introduction

During the decade of the 1980's an average of 7,000 pedestrians and 900 bicyclists were killed each year in collisions with motor vehicles (see Figures 1.1 and 1.2). Although pedestrian fatalities declined during the decade, non-occupant fatalities continue to comprise approximately 16 percent of motor vehicle fatalities overall (NHTSA, 1991a). In some urban areas this percentage increases to up to half of motor vehicle fatalities. In addition to these fatalities, over 110,000 pedestrians and 75,000 bicyclists are estimated to be injured each year in motor vehicle crashes (NHTSA, 1991b).

During the 1970's pedestrian and bicycle safety was a priority for the National Highway Traffic Safety Administration (NHTSA) and the Federal Highway Administration (FHWA). In the 1980's, it was not. Recently, however, the Federal Government has renewed its commitment to pedestrian and bicycle safety and has taken steps to promote these alternative transportation modes.

As part of this reinvolvement, this report has been prepared to review key countermeasure developments and program activities impacting on pedestrian and bicycle safety over the past decade. The official time frame for the review is 1982-1989, although for continuity some summarizing of activities prior to 1982 is presented and the upper end of the time frame has been extended to incorporate current developments.

The report serves several purposes. It pulls together into one document information from a wide array of sources, including Federal, State and local governments, non-government agencies and organizations, and in many cases, "word-of-mouth" communications. At a time when the Federal Government is expanding its own involvement in the pedestrian and bicycle safety areas, the report will spotlight efforts already underway in communities across the country and encourage increased state and local pedestrian and bicycle safety activities. It can also help lay the groundwork for increased Federal involvement in the years ahead.

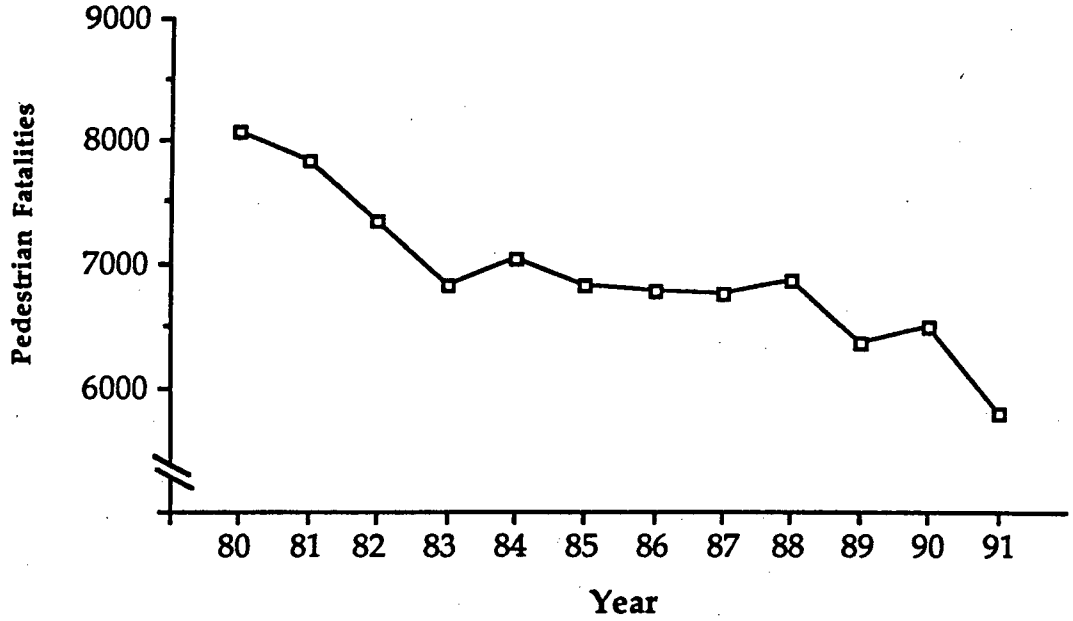

Figure 1.1. Pedestrian Fatalities, 1980-1991.
(Source: NHTSA, 1992a)

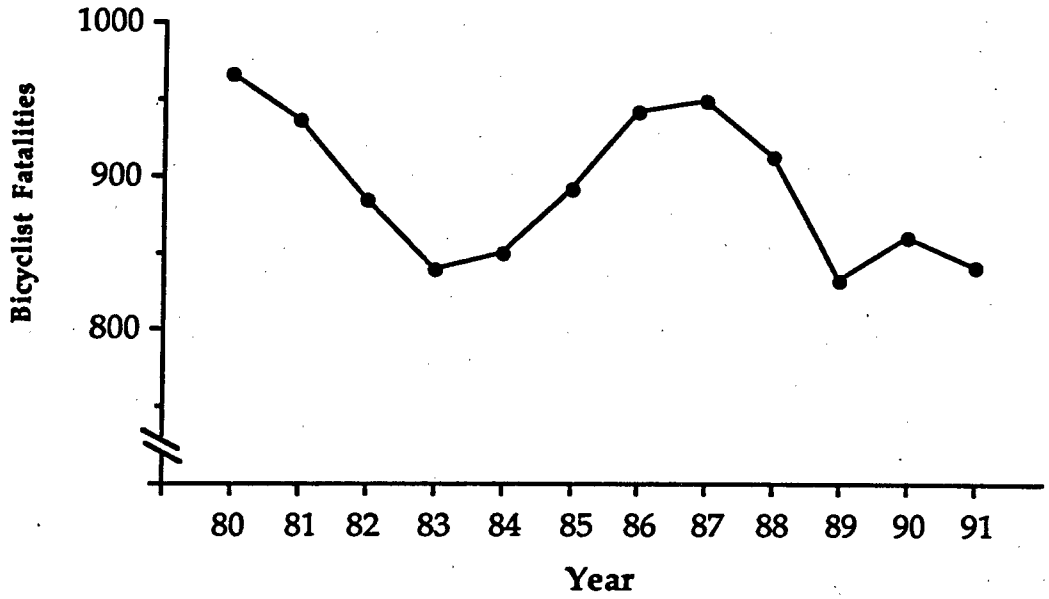

Figure 1.2. Bicyclist Fatalities, 1980-1991.
(Source: NHTSA, 1992b)

This report is one of three documents that will result from the NHTSA project, "Review and Update of Pedestrian and Bicyclist Problems, Programs, and Processes." The second document will be a pedestrian and bicyclist motor vehicle crash and injury report, based on the General Estimates System (GES) data base. The GES is a nationwide sample of police-reported motor vehicle crashes in the United States, including some 1,700 pedestrian and 800 bicycle crashes annually. The initial report will present national (weighted) estimates of pedestrian and bicycle crashes and injuries for the three-year period 1988-1990. Subsequent reports are planned based on this original prototype and incorporating additional years of GES data.

The third report planned under this project addresses the area of technology transfer. The report identifies technology transfer issues (e.g., production of countermeasures in usable quantities, need for fulfillment center, absence of a cohesive distribution network) in the pedestrian and bicycle safety areas, outlines a plan of action, and discusses strategies for overcoming problems. A key recommendation is that NHTSA/ FHWA work in partnership with other non-government organizations to develop "an infrastructure of implementers" at the state and local levels to whom they can convey their safety products.

The present report is an important first step in this process: by identifying *what* has transpired, the report also identifies a rich network of organizations and individuals eager to be part of a larger pedestrian and bicycle safety agenda. Information for the report was gathered from a review of the published literature, from contacts with key individuals at NHTSA and FHWA, and from interviews with dozens of other professionals across the country. These were persons serving in a variety of capacities in both the private and government sectors and included state and local pedestrian/bicycle coordinators, local traffic engineers, researchers, city planners, and persons representing private organizations such as the National Safety Council and the Rails-to-Trails Conservancy.

The following chapters present the results of these efforts. Two caveats are in order. First, the report does not presume to encompass all programs and activities. At the national level, coverage should be fairly complete, as most Government

activities are well documented and other (non-government) groups involved in pedestrian and bicycle safety are generally known and easily contacted regarding their activities.

At the state and local levels, the process of identifying pedestrian and bicycle programs and activities necessarily became more dependent on personal experiences and contacts. A review of ten years of bicycling newsletters provided some input to the process. The difficulty at this stage of the review was that few of the programs and activities have been clearly documented, and even fewer evaluated. This report highlights those programs and activities which our review was able to identify, realizing that some significant pedestrian and bicycle safety efforts may have been overlooked.

A second point relates to the organization of the report. Because of its focus on countermeasure development and program activities, categorizing identified activities into "the three E's" of education, engineering, and enforcement/regulation seemed a reasonable approach to follow. Within each of these topic areas we then reviewed activities at the national, state, and local levels.

In practice we found this approach sometimes difficult to apply. Some countermeasures (such as measures to enhance conspicuity) could be placed into more than one category, while larger, comprehensive programs such as "Walk Alert" could be discussed at all program levels. Also, programs and activities at the national level significantly influenced activity at the state and local levels, and vice versa.

We have addressed this situation by discussing programs in greatest detail in the section in which they are first introduced. For the comprehensive programs, this is most often in the education section. Thus, the Walk Alert program has been described most fully in Chapter 3 (Pedestrian Education Countermeasures and Programs), but is picked up again in Chapters 4 (Pedestrian Facilities and Engineering) and 5 (Pedestrian Enforcement and Regulation). We have also tried to integrate national, state and local, and government/non-government activities, and to highlight areas where one has particularly influenced the other.

Although pedestrians and bicyclists share many common problems as non-motorized participants in a U.S. transportation system that is heavily oriented toward motor vehicles, the solutions to these problems often take very different forms. Also, the process of developing these solutions has followed very different paths: pedestrian safety activities have generally been initiated at the national level, whereas bicycle safety activities have most often originated locally. Because of these important differences, we have not attempted to integrate the two: pedestrian key developments are discussed in Chapters 3-5 and bicycle key developments in Chapters 6-8.

In addition to the individual pedestrian and bicycle chapters focusing on education, engineering, and enforcement/regulation, Chapter 2 presents an overview of national policy and trends impacting on each of these areas. Chapter 9 summarizes the most significant countermeasure developments and trends and relates them to the overall technology transfer needs for increasing the safety of both pedestrians and bicyclists. References are presented at the end of each chapter, and a resource listing is included as an appendix.

It is hoped that this report will be a useful resource to individuals at all levels of government and non-government activity who are working to improve the pedestrian and bicyclist safety environment.

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Chapter 2. Policies and Trends in Pedestrian and Bicycle Safety

This chapter highlights key policies and trends impacting on pedestrian and bicycle safety program and countermeasure development. Where NHTSA and FHWA are concerned, both have important but different responsibilities in the pedestrian and bicyclist safety program areas. NHTSA identifies pedestrian and bicyclist crash problems and develops cost-effective behavioral countermeasures and procedures for applying them at the State and local levels, while FHWA's focus is on researching, planning, designing, and constructing pedestrian and bicycle accommodations and increasing the safety of these two travel modes.

The information in this chapter is presented chronologically within three time periods corresponding to just prior to, during, and since the 1982-1989 focus period of this study.

The situation in 1980

- In April, 1980, the Secretary of Transportation sends the "Bicycle Transportation for Energy Conservation" report to the President and the Congress (U.S. DOT, 1980). The report concludes that increased bicycle use for transportation could result in substantial energy savings, and that a major increase in Federal support is warranted. To increase use, emphasis should be given to education and training (not special facilities) -- a "sales approach" to marketing bicycle use. Categorical funding is not supported, but increasing the States' flexibility to use Federal-aid funds for non-construction bicycle projects is supported. The roles of various levels of government and the private sector are described, and detailed action plans for each of DOT's modal administrations are developed.

- The American Association of State Highway and Transportation Official's "Guide for the Development of New Bicycle Facilities: 1981" is published (AASHTO, 1981). This includes major revisions to the original 1974 edition. The report incorporates much of the contemporary thinking of state and local agencies on how best to accommodate bicycles.

- The Bicycle Federation of America begins operation in Washington, DC. Five Federal agencies and departments contribute to a grant to the Bicycle Federation to help fund the organization of the first Pro Bike conference, held in Asheville, North Carolina in November, 1980.

- Bicycle and pedestrian safety is one of 18 highway safety program areas eligible for Section 402 funding.

- The Office of the Secretary, U.S. Department of Transportation, as well as NHTSA and FHWA, either maintain or expand their staff assigned to bicycle and pedestrian safety topics.

Developments from 1981 through 1989

- In 1981 the Federal Highway Administrator issues a bicycle policy statement that recognizes the bicycle as a legitimate mode of transportation and instructs FHWA field offices to "ensure that full consideration is given to the safe accommodation of bicycle traffic on all federal-aid highway projects." Despite this support, bicycle (and pedestrian) staffing at the Federal level wanes.

- In 1982, Congress acts on U.S. DOT legislative recommendations concerning bicycle and pedestrian programs and authorizes the use of Federal-aid highway funds for construction and non-construction programs, setting the Federal share at 100% of project costs (Section 217 of the 1982 Surface Transportation Assistance Act). However, most States do not use the Section 217 authority, and the total funds spent during this period, under this authority, is less than $20 million nationwide.

- The Congress directs the NHTSA to undertake rulemaking to establish a limited number of highway safety "priority areas" and to create program guidelines to ensure that the majority of Section 402 highway safety funds are allocated by the States to these areas. The initial rulemaking identifies six areas; bicycle and pedestrian safety is not included as a priority (Federal Register, April 8, 1982). In a subsequent rulemaking (1988), NHTSA again rejects adding bicycle and pedestrian safety to the list of priority areas.

- The action plans developed by DOT agencies to implement the recommendations from the Bicycle Transportation for Energy Conservation report are set aside.

- NHTSA conducts some research projects in 1981-82, including the development of pedestrian and bicycle accident-typing manuals, but does not fund other planned pedestrian and bicycle program development, demonstration, and evaluation efforts. In the mid-1980's, FHWA funds research to develop specific criteria for designating streets and highways for bicycle use (Wilkinson and Moran, 1986). Some pedestrian research is also conducted, especially concerning the older pedestrian, and FHWA

carries out a number of pedestrian projects pertaining to engineering. A pooled fund research project, proposed by the TRB Bicycle Committee, is selected by FHWA and sufficient States indicate interest to fund a study begun in 1989.

- An "International Pedestrian Conference" is organized by the City of Boulder in 1981 and held each year since. A broad coalition of traffic safety interests establish an annual meeting called LifeSavers, and bicycle and pedestrian topics are usually included on the agenda.

- The Bicycle Federation expands its clearinghouse and technology transfer activities, produces four more Pro Bike conferences (1982, 1984, 1986 and 1988), initiates the Pro Bike News newsletter (1981), and develops training courses for bicycle and pedestrian program specialists (1986-89).

- The U.S. domestic bicycle industry's trade association, the Bicycle Manufacturers Association of America, declines in members and programs, and abandons its traditional promotion and safety information role. In 1986 the industry creates a new, more broadly based organization to address promotion of bicycling -- the Bicycle Institute of America (BIA) -- and hires the Bicycle Federation to manage the association.

- Beginning in the mid-1980's, the public health community focuses increased attention on injury prevention. Having experienced some success getting child safety seat legislation passed, pediatricians become interested in promoting the use of bicycle helmets. The Harborview Injury Prevention and Research Center leads the way with a combination of research, community education, and outreach, and goes on to foster national attention to the subject.

- Beginning in 1986, the Centers for Disease Control funds a network of "Injury Prevention Centers" whose work programs include pedestrian and bicycle safety.

- A more sophisticated approach to traffic safety campaigns, developed for safety belt and anti-drunk-driving initiatives, begins to spill over to other subjects including bicycle helmets.

- The National Safe Kids Campaign is established in 1988. Traffic injuries (especially to child bicyclists and pedestrians) are one of the Campaign's five identified priority areas, and bicycle safety and the wearing of bicycle helmets are identified as focus areas for the Campaign's first year. State and local Safe Kids coalitions organize bicycle helmet promotion activities, and some interest begins to develop in mandating bicycle helmet use.

- A new advocacy program, the National Bicycle Policy Project, is created by the Bicycle Federation and Bikecentennial in 1988. The goal is to change policies and standards at the national level to enhance conditions for bicycling.

- Several other significant new national trends, topics, and issues emerge and focus attention on bicycling and walking:

  - The U.S. experiences a tremendous growth in interest in fitness issues -- nutrition, exercise, and lifestyle -- that leads to greatly increased walking and bicycling activity.

  - Walking takes on the identity of an "organized" sport and form of recreation and fitness, supported by clubs, events, magazines, and special shoes. Within three or four years it is noted as the most popular form of outdoor recreation in America.

  - The Rails-to-Trails Conservancy is organized in 1985 to save abandoned railroad rights-of-way and convert them into recreational trails, primarily for walking and bicycling. In three years, the membership exceeds 70,000.

  - In 1986 the President's Commission on Americans Outdoors issues its findings and calls for a nationwide system of "greenways" together with trails for walking and bicycling.

  - Increased interest in the environment and increased highway congestion help lead to a doubling in bicycle commuting between 1984 and 1990 (Bicycle Institute of America, 1991).

- The most significant change in bicycle design since the introduction of the European-style racing bike in the early 1970's comes with the beginning of mass-produced mountain bikes in 1982. By the end of the decade, mountain bikes represent over 50 percent of the bicycles sold annually in the United States, helping to account for the largest ten-year bicycle sales volume in the industry's history. Bicycles out-sell motor vehicles almost every year.

- Government bicycle programs and staff positions continue to expand at the state and local levels. Some States (e.g., Florida, Ohio, and North Carolina) develop extensive programs as do some metropolitan communities (e.g., Seattle, San Diego, and Madison).

- The Seattle Police Department experiments with bicycle-mounted police in 1985 and starts a new trend called "Cops-on-Bikes" which expands to nearly 100 towns and cities by the end of the decade.

Progress in the 1990's

- In September, 1989, a group of bicycle experts from Government, industry, the media, and user groups convenes in Aspen, Colorado and concludes that the most important action to the future of bicycling is the provision of more safe places to ride, and that the key to developing better riding conditions is more positive Government bicycle programs. A task force develops a plan for promoting more Government involvement in bicycling, and the Bicycle Federation begins implementation of the plan by establishing the National Bicycle Program Campaign.

- The Centers for Disease Control expands its support for injury prevention programs, including bicycle and pedestrian topics.

- U.S. DOT issues a new National Transportation Policy (1990) with positive references to bicycling and walking. Now, it is Federal transportation policy to:

  "Promote increased use of bicycling and encourage planners and engineers to accommodate bicycle and pedestrian needs in designing transportation facilities for urban and suburban areas.

  "Increase pedestrian safety through public information and improved crosswalk design, signaling, school crossings and sidewalks."

- In June, 1990, FHWA in cooperation with NHTSA hosts a "Symposium on Effective Highway Accident Countermeasures." The Symposium focuses on five areas of highway safety, including improving pedestrian safety. The following short-term countermeasures are recommended (FHWA, 1991):

  - Initiate a national pedestrian awareness campaign;
  - Establish pedestrian safety as a priority area;
  - Provide engineering improvements to improve pedestrian and bicycle safety;
  - Improve safety education for pedestrians;
  - Improve enforcement of pedestrian laws and ordinances.

- FHWA Administrator Dr. Thomas Larson addresses Pro Bike 90 and states that bicycling and walking have too long been the "overlooked modes" and adds that he wants this to change. He states his intention to create a bicycle/pedestrian program manager in the FHWA and indicates support for adding bicycle and pedestrian safety to the list of Section 402 priority areas.

- The Transportation Research Board issues Special Report 229, "Safety Research for a Changing Highway Environment" (1990), and recommends additional attention to bicycle and pedestrian safety topics.

- NHTSA and FHWA jointly implement a series of pedestrian safety program demonstration grants, beginning in 1990.

- The DOT Appropriations Act of 1991 directs the U.S. DOT to establish a bicycle and pedestrian program coordinator position, and directs the DOT to undertake a National Bicycling and Walking Study.

- The U.S. DOT, FHWA, and NHTSA all re-establish professional positions to focus on bicycle and pedestrian issues. New bicycle and pedestrian research projects are planned and implemented, and new materials are developed.

- NHTSA and FHWA finalize rulemaking in October 1991 to add pedestrian and bicycle safety to the list of Section 402 priority areas.

- The Bicycle Federation creates a new operating division called the Pedestrian Federation of America, intending to focus the same kind of attention and action on pedestrian issues as has been generated on bicycling issues. A highway safety and facilities-oriented national conference takes place in October, 1991, and FHWA Administrator Larson delivers the keynote address.

- Government and the private sector begin to take a more comprehensive approach to increasing bicycle use and safety that emphasizes better riding conditions and bicycle facilities in addition to rider education and training -- a shift from a purely "sales approach" to a more market-driven philosphy of promoting bicycle use and safety.

- NHTSA begins advocating broad-based Community Traffic Safety Programs as a means of establishing comprehensive, sustained, local safety initiatives.

- The NHTSA and FHWA develop a joint Four-Year Pedestrian Action Program detailing a series of actions to promote and enhance pedestrian safety nationwide by stimulating State and local interest and participation. The activities involve refinement and application of the Walk Alert program (a comprehensive pedestrian safety program) and providing technical assistance to State and community leaders in the planning, development, and implementation of community-based pedestrian safety programs. Also, NHTSA and the Consumer Product Safety Commission (CPSC) develop a memorandum of understanding for a cooperative program aimed at bicycle safety.

- The Intermodal Surface Transportation Efficiency Act (ISTEA) is signed into law in December 1991. The Act includes a variety of measures designed to enhance and encourage bicycling and walking:

  1. All States are required to establish bicycle and pedestrian program coordinator positions within the DOT.

  2. All States are required to develop long-range plans for bicycle and pedestrian provisions, as well as short-range plans for these modes.

  3. Major metropolitan areas are required to develop long- and short-range bicycle and pedestrian plans.

  4. Over $3 billion is set aside for "transportation enhancements" which include "bicycle and pedestrian provisions."

  5. The Highway Safety Program retains pedestrian and bicycle safety as a priority area.

  6. The National Recreational Trails Trust Fund is established.

- NHTSA and FHWA jointly provide Pedestrian Safety Resource Kits to NHTSA and FHWA field offices and to State Governors' Highway Safety Representatives.

- NHTSA and FHWA jointly conduct research in safeguarding older pedestrians and the development of a pedestrian and bicyclist training program for safety professionals. NHTSA begins a long-term project to reduce alcohol-involved pedestrian crashes.

- The Federal Highway Administration develops a comprehensive, multi-year bicycle and pedestrian research program.

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Chapter 3. Pedestrian Education Countermeasures and Programs

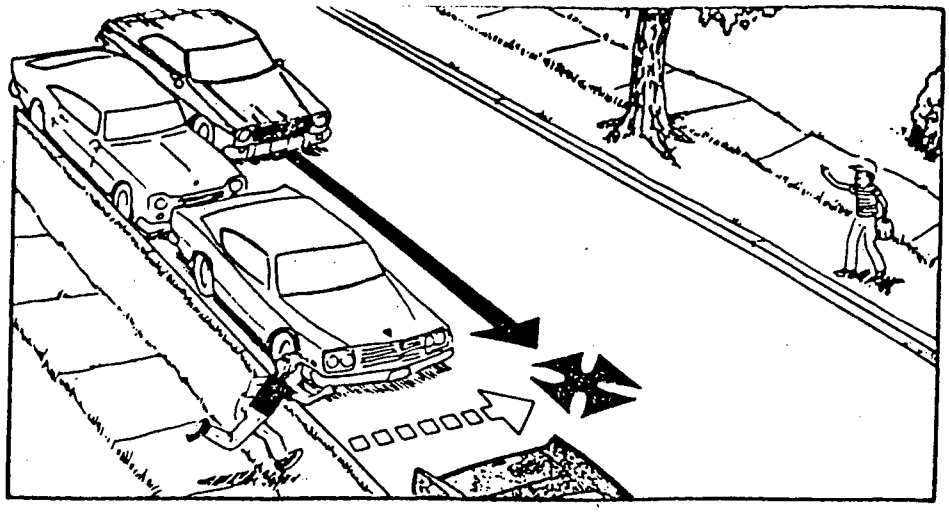
Federal Government and Other National Activities

Background

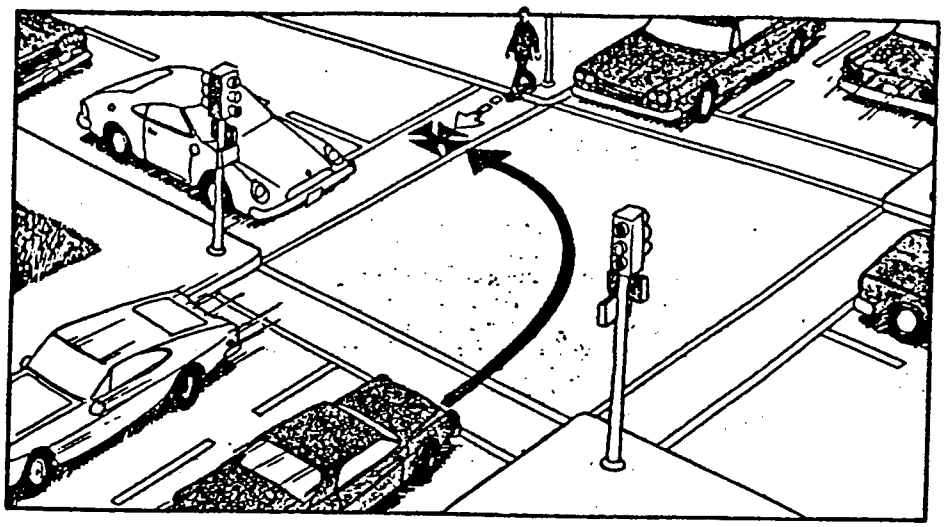
Before reviewing pedestrian education activities occurring at the national level during the 1980's, it is important to briefly summarize some of the research activities of the prior decade. In the 1970's the level of financial resources available for both pedestrian and bicycle safety activities was considerably higher than in the 1980's, and it was during this time that much of the research was carried out that formed the basis for subsequent countermeasure and program development. Federal Government pedestrian and bicycle safety education activities during the 1980's and since have largely been an expansion and refinement of efforts begun in the 1970's.

Of greatest significance was NHTSA/FHWA research activity directed at identifying the causal factors of pedestrian crashes and appropriate countermeasures to address these causes. The initial research focused on urban pedestrian crashes (Snyder and Knoblauch, 1971), while subsequent studies extended the methodology to rural crashes (Knoblauch, 1975: Knoblauch, 1977), and to pedestrian crashes occurring on freeways (Knoblauch, Moore and Schmitz, 1978). From this research evolved the basic pedestrian crash "typology" that remains a focal point of much of NHTSA/FHWA's current pedestrian safety activity, including analysis of the General Estimates System (GES) data base. The crash types represent the most common pedestrian crash situations. Each is defined by a specific sequence of events, and each has precipitating events, predisposing factors, and characteristic populations and/or locations that can be targeted for interventions. Some of the more frequently occurring crash types are depicted in Figure 3.1.

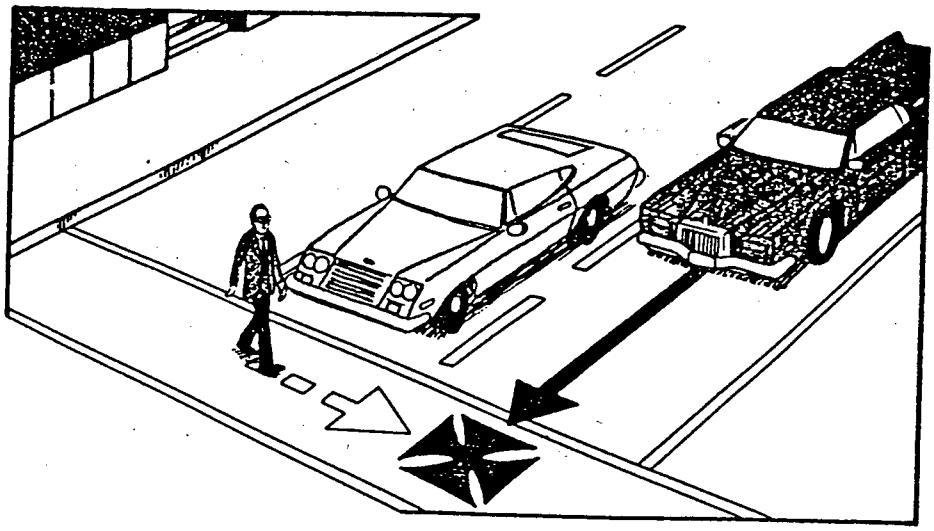
Recommended interventions and countermeasures developed from the initial pedestrian crash typing research included a mixture of public information and education (PI&E), engineering, and enforcement/regulatory measures. The first "set" of pedestrian crash types for which countermeasures were developed and



Accident type: DART-OUT

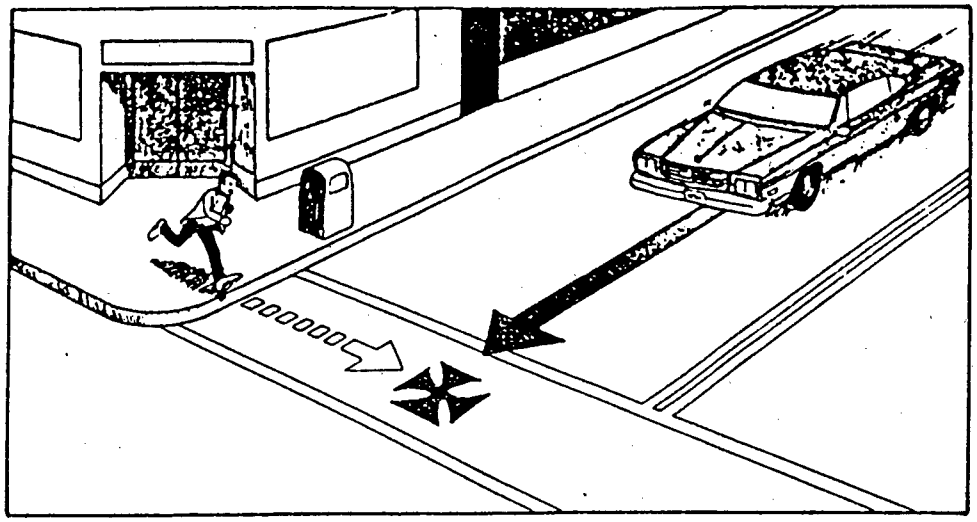


Accident Type: VEHICLE TURN/MERGE

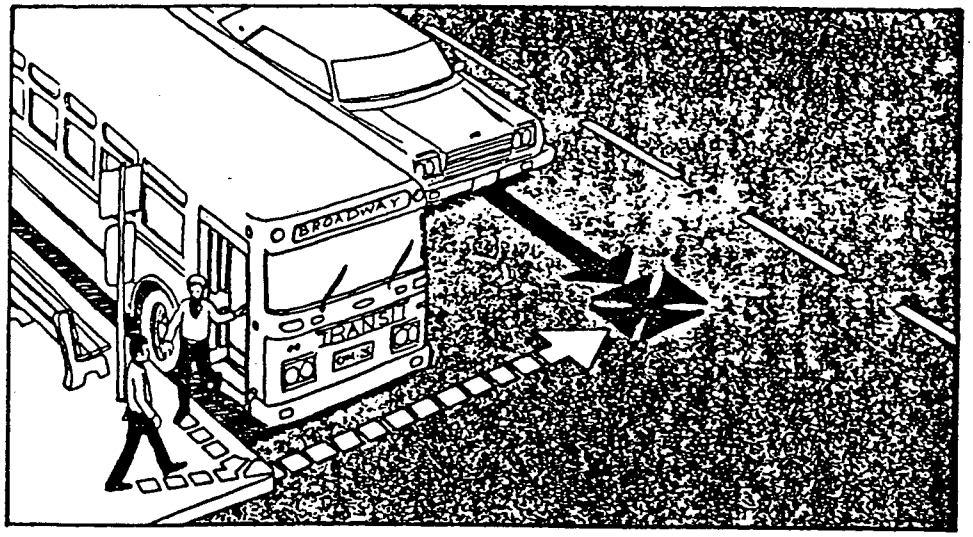


Accident Type: MULTIPLE THREAT

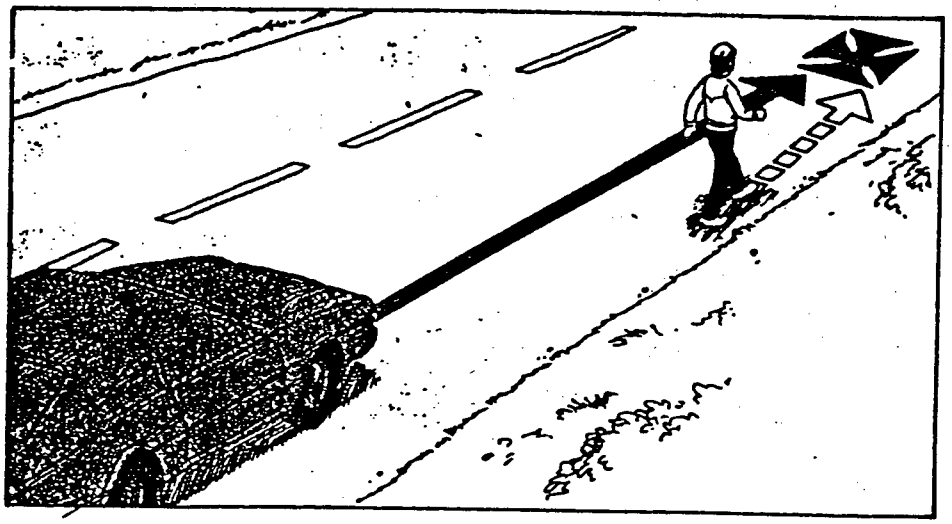
Figure 3.1. Selected Pedestrian Crash Types.
(Source: NHTSA, 1981)



Accident Type: INTERSECTION DASH



Accident Type: COMMERCIAL BUS STOP RELATED



Accident Type: WALKING ALONG ROADWAY

Figure 3.1. Selected Pedestrian Crash Types. (cont.)

tested included: dart-outs, vehicle turn/merge, multiple threat, commercial bus stop related, and vendor-ice cream truck. These five crash types had been found to account for nearly half of over 12,000 crashes investigated in 13 cities and rural areas in six states. Beginning in the mid 1970's, research was carried out to evaluate a number of the recommended countermeasures (e.g., Berger, 1975; Petzold, 1977). Examples of particularly effective countermeasures include:

- a bus stop location ordinance requiring bus stops to be located at the far side of intersections;
- a model ice cream truck ordinance requiring ice cream trucks to vend only when lawfully parked on designated types of streets and to display a stop signal arm with flashing lights; motorists required to come to a full stop prior to passing;
- school-based training for young children to teach them to stop at the edge of the traffic lane (or the edge of a parked car) and to search correctly before entering the roadway.

As a final step in the process, program guides were developed to assist individuals and organizations at the state and local levels in implementing pedestrian safety programs based on the research findings. The first such document was the "Model Pedestrian Safety Program User's Manual" originally published by FHWA in 1978 (Knoblauch and Crigler, 1978). The manual guides readers through a six-step process of program development and identifies potential engineering, education, and enforcement countermeasures. A few years later NHTSA developed the "Pedestrian Accident Reduction Guide," a companion document providing more detailed information on the uses of crash typing in state and local pedestrian safety programs and the countermeasures available for addressing particular crash type problems (NHTSA, 1981). The MAT (Manual Accident Typing) and CAT (Computerized Accident Typing) manuals were also developed for use by persons wanting to "type" the pedestrian and bicycle crashes occurring in their own communities (NHTSA, 1983).

Recent Research Activities

The crash typing and countermeasure development activity carried out by NHTSA and FHWA during the 1970's and early 1980's significantly influenced pedestrian safety developments in the past decade, not only in the area of educational programs and countermeasures, but in engineering and enforcement/ regulatory activities as well. During the 1980's, funding for some research at the Federal level continued for pedestrian countermeasure development and testing. Most of this research was directed at engineering countermeasures and will be reviewed in the following chapter. One area of research that is related to education, however, is that of conspicuity. Many conspicuity-increasing measures depend on public education and information to bring about changes in behavior (e.g., wearing of reflective vests), and messages to "see and be seen" have been incorporated into most educational programs for pedestrians as well as bicyclists.

During the period 1980-1984, NHTSA sponsored research to identify and test specific countermeasures to improve the conspicuity of pedestrians and bicyclists (Blomberg, Hale and Preusser, 1984; Hale and Zeidler, 1984). The research involved an examination of the role of conspicuity in pedestrian and bicyclist crashes, an extensive literature review, and an analysis of the potential market for conspicuity-enhancing products. Field testing of the relative effectiveness of various types of materials and devices to improve pedestrian visibility at night included tests of the following:

- plain white T-shirt (baseline)
- retroreflective disks or "dangle tags"
- retroreflective jogging vest
- retroreflective belt, headband, wristband, and ankleband
- flashlight (held and swung while walking).

As a result of these tests, the authors recommended that white clothing not be promoted as a conspicuity enhancer for pedestrians walking on roadways at night; instead, pedestrians should carry a flashlight or other light source and wear retro-reflective materials outlining parts of the body (head, waist, wrists, ankles). Vests

and retroreflective material added to shoes were also recommended for joggers. These conspicuity-increasing countermeasures were seen as particularly relevant for reducing the number of walking-along-roadway pedestrian type crashes occurring at nighttime. Results of this important research were documented in the NHTSA report and also publicized in *Bicycling Magazine.*

Program Guides and Planning Documents

Program guides and planning documents are generally targeted toward a professional audience and provide guidance in planning and implementing a particular set of activities. In the area of pedestrian safety, some program guides have been more narrowly focused, while others, such as the "Walk Alert Program Guide," have covered the full gamut of education, engineering, enforcement, and regulatory interventions. This section will introduce these program guides, focusing on their educational components. Later sections may also reference a particular guide with respect to its engineering and/or enforcement and regulatory components.

In 1983, NHTSA published "Guidelines for a K-12 Traffic Safety Education Curriculum" (Lockett and Wyron, 1983). The report (no longer available) included recommended content for instruction in the areas of motor vehicle occupants, alcohol, pedestrian safety, and bicycling safety. The pedestrian topics addressed included:

- basic traffic knowledge
- crossing in the middle of the block
- crossing at intersections
- avoiding a "multiple threat" situation
- walking along the roadway
- entering and exiting a vehicle.

Expected behavioral outcomes, instructional goals, and objectives were specified for each topic, along with suggested age-appropriate teaching procedures and materials. Many of the suggested procedures were adapted from a "Pedsafe" curriculum which had been developed earlier for NHTSA by Applied Science Associates, Inc. (Duecker and Chiplock, 1981) and followed directly from the crash typing and counter-

measure development activities of the 1970's.

In 1987 FHWA released a revised and updated "Model Pedestrian Safety Program User's Manual" (Knoblauch and Crigler, 1987). This new version was shorter than the original but still emphasized the six-step process of (1) determining the extent of the traffic safety problem, (2) identifying alternative solutions, (3) selecting the best alternative, (4) implementing the selected alternative, (5) evaluating its effectiveness, and (6) maintaining the program. To determine the nature and extent of the pedestrian problem, users are encouraged to listen to citizens' complaints as well as to analyze the causes of their crashes (by classifying them into types) and collect relevant pedestrian behavior data. Potential solutions are again identified in the engineering, education, and enforcement/regulatory categories. Figure 3.2, taken from the Guide, presents the educational countermeasures identified and their applicability to specific crash types. For many of the crash types, no education countermeasure could be identified.

The "Model Pedestrian Safety Program Supplement" provides more detailed information on the specific pedestrian safety countermeasures identified, discussing advantages and disadvantages of each, implementation considerations, and conditions where the countermeasure would be most beneficial (Knoblauch and Crigler, 1987). The section on education countermeasures contains information on 28 educational approaches or programs for various age levels, ranging from preschool children to older adults.

Also at this time, the "Walk Alert" program was developed (NSC, 1989). The program was a cooperative effort of the National Safety Council, FHWA, NHTSA, and various service and community organizations. The goal of Walk Alert is to reduce the incidence of pedestrian traffic crashes through a comprehensive program of public education, traffic engineering, and law enforcement. The program is directed primarily at local safety volunteers and concerned citizens from community groups and service organizations, but can also be used by city and county governments, street and highway departments, law enforcement and public safety agencies, schools, and traffic engineering departments. The "Walk Alert Program

Countermeasures / Accident Type	Preschool					Elementary School								High Sch.			General Public						Older Adults		
	Parental Guidance	Safety Town/Safety Clubs	Television Programs	Walking In Traffic Safely	Watchful Willie	Officer Friendly	Education Within the Curriculum	Green Pennant Program	"Big Wheel" Spot	Willy Whistle Program	Safe Street Crossing	Child Intersection Dash TV Spot	"And Keep on Looking" Film	Assemblies	Drivers Education	Youth Traffic Court	Talks to Groups	Community Action Program	Use of the Mass Media	Multiple Threat Spot	Vehicle Turn-Merge Spot	Adult Intersection Dash Spot	Safety Courses	Talks to Groups	Community Contact Programs
Dart-out (First Half)					●					●															
Dart-out (Second Half)					●					●															
Midblock Dash																									
Intersection Dash												●	●									●			
Turn-Merge Conflict													●								●				
Turning Vehicle													●												
Multiple Threat													●							●					
Bus Stop Related						●																			
School Bus Stop Related						●																			
Ice Cream Vendor																									
Trapped																									
Backup	●																								
Walking on Roadway																									
Result Vehicle-Vehicle Crash																									
Hitchhiking																									
Working in Roadway																									
Disabled Vehicle Related																									
Nighttime Situation																									
Handicapped Pedestrians																									
Pedestrian Safety in General	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●	●				●	●	●

• Dots designate countermeasures believed to positively affect behavior/accident types.

Figure 3.2. Matrix of Potential Educational Countermeasures for Urban Pedestrian Accidents.
(Source: Knoblauch and Crigler, 1987)

Guide" includes the following:

- A discussion of the characteristics of pedestrian crashes, with diagrams of the most common pedestrian crash types;
- A checklist for evaluating pedestrian safety activity in the local community;
- A discussion of alcohol, conspicuity, rural location, and railroad grade crossings as special areas of concern for pedestrian safety;
- Identification of appropriate pedestrian safety messages for drivers and pedestrians at all age levels, along with brief descriptions of the programs available for presenting these messages;
- Description of engineering measures and physical facilities that might effectively solve many pedestrian safety problems, including sidewalks, special facilities for disabled people and older adults, signs, school zone improvements, safety lanes, parking, marked crosswalks, and pedestrian malls (to be further discussed in Chapter 4);
- A special section addressing the safety needs of school children;
- Guidelines for building a Walk Alert campaign, organizing a public information campaign, and evaluating the performance of the campaign;
- A resource guide of recommended pedestrian safety programs and audiovisual and print materials organized by target age group, with information on program length, format, and the central messages covered.

The Walk Alert program has been implemented to varying degrees in at least a dozen states and localities, but has not been comprehensively evaluated. NHTSA and FHWA are currently revising the program and plan to aggressively market the new version.

Another example of a pedestrian safety program guide is NHTSA's "Planning Community Pedestrian Safety Programs - An Agenda for Action" (NHTSA, 1990). Like the Walk Alert program guide, this document is directed at developing a coordinated community effort, either working through an existing community traffic safety program (CTSP) or independently. It identifies the key components of a CTSP (problem assessment, goal setting, target group identification, etc.) and outlines the

steps in formulating an action plan and conducting an evaluation of the program. While it does not contain specific information about the kinds of activities that should occur, it does include a list of recommended resources.

Two final program guides developed during the 1980's targeted special populations. One, "Safe Street Crossing for Kids - A Planning Guide" (NHTSA, 1989) is directed at reducing urban pedestrian crashes among children 5-14 years of age. The Guide was prepared by NHTSA to encourage local areas to implement community child pedestrian safety programs based on the "Safe Street Crossing for Kids" program. More information on this program is included in the section on education programs and materials.

A booklet developed by the American Automobile Association (AAA) entitled "Older Adult Pedestrian Safety" (AAA, 1984) offers guidelines for developing pedestrian programs to meet the needs of older adults. As with the "Safe Street Crossing for Kids" planning guide, the activities are oriented more toward community public information and education rather than engineering or enforcement and regulation activities.

Education Programs and Materials

A wide range of programs and materials has been developed to educate children and adults of all ages concerning pedestrian safety issues. These materials have been developed by a variety of Government and private organizations, including NHTSA, FHWA, the National Safety Council (NSC), the Centers for Disease Control funded injury control centers, the American Automobile Association (AAA), the American Association of Retired Persons (AARP), the National Association for the Education of Young Children (NAEYC), and Disney Education Productions. They include instructional packages, films, videos, public service announcements, brochures, and fact sheets.

Many of these materials, along with the program guides and planning documents already cited, are included in the "Pedestrian Safety Program Resource Kit" produced by NHTSA and FHWA in the summer of 1990. The kits were distributed

to all FHWA and NHTSA Regional/Divisional offices and Governor's Highway Safety Representatives. Additional kits are scheduled to be distributed in the spring of 1993. Plans are to regularly update the kits with new or revised materials.

The chart on the following pages identifies many of the more recent pedestrian safety education materials (see Table 3.1). Most have been developed by either the Federal Government or national, non-government organizations, although a few were locally developed. The discussion that follows highlights key programs and trends and is organized according to targeted age group.

Materials for Children. Many of the pedestrian safety materials developed for preschool and elementary school age children at the national level have focused on preventing "dart-out" accidents by teaching children safe street crossing techniques. Very young children are taught to stop at the "curb" and not to cross a street without an older person present. Older children are taught how to look "left-right-left" before crossing a street and the meaning of traffic signs and signals.

Two programs of special note for the preschool child are "Watchful Willie," developed by the NSC (1983, rev. 1987), and "Walking in Traffic Safely" (WITS), a program originally developed by NHTSA and later redesigned and distributed by the National Association for the Education of Young Children (1985, rev. 1990). Both consist of a series of lessons with support materials and are appropriate for use by parents or classroom teachers.

Another program that is geared toward very young children is "Safety Town." Although the program has been in existence in some form since the early 1960's, it is continuously updated to reflect new information and materials. Currently there are 800-900 Safety Town programs across the U.S., supported by police departments, service organizations, schools, local parks and recreation offices, etc. Program materials address a range of safety topics including contact with strangers, fire safety, and wearing of seat belts, as well as pedestrian safety. The most visible part of the program is a miniature "safety town" through which children can walk or ride on

Table 3.1. Selected Pedestrian Educational Materials and Program Guides

Materials for Children			
TITLE	FORMAT	AUDIENCE	PRODUCER/ SOURCE
Watchful Willie Pre-school Pedestrian Program	3-ring binder w/5 lessons and support materials	Preschool	NSC 1983 (rev. 1987)
Walking in Traffic Safely (WITS)	Storybooks and support materials	Preschool to 6 years old	NAEYC 1985 (rev. 1990)
Children Riding on Sidewalks Safely (CROSS)	Storybook w/ guide, parent's brochure, poster	Preschool	NAEYC 1990
Street Safe, Street Smart	Film/Video (13 min)	Preschool	Disney Educational Productions 1989
Stop and Look with Willie Whistle (formerly "Willy Whistle Safe Street Crossing Program")	Film/Video, Teacher's guide, PSA	K-3 grade	NHTSA 1976 (rev. 1991)
Kids and Cars Don't Mix! (Wary Walker)	Videos, classroom curriculum, media materials, etc.	K-3 grade	Harborview Injury Prevention & Research Center 1988-89
See and be Seen	Film/Video (9 min)	K-3 grade	AAA 1985
10 Little Pedestrians	12 panel brochure	K-4 grade	Outdoor Empire Publishing 1989
I'm No Fool as a Pedestrian	Film/Video (15 min)	K-4 grade	Disney Educational Productions 1988
Walk Safely	Film/Video	K-6 grade	Fiesta Films 1983
Getting to School the Safe Way	Video	3-6 grade	Los Angeles Police Department 1988
Walking with Your Eyes (formerly "And Keep on Looking")	Film/Video	4-7 grade	NHTSA 1983 (rev. 1991)
Wanda Walker (rap)	Video	Jr High	Penn. DOT/State Chapter of AAP 1990
Walk Alert: Safety for Junior High School Students	3-fold brochure	Jr High	NSC 1987

Continued

Table 3.1. Selected Pedestrian Educational Materials and Program Guides

TITLE	FORMAT	AUDIENCE	PRODUCER/ SOURCE
Materials for Parents of Children			
Parents, Safeguard Your Child	4-fold brochure	Parents	AAA 1987
Children in Traffic- Why are they Different?	Film, booklet (13 min)	Parents	AAA 1983
Parents, Children and Traffic	3-fold brochure	Parents	AAA 1981
Materials for Older Adults			
Walking Through the Years	13 page paper; slides; pamphlet	Older adults	NHTSA 1990
Mission Impossible: Operation Safe Walk	Video (16 min), user's guide	Older adults	NY City DOT, State Highway Safety Offices 1990
Safety Steps for Pedestrians	slides; audio-cassette; brochure	Older adults	AARP 1989
Walk Alert: Pedestrian Safety for Older Adults	8 page booklet	Older adults	NSC 1987
Older Adult Pedestrian Safety	10 page booklet	Older adults	AAA 1984
Materials for Implementers/Others			
Planning Community Pedestrian Safety Programs- An Agenda for Action	23 page manual	State and Local program planners	NHTSA 1990
Walk Alert 1989 Program Guide	167 page manual	All ped safety personnel	NSC/FHWA/ NHTSA 1989
Model Pedestrian Safety Program: User's Guide and Supplement	44 page guide, 89 page supplement	Public and law enforcement officials	NHTSA 1987
Pedestrian Accident Reduction Guide	40 page manual	State and local program planners	NHTSA 1981
School safety patrol and crossing guard materials	Booklets, guides	School admin., traffic officials, etc.	AAA (ongoing)
"School's Open: Drive Carefully" Campaign	Media materials	Drivers	AAA (annually)

three-wheelers and practice specific traffic skills. Although the entire program is designed to be set up in a permanent location and offered to groups of children over a two-week period, parts of it can be individually developed and taken into school classrooms and other settings.

While many of the preschool programs cited have been widely used, their effectiveness in reducing preschoolers' involvement in pedestrian collisions has not been demonstrated. However, a few programs for older children have been formally evaluated and shown effective. At the elementary school age level, the "Safe Street Crossing for Kids" program noted earlier was developed and evaluated in two counties in Florida. The program was found to produce a significant reduction in pedestrian crashes among children 5-9 years old: a 22% reduction in Dade County and a 51% reduction in Hillsborough County (NHTSA, 1989). The specific components of the program, including activity descriptions, materials, schedules, and lesson plans, were documented in a "Safe Street Crossing for Kids" manual and handbook (no longer available from NHTSA).

The "Willy Whistle Safe Street Crossing Program" for kindergarten through third graders and the film, "And Keep on Looking" for children in grades 4-7 were developed by NHTSA. "Willy Whistle" is an animated police officer's whistle that instructs children on how to cross midblock and to always look left-right-left before crossing. The "Willy Whistle" film was extensively field tested in Los Angeles, Columbus and Milwaukee, and found to reduce dart and dash crashes by over 30 percent among 4-6 year-old children (Blomberg et al., 1983).

"And Keep on Looking" was designed as a follow-on to Willie Whistle. The 15-minute film/video addresses the more complex pedestrian traffic situations that children encounter as they grow older such as turning vehicles, parking lots, and visual screens. A series of evaluations carried out in Connecticut, Seattle, and Milwaukee showed an increase in safe street crossing knowledge, some improvement in safe street crossing behavior, and a 20 percent reduction in pedestrian crashes (Preusser and Lund, 1988).

Both "Willy Whistle" and "And Keep on Looking" have been recently

updated and made available on video cassette, along with television public service announcements and teachers' guides. The new titles are, "Stop and Look with Willy Whistle" and "Walking with Your Eyes."

The "Kids and Cars Don't Mix!" program developed by the Harborview Injury Prevention and Research Center is a strong new addition to the list of available pedestrian safety programs for young children. This program, which includes the "Wanda Walker" character, will be discussed in the section on State programs and initiatives.

As evidenced in the chart, a variety of other films, videos, and print materials has been developed to deliver pedestrian safety messages to children and, in some cases, to their parents. The Disney Education Production film, "I'm No Fool as a Pedestrian" featuring Jiminy Cricket has likely been viewed by millions of children. Also, the AAA Foundation for Traffic Safety has produced a number of excellent programs and films for children, including the 1985 "See and be Seen" film and an adaptation of a German film, "Children in Traffic - Why Are They Different?" (directed to an adult audience). AAA has also been a supporter of school bus safety and has sponsored school safety patrol programs nationwide.

There have been only a few pedestrian education tools developed at the national level and designed for children at the junior high and high school levels. In conjunction with the Walk Alert program, the National Safety Council has produced a brochure, "Walk Alert - Safety for Junior High School Students." Also, one of the five alcohol and pedestrian safety pamphlets recently developed by NHTSA targets young adults, but might be appropriate for high school students as well. Recognizing the dearth of materials for this age group, some states and localities have acted to help fill the gap; their input will be noted in the final section of this chapter on state and local pedestrian education activities.

Pedestrian Education Materials for Adults. The "Walk Alert General Audience Booklet" (National Safety Council, 1988) is one of the few pedestrian safety materials targeted for a general adult audience. One of the five NHTSA

pedestrian/alcohol pamphlets is also intended for "general audience." Most adult pedestrian safety materials have been directed at more specific audiences -- parents of young children, drivers of motor vehicles, school crossing guards, school safety patrol leaders, and, in recent years, older adults. The latter is a particularly significant trend, given the increasing numbers of older adults and their overrepresentation in pedestrian - motor vehicle collisions. Some examples of education programs and materials for the older pedestrian include:

- "Walking Through the Years," a 13-page paper describing the major risk factors for older pedestrians and actions to reduce those risks. Includes slide set and pamphlet (NHTSA, 1990);
- "Walk Alert: Pedestrian Safety for Older Adults," an 8-page booklet by the National Safety Council (1987);
- "Older Adult Pedestrian Safety," the 10-page program guide booklet described earlier, available from local AAA offices (1984);
- "Safety Steps for Pedestrians," a slide/audiocasette program and pedestrian safety planning guide available from the American Association of Retired Persons (1987);
- "Mission Impossible: Operation Safe Walk," a 16-minute video and user's guide identifying the principal pedestrian crash types affecting older adults, developed by the New York City DOT and available from NHTSA or local highway safety offices (1990).

Messages for older adults have generally been based on an understanding of the kinds of pedestrian crashes in which they are most frequently involved and center around proper search behavior, wearing bright clothing during the day, carrying a flashlight and wearing retroreflective materials at night, the meaning of traffic signals such as the "flashing/don't walk" signals, and other safe street crossing techniques. Programs and materials are most often designed for use in senior citizen centers and similar settings.

Other National Level Pedestrian Education Activities

In addition to these programs and materials, a number of other activities and

trends at the national level have significantly impacted on pedestrian safety education over the past decade. The pedestrian safety programs of AAA deserve special note. For over 50 years the organization has conducted its "Pedestrian Protection Program." The program awards cities and states that have made special efforts to reduce their number of pedestrian related deaths and injuries. Over 70 percent of all U.S. cities with populations over 25 thousand participate in the program, annually submitting information on the number of pedestrians injured or killed in their community and the kinds of activities (education, engineering, enforcement) undertaken to address the problem. If requested by the city, AAA prepares an appraisal of that city's performance against others of similar size. AAA also distributes packets of materials (brochures, guidelines, etc.) for use by local police, traffic engineers, mayors, etc. Last year nearly 700 cities were recipients of these material packets. Other activities of the AAA include education of the motoring public (e.g., "School's Open - Drive Carefully" campaign), sponsorship of school safety patrol programs (since the 1920's), annual poster contests which receive entries from nearly every state in the country, and the "Safe Route to School" program.

Another national organization which has actively involved itself in pedestrian safety education is the American Association of Retired Persons (AARP). AARP has made its "Safety Steps for Pedestrians" program available to all of its 5,000 local chapters, and regularly responds to program requests from non-member individuals as well. NHTSA assisted AARP in the development of this program.

A related trend which has been of particular significance for pedestrian safety education at the national level is the strong degree of cooperation between the various agencies of the Federal Government as well as between the Federal Government and the private sector. The Walk Alert program, a cooperative effort of the NSC, NHTSA, FHWA and other organizations, is just one example. But other examples abound -- particularly situations where the government has carried out the necessary research and produced the key findings, and the private sector has responded by producing the programs and materials to disseminate this information to the local CTSP director, classroom teacher, safety patrol leader, or other key

implementer. The AAA and AARP materials and Walt Disney films are just a few examples of this level of mutual support.

State and Local Pedestrian Education Activities

Background

Although some states and communities have worked to develop their own pedestrian safety education programs and materials, most activity at the state and local level has been directed at implementing the programs developed nationally. While clearly the key to fewer injuries and deaths, these pedestrian safety activities have generally not been well documented.

As has already been noted, pedestrian safety was not a priority area for 402-funding during the 1980's, and very few pedestrian safety projects were funded under this mechanism. Pedestrian (and bicycle) safety has, however, been a component of some community traffic safety programs (CTSP's), and has received attention from several CDC-funded injury control centers. The present section will review what is known about recent state and local initiatives in the area of pedestrian safety education and highlight some of the key efforts.

State Pedestrian Education Activities

Three states that have been particularly active in promoting pedestrian safety through educational programs and activities are Pennsylvania, Florida and Virginia. In Pennsylvania, Section 402 Federal grant monies are being used to fund Comprehensive Highway Safety Projects in 64 of the State's 67 counties. Pedestrian safety is an integral component of these projects. The Pennsylvania DOT is implementing a pedestrian public information and education campaign called "Walk Smart" statewide. It has joined forces with the State Department of Education to assure that each child will receive age-appropriate instruction in pedestrian safety education: preschool - 2nd graders through the "Watchful Willie" program; 3rd-6th graders through a combined pedestrian/safety belt/bicycle program using "Getting to School

the Safe Way" (a video developed by the Los Angeles Police Department) and other programs; and for older children a newly created "rap" video entitled "Wanda Walker". Special emphasis is being placed on pedestrian safety programs in urban areas. For example, Philadelphia has developed a comprehensive campaign of education, engineering, and enforcement based on the Walk Alert program. The title of their PI&E campaign is "Philadelphia Kids Walk Smart."

The state of Florida has initiated a wide range of pedestrian safety activities. Their "Bike Ed" program has been expanded into a comprehensive traffic safety education curriculum for grades K-8, with an emphasis on pedestrian safety for children in grades K-2. Florida DOT has also sponsored two statewide conferences designed, in part, to focus attention on pedestrian safety and to foster the establishment of local coalitions to promote pedestrian safety, and has sponsored training workshops on pedestrian safety programs for State and local program coordinators. Both of these activities have been carried out with assistance from the Bicycle Federation of America and its sister organization, the Pedestrian Federation of America.

Florida DOT has also joined with the University of Florida in two ongoing research studies. One study is examining how children travel to and from school and ways to enhance the safety of their trip. Recommendations will likely include a mix of education, engineering, and enforcement/regulatory measures. A second study is focusing on the special needs of older pedestrians, and involves collection of observational data at three different sites. Again, this study is likely to result in a combination of education, engineering, and enforcement recommendations. Results of these research efforts will be highlighted at a conference in December of 1992. Finally, Florida DOT has recently completed the "Florida Pedestrian Safety Plan" to provide overall direction to its pedestrian safety program (Florida DOT, 1992).

As a final example of a state that has been particularly active and innovative in the area of pedestrian safety, a program recently under way in Virginia provides local communities with individualized reports that define their pedestrian/bicycle safety problem and give a "blueprint" for a program tailored to their particular

needs. The Virginia program is being offered through the State's Transportation Safety Training Center at Virginia Commonwealth University and is funded with Section 402 grant monies. A "Pedestrian and Bicycle Safety Evaluation Team" that includes a police officer, bicycle safety specialist, traffic engineer, department of education representative, and other highly qualified specialists examines crash data, travels to the local site to present a two-day program, conducts interviews, and visits actual crash sites prior to preparing its report and recommendations. To date assessments have been completed for three communities, and three additional communities have requested the program's services. All evaluations and plans are developed at no cost to the community. The program has been in operation for less than a year and has set a goal of completing one community evaluation per month.

Local Pedestrian Education Activities.

In addition to these statewide efforts, a number of cities stand out when considering local initiatives in the area of pedestrian safety education. As with the state programs, it is often the case that education activities are part of a larger program that involves engineering and enforcement/regulatory components as well. For this reason, many of the communities cited here will be discussed again in later sections of this report.

Although the time frame for the "Denver Pedestrian Safety Project" precedes the focus period of this report, it is an excellent example of a coordinated community approach to reducing pedestrian crashes (Thackray and Chiplock, 1981). The Denver project ran from 1977-1980 and was a joint effort of the Colorado Division of Highway Safety, the Denver Police Department, and Applied Science Associates, Inc. (a research organization). It encompassed problem identification, countermeasure development and implementation, and effectiveness evaluation. The countermeasures resulted from input from numerous broad-based committees and included extensive PI&E activities, an education program for children in grades K-3, selective pedestrian law enforcement, and identification of high crash locations coupled with traffic engineering modifications. Results of the evaluation showed a statistically

significant reduction in pedestrian crashes in Denver, compared to increases for three comparison cities during the same time period. The K-3 pedestrian education program, featuring an original "Wise Owl" character, was also associated with a significant reduction in crashes among children exposed to the curriculum.

Certainly one of the key players in the field has been the city of Seattle. Although Seattle has a long history of "pedestrian friendliness," its efforts to enhance pedestrian safety were boosted in 1987 by a Federal grant from the Department of Health and Human Services. Support has also come from a Centers for Disease Control grant: Harborview Medical School in Seattle is host to one of the CDC-funded injury control centers and has coordinated Seattle's pedestrian education efforts. From the outset, Harborview's activities were intended to serve as a model for communities and states nationwide, and indeed, aspects of their program have been picked up and used in locations across the country (Washington State and Utah being two good examples).

Pedestrian education activities in Seattle have been directed primarily at children. Materials that have been developed as part of the "Children's Pedestrian Safety Campaign" include a school-based curriculum, a community guide, numerous flyers, parent-child activity books, a pedestrian rodeo guide, information for school PTA's, posters, and a variety of television and radio public service announcements. The school curriculum, "Kids and Cars Don't Mix," uses videos, worksheets, a safety rap song, a "map to safety" poster, and other props to teach children safe street crossing behaviors. Children in grades K-1 and 2-3 participate in five classroom based lessons plus a field day where they are videotaped crossing a street. Older students in grades 4-5 are taught to assist with the younger students. Students completing the activities are awarded "Wary Walker" stickers, pencils, buttons, etc. Extensive evaluation has shown significant changes in street crossing behavior for children exposed to the curriculum.

Other components of the "Children's Pedestrian Safety Campaign" include a pedestrian safety merit badge program developed for the Totem Girl Scout Council (over 100,000 girls participating) and special educational materials developed for

physicians. The program also has strong engineering and enforcement components that will be discussed in future sections. Indeed, one of the greatest strengths of the Seattle program is the strong degree to which it has integrated a variety of educational, engineering, and enforcement activities all directed at reducing pedestrian crashes and injuries.

Another city which has been active in pedestrian education activities is Milwaukee. Milwaukee is known as a pedestrian-friendly city, having regularly received awards and recognition from the American Automobile Association. Since the 1950's, the Milwaukee Safety Commission has promoted pedestrian safety for school-age children through its school crossing guard and traffic safety education programs. The Commission hires and trains adult guards, works with student safety cadets, gives recognition to schools with exemplary safety programs, and sponsors a summer time "Safety Fest" that is regularly attended by over 30,000 children. To help in its work, the Commision has developed several training videos, including one for school safety cadets as well as a more general safety video and teacher's guide for children in grades K-6. For adults, the Commision includes pedestrian safety in its defensive driving courses and has developed a slide program and pamphlet addressing issues of pedestrian safety.

Several other cities, finding a void in existing materials, have created pedestrian safety materials of their own. The "Wanda Walker" rap video developed for use in the Pennsylvania and Philadelphia "Walk Smart" campaigns is one example. In addition, the Los Angeles police department has created "Getting to School the Safe Way," a pedestrian and bicycle safety video for third to sixth grade students.. Another video which was locally developed but which is being distributed nationally is "Mission Impossible: Operation Safe Walk" developed by the New York City DOT to address the special safety needs of older pedestrians.

Finally, a number of cities have received $30,000 NHTSA/FHWA grant awards to develop comprehensive community pedestrian safety programs. Cities receiving awards in 1990 included: Missoula, Montana; Rochester Hills, Michigan; New York City; Middlesex County, New Jersey; and Medford, Haverhill and Lowell,

Massachusetts. The three Massachusetts communities are part of a program called "Saving Lives Communities." Each of these communities has a full-time pedestrian safety coordinator. In addition to the seven 1991 awardees, five additional communities received grant awards in 1991. These were: Boston, Massachusetts; Phoenix, Arizona; Seattle, Washington; West Valley City, Utah; and Burlington, Vermont. The programs in these cities are all comprehensive in scope, but place special emphasis on pedestrian safety education.

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Chapter 4. Pedestrian Facility and Engineering Developments

Federal Government and Other National Activities

Background

In regard to facility design and engineering developments, the list of candidate countermeasures is long and broad, from a wholesale change in the roadway cross-section to a simple signing or signal improvement. As a guide or standard to such changes, engineers have relied on a set of standard references, such as the Manual on Uniform Traffic Control Devices (MUTCD), the Traffic Control Devices Handbook, the Transportation and Traffic Engineering Handbook (Institute of Transportation Engineers or ITE), various American Association of State Highway and Transportation Officials (AASHTO) references such as A Policy on Geometric Design of Highways and Streets ("Green Book"), various Federal Highway Administration reports and guides, ITE reports, and others.

In addition, for the decade of the 1980's, several key documents stand out as central from a Federal Government or national perspective, either as synthesis reports, users' guides, or research documents. Since these are facility or engineering related, virtually all were sponsored by FHWA or the Transportation Research Board (TRB). They include:

- Vallette and McDivitt's "Pedestrian Safety Programs - A Review of the Literature and Operational Experience" prepared for FHWA in 1981, which included the activities and experiences of a variety of U.S. cities with successful pedestrian safety programs;

- Chapter 16, "Pedestrian Ways," written in 1982 by Pfefer, Sorton, Fegan, and Rosenbaum for FHWA in the "Synthesis of Safety Research Related to Traffic Control and Roadway Elements - Volume 2;"

- "Pedestrian Signalization Alternatives" (Zegeer, Opiela and Cynecki, 1983), a research study prepared for FHWA;

- "Pedestrian Trip Making Characteristics and Exposure Measures" (Tobey, Shunamen and Knoblauch, 1983), a research study for FHWA;

- "Methods of Increasing Pedestrian Safety at Right-Turn-on-Red Intersections" (Zegeer and Cynecki, 1986), a research study and separate user's guide for FHWA;

- The "Model Pedestrian Safety Program User's Guide" (with supplement) (Knoblauch and Crigler, 1987) which updated and condensed an earlier 1977 document;

- "Planning and Implementing Pedestrian Facilities in Suburban and Developing Rural Areas" (Smith, Opiela, Impett, Pietrucha, Knoblauch and Kubat, 1987), prepared for the National Cooperative Highway Research Program (NCHRP Reports 294 A and B), which provided useful details for pedestrian facilities in rural and suburban areas;

- The 1987 FHWA document by Earnhardt and Simon entitled, "Accessibility for Elderly and Handicapped Pedestrians - A Manual for Cities," provides guidance for planners and other officials relative to design problems and recommended solutions;

- "Investigation of Exposure Based Pedestrian crash Areas: Crosswalks, Sidewalks, Local Streets, and Major Arterials" (Knoblauch, Tustin, Smith, and Pietrucha, 1987), a research study for FHWA;

- "Pedestrians and Traffic Control Measures - Synthesis of Current Practice" (Zegeer and Zegeer, 1988), prepared for the National Cooperative Highway Research Program (NCHRP Report 139);

- The 1989 FHWA report, "Planning, Design, and Maintenance of Pedestrian Facilities" (Bowman, Fruin, and Zegeer) consolidates the state-of-the-art pertaining to pedestrian facilities;

- The "Walk Alert 1989 Program Guide" produced by the National Safety Council in cooperation with FHWA and NHTSA covers not only engineering but also education and enforcement/regulatory countermeasures; and

- An update to the 1982 "Pedestrian Ways" synthesis paper entitled "Synthesis of Safety Research - Pedestrians" (Zegeer, 1991).

All of the reports in this list help to legitimize the process of improving pedestrian safety through engineering countermeasures. Some of these facility design and engineering reports have spawned safety activities at the state and local levels as well.

Engineering Countermeasure Activities

Many engineering countermeasures have been identified. The "Model Pedestrian Safety Program User's Guide" (Knoblauch and Crigler, 1987) lists the following: barriers, bus stop relocation, marked crosswalks, grade separation, facilities for the handicapped and older adults, lighting, one-way streets and diagonal parking, retro-reflective materials, safety islands, sidewalks, signalization, signs and markings, urban pedestrian environments, and vehicular traffic diversion strategies. Pedestrian crash types and potential engineering countermeasures are shown in Figure 4.1, taken from the same source.

Many of these strategies could be called traffic control techniques. NCHRP "Synthesis Report 139" cautions that simple blanket installation of such remedies is often inappropriate, and that tailoring particular strategies to suit a given location is the best way to proceed (Zegeer and Zegeer, 1988). This document and others state that some of the most effective treatments at selected locations include crossing guards at school zones, selective use of signal timing, pedestrian barriers, overpasses and underpasses (although these are rarely cost-effective), and sidewalks.

Numerous new developments with respect to engineering improvements have resulted in recent years. For example, until recently, no specific guidelines existed for conditions where it is recommended to install sidewalks. While sidewalks are typically installed in urban areas, the high cost often prevents their construction in business and residential areas. Also, considerable confusion has existed on whether painted crosswalks are safer for pedestrians than unmarked crosswalks.

Two recent publications have helped to resolve these issues. A 1987 study developed specific guidelines for installation of sidewalks based on land use for new or existing streets (Knoblauch, Tustin, Smith and Petricha, 1987). Guidelines for marked crosswalks at uncontrolled intersections were also developed based on pedestrian volume, traffic volume, and roadway type. Further information was provided in the TRB synthesis study (Zegeer and Zegeer, 1988) on conditions where sidewalks and marked crosswalks, as well as other pedestrian safety measures, are

Countermeasures / Accident Type	Engineering and Physical																					
	Barrier: Median	Barrier: Roadway/Sidewalk	Barrier: Street Closure	Bus Stop Relocation	Crosswalk: Intersection	Crosswalk: Midblock	Diagonal Parking-1 Way Street	Grade Separation	Facilities for Handicapped	Lighting: Crosswalk	Lighting: Street	One-Way Streets	Retroreflective Materials	Safety Islands	Sidwalk/Pathway	Signal: Ped. (Shared)	Signal: Ped. (Delayed)	Signal: Ped. (Separated)	Signal: Traffic	Signs and Markings	Urban Ped. Environment	Vehicular Traffic Diversion
Dart-out (First Half)	●	●				●	●														●	●
Dart-out (Second half)	●	●				●	●					●		●							●	●
Midblock Dash	●	●				●								●							●	●
Intersection Dash					●			●		●	●			●			●	●		●		
Turn-Merge Conflict								●									●	●				
Turning Vehicle								●									●	●				
Multiple Threat								●		●	●					●	●	●	●		●	
Bus Stop Related				●																	●	
School Bus Stop Related				●																		
Ice Cream Vendor																				●		
Trapped					●			●						●		●	●	●				
Backup																						
Walking on Roadway		●									●		●		●					●		
Result Vehicle-Vehicle Crash																				●		
Hitchhiking											●		●									
Working in Roadway																				●		
Disabled Vehicle Related																				●		
Nighttime Situation										●	●		●									
Handicapped Pedestrians									●													

• Dots designate countermeasures believed to positively affect behavior/accident types.

Figure 4.1. Matrix of Potential Engineering Countermeasures for Urban Pedestrian Accidents.
(Source: Knoblauch and Crigler, 1987)

most beneficial to pedestrians. Such information was based on the available literature and on questionnaire input from the experiences of 48 State and local highway agencies throughout the U.S. While some of this information is covered in the Walk Alert program manual, there is a need to distribute the information on a wider basis throughout the U.S.

Many innovative traffic control measures for pedestrians have also been developed and tested in recent years. For example, Zegeer, Opiela and Cynecki (1983) examined several new sign and signal alternatives to indicate the clearance interval and also to warn of pedestrian-vehicle conflicts. In another FHWA study, Zegeer and Cynecki (1986) developed and tested countermeasures for increasing pedestrian safety at right-turn-on-red intersections, and a users' guide was developed to assist highway agencies in applying the results. Useful input resulted from both of these studies, but, as has been the case with many final reports and manuals produced in recent years, limited funds were available to distribute the information to local users. Thus, the situation exists where improved technology and countermeasure information is available, but where it is not being communicated to those who can best put it into practice.

Although oriented more to education, the "Walk Alert 1989 Program Guide" (NSC, 1989) also contains suggested engineering or facility improvements. The potential engineering countermeasures mentioned grew out of the "Model Pedestrian Safety Program User's Guide," the TRB Pedestrian synthesis, and other recent pedestrian safety studies and reports. For example, recommended guidelines for sidewalk installation and proposed minimum sidewalk widths are offered. Facilities for disabled people and older adults mentioned in Walk Alert arise from the earlier mentioned manual (Earnhardt and Simon, 1987) pertaining to elderly and handicapped pedestrians. Traffic signals and pedestrian signals can be effective, yet care must be exercised when the timing cycle is set. Safety islands can help when pedestrians have to cross wide or busy streets. Marking a crosswalk may develop a false sense of security for pedestrians, and the Walk Alert guide offers recommended guidelines for crosswalk markings. And as a final example, pedestrian

malls, which separate pedestrians and vehicles, can be an excellent safety remedy, but their use must fit the local traffic and land use.

Some of the research leading to the countermeasures mentioned in the Walk Alert and other guidebooks spans many years. Both of the synthesis documents by Zegeer tend to highlight the background research and development.

State and Local Pedestrian Facility and Engineering Activities

Background

Virtually all states in the U.S. engage in engineering activities related to pedestrian safety, and good examples can be drawn rather easily. In many states, much of the pedestrian safety activity is carried out at the local level rather than at the state level. Certain cities and states appear to have been particularly active and innovative in this area, and the sections that follow will attempt to provide some examples.

At least some of the engineering (or other) advances for pedestrians are a result of gains made in the bicycling area. Bicycling has had appreciable "grass roots" organization and support over the last two decades, and the pedestrian movement has tended to learn from this and follow suit. There used to be only a few statewide bicycle coordinators in the U.S.; now there are statewide bicycle/pedestrian coordinators and some statewide pedestrian coordinators as well. Different pedestrian spokespersons tend to agree that often it is the positioning and energy of coordinators or other pedestrian advocates that is key to getting improvements in place.

Engineering or facility improvements for pedestrians also have some link with planning concepts. While there are some standards in place for things like sidewalks, crosswalks, and signing, there is extensive literature about land use planning, landscape architecture, and other related subjects that has led to relating walking (and bicycling) to aesthetics, promotion of livable environments, and other such concerns. This, in turn, leads to the planning and development of continuous networks for pedestrians. Use of park and ride lots and interfacing with transit is often

part of the network, along with the use of pedestrian malls. Thus, while some of these pedestrian-related features are not synonymous with engineering or facility countermeasures, they nonetheless have pedestrian safety implications.

State Activities

Given this background, the following text will provide examples of noteworthy state pedestrian facility and engineering activities, realizing that the examples are far from complete. To some extent the recognition is directly related to the amount of documentation and general publicity associated with the various engineering improvements.

In recent years Florida has been active in promoting pedestrian improvements. The "Livable Cities" conference in Gainesville in 1988 was an outgrowth of the annual international pedestrian conferences held in Boulder, Colorado for over a decade. At least partly funded by the State energy office, the Florida DOT has published several documents pertaining to planning and engineering improvements, including the "Florida Pedestrian System Plan" (Applied Science Associates, 1989) and "Developing Pedestrian Plans - Pedestrian Coordinators Manual" (Applied Science Associates and the Bicycle Federation of America, n.d.). The System Plan Executive Summary states that "the purpose ... is to lay out the FDOT's strategy for improving pedestrian transportation in the State over the next five to twenty years to ensure that walking is a major component of Florida's transportation system."

The Executive Summary also lists the following facility improvements (p.11) that are necessary to meet this objective:

1. Sidewalk construction programs need to be instituted in all urban areas to correct backlog deficiencies;

2. Width of existing sidewalks should be increased as needed to account for reductions in walking space due to obstructions;

3. Construction of bus stop shelters should provide for sidewalk access in both directions and appropriate street crossing facilities;

4. The use of rural cross sections in areas where pedestrians are likely to walk should be avoided. If a rural cross section is used, then a sidewalk should be installed, offset from the roadway by at least the clear zone width;

5. All road re-surfacing projects should include provisions to prevent more than 1/2 inch pavement lips, to avoid problems for wheelchairs;

6. Crosswalks shall be considered whenever circumstances suggest pedestrian demand or the need for crossing assistance;

7. Other pedestrian crossing aids, such as pedestrian signals, push buttons, raised median strips, mid-block crosswalks and signals, should be installed wherever pedestrian activity can be expected, including within 1/2 mile of any public facility, such as shops, schools, offices, parks, and residential areas;

8. All existing pedestrian facilities should be examined to determine that they meet minimum standards for handicapped access;

9. Painted stop bars should be offset a minimum of four feet from a marked crosswalk. In the absence of a marked crosswalk, the stop bar should be offset a minimum of eight feet;

10. A regular program of maintenance of all pedestrian facilities, including crossing signals and buttons, needs to be implemented.

An overview of the pedestrian engineering program from the coordinators manual illustrates how walking is tied to quality of life (p. 33):

> Traffic engineers and planners must provide walkable environments. Engineering solutions must make fundamental changes to the previous approaches used to design our cities and highways. The most pressing safety problems -- lack of sidewalks, crosswalks, and pedestrian signals -- can be solved by inventive engineering solutions to "retrofit" the missing pieces into the existing infrastructures.
>
> Most importantly, engineers must understand that making a community walkable means more than simply eliminating safety hazards: It also requires a conscious effort to design an environment that is scaled to the pedestrian's abilities and sensitive to a pedestrian's needs and interests. A truly walkable environment involves short trip distances, protection from the environment, and enjoyable things to see and do along the way.

Various pedestrian improvements have also been implemented in Pennsylvania. As noted in Chapter 3, safety programs are being implemented in 64 of Pennsylvania's 67 counties using Federal Section 402 Highway Safety Program funding. Pedestrian safety is part of all of these projects, and is the priority element in 11 counties that contain 80 percent of the State's pedestrian crashes. These are comprehensive programs that feature engineering along with education (Novak, 1990).

In Philadelphia, a comprehensive project entitled "Street Smart" is based on Walk Alert and includes the following engineering countermeasures:

- Modifications of signal timing to provide increased pedestrian crossing time;
- Refurbishing of pavement markings;
- Potential inclusion of pedestrian refuge islands at specific intersections;
- "Kick-off" of the new pedestrian public information/education campaign, "Philadelphia Kids Walk Smart," to coincide with the planned physical improvements;
- Publicized selective police enforcement during the kick-off period and continued selected enforcement periods throughout the year.

Philadelphia also has a history of programs related to school area pedestrian safety (Isakoff, 1984).

Washington State has been a leader in pedestrian safety, and a good bit of the credit belongs to the city of Seattle. Engineering countermeasures in Seattle include traffic calming (measures like street narrowing to slow the speed of traffic), spot improvements (some of which are initiated through a citizen request form), offset stop bars, lighting, a priority accessible network (PAN) for elderly and handicapped pedestrians, and others. Seattle is also the home of the Harborview Injury Prevention and Research Center (HIPRC), and the Center has been active in pedestrian safety programs. As an example, HIPRC developed "Kids and Cars Don't Mix!," a comprehensive program implemented in Seattle that included some engineering components. The Seattle Engineering Department is participating by identifying traffic situations that pose the least risk to pedestrians, as well as examining the

effect of educational efforts designed to have drivers stop for pedestrians in crosswalks, which has become a Washington State law. The city of Bellevue, Washington, also has an active program. As an example, Bellevue has identified pedestrian corridors and routes and redesigned sidewalks to urban standards.

Colorado should be mentioned in this discussion for several reasons. Boulder has hosted for many years the Annual Pedestrian Conference, which has become an international gathering. Boulder also leads with its Alternative Transportation Program designed for both pedestrians and bicyclists. Denver is also noted for pedestrian improvements, with examples including a pedestrian mall and various pedestrian trails.

Finally, several states have been recognized recently by the AAA awards program for engineering efforts. These include Wisconsin, Virginia, Ohio, and New York State.

Local Activities

Much of what applies to good state programs applies as well to local programs. There are now a number of local pedestrian coordinators in place that greatly facilitate the initiation and completion of improvements. Principles of land use planning and the connection to concepts like livable cities, green spaces, separation from vehicles, and others have had an important role. Once again, a few examples will be given, but to some extent the cities are identified because either they have received publicity or have conducted some research and/or evaluation of pedestrian safety improvements. There are many other cities that could be added to the list.

Seattle has been mentioned previously, along with Philadelphia, Boulder, Denver, and Milwaukee. Phoenix has an active traffic engineering department sensitive to pedestrian needs. Phoenix requires sidewalks with all new development and is moving toward a requirement for more clear space between the road or street and the sidewalk. In its Neighborhood Traffic Management program, a three-person engineering team works with neighborhoods to lend guidance and help get support for their projects. More than 25 different neighborhoods are participating, and

some engage in community speed watches using radar loaned from the city. This has led to some use of traffic calming techniques. All major streets have continuous lighting, which is good for pedestrian safety as well as crime prevention.

A landmark study of pedestrian safety in marked crosswalks was conducted by Herms in San Diego in the early 1970's (Herms, 1972). More recently, this city has done considerable work with audible signals for pedestrians. Washington, D.C. has experimented with sidewalk barriers to prevent midblock crossings and was a test city in the FHWA study on Pedestrian Signalization Alternatives. As part of that study, they were involved in testing the experimental DON'T START pedestrian signal indication, and the WALK WITH CARE signal, as well as various other signs and pedestrian signal alternatives.

Other localities recognized by AAA for engineering improvements include San Jose, San Diego, Anaheim, Thousand Oaks, and Lakewood in California; Hampton, Virginia Beach, and Roanoke in Virginia; Milwaukee, Wisconsin; and Philadelphia, Pennsylvania.

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Chapter 5. Pedestrian Law Enforcement and Regulation

Federal Government and Other National Activities

Of the three "E's" (education, engineering, and enforcement) frequently mentioned as strategies in pedestrian safety, enforcement has typically received much less attention than the other two categories. However, both enforcement and regulatory activities are important parts of a comprehensive pedestrian safety program. To be effective, enforcement and regulatory actions against both drivers and pedestrians should be used.

Although not part of the 1980's period upon which this document is focusing, a study prepared for NHTSA in 1974 has relevance to this area. This was the work of English, Conrath, and Gallavan entitled "Pedestrian Laws in the United States" (1974), which reviewed the pedestrian laws of all 50 States and 50 randomly selected communities. The study served to point out both the uniformity and diversity that exists with regard to these laws.

Although traffic laws and ordinances are enacted by State and local governments, standardization of laws across jurisdictions is necessary for widespread understanding. The Uniform Vehicle Code, or UVC, published by the National Committee on Uniform Traffic Laws and Ordinances, was designed for this purpose (NCUTLO, 1987). Article V of Chapter 11 of the code pertains to the rights and duties of pedestrians. Examples of items covered include pedestrian obedience to traffic-control devices and traffic regulations, the right of way in crosswalks, crossing at other than crosswalks, using the right half of crosswalks, walking on highways, and yielding to emergency vehicles. The recommendations presented in the UVC derive from actual traffic law experience from various states.

The Model Traffic Ordinance, or MTO, was revised in 1987 and published as part of the UVC. The MTO contains a recommended set of ordinances for municipalities or other forms of local governments. The MTO consistently follows the UVC and likewise attempts to develop a standard group of ordinances that are widely understood. Article III of Chapter 3 lists suggested ordinances for pedestrians

and passengers. Included are crossing the roadway at right angles, prohibited crossings, boarding or alighting from vehicles (or structures), and unlawful riding (NCUTLO, 1987).

Although developed back in the mid- to late-1970's, several NHTSA model pedestrian ordinances (also noted in Chapter 3) are relevant to this section. The ordinances and their rationale are succinctly described in the "Synthesis of Safety Research - Pedestrians" (Zegeer, 1991, p.90):

> Model ice cream truck ordinance - this type of regulation is needed in many areas to deal with the problem of children [who] walk or run into the street to or from ice cream vending trucks. This ordinance has several components, including: (1) requiring drivers to stop before overtaking a vending truck, (2) requiring "stop then go if safe" swing arms and alternately flashing lights on vendor trucks, and (3) restricting the locations where vending trucks are allowed. According to a 1979 NHTSA study, such an ordinance was put into effect in Detroit in June of 1976. During the first partial vending season, related pedestrian crashes dropped 54 percent. In the first full vending season, related crashes were reduced by 77 percent (i.e., from a three-year average of 48.7 per year to 11 in 1977) (NHTSA, 1979).
>
> Model bus stop ordinance - This measure requires that bus stops be relocated from the near side to the far side of an intersection. It also prohibits pedestrians from crossing in front of a stopped bus unless allowed to do so by a traffic control device or police officer. This ordinance can increase the visibility between an approaching motorist and crossing pedestrians and thus decrease bus-related pedestrian crashes.
>
> Multiple vehicle overtaking ordinance - One of the common types of pedestrian crashes on multilane roadways is termed a "multiple threat" crash. This crash type involves pedestrians [who] step into a traffic lane (often in a crosswalk) in front of a stopped vehicle and then into the adjacent lane without looking prior to being struck by an oncoming vehicle. This ordinance would require drivers to yield to pedestrians in a crosswalk and to stop before passing a vehicle stopped at a crosswalk [for any reason].
>
> Disabled vehicle ordinance - To reduce pedestrian crashes on freeways, this ordinance requires that motorists move their vehicle as far as possible off the road and place a warning device behind it. Reflective materials must also be carried in the vehicle to wear when walking along access-controlled roads at night. It also prohibits standing in roadways during vehicle repairs.

Parking near intersections or crosswalks ordinance - This ordinance provides that vehicles should not park within 50 ft. of a marked crosswalk or within 60 ft. of an intersection without a marked crosswalk on that approach. This ordinance, when obeyed, should help drivers approaching an intersection to see pedestrians more easily.

There is a need for more effectiveness evaluations of enforcement strategies. The "Model Pedestrian Safety Program User's Guide Supplement" (Knoblauch and Crigler, 1987) offers a matrix of crash types and associated enforcement strategies, although it is readily apparent that the number of filled-in boxes is few (see Figure 5.1). Tracking the pedestrian crashes and injuries in some of the cities with active enforcement programs should be undertaken to determine the benefits of these strategies.

The recent community pedestrian grants jointly awarded by NHTSA and FHWA may offer a means of tracking the results of enforcement efforts. The grants, for $30,000 each, were covered in Chapter 3 because of their emphasis on education; however, enforcement strategies may also be utilized. In addition, NHTSA has awarded two separate pedestrian safety program grants to Montgomery County, Maryland, and Eau Claire, Wisconsin. Although encompassing all of the "three E's," these two programs will be administered by law enforcement agencies and will have particularly strong enforcement components.

One of the most recent developments in this area was a 1990 NHTSA Pedestrian Law Enforcement Strategies Workshop. A group of 25 state and local law enforcement and traffic safety specialists was convened to focus on pedestrian safety as related to law enforcement. Common pedestrian safety problems identified by the participants were: (1) behavior and perceptions of pedestrians and motorists, (2) policy priorities, (3) data collection and analysis, and (4) engineering and community growth. The particular pedestrian law enforcement issues identified were:

1. Public awareness of pedestrian laws
2. Public perceptions about the enforcement of pedestrian laws
3. Community support for pedestrian law enforcement activities
4. Police training and support
5. Funding for pedestrian law enforcement

Countermeasures / Accident Type	Child Protection					Enforcement/Regulations									
	Safe Route to School Prog.	School Bus Routing Plan	School Bus Patrols	School Crossing Guards	Play Streets	Enforcement	Ice Cream Truck Ordinance	Bus Stop Ordinance	School Bus Regulations	Dismounted Motorist Regs.	Vehicle Hazard Lights Regs.	Freeway Walking Regs.	Regs. for Peds. on Highways	Vehicle Overtaking Law	Parking Near Intersections
Dart-out (First Half)					●										
Dart-out (Second Half)					●										
Midblock Dash					●										
Intersection Dash															●
Turn-Merge Conflict															
Turning Vehicle															
Multiple Threat														●	
Bus Stop Related								●							
School Bus Stop Related		●	●						●						
Ice Cream Vendor							●								
Trapped															
Backup															
Walking on Roadway													●		
Result Vehicle-Vehicle Crash															
Hitchhiking												●			
Working in Roadway															
Disabled Vehicle Related										●	●				
Nighttime Situation											●				
Handicapped Pedestrians															
Pedestrian Safety In General	●	●	●	●	●	●									

• Dots designate countermeasures believed to positively affect behavior/accident types.

Figure 5.1. Matrix of Potential Enforcement Countermeasures for Urban Pedestrian Accidents.
(Source: Knoblauch and Crigler, 1987)

6. Data collection and analysis
7. High risk populations: the elderly
8. High risk populations: pedestrians on high-speed roadways
9. High risk populations: alcohol-impaired pedestrians
10. High risk populations: children
11. Other problems, ideas and observations

A variety of recommendations for dealing with these problems was also developed. A manual of pedestrian law enforcement strategies will be published in 1992.

State and Local Pedestrian Enforcement/Regulatory Activities

Virtually the same comments apply here as were included in the previous chapter on engineering improvements. That is, there are many examples of state and local enforcement efforts that could be cited. The programs cited here have either received some publicity or have incorporated some research and/or evaluation of an enforcement component.

On the negative side, regulations remain in place in many State highway departments that do not include construction of sidewalks as part of local highway projects. There are also highway departments that impose limitations on the frequency of crosswalks.

Wisconsin and Washington State tend to be recognized as states with good pedestrian enforcement programs, and part of this recognition no doubt derives from exemplary efforts in Milwaukee and Seattle. Milwaukee is perennially recognized by the American Automobile Association (AAA) through its awards to cities making gains in pedestrian safety. Theirs is a comprehensive program, but enforcement of pedestrian safety has been a consistent ingredient for the past 25 years. Pedestrian enforcement is emphasized in police roll calls, and officers are encouraged to make contacts both with pedestrians who commit violations and with motorists who endanger pedestrians. Many of the contacts result in warnings, but citations are issued if necessary. The numbers of warnings, citations, and citizen contacts are routinely totaled.

The police have strong support from municipal judges as well. First time walking violators tend to receive suspended sentences, but motorists who fail to

yield to pedestrians are usually fined. These violations also yield driving record points as assessed by the Wisconsin DOT (National Safety Council, 1988).

Both Seattle and Washington State passed comparable pedestrian laws in 1990 that clearly favor the pedestrian. Seattle's ordinance reads as follows:

> Seattle Municipal Code Section 11.20.040
> When traffic-control signals are not in place or not in operation, the operator of an approaching vehicle shall stop to allow a pedestrian using an unmarked or marked crosswalk or a disabled person using a curb ramp as provided in Section 11.40.090 to cross the roadway when the pedestrian or disabled person is upon the half of the roadway upon which the vehicle is traveling, or when the pedestrian or disabled person is upon the opposite half of the roadway and moving toward the approaching vehicle. This section shall not apply to pedestrians crossing a roadway at a point where an accessible pedestrian tunnel or overhead pedestrian crossing has been provided.

Seattle motorists failing to yield the right-of-way may be ticketed (total cost $47.00). Pedestrians, including joggers, disobeying signals or jaywalking may also be ticketed (total cost $19.00). Ticketing performance measures have also been used, such as each officer writing one ticket per day to a motorist who fails to yield to a pedestrian. A rule-of-thumb has been for officers to ticket two motorists for every jaywalking offense that results in a ticket. Pedestrian decoys have been used to cross streets at crosswalks where police can observe motorist behavior. This strategy has been supported by the public, and citizens have even volunteered to serve as decoys.

All of this Seattle enforcement activity occurred after a highly publicized public information and education campaign coordinated by the local Harborview Injury Prevention and Research Center. Public service announcements, newspaper articles, radio spots, billboards, and bus posters were ingredients. Having education precede pedestrian enforcement is considered to be a key ingredient in successful enforcement programs. The State of Montana and the city of Missoula, Montana have enacted pedestrian laws that are quite similar to the laws in Seattle and Washington State.

Other states and localities have been recognized by AAA in recent years for enforcement efforts. The states include Indiana, Virginia, Ohio, and New York

State. Localities with strong enforcement and administration programs include San Jose, San Diego, Anaheim, Modesto, and Thousand Oaks in California; Brecksville and Cleveland Heights in Ohio; Grosse Pointe Woods and Sterling Heights in Michigan; and Norfolk, Virginia.

Also worth noting are state efforts to deal with the problem of pedestrians on high-speed roadways. In regard to construction worker safety, the Michigan State Police instituted the Construction Zone Accident Reduction (CZAR) program, which involved vigorous ticketing of speeding motorists in work zones. Pennsylvania State law allows a double fine to motorists speeding in work zones. Virginia is considering this legislation as well.

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Chapter 6. Bicyclist Education Countermeasures and Programs

Background

With little Federal monies expended directly on bicycling in the 1980's, program activity centered within national non-governmental organizations (NGO's) and at the state and local level, often with minimal documentation and evaluation. Program activity included within this review reflects the extent to which this activity was documented and publicized or its materials distributed. No attempt has been made to cite every activity nor comment on every item identified, but rather examples of a type of activity or unique elements have been included.

Much of the public information and education program activity directed at bicycling safety during the 1980's reflected the influence of a pivotal study entitled "A Study of Bicycle/Motor-Vehicle Accidents: Identification of Problem Types and Countermeasure Approaches" (Cross and Fisher, 1977). Its original three-volume publication by NHTSA in 1977, and the subsequent publication by the American Automobile Association (AAA) of a single-volume summary a year later (Cross, 1978), have been the basis for determining the goals and objectives in many bicycle safety programs. Summaries of this study were published in *Bicycle Forum* magazine and in a four-page monograph in the Bicycle Forum Technical Note Series (Williams, 1988). These shorter versions disseminated the findings, and thus their influence, even further.

The Cross study, as it has come to be known after its principal author, Kenneth D. Cross, identified bicycle/motor vehicle crash types, classifying them into 36 types within seven major categories. The study also identified the median age of the bicyclists involved in each crash type. It determined that some crash types, such as driveway rideout, involved primarily child bicyclists, thus allowing educational objectives to be targeted to the age group most affected. Table 3.1 summarizes the major bicycle/motor vehicle crash types, giving the median age for each and the percentage of total injuries and fatalities. (A more current presentation of bicycle crash type frequencies will be available in a forthcoming (late 1993) report from NHTSA

Table 6.1. Bicycle-Motor Vehicle Accident Types

CLASS	TYPE	DESCRIPTION	Fatal (Col. %)	Non-Fatal (Col. %)	Median Age
A.	1	Residential Driveway/Alley, Pre-crash path perpendicular to rdwy	6.7%	5.7%	9.8
Bicycle	2	Commercial Driveway/Alley, Pre-crash path perpendicular to rdwy	2.4	3.2	13.8
Rideout	3	Driveway/Alley Apron, Pre-crash path parallel to roadway	2.4	2.5	11.5
	4	Entry over Shoulder/Curb	3.6	2.5	11.5
B.	5	Intersection controlled by sign	7.8	10.2	11.8
Bicycle	6	Intersection controlled by signal: Signal phase change	0.6	3.1	16.1
Rideout:	7	Intersection controlled by signal: Multiple Threat	2.4	2.0	15.2
Intersection	-	Intersection controlled by signal: Other	1.2	1.7	16.9
C	8	Commercial Driveway/Alley	----	5.3	15.4
Motorist	9	Motorist Turn-Merge/Drive Through: Inters. controlled by sign	1.2	10.2	16.3
Turn-Merge	10	Intersection controlled by signal	----	1.9	13.3
	11	Motorist backing from residential driveway	----	0.8	----
	12	Motorist Driveout: Controlled intersection	1.2	0.5	----
D.	13	Bicyclist not observed	24.6	4.0	18.1
Motorist	14	Motor vehicle out of control	4.2	0.7	----
Overtaking	15	Counteractive evasive action	2.4	1.7	12.3
	16	Motorist misjudged space required to pass	1.8	2.0	15.0
	17	Bicyclist's path obstructed	0.6	2.0	16.3
	-	Type Unknown	4.2	0.1	----
E.	18	Left turn: Parallel paths, same direction	8.4	8.4	12.7
Bicyclist	19	Left turn: Parallel paths, facing approach	3.0	3.2	13.8
Unexpected	20	Swerve left: Parallel paths, same direction (unobstructed path)	3.6	1.5	11.5
Action	21	Wrong-way bicyclist turns right: Parallel paths	1.2	1.1	----
F.	22	Left turn: Parallel paths, same direction	0.6	1.3	15.9
Motorist	23	Left turn: Parallel paths, facing approach	----	7.6	20.1
Unexpected	24	Right turn: Parallel paths	1.8	5.6	16.8
Action					
G	25	Vehicles collide at uncontrolled intersection: Orthogonal paths	0.6	2.8	12.4
Misc.	26	Vehicles collide head-on: Wrong-way bicyclist	2.4	3.6	12.9
	27	Bicyclist overtaking	0.6	0.9	----
	28	Vehicles collide head-on: Wrong-way motorist	1.8	0.8	----
	29	Parking lot/Other open area: Orthogonal paths	0.6	0.8	----
	30	Head-on: Counteractive evasive action	----	0.1	----
	31	Bicyclist cuts corner when turning left: Orthogonal paths	0.6	----	----
	32	Bicyclist swings wide when turning right: Orthogonal paths	----	0.3	----
	33	Motorist cuts corner when turning left: Orthogonal paths	----	0.4	----
	34	Motorist swings wide when turning right: Orthogonal paths	----	0.1	----
	35	Motorist driveout from on-street parking	----	0.3	----
	36	Weird	----	1.1	----
	37	Insufficient Information to classify	7.2	----	----
		TOTALS	100	100	

Source: Cross (1978)

using the General Estimates System database.)

Some additional research was conducted at the Federal level during the late 1970's and early 1980's. Except for the Cross study, however, there was not widespread application of these research findings. The four NHTSA-sponsored studies include:

- "Bicyclists' Inclination and Ability to Search Behind Before Turning Left" (NHTSA, 1980);
- "The Effects of Right-Turn-on-Red on Pedestrians and Bicyclists" (Blomberg, DeBartolo, Leaf and Preusser, 1981);
- "Identification and Development of Countermeasures for Bicyclists/Motor Vehicle Problem Types" (Blomberg, Cross, Farrell, Hale and Leaf, 1982);
- "Conspicuity for Pedestrians and Bicyclists: Definition of the Problem, Development and Test of Countermeasures" (Hale and Zeidler, 1981; Blomberg, Hale and Preusser, 1984).

This chapter highlights a broad range of educational programs and materials developed and implemented during the decade of the 1980's. As in previous chapters, these are identified within the categories of Federal Government, national non-governmental, state and local sources. Figure 2.1 presents a summary of many of the items that are identified and discussed in the text.

Federal Government Bicyclist Education Activities

Bicyclist Education and Training

Little public information and education program activity for bicycling was undertaken at the national level by Federal Government agencies during the 1980's. In the early part of the decade, the Environmental Protection Agency produced the "Bicycling To Work" video and accompanying seminar booklet (EPA, 1983), and the Consumer Product Safety Commission issued a Safety Alert on night time riding (CPSC, 1984). In 1989-90, NHTSA produced a two-page bicycle safety flyer for parents that outlined the basic types of crashes in which young children are involved.

Table 6.2. Selected Bicyclist Educational Materials and Program Guides*

TITLE	FORMAT	AUDIENCE	PRODUCER/ SOURCE
Materials and Programs for Children			
Children Riding on Sidewalks Safely	Storybook and parent brochure	Pre K-1 grade	NAEYC (no date)
Otto the Auto Bicycle Safety Series	Video	Pre K-1 grade	AAA (1981)
Elephants Never Forget	Video	Grades K-3	Monroe Co. NY Bicycle Helmet Coalition: Ride Safe, Inc. (1990)
I'm No Fool on a Bicycle	Video	Grades 2-3	Disney (1989)
Complete Bicyclist Education Program	Video and on-bicycle lessons	Grades 4-6	Mountain Bicyclist's Association (1982) Rev. NBEC 1986 Rev. BFA 1989
Bicycle Safety Camp	Video	Grades 3-5	David Levine and Associates (1989)
Basics of Bicycling	Video and 7-lesson teacher's guide	Grades 4-5	BFA; NCDOT (1991)
Be Safe on Your Bike	Video	Grades 6-9	LosAngeles Police Dept.; USC (1989)
Montana Bicyclist Training Program/ Bike Ed America	Booklets; on-bicycle training	Grades 4-5	Florida DOT (1989- ongoing)
Materials for Parents of Children			
Bicycle Safety: What Every Parent Should Know	4 page brochure	Parents	Bikecentennial (1981)
Children in Traffic- Why Are They Different?	Video	Parents	AAA (1983)
Heads You Win	Video	Parents	NC Dept. of Health, Environment, and Natural Resources (1990)
Prevent Bicycle Accidents	2 page flyer	Parents	NHTSA; Safe Kids

Materials for Adults and Older Teens			
TITLE	FORMAT	AUDIENCE	PRODUCER/ SOURCE
Effective Cycling	Book	Adults/Teens	MIT Press (1984;1988)
Effective Cycling	Video	Adults/Teens	Seidler Productions, Inc. (1992)
8 informational brochures	Brochures	Adults/Teens	National Bicycle Education Consortium; BFA (1984)
Bicycling to Work	Video and booklet	Adults	EPA (1983)
Bicycle Safety First	13 min slide format video	Adults	Tim Kneeland and Associates (1989)
Bicycling Safely on the Road	Film	Adults/Teens	John Forester (1980)
Bicycling on Three Wheels	Film	Seniors	AAA; U of FL (1983)
Street Smarts	Booklet	Adults/Teens	Rodale Press (1988)
The Bicycle Users Manual	Booklet	Adults/Teens	Rodale Press (1991)
Materials for Implementers/Others			
A Guide to Bicycle Rodeos	Booklet	Rodeo producers	Bikecentennial (1988)
AAA Guide to Skills Tests and Bicycle Rodeos	Booklet	Rodeo producers	AAA, 1985
Manual for Evaluation of Bicycle Helmet Programs	Manual	Program Evaluators	NY DOH (1990)
Physician's Resource Guide for Bicycle Safety Education	Kit with fact sheets; brochures; video	Physicians; parents	AAP (1990)
North Carolina Bicycle Helmet Campaign Guide	Booklet	Helmet promoters	Bikecentennial (1991)

* Organizations producing a number of bicycling education materials include AAA, National Safe Kids Campaign, Harborview Injury Prevention and Research Center, Outdoor Empire Publishing, Cascade Bicycle Club, Bicycling Magazine (Rodal Press), and many State and local governments.

Government activity in bicyclist training during this period was also minimal. The influence of the NHTSA-sponsored Bike Ed 77 conference continued as networks became established and materials and technical assistance were shared. Bike Ed 77 laid the groundwork for the first Pro Bike conference in 1980.

Helmet Promotion

In the mid-1980's injuries became increasingly recognized as a major public health problem, and more Federal funding became available for prevention activity. Bicycle helmet use, especially for children, was identified as a relatively easy, cost effective means of preventing or reducing the severity of costly head injuries.

The most active agency in bicycle helmet public information and education within the Federal system has been the Centers for Disease Control (CDC). With new funding for injury prevention, the CDC established its Division of Injury Control in 1985 and began funding the creation of a network of regional injury control centers such as those located at Harborview Medical Center (University of Washington), Dartmouth College, Harvard University, University of North Carolina, and The Johns Hopkins University. This infrastructure encouraged a tremendous influx of new program activity in several injury areas, including bicycling. Through capacity building grants such as the one received by the North Carolina Department of Health, Environment, and Natural Resources, CDC has provided funding to various state and local helmet promotion efforts. CDC has also funded research of bicycle helmet promotion strategies and the effectiveness of various levels of helmet promotion through grants awarded to such organizations as the Michigan Department of Health (Michigan Bicycle Helmet Advisory Committee, 1991) and Dunlap and Associates.

The Consumer Product Safety Commission published a Safety Alert on helmets (CPSC, 1989), conducted tests to determine product compliance with ANSI standards, and published a joint helmet promotion flier with NHTSA. CPSC also considered and denied a petition from the Consumer Federation of America and others calling for mandatory Federal performance standards for helmets.

With the exception of the publication of the joint flier with the CPSC and the use of helmets on all images of bicyclists, there has been little NHTSA activity specifically promoting bicycle helmet use. However, NHTSA has studied how helmets are being promoted by others in research conducted by the Bicycle Federation of America (Tracy, 1991). More extensive information and a directory of national, state, and local helmet programs is available in the "Review of Bicycle Helmet Promotions in the United States" due to be released by NHTSA in 1992.

National Non-Governmental Bicyclist Education Activities

Background

Bicycle safety materials have been created by a variety of national organizations traditionally involved in bicycling, safety, and youth, such as the American Automobile Association (AAA), Bicycle Forum/Bikecentennial, the National Bicycle Education Consortium (NBEC), and the Bicycle Federation of America (BFA). As the awareness of the cost of injury and the opportunities for prevention became more widespread in the mid 1980's, other non-traditional groups became more visibly involved in bicycle safety and/or helmet promotion activity. These included medical, public health, and injury-prevention-focused organizations such as the National Safe Kids Campaign, the American Academy of Pediatrics (AAP), and the National Head Injury Foundation (NHIF). Outdoor Empire Publishing of Seattle, Washington has also been influential in producing bicycle safety brochures and booklets that have been aggressively marketed in large quantities at a low cost to State agencies and traffic safety organizations. An example is the "Bicycle Driver's Guide" and its accompanying "Instructor Edition" (Outdoor Empire Publishing, undated).

Most bicycle safety information targets elementary school-aged children, their parents, or adult bicyclists. The remainder of this section reflects this three-level classification scheme and is followed by discussion of helmet campaign activities.

Information and Programs for Children

Few materials have been developed specifically for the pre-kindergarten to first grade-aged child. For very young children, a storybook and parent brochure focusing on "big wheel" safety was developed by the National Association for the Education of Young Children. Entitled, "Children Riding on Sidewalks Safely" (CROSS), the material was developed under an NHTSA grant.

"Otto the Auto Bicycle Safety Series" (AAA, 1981) is perhaps the most age-appropriate nationally marketed bicycle safety video for this group. It features an animated car that teaches children about "borders" at the edge of the road, how to pick a bike that fits, and why bicycle riders must ride with traffic. These four-minute segments are based on the Cross study findings and recommendations for young child bicyclists. As bicycle helmet use has become more emphasized, however, the lack of helmet use and promotion in this video has resulted in diminished use by bicyclist educators. The trend of retiring or updating material not reflecting helmet use has been noted across all bicycle safety awareness and training media.

A third example is the updated Disney Studio video, "I'm No Fool on a Bicycle" (1989), which combines animation, live action in traffic, and costumed characters to effectively reach its second and third grade student audience.

Another key piece in the field of awareness videos for a child audience is the collaborative work produced by the Los Angeles Police Department and the University of Southern California Film Department. "Be Safe on Your Bike" (1989) is the second in a series of traffic safety videos for children. This nationally distributed video illustrates key bicycling traffic skills and is narrated by U.S. National Cycling team members.

While there have been many variations in bicyclist education program development, three major types have emerged. One type is the school-based approach for elementary school-aged children represented by the "Complete Bicyclist Education Program" (CBEP), "Bike Ed America," and "The Basics of Bicycling." Another type is the community-based approach, represented by the "Effective Cycling" series, which has been taught mostly by volunteers to adults. The third type of education program

involves a one-day bicycle rodeo event offering a varying mix of bicycle safety awareness and skills training.

School-based approach. The roots of the CBEP are in a concept development grant from the Huffy Foundation in the late 1970's (which led to a development grant from the Gates Foundation) and in an NHTSA fourth grade bicycle driver education course developed by Dunlap and Associates (1981). The Mountain Bicyclists Association of Denver, Colorado published the first of three versions of the CBEP in 1982 (MBA, 1982). Subsequent revisions of this program for fourth through sixth graders were published by the National Bicycle Education Consortium in 1986 and by the Bicycle Federation of America in 1989.

The CBEP included modules on the bicycling environment, hazard awareness, and riding with traffic, which are taught through on-bike instruction and a video tape. Nationwide, approximately 8,000 copies of the program have been distributed, including at least two states, Ohio and Arizona, that have distributed a copy of the CBEP to every elementary school.

As the CBEP was being created and revised, another school-based series of bicyclist education programs was being developed, first in Montana and then also in Florida and Hawaii. The earliest effort, referred to as the "Missoula Bicyclist Training Program," included classroom and on-bike lessons for fourth grade students. The Missoula program was revised to become the "Montana Bicyclist Training Program" and was taken to fourteen school districts through a series of teacher training workshops. A bicyclist training program for the State of Florida evolved from the Montana program in the late 1980's and has been introduced in several school districts.

Later, the Montana and Florida programs were used to create "Bike Ed America," an effort to develop a new program for nationwide distribution. A series of 20 half-hour sessions, including classroom and on-bike lessons, has been used in Florida, Montana, Hawaii, and Washington, D. C.

As "Bike Ed America" grew to incorporate pedestrian lessons for younger students, the name was changed to "Traffic Ed." This program is in the late

development stage, with publication anticipated in 1992. It plans to include bicycle instruction for third through fifth grade students and pedestrian instruction for younger students.

"The Basics of Bicycling" (BFA, 1991), a new bicyclist education program for fourth and fifth grade students, was developed and published by the Bicycle Federation of America in cooperation with the North Carolina DOT Bicycle Program. The goal of this program is to reduce the number of bicyclist crashes and injuries by teaching children the basic skills and knowledge needed to ride a bike safely. This basic introductory program focuses on the key elements identified in the crash literature and does so in a format designed to fit in an already packed elementary school curriculum. The seven lessons combine two classroom sessions with live action video support and five on-bike sessions.

In its evaluation of "The Basics of Bicycling" program, the University of North Carolina Highway Safety Research Center found that it met its program objectives (Stutts and Hunter, 1990). Children from schools that used the curriculum were able to demonstrate increased knowledge and practice of safe riding behaviors when compared to children from control schools. In addition, these experimental students also had fewer bicycle-related crashes and injuries during the summer following the program, although numbers of crashes and injuries were very small.

Community-based approach. The second major type of bicyclist education is a community-based approach often taught by local instructors at a community college or adult education setting. The most influential program of this type is the "Effective Cycling" series created by John Forester in the late 1970's and revised throughout the 1980's (Forester, 1988). This program teachers assertive cycling skills in a traffic setting and includes a test of participants' driving skills. "Effective Cycling" was initially created for adults and later modified for use with middle school and then elementary school students as young as nine years old. Since 1976, the adult version of this program has been administered nationally by the League of American Wheelmen who have trained approximately 200 Effective Cycling Instructors (ECI's) to offer the program at the community level.

Bicycle rodeos. Bicycle rodeo events have become very popular nationwide among civic, community, and injury prevention groups, especially local Safe Kids coalitions, who wish to implement a specific, single-day bicycle safety project. A bicycle rodeo is typically organized to be a local event and usually involves the help of many volunteers.

Many of these one-day events follow "A Guide to Bicycle Rodeos," the 1988 revision by Bikecentennial to the "AAA Guide to Skills Tests and Bicycle Rodeos" (Williams and Burden, 1985). This guide has become the single most consulted resource to organizing a rodeo. Included are lesson plans for various stations with an explanation of what the child cyclist and volunteers should be doing and why the skill is important. This rodeo guide emphasizes skills training rather than competition for points, as others have done. Bicyclists are encouraged to practice each skill until it is mastered.

Information for Parents

Perhaps the most widely distributed material targeting parents of elementary school-aged bicyclists is a brochure called "Bicycle Safety: What Every Parent Should Know" (Williams, 1981). A distribution system that allows purchase of the camera-ready artwork or the printed brochures themselves has resulted in the dissemination of nearly 1.5 million copies of this four-page brochure. This brochure debunks myths commonly held, introduces parents to the types of crashes children typically have, and suggests specific ways parents can work with their children to avoid these problems. Those graphics without helmets were modified in 1989.

An influential film released in the mid-1980's has helped change the way adults think of child pedestrians and bicyclists in traffic. "Children in Traffic - Why Are They Different," created in Germany and distributed by the American Automobile Association (AAA, 1983), shows how children's perceptions of traffic differ from those of adults, and explains how this makes it difficult for them to understand the way traffic operates. Throughout the 1980's and to the present, the AAA has continued to be a major source of bicycle safety awareness materials. AAA brochures,

booklets, posters, and films are available either free or for a nominal charge through their national office and local chapters.

In 1983 the American Academy of Pediatrics TIPP (The Injury Prevention Program) was created to take advantage of the high level of confidence most parents have in information they receive from their child's pediatrician. This program encourages pediatricians to include injury prevention counseling, including bicycle safety, in their parent education. Doctor-to-parent counseling is reinforced with take-home TIPP sheets about selecting a bicycle that fits and training a child to use it safely. At the end of the 1980's, specific helmet promotion activities were added. This addition is discussed in the helmet promotion section later in this chapter.

Childhood injury prevention has been elevated to a national priority in part by the National Safe Kids Campaign. Bicycle safety, and especially the promotion of helmet use, was the Campaign's major emphasis during 1989. Well over one million magazines for parents and children were distributed with help from a national media campaign, local Safe Kids coalitions, and tips printed on food product packaging. Information included general bicycle safety tips as well as other injury prevention messages. The NHTSA bicycle safety flyer cited earlier received wide distribution through the Campaign. The promotion of bicycle helmet use was identified as a key focus area during the initial year of the Campaign, and will be further discussed in a later section of this chapter.

Information for Adult Cyclists

During the 1980's few program materials and videos were created to increase the safety of adult cyclists. In 1980 the "Bicycling Safely on the Road" film by John Forester was released as a companion to the Effective Cycling program. The film advocated a "serious vehicle" approach to bicycle riding, stressing the responsibility of the rider.

A series of eight safety and encouragement brochures was created by the National Bicycle Education Consortium (NBEC) and the Bicycle Federation of America in 1984. The NBEC was a unique group of ten bicycling, recreation, and safety

organizations that sought to unify the safety messages being addressed to adult cyclists. Each flier focused on a specific topic such as maintenance, fitness, and helmets. These were widely distributed through the ten NBEC member organizations via bulk orders from other organizations and to the public through offers in general readership magazines.

"Bicycle Safety First" (Tim Kneeland and Associates, 1989), is a 13-minute video created for adults preparing for extended group bicycle tours such as the American Lung Association's Trek Across America. This slide format program emphasizes helmet use, bike fit, and bicycle handling and traffic skills for the inexperienced adult bicyclist.

Bicycling Magazine regularly prints articles on various elements of bicyclist education. "Street Smarts" (1988) and "the Bicycle User's Manual" (1991) are two booklets among several produced by Rodal Press, the publisher of *Bicycling Magazine*, covering many aspects of bicycle ownership and usage.

"Bicycling on Three Wheels" (1983), created for AAA by the University of Florida, is the only piece identified that has been created expressly for senior citizens using an adult tricycle.

Helmet Campaign Programs

During the mid- to late-1980's, bicycle helmet promotion was influenced by several national trends. In 1984, the Snell Memorial Foundation and the American National Standards Institute (ANSI) each published their first standards for protective headgear for bicyclists. These standards were quickly adopted by the bicycle helmet industry. New technology in the industry introduced lighter, more fashionable helmets designed to be more appealing to potential users.

Helmets were also introduced for toddlers and for child cyclists. Many retail bicycle dealers who did not already stock a wide assortment of helmets began to do so, and more large discount department store chains began carrying lower cost helmets. The number of available helmet models increased from less than ten to well over 100 during this time. Awareness of helmets and their use was heightened by

the publishing of Consumer's Union research findings in the May 1990 issue of *Consumer Reports* magazine.

Another highly visible yet controversial helmet promotion influence at the national level was a 1986 ruling that uniformly mandated that helmets meeting one of the national standards be worn by bicycle racers in all events sanctioned by the United States Cycling Federation, the governing body of amateur and Olympic racing (USCF, 1986). No participation is allowed without a helmet that meets either the ANSI or Snell standards. (Mandatory bicycle helmet legislation for states and localities has become more widespread in the late 1980's and early 1990's. These laws/ordinances apply to various groups of general cyclists, rather than to sanctioned competitors.)

The most influential work in helmet promotion has become a model for major national as well as local campaigns including the National Safe Kids Campaign and the American Academy of Pediatrics (AAP). The Washington (State) Children's Bicycle Helmet Campaign was begun in 1986 by the Harborview Injury Prevention Research Center, Cascade Bicycle Club, the Seattle-King County Health Department, and others in an active coalition of local organizations. This coalition developed and tested a multifaceted community-based helmet campaign that has successfully increased children's helmet use from 1-2 percent to 40 percent in the last four years.

The significance of this campaign led by Harborview lies not only in its local success but also in its nationwide dissemination of information, campaign materials, and technical assistance. Harborview also conducted landmark research quantifying the effectiveness of helmets in preventing head injury. "A Case-Control Study of the Effectiveness of Bicycle Safety Helmets" (Thompson, Rivara and Thompson, 1989) was published in *The New England Journal of Medicine*. Subsequent published research pertains to bicycle-related head and facial injuries (Thompson, Thompson, Rivara and Wolf, 1990) and helmet use survey methodology and results (DiGuiseppi, Rivara and Koepsel, 1989; DiGuiseppi, Rivara and Koepsel, 1990).

Other nationally recognized or widely influential work began at the local

level. The Washington (DC) Area Bicyclist Association (WABA) began compiling and disseminating helmet information for consumers in the late 1970's, but received more national attention during the 1980's. Its helmet advocacy program, now called the Bicycle Helmet Safety Institute (BHSI), maintains an extensive documentation center and widely distributes at-cost copies of these documents.

To help support its network of state and local coalitions, the National Safe Kids Campaign prepared its "Bike Helmet and Bike Safety Awareness Campaign Strategy" (NSKC, 1989). The guide provides an overview of child bicyclist injuries and suggests countermeasures and strategies for building a community-based program to increase helmet use. Other support materials such as public service announcements (PSA's) and brochures were also distributed nationally and through local coalitions. Through support from Bell Helmets, a Safe Kids corporate sponsor, a bike helmet injury prevention kit was developed for medical professionals in 1990, along with matching grants for local coalitions. In addition to coalition building and support, as well as program and materials development, Safe Kids also conducts a media and public relations campaign, targets public policy issues, and organizes conferences and training sessions.

In 1988 the American Academy of Pediatrics (AAP), the Bicycle Federation of America (BFA), and the National Head Injury Foundation (NHIF) created "Head Smart," a joint campaign by the three organizations with the goal to increase bicycle helmet use from an estimated 2-3 percent to 20 percent nationally. As part of the Head Smart campaign, NHIF funded the development of several helmet promotion materials including the "Lou and his Friends Have Something Important to Tell You..." brochure. This brochure has since been reprinted and an estimated 1.5 million copies distributed.

The three organizations continued their helmet promotion efforts as they sought funding for a larger, more comprehensive campaign. Although no large scale funding was ever secured, each partner remained active: NHIF created a helmet promotion kit for its state and local chapters, BFA continued to serve as a clearinghouse of information and conducted testing of various levels of school-based

helmet strategies for Florida DOT, and AAP entered into an agreement with Sandoz Pharmaceuticals to begin a new campaign.

In 1990 AAP, Sandoz, and Troxel (a helmet manufacturer) created a helmet promotion program to reach children and their parents through pediatrician counselling. Materials distributed to member pediatricians nationwide included the "Physician's Resource Guide for Bicycle Safety Education" (AAP, 1990) with basic facts and counseling guidelines emphasizing helmets, brochures for parents with a mail-in coupon for a 40% savings on a Troxel helmet, and "Bicycle Safety Camp," a 25-minute helmet promotion video for children (David Levine and Associates, 1989). A nationwide advertisement in Sunday newspapers also offered the video to the public for $9.95 plus proofs of purchase of Sandoz cough syrup. In addition, AAP offered a series of $4,000 mini-grants to ten state AAP chapters for community-based bicycle helmet programs.

Manufacturers such as Bell, Pro-tec, and Troxel have also contributed to increased helmet ownership through discount programs either through bicycle shops, bulk purchases, or by mail. A bicycle manufacturer and helmet distributor by the name of Specialized offers a free helmet with the purchase of one of their bicycle models. Giro, another helmet manufacturer, offers a children's helmet trade-in rebate toward the purchase of a larger helmet. Other helmets are distributed through direct bulk sales to schools, PTA's and community groups from such companies as American Health and Safety Products, Ride Safe, and Shinn and Associates.

Additional helmet promotion activity has been stimulated by policy statements directly supporting the promotion of helmets and their use. These have been developed and issued by national organizations such as the National Association of Governor's Highway Safety Representatives (NAGHSR), AAP, and the League of American Wheelmen (L.A.W.).

State Bicyclist Education Activities

Bicyclist Education

Several states have directly promoted bicycle education and other countermeasures at either the government or non-government level. Two key examples of government sponsored programs are the North Carolina and Florida DOT bicycle programs. Each has created and distributed bicycle safety booklets, flyers and fact sheets, and maintains lending libraries of films and video tapes. For example, "Streetwise Cycling - A Guide to Safe Bicycling in North Carolina" (NC DOT, 1987), a 31-page guidebook outlining basic traffic laws, riding skills, and equipment information, is distributed free to North Carolina citizens.

These two states have also created and promoted bicyclist education programs. In North Carolina, the State version of "The Basics of Bicycling" (NC DOT, 1991) is being made available free to schools, agencies, and organizations located in the State. Communities throughout the State are using the program in schools, youth groups, recreation programs, and police community service programs. Both North Carolina and Florida conduct various training sessions for law enforcement officers, teachers, parks and recreation staff, and others.

Programs in Arizona, Ohio, and New York have implemented the "Complete Bicyclist Education Program" (CBEP) statewide. In Arizona, a copy of the program was purchased for each elementary school by the Arizona Safety Council in 1988. The same was done in 1989 in Ohio by the State Departments of Education and Transportation. In New York State, the DOT and the Cornell Extension Service modified the CBEP to meet their needs as they taught bicyclists through 4-H and Extension programs.

A unique program in Virginia targets the sales force at large discount department store chains where a majority of bikes, particularly children's bikes, are sold. "Sell a Bike, Save a Life" kits consisting of a short video tape and three-ring binder program guide were created by the Department of Motor Vehicles Community Traffic Safety Program in Virginia Beach, Virginia in 1990. This 30 to 40 minute program highlights bicycle crash statistics, rules of the road, bicycle size and fit, and the

need for safety equipment such as a helmet. Sales personnel complete a brief bicycle safety knowledge quiz, view a video tape, role play providing information to customers, and take a post-session quiz.

State chapters of national organizations have also been active in promoting awareness of bicycle safety. One example is the "Bike Safety: First Ride, Every Ride" 1990 campaign conducted by the Pennsylvania Chapter of the American Academy of Pediatrics. Brochures and posters aimed at parents who were buying their child's first two-wheeler were distributed through pediatricians' offices throughout the State. Information to parents included basic safety tips and a contract for them to sign promising to teach safe riding habits such as the use of hand signals. Also included was a contract for the children to sign promising to stay on the sidewalk.

In Minnesota, a five-day Pedal Power Camp is held each summer by the Minnesota Community Bicycle Safety Project of the 4-H (Clark and Wright, 1987). Fourteen to 17 year-old cyclists learn maintenance and effective cycling skills that they then teach to others in their own communities during the year.

Bicycle Helmet Promotion

Much recent state activity has focused on encouraging and supporting local bicycle helmet promotions. For example, the North Carolina DOT in 1990 created several helmet promotion materials for free distribution and convened a day-long workshop for interested organizations, agencies, and individuals from 43 different communities. In 1989, the Dartmouth Injury Prevention Research and Resource Center provided materials and technical assistance to help organizations and agencies throughout New Hampshire identify ways to stretch limited resources to promote helmets. In New York State, the Department of Health in 1990 also provided helmets for low income programs in exchange for local data collection, matching funds, and brief monthly reports.

Helmet promotion materials that have been created at the state level include:

- "North Carolina Bicycle Helmet Campaign Guide," created for the State DOT Bicycle Program by Bikecentennial (1991);

- "Increasing Bicycle Helmet Use in Michigan," administered by the Michigan Department of Health (1991);
- A 1990 kit entitled "How to Conduct a Bicycle Helmet Campaign in Your Community" by the Connecticut Childhood Injury Prevention Center;
- A 1989 "Bike Smart Kit" from the American Trauma Society Pennsylvania Division (1989).

A helmet demonstration project funded by the Centers for Disease Control and conducted by the North Carolina Department of Health, Environment, and Natural Resources in Pitt County, North Carolina created several materials, including a pre- and post-campaign telephone survey instrument and "Heads, You Win," a video tape introducing parents to bicycle crash, head injury, and helmet information (NC DHENR, 1990). In addition, the New York State Department of Health has published a "Manual for Evaluation of Bicycle Helmet Programs" (1990) containing survey instruments and methodology and data analysis instructions.

The topic of *mandatory* bicycle helmet use legislation, a fairly recent development, is discussed in Chapter 8, where bicycle enforcement and regulatory developments are addressed.

Local Bicyclist Education Activities

Bicyclist Education

Local level bicyclist education activities have ranged from sophisticated multi-component awareness campaigns in a regional area to single-day small audience events. Perhaps the most common mechanism for delivering bicycle education information and materials at the local level is the school assembly program. While "Officer Friendly" type programs conducted by law enforcement agencies have continued for decades, a broad range of other groups such as hospital outreach and injury prevention programs have more recently become involved. What follows is a sample of these activities.

Local bicycle club members have often been asked to share their experience with school classes. Cascade Bicycle Club in the Seattle, Washington area has

brought the lycra-clad, bicycle safety hero "Sprocketman" to life in a focused assembly program that has reached thousands of primary grade students since they began the program in 1987. The dynamic Sprocketman (or Sprocketwoman), one of a trained corps of club volunteers, delivers a maximum of six messages to primary grade audiences and distributes a coloring book reinforcing the same messages. Cascade has provided information and the pattern for the Sprocketman costume to other localities.

A number of local regions have focused their efforts on public information through mass media. The Missoula, Montana Bicycle Program worked with a local television station production team from 1981 to 1985 to create a series of 20 public service announcements on various topics, such as lights at night, helmets, theft, and yielding to pedestrians. In the last few years in San Diego, California and Jacksonville, Florida, the backs of transit buses have carried a series of bicyclist and motorist education messages on traveling "billboards" advising all to share the road responsibly.

Route selection and signage has targeted both the cycling and motoring public in places such as Washington, D. C. and North Carolina. State and local bicycle route and suitability maps identify the best places for cyclists to ride. Examples include Dayton, Ohio; the Wisconsin Escape Guides; Portland, Oregon; Durham, North Carolina; Maryland DOT Bicycle Map; San Francisco, California; and the Minnesota Bikeways map. These maps usually indicate lower traffic volume streets, special routes, the uphill direction of steep hills, and general bike safety information.

A compendium of local and general bicycling safety information has been provided to college students on several campuses including the University of California at Davis and the University of Montana. "The Cyclist Survival Guide" (1986), a booklet detailing the basic rules of the road, theft and parking information, and cyclist lane position in various traffic conditions, was created in a joint effort between the University of Montana and the Missoula Bicycle Program.

The standard bicycle rodeo concept has been modified and enhanced in some localities. On-street, neighborhood bicycle rodeos have been conducted by local

parent groups supervised by the police department in Coon Rapids, Minnesota since 1986. Children learn valuable skills at the end of their own driveways and in their own neighborhoods. Children in Missoula, Montana get a jump on the start of the spring bicycling season with the annual "Cycle Challenge" rodeo held inside the local shopping mall.

In Polk County, Florida a retired school bus was outfitted with all the bikes, helmets, and other equipment required to teach in-class and on-bike lessons to elementary school-aged bicyclists. This "bicycle bus" is driven to various schools in the State where physical education teachers are given on-site training prior to teaching their own students.

Alamance County, North Carolina schools have trained physical education teachers to use "The Basics of Bicycling" and are implementing the program in six of the county's elementary schools with the help of a grant from the State health department (1991-92).

Bicycle Helmet Promotion

Many of the significant initiatives in helmet promotion in the 1980's began at the local level in places such as Palo Alto, California; Missoula, Montana; and, most notably, Seattle, Washington. These efforts often served as models for later national, state, and local campaigns. Most of the helmet program activity centered on public awareness and information and increasing helmet ownership, primarily through some form of discount. For example, many of the local Safe Kids coalition activities in 1989 involved distributions of coupons to purchase helmets at a reduced cost. Many also involved some type of school presentation to children, parents, or both. The Virginia Safe Kids Coalition distributed 250,000 coupons through its local coalition partners for $10 off a Bell helmet at any one of 73 shops in the State. Other discounts offered coupons distributed through local large discount department store chains such as the 150,000 coupons distributed through Fred Meyer stores in Portland, or through local corporation paychecks and pediatricians' offices as was done in Pitt County, North Carolina.

Bicycle clubs have also initiated helmet promotion activity. In the last few years several have conducted their own discount programs like the one in Harrisburg, Pennsylvania that annually matches a local retailer's coupon to create a $10 off coupon. Others like the Cascade Bicycle Club in Seattle, Washington make presentations in school assemblies and to youth groups.

Another means of promoting helmet ownership at the local level has been through community-sponsored direct sales of discounted helmets. A PTA or neighborhood group may organize a bulk helmet purchase from a direct distributor, or helmets may be available for purchase through a local AAA chapter or hospital.

Health insurance companies and medical centers such as Care America in southern California and Dean Medical Center in Madison, Wisconsin have also created recent programs to inform their constituents and encourage helmet ownership through discounts. Blue Cross/Blue Shield of Pierce County, Washington has taken this one step further by waiving the deductible for its insured bicyclists who were wearing helmets at the time they were injured.

Other strategies specifically promoting helmet use include randomly stopping users and rewarding them with certificates good for ice cream, movies, or video games as was done in Missoula, Montana. Organized special events or opportunities for helmet users such as riding in the Memorial Day parade in Madison, New Jersey also promote helmet use.

AAP mini-grants and merit awards in 1990 and 1991 fostered the growth of local coalitions; trained others to deliver helmet messages; disseminated materials at community events; conducted raffles, giveaways, and other discount programs; and organized bicycle rodeos. Others specifically targeted helmet distribution to children from low income families. One local New York State helmet coalition created "Elephants Never Forget," an animated and live action video for young children (Monroe County Bicycle Helmet Coalition, 1990).

State and local bicycle safety education activities over the past decade have been many and varied. There is little reason to expect that this intense level of activity will diminish in the years ahead.

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Chapter 7. Bicycle Facility and Engineering Developments

Background

As with pedestrian facilities, a fairly standard set of publications exists for guiding bicycle facility planning, design, and construction. With bicycles, however, there is less experience to draw upon, and many areas remain poorly defined. This situation is gradually being remedied as more facilities are being built and their impact monitored. Research studies are still needed, however, to establish more specific guidelines for selecting particular treatments or facilities and to evaluate the safety of these treatments.

The 1984 AASHTO Geometric Design of Highways and Streets ("Green Book") recommends the following for enhancing an existing roadway's safety and capacity for bicycle traffic:

- paved shoulders
- wide (15-foot minimum) outside traffic lanes if no shoulder
- bicycle-safe drainage grates
- manhole covers adjusted to the grade
- maintenance of smooth, clean riding surfaces.

For more detailed guidelines for construction of both on- and off-road facilities, readers are referred to the AASHTO "Guide for the Development of New Bicycle Facilities," originally published in 1981 and revised in 1991. Sections in the guide provide an overview of planning considerations for bicycles; discuss the types of facility improvements and factors to consider when locating a facility; offer guidelines for accommodating bicycles when constructing new highways or improving existing highways; and provide guidance for the design and construction of new bicycle facilities as well as the operation and maintenance of existing facilities. Numerous photographs and diagrams help to clarify the various types of facilities and treatments, and specific instructions are given for determining minimum curve radii, stopping sight distances, etc. The 1991 Guide is only slightly different

from its predecessor: new areas discussed include the use of pedestrian actuated buttons as an alternative to signal detectors, restriping to create wide curb lanes, operational problems with bike paths located adjacent to roadways, curb cuts and ramps at intersections, and requirements for terminating bicycle paths at intersections.

Two other valuable resources for bicycle facility planners and traffic engineers are the Manual on Uniform Traffic Control Devices (MUTCD) and the Traffic Control Devices Handbook. Part IX of the MUTCD covers bicycle-related signs, pavement markings, and signals which may be used either on roadways or on special bikeways. The five basic types of bicycle facilities are defined as follows (p. 9A-2):

> **Bikeway** - Any road, street, path, or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.
>
> **Bicycle Trail** - A separate trail or path from which motor vehicles are prohibited and which is for the exclusive use of bicycles or the shared use of bicycles and pedestrians. Where such trail or path forms a part of a highway, it is separated from the roadways for motor vehicle traffic by an open space or barrier.
>
> **Designated Bicycle Lane** - A portion of a roadway or shoulder which has been designated for use by bicyclists. It is distinguished from the portion of the roadway for motor vehicle traffic by a paint stripe, curb, or other similar device.
>
> **Shared Roadway** - A roadway which is officially designated and marked as a bicycle route, but which is open to motor vehicle travel and upon which no bicycle lane is designated.
>
> **Bicycle Route** - A system of bikeways designated by appropriate route markers, and by the jurisdiction having authority.

The Traffic Control Devices Handbook is intended to "offer guidelines for implementing the standards and applications contained in the Manual." Part IX deals specifically with traffic control devices for bicycle facilities and provides information relevant to signage for bicycle facilities, pavement markings on bikeways, accommodating bicyclists at signalized intersections, maintaining bicycle facilities, and handling special bicycle operation problems (e.g., two-way bicycle lanes, bicycle

operation on freeways, and sidewalk bikeway criteria). Together, the MUTCD and TCD Handbook provide local design and traffic engineers considerable information for improving the safety of bicyclists traveling on both existing roadways and specially designed bicycle facilities.

A final guide which should be noted was published in 1980 by the American Society of Civil Engineers (ASCE). Entitled Bicycle Transportation - A Civil Engineer's Notebook for Bicycle Facilities, 1980, the guide was prepared by members of the Society's Bicycle Transportation Committee. Separate chapters of the guide address facility planning, landscaping, geometrics, structures, pavements, drainage, traffic controls, amenities, lighting, parking, and maintenance and security. The Committee notes that "the user of this notebook ... should bear in mind that bicycle facility planning in conjunction with the fast moving motor vehicle traffic of today is a new science that is far from yet becoming a pure science." In a statement of policy, ASCE affirms the bicycle as a significant mode in the transportation system, recognizes the importance of improved bicycle facilities in promoting bicycle use, and accepts responsibility for the planning, design, and construction of bicycle facilities.

At the same time, a recent ASCE-sponsored survey of U.S. colleges and universities with engineering programs revealed that instruction in bicycle engineering was non-existent at 60 percent of the schools, and only minimal at the rest. No school reported requiring bicycle engineering education as part of its curriculum. The greatest concern expressed by survey respondents was safety; but they also did not believe that there was much potential for a significant increase in bicycle use (Elliot, 1991).

The following sections describe key bicycle facility and engineering countermeasure developments during the 1980's until the present. In the area of national developments, the focus is primarily on research activities and their impact. At the state level, activity has been a mixture of research and the development of guidelines, training manuals, etc. While some of this has also carried over to the larger cities, the focus at the local level has been on implementing the various engineering countermeasures.

Federal Government and Other National Activities

Research Studies

In December 1982, FHWA published a "Synthesis of Safety Research Related to Traffic Control and Roadway Elements." Chapter 15 of this report deals with "Bicycle Ways" (Pfefer et al., 1982). Bicycle ways (or bikeways) are defined according to 1981 AASHTO guidelines as "any road, path, or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes." The chapter reviews the literature with respect to bicycle crash experience, then summarizes what is known about the safety of a wide range of traffic devices and engineering treatments. (Education and enforcement options are also briefly addressed.) Some of the engineering measures covered include shared versus separate bicycle facilities, wide curb lanes, drainage grates, roadway shoulders, bicycle routes and lanes, and intersection hazards. As might be expected, the data for addressing many of these engineering treatments were sparse, and recommendations often followed the AASHTO or MUTCD guidelines. The primary importance of this synthesis report was its treatment of bicyclists as legitimate users of traffic control and roadway elements, and its identification of areas where further research is needed to address their unique safety problems.

A few more focused research studies were carried out during the time frame of this review, each helping to fill gaps in our knowledge concerning engineering approaches to improving the safety of bicycle transportation. An FHWA-funded research project examined the effects of using wide curb lanes as shared lane bicycle facilities (McHenry and Wallace, 1985). Thirty-five millimeter cameras mounted alongside selected multi-lane urban highways were used to record vehicle and bicycle positions during passing maneuvers on roadways with varying outside lane widths. Results suggested that optimal lane width was greater than 13 feet 8 inches, but less than 17 feet. Additional research was recommended to quantify the impact of bicycle/motor vehicle lane sharing while taking into account a wide range of parameters including number of travel lanes, shoulder presence, motor vehicle

volumes, vehicle speeds, etc. It was felt that this level of research was needed to establish national guidelines for shared roadway use.

A key research effort was the development of specific criteria for designating streets and highways for bicycle use. "Highway Route Designation Criteria for Bicycle Routes" (Final Report and Handbook), was prepared by the Bicycle Federation of America for FHWA (Wilkinson and Moran, 1986). The final report includes a comprehensive literature review and state-of-the-art synthesis. The handbook, an abbreviated version of the final report, was designed "to simplify the task of selecting and designating streets and highways as bicycle routes." It was prepared primarily for use by state and local transportation engineers and includes an overview of bike routes (what they are, reasons for having them, etc.), a discussion of the various alignment and suitability factors that define a "good" bike route, and guidelines for selecting and designating bike routes. Issues of liability, bicycle use of controlled access freeways, and mapping are also discussed.

A final FHWA research project still under way is a study entitled, "The Effects of Bicycle Accommodations on Bicycle/Motor Vehicle Safety and Traffic Operations." The work is being carried out by the Bicycle Federation of America under subcontract to the Center for Applied Research. The end-product of the effort will be a guide for practitioners detailing how to identify appropriate treatments to accommodate bicycles in conjunction with streets and highways. An interesting note on this project is that it is being funded under FHWA's Pooled Fund Research Program. Under this program, FHWA circulates to the States a package of research proposals, and each state indicates which of the projects it would like to see undertaken and the amount of money (from its own highway program funds) it would be willing to commit to the project. If sufficient support is proferred for a particular project, FHWA initiates the study as a contract research project. In the case of this study, the research proposal was developed and submitted by the TRB Committee on Bicycles and Bicycling.

Other National Activities

In addition to these research efforts, other activities were initiated to help disseminate needed information to persons at the state and local levels responsible for implementing engineering programs and facilities. Bicycle Forum, a quarterly journal published by Bikecentennial, expanded its services by beginning publication of its "Technical Note Series." This series supplements the articles on various aspects of bicycling regularly appearing in the journal with concise summaries of technical information on specific topics. Sample topics include bicycle parking location, facility design and liability, and bicycles and traffic signals. The Bicycle Federation of America also established itself as a clearinghouse for information and technical assistance, introducing its newsletter ("Pro Bike News"), the Pro Bike conferences, and a variety of special training programs.

A national program impacting on bicycles that greatly expanded during the 1980's is the "Rails-to-Trails" movement. The idea behind the movement, which began in the mid-1960's, is to convert abandoned or unused rail corridors into public trails for use by walkers, joggers, bicyclists, and others. One of the program's most significant early successes was the 1973 conversion of the Burke-Gilman Trail in Seattle, Washington. This 12-mile trail serves an estimated 4,000-5,000 users (80% bicyclists) on a busy day (Puncochar and Lagerwey, 1987). Nationwide, 2,746 miles of linear parkland now serve an estimated 27 million users a year as a result of the Rails-to-Trails movement (Nevel and Harnik, 1990). Again, many of these users are bicyclists.

A final issue that impacts on the field of bicycle engineering is that of liability — the potential for being found "negligent" by the courts in the design, construction, or maintenance of a bicycle facility. Liability concerns mushroomed during the 1980's, partly as a result of large increases in the numbers of bicyclists, but also from the widespread lack of practical experience in the construction of bicycle facilities on the part of local engineers. A number of recent publications have addressed the issue of liability as it pertains to bicycle facilities (e.g., Sorton, Walsh and Williams, 1990; Hill, 1986: Seifreid, 1985). A 1990 TRB Human Factors Workshop entitled

"Reducing the Conflict Between Bicyclists, Pedestrians, and Motorists" also addressed the topic.

The impact of liability on bicycle facility construction has varied from state to state, depending on whether the state has adopted legislation that gives it some immunity from suit. In many states, liability issues have been a major concern in deciding not only what kind of facility to construct and how to construct it, but whether or not to construct the facility at all. On the positive side, liability concerns have led to increased care in the design, construction, and maintenance of bicycle facilities. Careful adherence to commonly available design guidelines and use of standard construction practices are recommended to protect against being found negligent.

State Bicycle Facility and Engineering Activities

A key development in bicycle facility and engineering activities at the state level over the past decade has been the growth in the number of state bicycle facility planning and design guides. Three factors likely contributing to this growth are (1) publication of the "AASHTO Guide for Development of New Bicycle Facilities" in 1981, (2) the general increase in bicycling by the adult population, bringing with it a demand for more facilities as well as better accommodation of bicyclists on the existing road network, and (3) a perceived need by the states to ensure uniform bicycle facilities and treatments as a means of risk management.

A few states, including California, Oregon and Wisconsin, had bicycle engineering guides prior to 1980. In fact, the California guide (California DOT, 1978) served as the basis for the AASHTO guide. Current state guidelines all conform to the AASHTO Guide, but generally incorporate additional detail. Areas typically covered include:

- criteria for identifying proper locations for bicycle facilities (<u>location</u> criteria);
- criteria for selecting the best facility for the appropriate location (<u>selection</u> criteria);

- specific criteria for bicycle facility design (design criteria).

Other topics sometimes addressed include steps in the planning process, cost estimates for the various treatments, maintenance considerations, and approaches for evaluating the suitability of a roadway for bicycling.

States developing new (or updated) guides during the past ten years include Florida (1982), New Jersey (1982), Minnesota (1983), Ohio (1983), Oregon (1988, as part of a Master Bike Plan), and Arizona (1988). In addition, both Florida and Washington State have utilized instructional courses, based on work by Alex Sorton at The Traffic Institute and John Williams of Bikecentennial (Florida DOT, 1986). Florida DOT staff travel to each of the State's 25 metropolitan areas once each year to present the one-day course to local engineers, planners, developers, private consultants and others impacting on local facilities. In recent years the course has alternating focusing on bicycles one year and pedestrians the next.

Florida also recently developed a "Bicycle Sketch Plan" that identifies goals, objectives, and programs for increasing levels of bicycling in the State (Florida DOT, 1991). A key part of this plan is identification of programs to make Florida's streets and highways more "bicycle friendly." The plan was developed for Florida DOT by Applied Science, Inc. and the Bicycle Federation of America.

The State of North Carolina is in the process of completing its own "Bicycle Facility Design Guidelines." Beyond supplying the necessary criteria for planning, designing, and constructing both on- and off-road bicycle facilities, the North Carolina guide will provide specific construction guidelines, including technical illustrations. Using this guide, a civil engineer inexperienced in bicycle projects should be able to produce detailed specifications for constructing most bicycle facilities.

In addition to establishing standards for bicycle facilities and treatments, a few states also have active programs to help fund bicycle facility projects. In North Carolina, for example, the State's Transportation Improvement Program has been structured to respond to the needs of bicyclists as well as motorists. Projects that are

eligible to receive funding under this program include independent bicycle projects (those that are separate from any other scheduled roadway improvement projects), incidental projects (those that are features of highway improvements), and unmet needs (projects that are qualified but for which funding is currently unavailable). Requests are evaluated by a bicycle committee that is appointed by the State Secretary of Transportation, and scheduled over a multi-year period. Since 1987 bicycle projects have been funded at a level of $250,000 - $500,000 per year. For fiscal year 1992, this amount will increase to $1,000,000.

Only a few other states have money specially designated for bicycle projects. Oregon passed legislation in 1971 requiring that not less than one percent of its State Highway Funds be spent for improvement of bicycle and pedestrian facilities. Washington State has a similar percentage of funds (from two different sources) allocated to bicycle projects. And in Illinois, two dollars has been added to the motor vehicle title transfer fee to raise approximately five million dollars annually for bicycle path construction.

Funding for bicycle facility construction in Florida was initially bolstered by returns from oil overcharge funds resulting from the mid-1970's oil crisis. Perhaps more so than any other state, however, Florida bicyclists have benefited from a statewide policy of incorporating bicycle (as well as pedestrian) improvements into virtually all construction projects, including both new construction and improvements. In the past decade, this has resulted in an estimated 20 million dollars spent on bicycle and pedestrian facilities. Further, this level of support is being increasingly seen at the local level, as more and more counties develop bicycle transportation plans and include funding for construction projects at the county level.

A few research studies conducted by State departments of transportation should also be noted. These include:

- An unpublished Wisconsin Division of Highways study of the costs and benefits of paved shoulders on state trunk highways. The analysis showed that savings in maintenance costs and crash reduction exceeded shoulder pavement costs.

- A 1981 Connecticut DOT demonstration project showing that the installation of bicycle lockers at rail commuter stations not only accommodated current bicycle users, but encouraged new users as well (CT DOT, 1981).

- A 1984 New Jersey DOT study designing and testing a new bicycle safe drainage grate. The study was an outgrowth of earlier New Jersey DOT policy requiring that bicycle safe grates be installed on all projects "where bicycle traffic could be expected." The New Jersey grate, made of cast iron, was found to have superior anti-skid properties compared to the only approved FHWA grate (made of galvanized steel). Further testing, however, was required in order for the grate to be approved by FHWA for use on federally funded projects (Feldman, 1984).

Local Bicycle Facility and Engineering Activities

Once the research has been conducted and the guidelines established, it is usually the job of the local transportation planner or traffic engineer to identify and oversee the design and construction of appropriate facility or engineering treatments. This can be as simple as deciding to install bike route signs along a roadway with a wide curb lane, or as complex as constructing a grade-separated bike path along a major arterial.

There are many examples of cities and communities across the country that have made significant changes in their cycling environments over the past decade. This section will highlight those efforts, focusing on the key developments and trends. As has been the case with other sections of this report addressing local activities, it is very likely that some notable programs will be missed. This has not been intentional and, indeed, is almost inevitable given the lack of formal documentation and evaluation for the vast majority of these efforts.

Many local areas have begun developing their own bicycle transportation plans. These may supplement existing state plans by providing additional criteria and guidelines, but they also serve the important function of identifying and prioritizing *local* bicycle traffic engineering needs. The overall goal of these documents is generally one of promoting bicycling, and this is accomplished, in part, by creating a friendlier bicycling environment. One excellent example is the City of Portland's "Alternative Transportation Program Guide" (Portland Office of Transportation,

1990). The Program Guide addresses bicycle route planning and facility development, parking provisions, curb cuts, information services concerning bicycle safety, maintenance needs, and other topics from a local perspective.

In Boulder, CO, the Alternative Transportation Center has assumed much of the responsibility for bicycle facility planning, working alongside the Boulder DOT (Boulder Alternative Transportation Center, 1991). Under this program, planned capital improvements for 1991 include three miles of bikeway, two underpasses, 150 bicycle parking spaces, and 40 bicycle lockers for two city employers. Another example of a good local bicycle plan comes from Tucson, Arizona. Since adoption of its "Major Streets and Routes Plan" (Tucson DOT, 1985), on-street bicycle routes have increased nearly 75 percent, totaling more than 100 centerline miles of signed and striped bicycle routes within Tucson.

In Florida, the State DOT encourages each of its local bicycle or pedestrian/bicycle coordinators to develop a comprehensive bicycle transportation plan, and most of the State's 25 coordinators have done so. One of the most complete is the Pinellas County (including St. Petersburg, Clearwater and Largo). Other Florida locales with particularly strong plans include Hillsborough County (Tampa), Broward County (Ft. Lauderdale), Lee County (Fort Myers), Gainesville, Pensacola, and Fort Walton. Outside of Florida, areas that have developed strong local bicycle facility and planning guides include Washington, D.C.; Madison, Wisconsin; Eugene, Oregon; Seattle, Washington; San Diego, California; Phoenix, Arizona; Dallas, Texas; and the Northeast Illinois Planning Commission.

Apart from these planning activities, the key effort at the local level has been the construction of the planned bicycle facilities. Some of these have been separate, off-road bicycle paths. Examples of communities with extensive off-road bicycle facilities include Seattle, Washington; San Diego, California; Arlington County, Virginia; and Pinnellas County, Florida. Much greater effort, however, has gone into shared road facilities, either a striped bicycle lane, wide outside curb lane, or designated bicycle route. Madison, Wisconsin; Phoenix and Tucson, Arizona; Gainesville, Florida; Eugene and Portland, Oregon; San Diego and Davis, California;

Madison, Wisconsin; and Boulder, Colorado are all good examples of cities that have added significant miles of shared road bicycle facilities to their existing road networks. Palo Alto, California has carried the process one step further, creating in 1982 the first "bike boulevard." The two-mile stretch of roadway restricts motor vehicle traffic and access while favoring bicycles.

Along a different line, another development at the local level during the decade of the 80's was the interfacing of bicycles with transit. The issue of "bikes on rails" and "bikes on buses" has a long history: in 1897, a San Francisco railway carried an average of 1800 bicycles per month on one route alone. Bicyclists paid twice the standard nickel fee, and hung their bicycles from hooks mounted on the ceiling of the train (Replogle, 1987). The demand for this service declined, however, following World War II, and it is only in recent years that bicyclists have reactivated their pursuit of access to rail and bus transit. The 1987 paper by Replogle provides an excellent review of this experience.

The groundwork for reintroducing bikes on trains was laid by the California Department of Transportation (Caltrans). In 1982, Caltrans sponsored a four-month demonstration project allowing bicycles to be carried in the passenger coaches on a commuter railway serving San Francisco and San Jose. Building on this beginning, the Santa Clara County Transit today allows bicycles on all of its light rail lines. Other railways accommodating bicycles include the Long Island Railroad, Metro North (serving New York City), the Massachusetts Bay Transit Authority (serving Boston), and New Jersey Transit (Replogle, 1987; Pro Bike News, 1988-1990).

With varying restrictions, bicycles are also allowed on subway or metrorail coaches in San Francisco, Atlanta, Miami, and Washington D.C. Also, San Francisco, San Diego, Santa Barbara, and Oakland in California, and Dallas, Phoenix, Seattle, Tucson, and Westchester County (New York City) all have policies and programs in place that allow bicycles to be carried either outside of buses (on front or rear mounted racks) or brought inside specially modified buses.

A related issue is bicycle parking at transit terminals and park-and-ride facilities. During the 1980's many communities greatly expanded the level of parking

and storage facilities available to bicyclists. Good examples here include Washington D.C., San Diego, Tuscon, and Seattle. Both Seattle and San Diego, for example, have programs where bicyclists can request that parking facilities be made available at a particular location. While not directly tied to any crash or injury reducing countermeasures, these issues of bicycle interface with transit and parking at transit terminals and work sites have considerable safety implications due to their potential for greatly increasing the numbers of bicyclists.

In addition to these specific facility developments, a number of new bicycle engineering programs and activities have been implemented at the local level. Many of these are bicycle counterparts to successful pedestrian programs. For example, Seattle has extended its "Citizen Pedestrian Improvements Request" program to bicyclists as well. Under this program, bicyclists can make direct requests to the city to carry out specific low-cost improvements to enhance their safety and access -- filling a pothole, changing a dangerous grate, improving access to a bicycle path, etc. All that is required is that the bicyclist fill out a postcard and mail it in to the Seattle Engineering Department. San Diego and Boulder, have similar programs.

Seattle has also instigated a Bicycle Rack Request program designed to provide safe and convenient parking in neighborhood business districts to encourage bicycling for short trips and errands. The program operates in a manner similar to the spot improvement program, with citizens requesting that a rack be installed using a simple postcard-type request form.

Another area in which Seattle has lead the way is in Neighborhood Traffic Management and Traffic Calming programs. While designed primarily for pedestrians, these programs benefit bicyclists as well. Phoenix, Los Angeles, Palo Alto, and Pasadena, California are other examples of cities that have used programs of this sort to improve conditions for bicyclists.

One final topic that was noted in the bicycle education section but fits here as well is that of bicycle mapping. During the 1980's a growing number of communities as well as some states began developing special maps for use by bicyclists. In addition to identifying safe riding routes, bicycle maps are often used to inform

riders about state and local laws pertaining to bicycling, encourage safe riding practices, publicize bicycle registration programs, identify local bicycling resources and events, etc. States with good bicycle mapping include North Carolina, Delaware, Maryland, Massachusetts, Ohio, Oregon, and Wisconsin. Notable examples of regional maps include those of the Finger Lakes Region in New York State, the Oregon Coast Bike Route, and the Claire Saltonstall Bikeway from Boston to Provincetown, Massachusetts. Good examples of community or urban bicycle maps exist for Durham and Wilmington, North Carolina; Seattle, Washington; Missoula, Montana; Eugene, Oregon; Providence, Rhode Island; and Baltimore, Maryland.

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Chapter 8. Bicycle Law Enforcement and Regulation

Background

Enforcement and regulation comprise the "third E" in a comprehensive bicycle safety program. As with pedestrian safety, less attention has been given to enforcement and regulation as tools for reducing bicycle-related crashes and injuries than to the other two "E's" -- education and engineering. Yet enforcement of existing traffic laws and adoption of new laws or regulatory measures can play a key role in creating a safer bicycling environment.

Bicycle law enforcement typically targets specific actions, either on the part of the bicyclist or the motorist, that have been shown to increase the likelihood of a crash. For example, an enforcement program might target bicyclists' failure to stop for stop signs, or motorists' failure to yield to bicyclists already traveling in the roadway. Enforcement programs can also reinforce state laws and local ordinances pertaining specifically to bicyclists, such as those requiring bicyclists to ride on the right-hand side of the road with the traffic flow, or those requiring headlights for nighttime riding or the wearing of bicycle helmets. The most effective bicycle law enforcement programs incorporate strong public education components.

Most bicyclists and bicycling organizations support stronger enforcement of traffic laws for themselves and for motorists. However, enforcement of traffic laws for bicyclists typically receives very low priority from local law enforcement agencies. Bicyclist noncompliance with traffic laws can, in turn, create tensions between motorists and bicyclists, particularly when the bicyclist is an adult. Despite this situation, there have been relatively few developments in the area of bicycle law enforcement over the past decade, for both adult and child bicyclists.

Regulatory activities are generally broader in scope, and because they are not as dependent on one-on-one contact between a law enforcement officer and an errant bicyclist or motorist, have potentially broader safety implications. At the national level, regulatory activities often take the form of standards or policy statements -- for example, the Uniform Vehicle Code sections on bicycles, or the

American National Standard Institute's approval of a (voluntary) performance standard for bicycle helmets. At the state and local levels, bicycle safety regulation can include passage of specific laws and ordinances that have far-reaching safety consequences, such as a requirement that elementary school curriculums teach bicycle safety education, or that children under a certain age wear a helmet when riding. As with law enforcement, the effectiveness of regulations can be enhanced by effective program "PI&E." Public understanding of the importance of a regulation, and in particular its potential for reducing injury and death, contributes to increased support and compliance.

This section will review the key bicycle enforcement and regulatory activities that have occurred over the past ten years. As in the other sections, the intent is to document the most significant programs, events and trends, and the extent of their impact. Specific examples will be cited, but once again the lack of documentation in this area makes it impossible to identify the full range of bicycle law enforcement and regulatory activities occurring during this time.

Federal Government and Other National Activities

Within the Federal Government two agencies share responsibility for bicycles and bicycle safety. The Consumer Product Safety Commission (CPSC) has regulatory authority over the bicycle as a "product." The CPSC, for example, has the authority to ban any manufactured/imported bicycle that presents an "unreasonable risk of injury," to recall and/or notify the public concerning a particular bicycle model that may be "imminently hazardous," or to set either voluntary or mandatory product standards for bicycle manufacture. NHTSA's primary concern, on the other hand, is with the use of the bicycle as transportation, and in the promotion of safe use of the bicycle on public roadways. This separation of responsibilities distinguishes the bicycle from other (motorized) transportation modes, which reside entirely under NHTSA jurisdiction.

An extension of this division of interests relates to bicycle helmets. Since the bicycle is not a motor vehicle and the bicyclist is not a motor vehicle operator,

NHTSA does not exercise authority over bicycle helmets or their use. CPSC recently ruled against adopting mandatory performance criteria for bicycle helmets as products, but does conduct tests on helmets for compliance with the voluntary Snell or ANSI standards. Both CPSC and NHTSA have joined in a cooperative program to promote bicycle safety through increased helmet use and other measures.

As with pedestrians, the basis for much of the enforcement and regulatory activities concerning bicycles and bicyclists at the national level is the Uniform Vehicle Code (UVC) and Model Traffic Ordinance (MTO), both published by the National Committee on Uniform Traffic Laws and Ordinances (NCUTLO). The UVC is a "specimen set of motor vehicle and traffic laws ... used extensively by states and local authorities as vehicle and traffic codes are revised and updated." A key provision of the 1975 revision of the UVC was article 11-1202 which states:

> Every person propelling a vehicle by human power or riding a bicycle shall have all of the rights and all of the duties applicable to the driver of any other vehicle . . . except as to special regulations in this article and except as to those provisions which by their nature can have no application (NCUTLO, 1987).

Today, all 50 states have adopted language similar to this aspect of the Uniform Vehicle Code so as to define or treat bicycles as "vehicles." This gives bicyclists the legal right to operate on the public roadway except where specifically prohibited (such as on an interstate highway).

A number of other key changes were introduced with the 1984 review of the UVC. These included dropping the requirement that cyclists ride on a usable bikepath adjacent to a roadway instead of in the roadway itself (i.e., a mandatory sidepath law), and allowing a bicyclist to signal a right-hand turn by pointing his right arm out horizontally. At the same time several changes recommended by the subcommittee were not adopted by the full committee. Included in these was the addition of wording which would have allowed bicyclists to pass cars operating in the same travel lane, either on the left or right-hand side.

The Model Traffic Ordinance (MTO) is "a specimen set of motor vehicle ordinances for a municipality or other unit of local government and is consistent with

the recommended state law embodied in the Uniform Vehicle Code." Recent changes to the MTO pertaining to bicycles include:

- A revised definition of bicycle that makes no reference to seat height requirement. The MTO defines a bicycle as "every vehicle propelled solely by human power upon which any person may ride, having two tandem wheels and except scooters and similar devices" (Revised, 1984);

- Addition of the term "bikeway," defined to include "every way, including highways, which is publicly maintained and which is in some manner specifically designated as open to public bicycle travel, regardless of whether the way is designated for exclusive use of bicycles or is to be shared with other transportation modes (New, 1986);

- Creation of a model bicycle registration ordinance covering license application procedures and fees, record keeping, issuance of a decal or sticker, etc. (Revised, 1986).

Several national level organizations are involved in bicycle enforcement and regulation activities. The League of American Wheelmen (L.A.W.) is a national association of bicyclists and bicycling organizations that was founded in 1880. Along with its promotion and education activities, the L.A.W. has traditionally functioned as an advocate for bicycle concerns at both the Federal and State level. It has lobbied Congress and State legislatures, developed model laws, and formulated policy statements regarding the regulation of bicycles. Although generally less active during the 1980's than in the previous decade, the L.A.W. has continued to represent the interests of cyclists. It has been actively involved in the "police on bicycles" movement and recently issued an action paper on bicycle helmets laws.

Concerning police on bikes, although police departments that adopt bicycle patrol units generally do so to help control crime in high traffic areas and to improve public relations, the League views such patrols as "a positive step toward building a better understanding between cyclists and the law enforcement community." Their 1990 brochure, "How to Get Police Onto Bicycles" provides the rationale for bike patrols and presents information for persuading law enforcement agencies to adopt a program in their community (L.A.W., 1990a). In 1991, the L.A.W.

sponsored the first annual "Police on Bikes Conference." A second conference was held in March of 1992.

The L.A.W. has also responded to the helmet law controversy. Its membership supports the wearing of bicycle helmets, and the League has taken a public position very strongly in favor of helmet use; however, it has not publicly endorsed bicycle helmet legislation. A 1990 publication of the League identifies and discusses key issues in bicycle helmet legislation, such as the importance of requiring helmets to meet current Snell or ANSI standards, not allowing failure to wear a helmet to be interpreted by the courts as contributory negligence in injury cases, and having the law apply to bicyclists of all ages (L.A.W., 1990b). The publication also gives examples of current helmet laws (California and New York State) and presents a model bicycle helmet ordinance for child passengers on bicycles and for bicycle operators of all ages. It was prepared as a resource for the League's state legislative representatives and for bicycle advocates at all levels of involvement.

A final legislative/regulatory activity at the national level is the National Bicycle Policy Project, a joint effort of the Bicycle Federation of America and Bikecentennial. The project was initiated in 1988 with the broad goal of working with Federal agencies and national associations to create policies, standards, guidelines, and regulations that are favorable to bicyclists and bicycling. The project has resulted in improved working relationships with organizations such as the American Association of State Highway and Transportation Officials (AASHTO), the National Park Service, and the U.S. Department of Transportation. Areas addressed by this ongoing project include transportation policy and legislation, highway and bicycle facility design, highway safety education, recreation and trails, professional training, research, and program administration and development.

State Bicycle Enforcement/Regulatory Activities

A number of legislative changes have occurred at the state level, partly in response to changes in the Uniform Vehicle Code but also in response to the general growth in the popularity of bicycling and the need to better accommodate bicyclists

in overall traffic safety planning. As has already been noted, all 50 states now treat the bicycle as a vehicle, subject to all appropriate vehicle rights and responsibilities defined in existing state traffic laws. At least two states, Montana and New Jersey, have repealed their mandatory sidepath laws, and others have passed legislation permitting bicyclists to ride on controlled access highways (e.g., New Jersey, Maryland), or on shoulders (e.g., California, Colorado, Oregon, Washington).

Another example of legislation at the state level has been the establishment of state bicycle programs and/or advisory councils. In 1980, only three states (Florida, North Carolina and Ohio) had full-time bicycle safety coordinator positions. Currently at least nine states have full-time positions and 21 more have part-time positions. The list continues to grow, in part due to the efforts of the National Bicycle Program Campaign, a special initiative of the Bicycle Federation of America (Clark, 1991).

Another area where legislative activity at the state level has occurred is that of bicycle safety education. North Carolina, Florida, and Washington State have all passed legislation requiring bicycle safety education to be included in their elementary school curriculums. However, in North Carolina and Washington State the absence of state appropriated funds to implement the required curriculum has limited the actual amount of activity occurring.

An area receiving considerable recent attention at both the state and local level is that of mandatory bicycle helmet use laws. As of January, 1992, four states had passed laws requiring helmet use by children being carried as passengers on a bicycle: California, Massachusetts, New York State, and Pennsylvania. Laws in the first three states apply to children under age 5, while the Pennsylvania law applies to children under age six. (The California law also has a weight requirement of under 40 pounds.) In addition, both the Massachusetts and New York laws specifically prohibit children under the age of one from being carried as passengers on bicycles. The State of New Jersey recently passed the only state-level helmet law to include bicycle operators as well as children. The New Jersey law, scheduled to go into effect in June 1992, applies to bicyclists under 14 years of age. Several local areas have also

passed helmet ordinances that extend to older riders; these will be reviewed in the section dealing with local initiatives.

Bicycle registration is another regulatory activity that has been pursued by a few states. In Minnesota, approximately five percent of the State's 2.6 million bicycles are registered under a voluntary registration law passed by the State Legislature in 1976. Proceeds from the registration fees (approximately $20,000-$60,000 annually beyond program implementation costs) are generally funnelled back into State bicycle program activities, such as the printing of educational or promotional brochures. Florida has recently initiated a statewide registration program modeled after the Minnesota program.

Finally, although bicycle law enforcement is, by its nature, a local activity, some related state-level activities can be noted. In 1981, the UNC Highway Safety Research Center developed a "Bicycle Law Enforcement Manual" (Hunter and Stutts, 1981) under a project funded by that State's Governor's Highway Safety Program. The Manual is intended to serve as a "how to" guide for communities interested in developing bicycle law enforcement programs. Sections in the manual address the need for bicycle law enforcement, current and past enforcement programs nationwide, key components of enforcement programs (legal issues, who should enforce, what to enforce, adjudication procedures, etc.), the responsibilities of the local bicycle officer, and materials and resources. Although a cutback in project monies prevented this manual from being utilized to develop model enforcement programs in the State of North Carolina, the manual remains available to anyone interested in developing a community based program of bicycle law enforcement.

One state that was often cited in the North Carolina manual and that continues to serve as a model for statewide bicycle law enforcement is that of Minnesota. As part of the Minnesota Community Bicycle Safety Project operated by the 4-H Youth Development and funded by the Minnesota Department of Public Safety, many police departments in the State continue to hire young people to enforce bicycle traffic laws during the spring and summer months. These "bike patrols," in addition to issuing warnings and citations to violators, teach bicycle safety to

children at camps, conduct bicycle rodeos, and lead seminars for violators.

One of the most active states in the area of bicycle law enforcement is the State of Florida. Throughout the 1980's the Florida DOT has sponsored workshops and training sessions with local police departments statewide to encourage their involvement in bicycle safety and law enforcement activities. A video and police officer's handbook based on the Florida program are due for release by Outdoor Empire Publishing in the near future.

Local Bicycle Enforcement/Regulatory Activities

The local community or municipality is where legislation ultimately impacts, and where the vast majority of bicycle law enforcement activities occur. Many of the events and activities already cited at the national and state levels have their local counterparts. For example, along with the increase in state bicycle programs and coordinators, there has been an increase in local programs. Cities that have established local bicycle programs with full-time bicycle coordinators (or pedestrian/bicycle coordinators) include: Tuscon, Arizona; San Diego, Davis, and Palo Alto, California; Boulder and Pueblo, Colorado; Missoula, Montana; Wilmington, North Carolina; Dayton, Ohio; Eugene and Portland, Oregon; Dallas, Texas; Arlington County, Virginia; Washington, D.C.; Seattle, Washington; and Madison, Wisconsin, along with some 20 communities in Florida (Clark, 1991). Not surprisingly, many of these names have appeared on previous lists of communities active in various areas of bicycle safety education, engineering, or facility development. Having one or more persons designated as responsible for addressing the needs of the bicycling community is a common denominator in many successful programs.

In response to the Model Traffic Ordinance's release of a Model Bicycle Registration Ordinance (1987), a growing number of communities have initiated either voluntary or mandatory bicycle registration programs. The programs serve as a deterrent to theft, aide in the recovery of bicycles that *are* stolen, and reinforce the view that the bicycle is a legitimate participant in the road traffic environment. Registration programs can also produce significant revenues, which can be directed back

to education programs, facility funding, law enforcement activities, etc.

A final key regulatory area that has carried over to the local level is mandatory helmet use by bicyclists. In addition to the states of California, Massachusetts, New York, Pennsylvania and New Jersey, several local areas have adopted ordinances, and legislation is pending in a number of other jurisdictions. None of the current legislation is directed at adult riders, although several pending laws and ordinances extend to adults. Laws in effect in Howard County, Maryland and Beechwood, Ohio cover all riders and passengers under 16 years of age, and a Montgomery County, Maryland law extends the age for coverage up to 18. An ordinance passed in Chapel Hill, North Carolina effective April 1992 applies to riders under age 16. The National Safe Kids Campaign is tracking pending legislation in a number of other communities and states. In at least two of the helmet law sites (Montgomery and Howard County, Maryland), evaluations of the impact of the helmet ordinances have been undertaken.

In the bicycle law enforcement area, the 1981 "Bicycle Law Enforcement Manual" (Hunter and Stutts, 1981) identified over a dozen programs nationwide that employed a variety of innovative and successful approaches to enforcement of road rules among bicyclists. A few of the programs, such as those in Madison, Wisconsin and Davis, California, targeted older cyclists, primarily the college population. Programs were most often run by the local police department using uniformed police officers, but sometimes civilians (e.g., college students) were hired and trained as bike officers. Many of the programs had special provisions to deal with young offenders. Approaches used included letters to parents, bicycle safety education classes, and special "peer courts."

Some of the programs cited in the 1981 Bicycle Law Enforcement Manual have continued until the present time, and others have been added. The Madison Police Department program is a good example (Madison Police Department, 1981). Initiated with Section 402 grant money in 1978, it remains a focal point of the city's bicycle and pedestrian safety activities. The Police Department conducts a year-round bicycle education and enforcement program, using officers on bicycles, and

hires a dozen or more college students to provide additional manpower during the summer months. The primary responsibility of the bicycle monitor is to educate the public and to enforce city ordinances pertaining specifically to pedestrian and bicycling violations.

A final development which has experienced tremendous growth in recent years is police bicycle patrols, popularly referred to as "cops on bikes." At last count, there were well over 100 police departments in 36 U.S. cities employing bike patrols (Pro Bike News, September 1991). As noted earlier, these patrols are used primarily to deter crime: Seattle reports that their bike patrol makes an average of 600 misdemeanor arrests and 180 felony arrests each month (Pro Bike News, August 1991). Even though most "cops on bikes" probably engage in very little enforcement of traffic law violations by bicyclists, they do serve as positive role models for the bicycling community, and programs could readily be adapted to incorporate active bicycle law enforcement.

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League of American Wheelmen (1990b). Helmet Issue Gets Hot: Time to Take Action. Baltimore, MD: L.A.W.

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Chapter 9. Summary and Conclusion

Summary of Activity

Clearly the amount of pedestrian and bicycle safety activity that has transpired over the past decade is not small. Moreover, this activity has occurred at all levels, from the Federal Government and various national organizations down to local communities in states across the county.

In the area of pedestrian safety, activity has been led by the Federal Government which has concentrated on the development of comprehensive program guides and support materials, with some continued funding for facility design and engineering countermeasure development and evaluation. There have also been recent efforts to work with local law enforcement agencies and to incorporate pedestrian safety into community traffic safety programs.

Key pedestrian safety program guides developed and/or refined during the 1980's include the Pedestrian Accident Reduction Guide (NHTSA, 1981), the Model Pedestrian Safety Program User's Manual (Knoblauch and Crigler, 1987), and the 1989 Walk Alert Program Guide, currently undergoing extensive FHWA/NHTSA revision. Various support materials in the form of films, videos, pamphlets, classroom curriculums, etc. have been developed by a number of different agencies and organizations including AAA, AARP, National Association for the Education of Young Children, Walt Disney Productions, as well as NHTSA, FHWA, and the National Safety Council.

At the state and local level, Florida and Pennsylvania offer perhaps the best examples of comprehensive pedestrian safety programs. The Florida pedestrian safety program has been evolving for nearly a decade, while the Pennsylvania program has developed more recently using Federal Section 402 grant money. A number of communities have also been awarded NHTSA mini-grants to initiate comprehensive pedestrian safety programs.

Examples of particularly innovative pedestrian safety activities include Virginia's community needs assessment program and Seattle's spot improvement and

traffic calming measures. In addition, Seattle and Washington State, and more recently Missoula and Montana, have passed legislation to protect pedestrians in crosswalks, accompanied by active law enforcement.

Bicycle countermeasure development and program activities have followed a very different path from these pedestrian safety activities. During the time frame of this review there was relatively little involvement of the Federal Government in bicycle safety research and program activities. Rather, activities have been inspired and supported by non-government organizations -- the Bicycle Federation of America, the National Safe Kids Campaign, the American Academy of Pediatrics, and others. In contrast to pedestrian safety activities, which have tended to follow a "top down" hierarchy, bicycle activities during this period were very much "grass roots" efforts.

Key program and countermeasure activities in the bicycle safety education area include the development and implementation of innovative "on bike" education curriculums for school-age children, and state and local helmet promotion campaigns. In the engineering area, an increasing number of states have developed bicycle facility guidelines, and both states and communities have developed bicycle planning guides.

Alternative transportation programs, such as those in Tuscon, Arizona; Boulder, Colorado; and Portland, Oregon have provided strong support for incorporating bicycle and pedestrian considerations into local transportation planning. Communities across the U.S. have also greatly expanded their available bicycle facilities, including off-road paths as well as shared road facilities. A growing number of communities are experimenting with linking bicycles with mass transit (rail and bus), and are encouraging bicycle commuting through better provision of parking and other facilities. Finally, but perhaps most significantly, there has been tremendous growth in the number of state and local bicycle (or pedestrian/bicycle) coordinators.

Both pedestrian and bicycle safety have benefited from the increased involvement of the health and medical community in issues of injury control, and from the establishment of a Division of Injury Control (soon to obtain Center status)

within the Centers for Disease Control. In addition to providing needed funding, the health and medical community has offered tremendous expertise and manpower to the problem of reducing pedestrian and bicycle injuries.

Pedestrian and bicycle safety activities have also benefited from the tremendous growth in the popularity of walking and bicycling. Whether for health and fitness, recreation, or transportation, an increasing number of Americans are demanding safer and more appealing settings for walking and bicycling.

Needs

What the current review has shown is that many "solutions" -- countermeasures and programs for reducing pedestrian and bicycle crashes and injuries -- have already been developed. And more importantly, many are being implemented in states and communities across the country. This is particularly true for bicycle activities, which have a strong basis in local initiatives.

What is needed is a coordinated effort involving local program implementers, State and Regional NHTSA and FHWA Offices, and non-government organizations working together in partnership to address the issue of pedestrian and bicyclist safety. Efforts in this direction are being undertaken by the Federal Government in the form of programs, grants, and activities in the pedestrian and bicyclist safety areas in the "Planning Community Pedestrian Safety Programs - Agenda for Action" and in other program areas.

One factor that will encourage coordination is the recent elevation of pedestrian and bicycle safety programs to priority status within the Federal Section 402 program area. This will give visibility to these activities, as well as produce some of the partnerships necessary for success. The recent creation of pedestrian and bicycle manager positions within FHWA and the Office of the Secretary will also contribute to this objective. And as a final example, the ongoing National Bicycling and Walking Study includes development of a strategic plan of action for the U.S. Department of Transportation for incorporating bicycling and walking into mainstream transportation activities.

The key questions that must be addressed include:

Who are the key players?

What are their roles?

How can they best support each other's activities?

The issue here is really one of effective technology transfer, and is addressed in a separate report resulting from this project (Wilkinson, Tracy, Hunter and Stutts, 1992). In short, the report stresses the need for developing an "infrastructure of implementers" -- local pedestrian/bicycle coordinators, Community Traffic Safety Program directors, health professionals, etc. -- in order to effectively convey pedestrian and bicycle safety products to users at the state and local levels.

The challenge is great, but must be met if America is it to lower its annual toll of nearly 200,000 pedestrians and bicyclists injured or killed in traffic crashes.

APPENDIX

Pedestrian and Bicyclist Safety Resource Directory

American Automobile Association
8111 Gatehouse Road
Falls Church, VA 22047
(703) 222-6621

AAA Foundation For Traffic Safety
1730 M Street, NW Suite 401
Washington, DC 20036
(202) 775-1456

American Academy of Pediatrics
141 Northwest Point Boulevard
P.O. Box 927
Elk Grove Village, IL 60009-0927
(708) 228-5005

American Association of Retired Persons
1909 K Street, NW
Washington, DC 20049
(202) 728-4888

American Association of State Highway and Transportation Officials
(AASHTO)
444 N. Capitol St. NW, Suite 225
Washington, DC 20001
(202) 624-5800

American Society of Civil Engineers
Bicycle Transportation Committee, Urban Transportation Division
345 East 47th Street
New York, NY 10017
(800) 548-ASCE

Bicycle Federation of America
1818 R Street, NW
Washington, DC 20009
(202) 332-6986

Bicycle Helmet Safety Institute
4611 Seventh Street, South
Arlington, VA 22204-1419
(707) 486-0100

Bicycle Institute of America
1818 R Street, NW
Washington, DC 20009
(202) 332-6986

Bikecentennial/Bicycle Forum, Inc.
P.O. Box 8308
Missoula, MT 59807
(406) 721-1776

Boulder Bicycle Program
Alternative Transportation
P.O. Box 791
Boulder, CO 80306
(303) 441-3900

Colorado Department of Highways
Bicycle/Pedestrian Coordinator
4201 E. Arkansas Ave., #225
Denver, CO 80222
(303) 757-9982

Coronet/MTI Film & Video (distributors of Disney Educational Productions and Learning Corporation of America)
108 Wilmot Road
Deerfield, IL 60015
(708) 940-1260 (800) 621-2131

Eugene Bicycle Coordinator, Traffic Division
858 Pearl Street
Eugene, OR 97401
(503) 687-5298

Federal Highway Administration, HSR-20
6300 Georgetown Pike
McLean, VA 22101
Contact: John C. Fegan
(703) 285-2383 Fax: (703) 285-2379

Florida State Bicycle/Pedestrian Coordinator
Department of Transportation
605 Suwannee St., M.S. 19
Tallahassee, Fl 32399-0450
(904) 488-4640

Harborview Injury Prevention and Research Center
325 Ninth Avenue, ZX-10
Seattle, WA 98104
(206) 233-3399 (206) 233-3210

Highway Safety Research Center, University of North Carolina
134 1/2 East Franklin Street, CB 3430
Chapel Hill, NC 27599-3430
(919) 962-2202 (800) 672-4527

League of American Wheelman (L.A.W.)
190 W. Ostend ST., Suite 120
Baltimore, MD 21230
(301) 539-3399 Fax: (301) 539-3496

National Association for the Education of Young Children
1834 Connecticut Avenue, NW
Washington, DC 20009-5786
(800) 424-2460 (202) 232-8777 Fax: (202) 328-1846

National Head Injury Foundation
1140 Connecticut Avenue, NW Suite 812
Washington, DC 20036
(202) 296-6443

National Highway Traffic Safety Administration
Office of Research and Development, Room 6240, NRD-42
400 Seventh Street, SW
Washington, DC 20590
Contact: Al Farina
(202) 366-5585 Fax: (202) 366-7096

National Safety Council
P.O. Box 11933
Chicago, IL 60611
(312) 527-4800 (800) 621-7619

National Safe Kids Campaign
111 Michigan Avenue, NW
Washington, DC 20010-2970
(202) 939-4993

National Technical Information Service
Springfield, Virginia 22160
(703) 487-4650

North Carolina Department of Transportation Bicycle Program
P.O. Box 25201
Raleigh, NC 27611
(919) 733-2804

Oregon Department of Transportation
Bikeway Program Manager
Room 200, Transportation Building
Salem, OR 97310
(503) 378-3432

Outdoor Empire Publishing, Inc.
511 Eastlake Avenue E.
P.O. Box C-19000
Seattle, WA 98109
(206) 624-3845

Pedestrian Federation of America
1818 R Street, NW
Washington, DC 20009
(202) 332-6986

Portland Alternative Transportation Program
1120 SW 5th Avenue, Room 810
Portland, OR 97204
(503) 796-7083

Rails-to-Trails Conservancy
1400 Sixteenth St. NW
Washington, DC 20036
(202) 797-5400

San Diego Bicycle Coordinator
Engineering and Development Department
1222 First Avenue, M.S. 405
San Diego, CA 92101
(619) 236-7214

Seattle Engineering Department, Bicycle Coordinator
708 Municipal Building
600 4th Avenue
Seattle, WA 98104
(206) 684-7583

Transportation Research Board
National Research Council
2101 Constitution Avenue, NW
Washington, DC 20418
(800) 428-9818

United States Cycling Federation
1750 E. Boulder Street
Colorado springs, CO 80909
(303) 578-4573

Washington Area Bicyclist Association
1015 31st Street, NW
Washington, DC 20007
(202) 872-9830

FHWA REGIONAL OFFICES

Region/State Time	Administrator	Address/Telephone
REGION 1 7:30 a.m. - 4:00 p.m.	John G. Bestgen, Jr. Regional Administrator Donald E. Hammer Deputy Regional Administrator	Leo W. O'Brien Federal Building Clinton Avenue & North Pearl St. Room 719 Albany, NY 12207 (518) 472-6476
REGION 3 7:45 a.m. - 4:15 p.m.	David S. Gendell Regional Administrator Joseph S. Toole Deputy Regional Administrator	George H. Fallon Federal Off. Bldg. 31 Hopkins Plaza, Room 1633 Baltimore, MD 21201 (301) 962-0093
REGION 4 7:45 a.m. - 4:15 p.m.	Leon N. Larson Regional Administrator Henry Rentz Deputy Regional Administrator	1720 Peachtree Road, N.W. Suite 200 Atlanta, GA 30367 (404) 374-4078
REGION 5 7:30 a.m. - 4:15 p.m.	Herbert R. Teets Regional Administrator Vincent F. Schimmoller Deputy Regional Administrator	18209 Dixie Highway Homewooc, IL 60430-2294 (708) 206- 3206
REGION 6 8:00 a.m. - 4:30 p.m.	Wesley S. Mendenhall, Jr. Regional Administrator Dale E. Wilken Deputy Regional Administrator	819 Taylor Street Fort Worth, TX 76102 (817) 334-3741
REGION 7 7:30 a.m. - 4:00 p.m.	Volmer K. Jensen Regional Administrator Archie L. Bedford Director, Engineering and Operations	6301 Rockhill Road P.O. Box 419715 Kansas City, MO 64141-6715 (816) 926-7563
REGION 8 7:45 a.m. - 4:15 p.m.	Louis N. McDonald Regional Administrator Marvin I. Espeland Deputy Regional Administrator	555 Zang Street Room 400 Lakewood, CO 80228 (303) 969-6722
REGION 9 7:45 a.m. - 4:15 p.m.	Edwin M. Wood Regional Administrator Jeffrey R. Brooks Special Assistant to Regional Administrator	211 Main Street Room 1100 San Francisco, CA 94105 (415) 744-2639
REGION 10 7:00 a.m. - 5:45 p.m.	Jerald P. Clark Regional Administrator Leon J. Witman, Jr. Deputy Regional Administrator	KOIN Center Suite 600 222 S.W. Columbia Street Portland, OR 97201 (503) 326-2053

NHTSA REGIONAL OFFICES

Region/States Time	Region Address	Name/Title	FTS/Commercial
REGION I (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont) 7:45 a.m. - 4:15 p.m.	NHTSA Regional Administrator Transportation Systems Center Kendall Square Code 903 Cambridge, MA 02142	George A. Luciano Regional Administrator	8-837-3427 (617) 494-3427 FAX-FTS 837-3646 FAX 617-494-3646
REGION II (New Jersey, New York, Puerto Rico and Virgin Islands) 7:45 a.m. - 4:15 p.m.	NHTSA Regional Administrator 222 Mamaroneck Avenue Room 204 White Plains, NY 10605	Thomas M. Louizou Regional Administrator	8-661-1220 (914) 946-1220 FAX 914-328-7925
REGION III (Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia) 8:00 a.m. - 4:30 p.m.	NHTSA Regional Administrator BWI Commerce Park 7526 Connelley Drive, Suite L Hanover, MD 21076-1699	Frank D. Altobelli Regional Administrator	(301) 768-7111 FAX 301-768-7118
REGION IV (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee) 7:45 a.m. - 4:15 p.m.	NHTSA Regional Administrator Suite 501 1720 Peachtree Road, N.W. Atlanta, GA 30309	Thomas J. Enright Regional Administrator	8-257-4537 (404) 347-4537 FAX-FTS 257-0097
REGION V (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin) 8:00 a.m. - 4:30 p.m.	NHTSA Regional Administrator 18209 Dixie Highway, Suite A Homewood, IL 60430	Donald J. McNamara Regional Administrator	(708) 799-6067 FAX 708-799-2658
REGION VI (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas) 8:00 a.m. - 4:30 p.m.	NHTSA Regional Administrator 819 Taylor Street, Room 8A38 Fort Worth, TX 76102-6177	Georgia S. Jupinko Regional Administrator	8-334-4300 (817) 334-4300 FAX-FTS 334-8339
REGION VII (Iowa, Kansas, Missouri, and Nebraska) 7:45 a.m. - 4:15 p.m.	NHTSA Regional Administrator P.O. Box 412515 Kansas City, MO 64141	Norman B. McPherson Regional Administrator	8-926-7887 (816) 926-7887 FAX-FTS 926-7884
REGION VIII (Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming) 7:45 a.m. - 4:15 p.m.	NHTSA Regional Administrator 555 Zang Street, 4th Floor Denver, CO 80228	Louis R. DeCarolis Regional Administrator	8-321-6917 (303) 969-6917 FAX 8-321-6294
REGION IX (American Samoa, Arizona, California, Guam, Hawaii, and Nevada) 7:45 a.m. - 4:15 p.m.	NHTSA Regional Administrator Suite 1000 211 Main Street San Francisco, CA 94105	Joseph Cindrich Regional Administrator	8-484-3089 (415) 774-3089 FAX-FTS 8-484-2532 FAX (415) 744-2532
REGION X (Alaska, Idaho, Oregon, and Washington) 8:00 a.m. - 4:30 p.m.	NHTSA Regional Administrator 3140 Jackson Federal Building 915 Second Avenue Seattle, WA 98174	Curtis A. Winston Regional Administrator	8-399-5934 (206) 553-5934 FAX 206-553-0480