March 1982
NHTSA Technical Report

DOT HS-806 131

U.S. Department
of Transportation
National Highway
Traffic Safety
Administration

Effectiveness and Efficiencies in Pedestrian Safety

Traffic Safety Programs
Office of Program and Demonstration Evaluation

Twenty-one of over 600 entries to Docket 81-12 are related to pedestrian safety programs. Eight entries contained specific project and effectiveness information. Some five indicated promise of effectiveness based on limited data or project application. The remainder were generally supportive, or touched on a peripheral aspect of the program.

Evidence of accident reduction was received from Denver, Colorado; Middletown, Ohio; Milwaukee, Wisconsin; Philadelphia, Pennsylvania; Miami-Dade County, Florida; the State of New Jersey, and the Commonwealth of Puerto Rico. Each of these projects is described in a section of the paper. Projects ranged from comprehensive community-wide; to enforcement of walking while intoxicated; to traffic engineering; to elementary education only.

Programs which promise effectiveness exist in Illinois; North Carolina; Ohio; Madison, Wisconsin; and, Baltimore, Maryland.

EXECUTIVE SUMMARY

According to the data in the National Highway Traffic Safety Administration's (NHTSA) Fatal Accident Reporting System (FARS), pedestrian fatalities constitute 16 percent of total highway-related fatalities. Excluding motor-vehicle occupants, pedestrians comprise the single largest category of fatalities on the nation's streets and highways. A review of national statistics indicates that 85 percent of all pedestrian accidents and 60 percent of all pedestrian deaths occur on urban streets. The FARS file indicates that in some large urban areas, 40 percent to 50 percent of the traffic deaths are pedestrians.

Alcohol has been implicated with estimates of one of every three adult pedestrian accidents in urban areas involving alcohol. A recent NHTSA-sponsored study, conducted in New Orleans, showed that positive blood alcohol concentrations (BAC) were found in approximately one-half of both the fatally and non-fatally injured pedestrians. Also, poor visibility, or lack of conspicuity, has been identified as a contributing causal factor in a large number of nighttime and daytime pedestrian (and cyclist) accidents in NHTSA research.

Pedestrian deaths have numbered about 8,000 annually for the last several years (FARS data). Additionally, almost 150,000 pedestrian injuries occur each year according to the National Accident Sampling System (NASS).

Pedestrian safety programs are a joint responsibility of NHTSA and the Federal Highway Administration (FHWA). NHTSA's focus is on the identification of pedestrian accident problems, and the development of cost-effective countermeasures and procedures for applying them at the State and local levels. These solutions aim at changing the unsafe behaviors of both drivers and pedestrians. FHWA's focus is on researching, planning, designing, constructing, and using pedestrian facilities such as sidewalks, pathways, bridges, and underpasses.

Over the past years, NHTSA, FHWA, and some States and communities have conducted research to develop and test countermeasures for various pedestrian problems. Typically, tests are made first to determine if safety knowledge can be increased and unsafe behavior decreased as a result of countermeasure application. The ultimate test is whether the specific types of accidents are reduced. Effectiveness results--for selected Federal, State and local countermeasures (education, safety messages, model regulations traffic engineering and enforcement)--indicate that a variety of solutions exist for a series of accident types; and results can be achieved in accident reduction.

Additionally, examples of other countermeasures which promise effectiveness in accident reduction include programs for elderly and handicapped; parents and pre-school children; and improving the visibility and conspicuity of pedestrians. To assist States and communities in the implementation of countermeasures, NHTSA and FHWA have developed and published guides, models, and procedures which aid in forming the basis for systematic and comprehensive programs. The goals of the foregoing are increased efficiency and enhanced cost reduction.

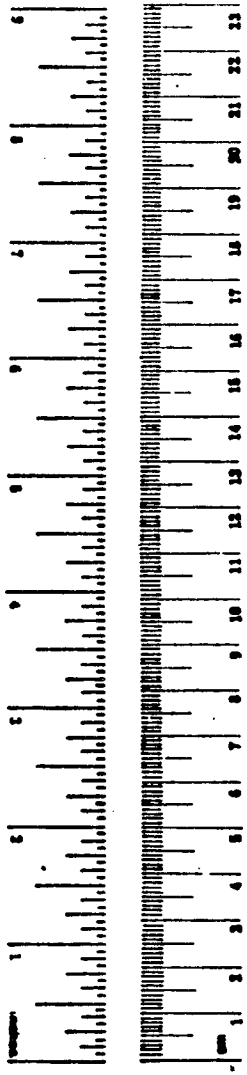
CONTENTS

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

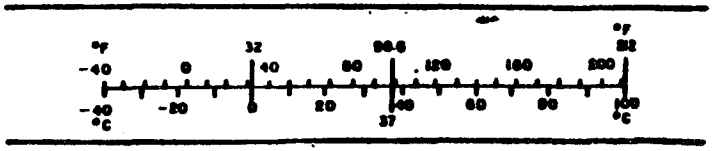
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT-HS 806 131		

4. Title and Subtitle	5. Report Date
Effectiveness and Efficiencies in Pedestrian Safety	March 1982
	6. Performing Organization Code: NTS-40
	8. Performing Organization Report No.
7. Author's: Ms. Pat Ehrlich, Dr. Alfred Farina, Mr. Lawrence Pavlinski and Dr. William E. Tarrants	
9. Performing Organization Name and Address: Office of Program and Demonstration Evaluation, Traffic Safety Programs, National Highway Traffic Safety Administration, U.S. Department of Transportation, Washington, D. C. 20590	10. Work Unit No. TRAIS
	11. Contract or Grant No.
12. Sponsoring Agency Name and Address: SAME	13. Type of Report and Period Covered: Evaluation Summary Report 1966 - 1981
	14. Sponsoring Agency Code: NTS-40

15. Supplementary Notes

16. Abstract: Pedestrian fatalities constitute 16 percent of total highway - related fatalities. Excluding motor vehicle occupants, pedestrians comprise the target single category of fatalities on the nation's streets and highways. A total of 85 percent of all pedestrian accidents and 60 percent of all pedestrian deaths occur on urban streets. In some large urban areas, 40 to 50 percent of the traffic deaths are pedestrians. Alcohol has been implicated with estimates of one of every three adult pedestrian accidents involving alcohol in urban areas. Poor visibility, or lack of conspicuity, has been identified as a contributing causal factor in a large number of nighttime and daytime pedestrian accidents. Pedestrian deaths have numbered about 8,000 annually and pedestrian injuries almost 150,000 annually. NHTSA's countermeasure focus has been on planning, design, construction and use of pedestrian facilities such as sidewalks, pathways, bridges and underpasses. Selected countermeasures include education, safety messages, model regulation, traffic engineering, and enforcement. Also included are programs for the elderly and handicapped, parents and pre-school children, and improved visibility.

17. Key Words	18. Distribution Statement
Pedestrian, pedestrian safety, pedestrian facilities	Distribution available to U.S. public through the National Technical Information Service, Springfield, VA 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	24	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

EFFECTIVENESS PAPER: PEDESTRIAN SAFETY

I. Scope of Problem

According to the data in the National Highway Traffic Safety Administration's (NHTSA) Fatal Accident Reporting System (FARS), pedestrian fatalities constitute 16 percent of total highway-related fatalities. Excluding motor-vehicle occupants, pedestrians comprise the single largest category of fatalities on the nation's streets and highways. A review of national statistics indicates that 85 percent of all pedestrian accidents and 60 percent of all pedestrian deaths occur on urban streets. The FARS file indicates that in some

2, 2a/. One study 9a/ indicates that the left turn vehicle/pedestrian accident is a major problem on one-way street networks (2:1 relationship of left turn vs right turn in pedestrian accident frequency).

Pedestrian deaths have numbered about 8,000 annually for the last several years (FARS data). Additionally, almost 150,000 pedestrian injuries occur each year according to the National Accident Sampling System (NASS).

Motorists and pedestrians co-exist and interact successfully most of the time. However, when this co-existence breaks down, the result is an accident. In seeking a systematic and effective approach to pedestrian safety, NHTSA began by ascertaining that accidents resulted from an identifiable change in successful patterns of behavior. A pedestrian and a moving vehicle are put on a "collision course" by decisions made earlier. As they approach the potential collision, there is a sequence of factors that determines the outcome. This is the pedestrian/motor-vehicle safety sequence:

1. Search: both driver and pedestrian scan their environment for potential hazards.

2. Detection: each perceives the other.

3. Evaluation: each recognizes the threat of a collision and the need for action to avoid it.

4. Decision: each determines what action to take in order to avoid a collision.

5. Action: successful performance of the appropriate action by either pedestrian or driver, or both.

6. Vehicle Reponse: a factor for the driver is the response of his vehicle to the action taken.

A failure at any step in the Safety Sequence will make an accident much more likely because the pedestrian or driver will not perform each of the succeeding steps. Preoccupied or intoxicated, he will not search adequately. Failing in that function, he will not take further steps in the sequence--detection, evaluation, decision, and action. Practically speaking, it takes a failure on the part of both the driver and the pedestrian for an accident to occur since an "error" (failure) by only one party can usually be compensated for by the other party. For example, the pedestrian enters the roadway without searching but the oncoming car does not strike him because the driver was

Applying the Safety Sequence [illegible] accidents yielded a new view of why accidents were happening. Such an approach was taken in a 1969 NHTSA research project which examined several thousand urban pedestrian accidents in 13 U.S. cities. 2/ It was found that these accidents could be grouped together into "accident types" on the basis of the errors made and consideration of environmental factors, e.g., parked cars, location, etc.

Analysis of the accident types indicated that seven major accident types account for 57 percent of the urban pedestrian accident total. They are: dart out accidents in which the pedestrian appears suddenly, usually from between parked cars (33 percent); intersection dash accidents where a person runs across the intersection, is seen too late by the driver, and is struck (8 percent); vehicle turn/merge where the pedestrian is usually unseen by the driver who is concentrating on turning into, or merging with, traffic (6 percent); multiple threat in which a vehicle stops for a crossing pedestrian and, in so doing, blocks him from view from a second car approaching the same direction (3 percent); bus-stop related where a pedestrian crosses in front of the stopped bus, is screened by the bus from the view of oncoming vehicle drivers, and is struck stepping out (3 percent); ice-cream vendor related where a pedestrian, usually a young child, is struck by a passing car while going to or from a vending vehicle (2 percent); and backing-up, where a pedestrian is struck by a backing vehicle (2 percent). Nearly all of these types are found in the suburban and rural areas also. In addition, some unique accident types in the suburban and rural areas include: "to and from a mailbox"; "school bus related"; "walking along the roadway;" and "freeway pedestrian accidents."

EFFECTIVENESS PAPER: PEDESTRIAN SAFETY

I. Scope of Problem

According to the data in the National Highway Traffic Safety Administration's (NHTSA) Fatal Accident Reporting System (FARS), pedestrian fatalities constitute 16 percent of total highway-related fatalities. Excluding motor-vehicle occupants, pedestrians comprise the single largest category of fatalities on the nation's streets and highways. A review of national statistics indicates that 85 percent of all pedestrian accidents and 60 percent of all pedestrian deaths occur on urban streets. The FARS file indicates that in some

2, 2a/ One study 9a/ indicates that the left turn vehicle/pedestrian accident is a major problem on one-way street networks (2:1 relationship of left turn vs right turn in pedestrian accident frequency).

Pedestrian deaths have numbered about 8,000 annually for the last several years (FARS data). Additionally, almost 150,000 pedestrian injuries occur each year according to the National Accident Sampling System (NASS).

Motorists and pedestrians co-exist and interact successfully most of the time. However, when this co-existence breaks down, the result is an accident. In seeking a systematic and effective approach to pedestrian safety, NHTSA began by ascertaining that accidents resulted from an identifiable change in successful patterns of behavior. A pedestrian and a moving vehicle are put on a "collision course" by decisions made earlier. As they approach the potential collision, there is a sequence of factors that determines the outcome. This is the pedestrian/motor-vehicle safety sequence:

1. Search: both driver and pedestrian scan their environment for potential hazards.

2. Detection: each perceives the other.

3. Evaluation: each recognizes the threat of a collision and the need for action to avoid it.

4. Decision: each determines what action to take in order to avoid a collision.

5. Action: successful performance of the appropriate action by either pedestrian or driver, or both.

6. Vehicle Reponse: a factor for the driver is the response of his vehicle to the action taken.

A failure at any step in the Safety Sequence will make an accident much more likely because the pedestrian or driver will not perform each of the succeeding steps. Preoccupied or intoxicated, he will not search adequately. Failing in that function, he will not take further steps in the sequence--detection, evaluation, decision, and action. Practically speaking, it takes a failure on the part of both the driver and the pedestrian for an accident to occur since an "error" (failure) by only one party can usually be compensated for by the other party. For example, the pedestrian enters the roadway without searching but the oncoming car does not strike him because the driver was

Applying the Safety Sequence [redacted] accidents yielded a new view of why accidents were happening. Such an approach was taken in a 1969 NHTSA research project which examined several thousand urban pedestrian accidents in 13 U.S. cities. 2/ It was found that these accidents could be grouped together into "accident types" on the basis of the errors made and consideration of environmental factors, e.g., parked cars, location, etc.

Analysis of the accident types indicated that seven major accident types account for 57 percent of the urban pedestrian accident total. They are: dart out accidents in which the pedestrian appears suddenly, usually from between parked cars (33 percent); intersection dash accidents where a person runs across the intersection, is seen too late by the driver, and is struck (8 percent); vehicle turn/merge where the pedestrian is usually unseen by the driver who is concentrating on turning into, or merging with, traffic (6 percent); multiple threat in which a vehicle stops for a crossing pedestrian and, in so doing, blocks him from view from a second car approaching the same direction (3 percent); bus-stop related where a pedestrian crosses in front of the stopped bus, is screened by the bus from the view of oncoming vehicle drivers, and is struck stepping out (3 percent); ice-cream vendor related where a pedestrian, usually a young child, is struck by a passing car while going to or from a vending vehicle (2 percent); and backing-up, where a pedestrian is struck by a backing vehicle (2 percent). Nearly all of these types are found in the suburban and rural areas also. In addition, some unique accident types in the suburban and rural areas include: "to and from a mailbox"; "school bus related"; "walking along the roadway;" and "freeway pedestrian accidents."

Both FHWA and NHTSA share concern for these accident types and are focusing on countermeasures to effect accident reductions.

On February 7, 1975, the "Pedestrian and Bicycle Safety Study" was submitted to Congress as required by Section 214 of the Highway Safety Act of 1973, Public Law 93-87. 3/

Pedestrian findings of the study were the following:

- o Insufficient attention in the past has been paid to this group considering the magnitude of the pedestrian safety problem relative to other program areas.
- o Funding limitations at the local level are usually the greatest hindrance to providing an adequate safety program.
- o The lack of formal policies and procedures concerning pedestrian violations of the law results in little or no enforcement.
- o There is a scarcity of data* on the types of pedestrian accidents, the effects of enforcement on accident rates, and the involvement of alcohol in pedestrian collisions. This makes problem definition, program planning, and countermeasure development very difficult.
- o Traffic safety education is directed toward children rather than toward all pedestrian age groups.

In summarizing the scope of the problem, it should be noted that past State and local activities in the pedestrian area have been scattered and diverse from an operational point of view. Until recently, most pedestrian activities were limited to school safety programs for children, and occasional enforcement efforts related to hitchhiking, jaywalking, or similar offenses. Some of the programs have not been adequately evaluated to determine their effectiveness in reducing accidents. Some organizations have been very active in promoting pedestrian safety through the development of safety curricula, films, safety messages, and accident inventories. The research in support of these programs has generally focused on demographic factors, overrepresentation of age/sex groups, and high-accident locations. FHWA and NHTSA are actively pursuing countermeasures to effect accident reductions for the major pedestrian motor-vehicle accident types.

* Significant advances have been made since this 1975 finding. 1/, 2/, 11/, 17/

II. Program Description

Pedestrian safety is a joint responsibility of NHTSA and the Federal Highway Administration (FHWA). NHTSA's focus is on the identification of pedestrian accident problems, and the development of cost-effective countermeasures and procedures for applying them at the State and local levels. These solutions aim at changing the unsafe behaviors of both drivers and pedestrians. FHWA's focus is on researching, planning, designing, constructing, and operating pedestrian facilities to increase safety. Examples are: sidewalks, pathways, intersections, bridges, overpasses, and underpasses.

The results of a 1971 study, 2/ where NHTSA first investigated the causes of urban pedestrian accidents, led to the initiation of a coordinated program of research aimed at producing countermeasures for specifically identified pedestrian safety problems.

NHTSA's current approach is to view the pedestrian problem in terms of accident-types originally identified through research. The accident-types are recurring accident situations for which the important behavioral errors of the driver and the pedestrian are known along with predisposing environmental factors (e.g., parked cars). These types (situations) are, in essence, classical traps in the real world to which pedestrians and drivers fall prey daily.

NHTSA's focus has initially been on urban pedestrian accidents since 85 percent of all pedestrian accidents and 60 percent of all pedestrian deaths occur on urban streets. Applying the Safety Sequence to accident reports from urban, suburban, and rural areas across the country and conducting interviews with drivers, pedestrians, and witnesses, showed that the majority fitted into 31 specific accident types. 2, 2a/ These 31 accident types provide a relatively complete description of the critical human errors in the accident situation.

The use of accident types provides a very powerful tool. Since each accident type is a specific problem, often involving a particular segment of the population, equally specific countermeasures can be developed.

The countermeasures operate by:

- Reducing or eliminating the predisposing factors; for example, removing the parked cars which screen pedestrians as they enter a street.
- Reducing or eliminating failures in the Safety Sequence. An example of this would be teaching the proper manner in which pedestrians should search for oncoming vehicles.

The testing and evaluating of countermeasures is carried out with the objective of providing fully developed, tested, feasible, and cost-effective countermeasures to localities along with techniques and procedures for applying them.

FHWA's focus for pedestrian safety is on the highway surroundings and the highway itself through the application of traffic engineering practices (planning, design, construction and operation of highway systems); and, providing safe sidewalks, pathways, intersections, bridges, overpasses, and underpasses for pedestrians. Current program emphasis is on the use of available Federal assistance for pedestrian facilities and encouraging those (such as curb ramps) which provide for easy mobility by, and safety of, elderly and handicapped pedestrians. Federal-aid highway construction funds may be used for the construction of pedestrian facilities. These may be incidental, or minor, features of construction projects when the facilities are built concurrently with improvements for vehicular traffic or may be built independently of other construction projects.

Areas of emphasis of FHWA include pedestrian considerations in highway planning, design, construction, and maintenance; using pedestrian data to develop programs; and eliminating laws or directives which may limit providing pedestrian improvements. Emphasis is also placed on providing safe accommodations (e.g., protected walkways and marked detour routes) for pedestrians in construction and maintenance zones.

FHWA's research effort focuses on developing more effective criteria and guidelines for the safe and efficient facilities for pedestrians in the highway environment. Safety improvements in areas of varying levels of pedestrian activity under new or reconstruction projects are addressed. In addition, attention is being directed to non-motor vehicle accidents as well as those involving motor vehicles. In order to increase pedestrian safety through engineering improvements, research focuses on conducting field evaluations of engineering modifications. This involves identifying operational and safety problems, developing and evaluating potential design solutions including cost effectiveness, and developing guidelines for FHWA, State, and local officials.

Occasionally, issues arise which call for reexamination of a situation or condition because of case law, Congressional inquiry or action, or changing conditions in the country. A long standing rule of the road, "Right-Turn on Red" (RTOR), has been subjected to recent inquiries as to its impact on traffic safety--particularly with respect to pedestrian and bicyclist accident involvement with motor vehicles. As practiced in the U.S. today, unless prohibited by a sign, RTOR allows motorists to turn right on a red signal after stopping and yielding the right of way. NHTSA proposed RTOR on a national basis as part of its 1972 proposed rulemaking related to revision of the Highway Safety Program Standards. 32/ Although the NHTSA proposed rulemaking did not come into being, subsequent activity in the mid and late '70's focused increased attention on the effect of RTOR on traffic accidents--particularly pedestrian and bicyclist involvements.

By 1976, some 43 States had adopted RTOR--commonly referred to as the "western rule" since its 1947 inception in California. 33/

In a 1976 FHWA report, it is stated that "The results of the accident analysis support the claim that accidents resulting from the RTOR feature are insignificant compared to all signalized intersection accidents. 34/ NHTSA sponsored

a three year study of bicycle/motor vehicle accidents--one of which was "Motorist Turn-Merge" (MTM) involving a RTOR. The motorist failed to observe the bicyclist before entering the intersection, and 85 percent of the MTM accidents involved a bicyclist who was riding facing traffic, i.e., the wrong way. 35/

According to a press release from Virginia, "Extensive studies conducted in Virginia, before the passage of the new law (RTOR), indicated no difference in either the frequency or severity of accidents where right turns on red are permitted. In fact, there was a slight decrease in accident potential at the intersections permitting RTOR." 36/

For a 1978-79 study related to RTOR, the American Association of State Highway and Transportation Officials (AASHTO) distributed questionnaires to each of the 50 States and many of the larger cities. After excluding responses which considered only "before" or only "after" RTOR laws/ordinances data, 14 agencies' average data were computed. Among the findings listed in the study report were the following: fatal, injury, and total accidents decreased; right and left turn accidents increased while rear-end accidents decreased; and, pedestrian accidents remained unchanged. 37/

During 1980, as a result of their RTOR study, the Insurance Institute for Highway Safety (IIHS) reported larger than average increases were found for crashes in urban areas and for crashes involving a single vehicle and a pedestrian--especially in urban areas. 38/ However, after a review of the IIHS study methodology and supporting data, FHWA Administrator Barnhart advised IIHS that FHWA "..cannot substantiate the principal conclusions of your report." 39/

NHTSA sponsored research during 1979-81 to focus on the specific impact of RTOR on pedestrian and bicyclist/motor vehicle accidents. In a draft final report resulting from the two year study, the researchers state that the RTOR pedestrian and bicyclist accident problem is significant and warrants further study and/or the development of approporiate countermeasures. This study should be considered as only one of the inputs needed to conduct a total assessment of the societal effects of RTOR. 40/

III. Effectiveness of Programs, Projects, and Countermeasures

Over the past years, NHTSA, FHWA, and some States and communities have conducted research to develop and test countermeasures for various pedestrian problems. Typically, tests are made first to determine if safety knowledge can be increased and unsafe behavior decreased as a result of countermeasure application. The ultimate test is whether the specific types of accidents are reduced. Effectiveness results for selected Federal, State, and local countermeasures are shown in Figure 1.

The following section presents brief summaries of countermeasures which effectively changed behavior or knowledge, or reduced accidents. Some projects were more comprehensive in that several countermeasures were used on a community-wide basis.

FIGURE 1

Accident Type	Effectiveness (Positive Changes)		
	Knowledge	Unsafe Behavior	Accident Reduction
DART-OUT Countermeasures:			
o K-3 Safe Street Crossing-Training 4/	+	+	20%
o Child Ped-Safety Messages 6/	+	+	20%
VEHICLE-TURN MERGE Countermeasures:			
o One-Way Streets 8/ 9/	N/A	N/A	29-62% (5 sites)
o Adult Safety Messages 21/	+	+	10% for Spanish Language Version

Accident Type	Effectiveness (Positive Changes)		
	Knowledge	Unsafe Behavior	Accident Reduction
MULTIPLE THREAT Countermeasures:			
o Adult Safety Messages 21/	+	+	Not effective (minimal exposure)
COMMERCIAL BUS STOP Countermeasures:			
o Model Ordinance 7/	NA	+	Up to 65%
ICE CREAM TRUCK VENDOR Countermeasures:			
o Model Ordinance 5/	+	+	77%
INTERSECTION DASH, MID-BLOCK CROSSING, SCHOOL BUS RELATED Countermeasures:			
o Ped-Safe (K-12 training rural) 20/	+ (High School)	+ (Elementary School)	Not yet tested

FIGURE 1 (Continued)

Accident Type	Effectiveness (Positive Changes)		
	Knowledge	Unsafe Behavior	Accident Reduction
WALKING IN ROADWAY			
Countermeasure:			
o Enforcement of Walking While Intoxicated 14/	NA	NA	14%
INTERSECTION			
Countermeasures:			
o Fixed Illumination	NA	+ 22/	69% Night 23% Day 23/
MULTIPLE TYPES OF ACCIDENTS			
Countermeasures:			
o Proper street crossing training (outdoor practice stressed) 10/	NA	NA	Estimated Savings of 19 Accidents for Four Cities
o Comprehensive; Traffic Eng'g K-3 Educ, Enf, PI&E and Ped Violator's School 11/	NA	NA	17%
o K-Elem, Traffic Safety Education 13/	NA	NA	4-year accident reduction from 27-6-5-1 accident(s per year.
o K-9 Child Pedestrian Education Pilot Project 18/	+	NA	NA
o Elementary School Children--Pedestrian Safety 19/	NA	NA	8-year fatality rate for 5-9 year olds reduced by 50%

N/A means NOT APPLICABLE and/or NOT AVAILABLE.

Safe Street-Crossing Training Program

The dart-out type pedestrian accident is the major child pedestrian accident. It involves a child entering the street midblock, sometimes from between parked cars (which screen him from the driver's view), not searching for oncoming cars, and being struck. This accident accounts for 33 percent of all pedestrian accidents; three-quarters of them occurring to children.

NHTSA undertook the development and test of a training program 4/ designed to improve children's crossing behaviors and to safeguard them against the dart-out accident. Based upon previous research which examined hundreds of dart-out accidents across the country, the critical errors of the children which led to the accident were already known. Behavioral sequences (e.g., stop at the curb, look left-right-left for oncoming cars, etc.) were developed which would protect the child from dart-out accidents.

The behaviors were incorporated into a training program. Also contained in the program were exercises (games) which recreated the play situations linked to the accidents, e.g., being chased into the street, entering the street to get a ball, etc. The safe behaviors became a required part of these activities.

When field tested in a major school system in Ohio, the training program proved effective. It showed a substantial reduction in dart-out child pedestrian accidents (43 percent) even when compared to a decrease (23 percent) in a set of comparison cities, i.e., a residual decrease of 20 percent.

A variation of this training has been implemented within the Denver, Colorado, school system with a subsequent reduction in dart-out accidents. (See page 11, 11/)

Child Pedestrian Safety Messages

NHTSA has developed a set of child pedestrian safety messages designed to protect children against the dart-out type accident. The messages contain behavioral advice developed as a result of analyzing hundreds of dart-out accidents. That is, NHTSA research showed the critical errors being made by the child in these accident situations, and the films were designed specifically to correct them.

A feasibility test of the new advice indicated that it was possible to change children's behavior in street crossing situations. This encouraged taking the next step: making the films professionally and field testing them for their ability to reduce accidents. A key character in these films is "Willy Whistle," an animated policeman's whistle, who explains to the young children how to cross safely.

The films were tested over a three year period in Los Angeles, California, Milwaukee, Wisconsin, and Columbus, Ohio. 6/ A 20 percent decrease in dart-out accidents among youngsters was the final result across the cities. Knowledge, behavior, and safety were all affected positively.

The materials include a 6½ minute film (for showing in school) and six TV spots which were extracted from the 6½ minute film. The TV spots show the various "components" of the safe crossing behavior, e.g., how to search for oncoming cars, where to stand while doing so, and always stopping before entering the roadway. A Willy Whistle poster emphasizing the crossing advice is also available.

Model Ice Cream Truck Ordinance (MICTO)

This countermeasure prevents young children from being hit while going to or from ice cream trucks. It does so by requiring passing drivers to stop when encountering a vending vehicle--actively selling--and then proceed slowly past the truck. In essence, the vending vehicle has the status of a stop sign under a limited set of conditions.

The approach adopted for the model regulation is based on the successful experience of Indianapolis, Indiana. In 1971 Indianapolis enacted City-County General Ordinance Number 108 governing the operation and equipment of ice cream trucks. Before enactment of this law, there were about 15 vendor accidents per year in Indianapolis. During the four months immediately before passage of the ordinance, there were already more than 15 such accidents. In the five year period immediately following passage of the ordinance, however, there were only five vendor pedestrian accidents total. 5/

The City of Detroit, Michigan, passed a version of the Model Ice Cream Truck Ordinance (MICTO) May 12, 1976, as part of a field test sponsored by NHTSA. 5/ The provisions of the MICTO went into effect June 10, 1976. In the first partial vending season, accidents were reduced 54 percent. When MICTO had its first full vending season, accidents among the children dropped 77 percent (from a three-year average of 48.7 accidents down to 11 in 1977).

The New Jersey Legislature enacted MICTO as a statewide law, effective in early 1981.

Model Bus Stop Ordinance

Bus stops present a hazard to pedestrians who cross in front of a stopped bus. The bus "screens" the pedestrian and overtaking drivers from seeing each other in time to avoid an accident. About 9,000 such accidents occur yearly with about 340 deaths resulting. The ordinance requires, where possible, that bus stops be routinely located on the far-side of the intersection, thus removing the screening effect. Accident experience with far-side locations in cities in Arizona, Colorado, and Connecticut indicate that bus stop related pedestrian accidents can be reduced by as much as two-thirds. 7/

One-Way Streets

Safety benefits are realized on one-way streets in reduced accident frequency and accident severity. In many cases pedestrian accidents are reduced with conversion to one-way streets. Traffic safety is generally increased by one-way streets because they provide a divided highway effect. Vehicles travel as groups with this configuration and such grouping provides gaps in traffic for the safer movement of pedestrians. 8/

One-way streets greatly reduce vehicle-pedestrian conflicts and have the added advantages of increasing the number of vehicles and reducing their delay. The following reductions in pedestrian accidents occurred as a result of conversions to one-way street systems: Sacramento, California, 62 percent; Hollywood, Florida, 51 percent; Raleigh, North Carolina, and Portland, Oregon, 50 percent. One-way systems eliminate many of the turning vehicle/pedestrian encounters. Generally, shorter light control cycles experienced on one-way streets are more in keeping with pedestrian tolerance and thus help to avoid crossing violations. 9/

In a study in Manhattan, New York, following the establishment of a pair of one-way streets, there was a reduction in pedestrian accidents from 117 to 77. There was a 29 percent decrease on one street and 41 percent on the other. 9/ However, a 1978 study indicated that the left-turn vehicle/pedestrian accident is a major problem on one-way street networks and should be fully addressed. 9a/

Education Program--1st and 2nd Grades

Alabama's four largest cities conducted programs related to proper street crossing procedures as well as other street-related activities such as bicycle riding and game playing. Outdoor practical experience was also stressed.

Results showed that a statistically sound reduction had occurred in the relevant accident data set and that it was reasonable to assume that the reduction was due to program effectiveness. The benefits estimated by computing the "before" period ratio and applying to the "after" period showed an estimated saving of 19 accidents for the four cities. 10/

Comprehensive Pedestrian Safety Project

Countermeasures were implemented in traffic engineering, education, enforcement, and public information during a three-year Denver, Colorado, project. The final report of the project was sent as a response to Docket 81-12. Excerpts from the final report 11/ are presented here.

Target groups such as K-3 and the elderly were addressed; "high risk" locations received engineering treatment; a pedestrian violator's school was initiated; a special pedestrian enforcement team was activated--along with a new policy related to issuance of citations for risk-taking behavior; and in-school and community-wide education was accomplished as part of a systematic public information program.

In terms of accident reduction, the K-3 program was the most successful component of the project. From 1978 to 1980, accidents involving 5-9 year olds decreased 40 percent from the average rate during 1972 through 1977.

In 1979, the actual accident frequency for the city was 6 percent lower than projected; and in 1980 there were 17 percent fewer accidents than projected by the regression analysis.

During the project period, Denver experienced a reduction in the accident rate which was statistically significant at the .05 level. During the same period, the accident rates increased for each of three comparison cities. The evaluators concluded that there is strong evidence that the project produced the observed accident reductions.

Comprehensive K-Elementary Traffic Safety Education Program

In Middletown, Ohio, a full curriculum of kindergarten through grade school level education was conducted (1977-81) with initial start-up and instructor time covered with Federal funds. Once begun, the local agency expanded the operation significantly, including the establishment of a community safety office within the Police Department. 13/

An excerpt from Ohio's response to Docket 81-12 indicates that: "As a result of the proper education and motivation of children, home-to-school pedestrian accidents dropped from 27 the year before the project was implemented, to an average of four during each of the three following years." (1977-78 at 27; 1978-79 at 6; 1979-80 at 5; 1980-81 at 1)

Enforcement of Walking While Intoxicated (WWI)

Responding to Docket 81-12, Puerto Rico noted that: "The Pedestrian Safety Project saved 11 WWI lives when comparing the dead pedestrians positive for alcohol for Fiscal Years 1979 and 1980." 14/

Officers, in special vans, patrolled selected sections of highways where high incidences of WWI pedestrians were being experienced. The WWI pedestrians were removed from the highway to prevent accidents and injuries.

Puerto Rico stated that the 14 percent pedestrian fatality reduction was converted to a lives-saved dollar value of $1.65 million compared to a $204,000 project cost (8 patrol vehicles and 18 officers) for benefit/cost ratio of 8:1.

Pre-School and In-School Education Program

From April 1, 1971, until March 31, 1974, the School Safety Section of the Milwaukee, Wisconsin, Safety Commission, participated in a grant authorizing an additional "School Safety Specialist." According to information in Docket 81-12, the following project results were achieved: closer supervision and recruitment of school crossing guards; increase in the number of children reached with program; new safety materials prepared; "safe route to school" implemented in all public elementary schools; purchase of 24 new safety films; and equipped 110 crossing guards with flashlights and traffic wands for use during daylight savings time.

Effectivness results were: During the first year (1979) of the grant, there was an 11 percent reduction in accidents involving children age 0-14. In the first eight months of 1980, there was a 12 percent reduction in accidents in the 0-14 age group compared to the first eight months of 1979. 15/

In-School Safety Project

At the Harrisburg, Pennsylvania, Public Hearing on Effective Highway Safety Programs, Pennsylvania's spokesman 16/ provided the following information: In 1972, Philadelphia began a Section 402 highway safety project targeted at grade-school children. Special materials for inner-city school children were developed. The fatality rate for children in this age group dropped from 10 per 100,000 in 1972 to 2.4 per 100,000 in 1976. In 1972 the City contributed 23.8 percent (127) of Pennsylvania's pedestrian fatalities; in 1976, 17.8 percent (65); and in 1980, 14.1 percent (50).

Comprehensive Demonstration Project

The five year (1977-82) Miami-Dade County, Florida, Pedestrian Safety Demonstration Project has been implementing several countermeasures in an effort to reduce specific pedestrian accident types. These countermeasures include: a K-3 safe street crossing program; public information and education program; and model ordinances related to commercial bus stop locations and intersection parking set-back.

In a response 17/ to Rulemaking Docket 81-12, we find the following Miami-Dade Project information related to costs and benefits:

- o The K-3 safe street crossing training countermeasures served 43,000 children. The cost of $102,400 amounts to $2.38 per student.
  - -- The results indicated a reduction of 11 percent in the number of mid-block dart-out/dash accidents when compared to the previous five years. With respect to children aged 14 or younger, there was a 14 percent reduction in mid-block dart-out/dash accidents during the project period. In addition, there was an overall reduction of 19 percent in all types of accidents to children aged 14 or under while the project was in effect.
  - -- Overall, there were 30 percent fewer accidents than expected among students receiving training.

Pedestrian Safety Education-Elementary School

Excerpts from New Jersey's response 19/ to Docket 81-12 indicate the following:

The New Jersey Office of Highway Safety has conducted pedestrian safety education aimed at elementary school children for a number of years. As a result of these programs, crash statistics reflect reductions in fatalities. Over the past 8 years, the fatality rate for 5-9 year old pedestrians has been cut by approximately 50 percent. The overall pedestrian fatality rate has been reduced by 25 percent.

Had the fatalities in the 5-9 groups continued at the rate of the early '70's, an additional 19 fatalities could be expected each year.

In summarizing the foregoing listing of programs, projects and countermeasures, it should be noted that a variety of solutions exist for a series of accident types and results can be achieved in accident reduction.

IV. Programs Which Promise Effectiveness in Accident Reduction

In the research cycle of development and testing of countermeasures, some countermeasures have not yet reached the field test phase. Other countermeasures take a longer time to accumulate accident reduction results, i.e., suburban and rural areas. Other countermeasures require additional specific tests or updating of results applicable to particular accident types. The following are examples of programs which promise effectiveness in accident reduction.

Evaluation of K-9 Grade Child Pedestrian Education Pilot Project

The following example was part of a larger report 18/ submitted to Docket 81-12: A new curriculum was developed for use in the North Carolina pulic schools on pedestrian education with modules for the kindergarten through the 9th grade. This curriculum was taught in a number of schools on a pilot basis, and an evaluation was carried out. The results of the evaluation showed improvements in knowledge on the part of the children. Attempts to discern changes in street crossing behavior or reductions in accidents were not as successful.

Evaluation of a subsequent expansion of the program confirmed the significant increases in knowledge. In addition, evaluation of the ease of using and administering the program showed high acceptance on the part of teachers and principals. On the basis of the partial positive results, a full scale implementation period followed, and the program is available now statewide.

PEDSAFE--Rural Pedestrian Safety Curriculum

PEDSAFE is a K-12 pedestrian safety training curriculum designed by NHTSA to combat pedestrian accidents which victimize suburban/rural children. 20/ Research conducted jointly by NHTSA and FHWA had previously identified the kinds of pedestrian accidents occurring to suburban and rural pedestrians.

The PEDSAFE project determined which of the accident types could best be countered by training administered through the school system. A K-12 curriculum aimed at protecting the children against ten kinds of accidents was developed. PEDSAFE is composed of three programs:

1. An elementary program consisting of separate units for grades K-6 with films, slide/tape programs, and parent participation materials. 20a/

2. An on-bus program conducted by the school bus driver with teacher support for grades K-6. 20a/

3. A Junior/Senior High School program which is a series of five projects designed for use in English, mathematics, science, health, and driver education classes. 20b/

The types of pedestrian accidents addressed by PEDSAFE include:

1. Mid-block Dash
2. Intersection Dash
3. Dart-out First Half
4. Dart-out Second Half
5. Walking Along Roadway
6. School Bus Related
7. Vendor--Ice Cream Truck
8. Multiple Threat
9. Mailbox Related
10. Hitchhiking

A field test of the K-12 curriculum in three Pennsylvania rural school systems was conducted with behavior and knowledge-change measures being the primary indices. Significant reductions were observed in various unsafe pedestrian behaviors, e.g., in mid-block and intersection crossings and in walking along the roadways. Significant gains in safety knowledge were made at the high school level. Thus, PEDSAFE has demonstrated that it can modify children's unsafe pedestrian behaviors which are known to lead to common types of suburban/rural pedestrian accidents, and it can improve their pedestrian safety knowledge.

Adult Safety Messages

Television Public Service Announcements (PSA), presenting behavioral advice to both pedestrians and drivers, were developed to reduce two types of pedestrian accidents: Vehicle turn/merge accidents involving turning vehicles at intersections, and multiple threat accidents where one vehicle stops to let a pedestrian cross and, in so doing, screens him from the view of an overtaking vehicle which strikes the pedestrian.

A field test 21/ of these safety messages produced positive behavioral results, but no reductions in accidents, an outcome possibly due to the limited TV exposure given to the PSAs. New material (non-TV), i.e., posters, pamphlets, prints ads, brochures) has been developed to increase the message's exposure.

Fixed Illumination (Lighting)

Safer pedestrian behavior patterns have been observed during studies to determine if fixed source illumination could be used to increase the safety of pedestrians when crossing the street. More pedestrians appear to pay attention to the aspects of the crossing environment which are most important to a safe crossing. They use a larger portion of the time of their crossing by watching the vehicular traffic, traffic signals, and the roadway ahead. Prior to the implementation of the crosswalk illumination, fewer pedestrians were this attentive in crossing.

A smaller proportion of the pedestrians are adversely influenced by distractions in the crossing environment. Also, proportionately fewer show a hazardous motivation or inadvertent disregard of what could be important environmental information while crossing. Common motivation, such as running to catch a bus, may be somewhat relieved because the pedestrian feels more prominently seen in the crossing area by the driver of the bus.

Abnormal behavior, such as horseplay or walking in the traffic stream, has become less frequent, perhaps because of a feeling of increased visibility (or being "spotlighted") to both motorists and other pedestrians. Perhaps a feeling of the special hazard at the crossing area may cause the offender to shy away from such activities. The greater frequency of pedestrians who appear to be brighter (more easily seen) is probably the key element of these behavioral improvements.

Drivers are apparently made more aware that a hazardous crossing area is in their path. Their actions at high accident sites which have been provided with special illumination show a significant improvement, which probably has a basis in the distinctive color of illumination, and the increased level of illumination and increased pavement brightness of the crossing area. 22/

Hartford, Connecticut, carried out an extensive street lighting modernization program in 1953. 23/ A study of accidents one year before and one year after showed nighttime accidents decreased 69.2 percent. During the same period, daytime accidents decreased 23.9 percent. Traffic volume increased 11 percent in the year after period as compared to the year before.

In early 1973, the continuous lighting on the main lanes of I-35 through Austin, Texas, was reduced by approximately 50 percent as a power saving measure in response to a critical energy shortage. Analyses of accident data 24/ revealed that reduction in roadway lighting significantly increased the frequency, rate, and severity of nighttime accidents in the affected freeway section. The most notable increases were associated with a sharp rise in nighttime rear-end and pedestrian related accidents.

Urban Intersection Improvement for Pedestrian Safety

Approximately one quarter of all pedestrian accidents occur at urban intersections. These accidents might be reduced by the use of improved pedestrian signals. Symbolic alternatives to the traditional WALK and DON'T WALK signal messages have been field tested and shown to offer significant improvements over the traditional messages. 25/ A walking man and upheld hand were shown to enhance pedestrian behavior, compliance, and understanding. Alternative timing schemes for combined pedestrian vehicle intervals were also studied.

Diagonal Parking

On one-way streets, diagonal parking tends to angle pedestrians crossing between intersections so they face traffic, thus better directing the attention of both the pedestrian and motorist to each other. This countermeasure is particularly applicable to local low speed one-way streets. Scanning of traffic by pedestrians is significantly increased after implementation of diagonal parking. Angle parking results in improving the fields of view of pedestrians and motorists, pedestrians acting more cautiously, and vehicle speeds tending to decrease. 26/

Elderly/Handicapped Pedestrians

Engineering solutions to the safety and operational problems for elderly and handicapped pedestrians involved in crossing streets were field tested to determine their effects on vehicular and pedestrian traffic. 27/

Widening the sidewalk at intersections resulted in significant reduction in pedestrian crossing time and improved the view of both drivers and pedestrians. Providing a pedestrian refuge island (waiting area)on wider streets resulted in about 18 percent of all pedestrians using the island to avoid conflicts. In about one-half of all crossings, people in wheelchairs paused or stopped on the island to use it as a refuge.

Selective prohibitions of right-turn-on-red can be effective in significantly reducing vehicular obstruction of the crosswalk in situations where the driver's view to the left is obscured. Another promising engineering solution is the installation of double conventional (recessed) curb ramps--those which lead directly to each crosswalk at an intersection. Each of these solutions enhanced the ability of elderly and handicapped pedestrians to cross roadways without significantly adversely affecting vehicular traffic operations.

Barriers

The installation of median barriers can significantly reduce mid-block crossings and running in the roadway. Median and meter-post barriers can also reduce the incidence of pedestrians darting out from behind parked cars. 26/

Barriers--such as chains, fences, hedges, or guard rails along the edge of the sidewalk or in the median--are installed at locations where a significant number of pedestrian accidents result from mid-block crossings. The majority of pedestrians crossing at mid-block do so out of convenience. While some people still cross at mid-block after the installation of barriers because "it is convenient," the percentage doing so is less.

Parental Reinforcement of Safe Play

The effects of a parent workshop and children's story books were evaluated on the rate of children's entries into the streets and parental reinforcement of safe play. The results 28/ indicate that the program reduced entries into the street and caused parents to reward and praise their children's safe play (an event that almost never occurred during baseline).

Combining measures of vehicular traffic and children's rate of entry into streets near their homes, the program reduced children's exposure from 16 occasions per 24 hours of outdoor play to one occasion per 24 hours of play.

Preschool Child Pedestrian Traffic Safety Club

NHTSA is developing a program in the form of a Children's Pedestrian Traffic Safety Club designed to prevent pedestrian accidents among preschool children. The concept follows directly from the European Clubs which have shown some success in changing both child and parental behavior in regard to dangerous traffic situations. Modifications as needed to fit the American traffic experience are being made and pilot tests of the program will be conducted.

Improving Pedestrian Conspicuity

Poor visibility, or lack of conspicuity, have been identified as contributing causal factors in a large number of nighttime and daytime pedestrian (and cyclist) accidents in NHTSA research. A study 29/ is now underway to determine the effectiveness of various conspicuity-enhancing strategies and devices for pedestrians (and cyclists).

V. Programs Which Increase Efficiency or Enhance Cost Reduction

To assist States and communities in the implementation of countermeasures, it is important to have guides, models, and procedures which aid in forming the basis for a systematic and comprehensive program. The following information and materials are intended to meet this need.

Pedestrian Accident Reduction (PAR) Guide

This guide provides a basis for the development of a pedestrian safety program at the State or local level. The guide contains information on the development of a central group concerned with reducing pedestrian accidents, methods for classifying accidents into NHTSA accident types, and descriptive information on countermeasures relevant to specific types of pedestrian accidents. (NHTSA/Traffic Safety Programs/NTS-14; scheduled for availability in 1982.)

Model Pedestrian Safety Program, User's Manual

This FHWA manual 30/ is directed at local officials responsible for establishing a pedestrian safety program. It offers guidance on the steps involved in setting up such a program and provides information to help select safety countermeasures. It also lists numerous possible solutions to safety problems. The advantages, disadvantages, target audiences, and implementation considerations for each of 25 solutions are presented. In brief, the six steps involved in setting up such a program are:

1. Determine the extent and nature of the pedestrian safety problems in the local jurisdiction
2. Identify alternative solutions to these problems
3. Select the best alternatives
4. Implement selected alternatives
5. Evaluate alternative's effectiveness
6. Maintain the safety program

Methodologies for systematically progressing through these six steps are presented in the manual.

Pedestrian Safety Program Information

A slide/cassette presentation entitled "Everyone Is A Pedestrian Sometime" is available for State and local use. It describes NHTSA's approach to the pedestrian accident problem and the countermeasures which are available. A booklet entitled "A New Look At Pedestrian Safety" is designed to inform people of the various accident types in the pedestrian area. These materials have been sent to States and many local communities and other organizations.

Engineering Safety Information

"Pedestrian Safety by Design" is a slide/tape presentation which is a nontechnical discussion of pedestrian traffic accidents and ways to reduce these accidents through physical improvements to the streets and highways. Emphasis is placed on pedestrian facilities, accommodations of the handicapped, and the responsibility of State and local governments to provide safe accommodations for pedestrians. Among the techniques discussed are sidewalks, signs and signals, lighting, bus stop locations, barriers, safety islands, grade separations, and curb ramps. (FHWA)

Assessing Programs for Safety Relevance

It's clearly very difficult to evaluate programs for accident reduction effects. NHTSA is currently developing a method by which existing pedestrian and cyclist safety programs (not developed by the Federal Government) can be assessed for their relevance to known accident problems. The purpose of the method is to provide guidance to State and local users of these programs in their selection decisions.

Development of Priority Accessible Networks: An Implementation Manual

This implementation manual 31/ outlines a sequence of decisionmaking steps for developing a systematic approach to the installation of countermeasures to assist elderly and handicapped pedestrians in having a safe, and barrier free, trip. It is based on the premise that the same planning principles of efficiency and effectiveness, which underlie other types of transportation planning, can be applied to the process of taking care of the needs of special populations.

By providing aids for the handicapped, these people can use pedestrian facilities in a safe manner. Without these considerations, these people might: be required to use the street rather than the sidewalk; stray from a safe path of travel without aids such as traffic signals (with bells, buzzers, clicks, or vibrations for walk/don't walk phases), curb ramps, and guidelines of thermo-plastic coated with sand or glass beads; or, not make the trip at all.

Pedestrian Considerations in Urban Areas: Training Course

The primary purpose of this pedestrian planning and design course has been to provide local, State, and Federal traffic engineers and transportation planners with the information, skills, and tools they need to plan and design

pedestrian facilities in their respective communities. The course outlines how local, State, and Federal agencies can plan, design, implement, and operate pedestrian facilities and programs. Through the course, the students have become more capable of:

1. Identifying the variety of needs of pedestrians;

2. Recognizing pedestrian problems within a given urban area;

3. Proposing applicable planning, design and/or program strategies to enhance walking as an alternative and complementary mode of travel in an urban area;

4. Conducting an evaluation of existing and proposed pedestrian facilities and programs; and,

5. Integrating pedestrian considerations into the total transportation planning, design, and implementation process.

Throughout the course, the safety needs and accident problems of pedestrians are presented so students realize the importance of safety considerations for pedestrians. (FHWA: National Highway Institute)

In summary, procedures do exist which assist in presenting countermeasures for State and local implementation. Some information and materials have already been made available and are in use in some States and local jurisdictions.

VI. Summary of Docket 81-12

Twenty-one of over 600 docket entries are related to pedestrian safety programs. Eight entries contained specific project and effectiveness information. Some five indicated promise of effectiveness based on limited data or project application. The remainder were generally supportive, or touched on a peripheral aspect, of the program. (See Figure 2).

Evidence of accident reduction was received from Denver, Colorado; Middletown, Ohio; Milwaukee, Wisconsin; Philadelphia, Pennsylvania; Miami-Dade County, Florida; the State of New Jersey, and the Commonwealth of Puerto Rico. Each one of these projects is described in a preceding section of this paper. Projects ranged from comprehensive community-wide to enforcement of walking while intoxicated to traffic engineering to elementary education only.

Programs which promise effectiveness exist in Ilinois; North Carolina; Ohio; Madison, Wisconsin; and Baltimore, Maryland.

Figure 2

Response to Docket 81-12

	Commentor: Officials State/Local		Other	Subject Addressed	V. Neg.	Comment: Neg.	Comment: Pos.	V. Pos.
				o Program Support				
	5	3	4	...General	--	--	6	6
	2	6	--	...Acc Reduction Info.	--	--	--	8
	1	--	--	o Program Relationships (Synergistic Effort)	--	--	1	
TOTALS:	8	9	4		--	--	7	14

VII. References

1/ NHTSA: A Comparison of Alcohol Involvement in Pedestrians and Pedestrian Casualties; HS-805-521; October 1979.

2/ NHTSA: The Identification of Precipitating Factors and Possible Countermeasures; HS-800-403; January, 1971.

2a/ NHTSA/FHWA: Causative Factors and Countermeasures for Rural and Suburban Pedestrian Accidents; Accident Data Collection and Analysis. DOT-HS-355-3-718, March 1977. (Publication No. DOT HS-802 266).

3/ NHTSA: Pedestrian and Bicycle Safety Study, Highway Safety Act of 1973 (Section 214); DOT-HS-801-383; March 1975.

4/ NHTSA: Experimental Field Test of Proposed Anti-Dart-out Training Programs: Volume I, Conduct and Results; Volume II, Implementation Guidelines and Program Materials; and Volume III, Program Staff Training Materials and Video Tape/Film; DOT-HS-4-00955; December, 1980.

5/ NHTSA: Experimental Field Test of the Model Ice Cream Truck Ordinance in Detroit; HS-803-410; April 1978.

6/ NHTSA: Experimental Field Test of Proposed Pedestrian Safety Messages; Volume I, Methods and Materials Development; Volume II, Child Messages; DOT-HS-4-00952.

7/ NHTSA: Development of Model Regulations for Pedestrian Safety; DOT-HS-801-287; November 1974.

8/ Transportation and Traffic Engineering Handbook; Prentice-Hall, Inc., Englewood Cliffs, NJ; 1976, (Institute of Transportation Engineers).

9/ Bruce, John A., One-Way Major Arterial Streets; Highway Research Board, Special Report 93; 1967.

9a/ U.S. Department of Transportation, Analysis of Pedestrian Crosswalk Safety on One-Way Street Networks; Research and Special Programs Administration, Office of University Research; DOT/RSPA/DPS/-50/78/28; 1978.

10/ Fortenberry, J.C. and Brown, D.B.; Problem Identification, Implementation, and Evaluation of a Pedestrian Safety Program; Auburn University for the Alabama Office of Highway and Traffic Safety; November 1980.

11/ Applied Science Associates, Inc. for the Colorado Division of Highway Safety; Denver Pedestrian Safety Project--Final Report; August 1981; Docket 81-12-N-01-008.

12/ NHTSA Regional Administrator memo to AA/TSP; Denver Pedestrian Safety Project; November 20, 1981.

13/ Ohio Department of Highway Safety; pg. 8 and Exhibit 4; Docket 81-12-N-01-095.

14/ Puerto Rico Traffic Safety Commission; pg. 1 and Attachment 3; Docket 81-12-N-01-220.

15/ Wisconsin Department of Transportation, Office for Highway Safety, Enclosure from City of Milwaukee; Docket 81-12-N-01-201.

16/ Mallory, B.; Effectiveness of Highway Safety Programs, Public Hearing Transcript, Pennsylvania Department of Transportation; Comments on Philadelphia, pg. 2; Docket 81-12-N-01-301.

17/ Miami-Dade County: Urban Pedestrian Safety Demonstration Project; Docket 81-12-N-01-437.

18/ Campbell, B.J.; Examples of Technical Activities in Support of State Highway Safety Programs; University of North Carolina-Highway Safety Research Center, August 1980; Docket 81-12-N-01-258-01

19/ Winston, C.A.; New Jersey Office of Highway Safety; October 30, 1981; Docket 81-12-N01-487.

20/ NHTSA: Identification and Feasibility Test of Specialized Rural Pedestrian Safety Training; Volume I, PEDSAFE Program Development Evaluation; NHTSA, DOT-HS-805-963.

20a/ NHTSA: Identification and Feasibility Test of Specialized Rural Pedestrian Safety Training; Volume II, PEDSAFE Elementary Materials; DOT-HS-805-964.

20b/ NHTSA: Identification and Feasibility Test of Specialized Rural Pedestrian Safety Training; Volume III, PEDSAFE Junior/Senior High School Materials; DOT-HS-805-965.

20c/ NHTSA: Identification and Feasibility Test of Specialized Rural Pedestrian Safety Training; Volume IV, PEDSAFE Audiovisual Scripts; DOT-HS-805-966

21/ NHTSA: Experimental Field Test of Proposed Pedestrian Safety Messages; Volume III, Adult Messages; DOT-HS-4-00952

22/ FHWA: Fixed Illumination for Pedestrian Protection; RD-76-8; December 1975.

23/ American Automobile Association: Manual on Pedestrian Safety: Washington, DC, 1964.

24/ Richard, S.H.; The Effects of Reducing Continuous Roadway Lighting to Conserve Energy: A Case Study; Texas Transportation Institute, Texas A&M; SAFE Journal, pgs. 24-26, Vol. 9, No. 1.

25/ FHWA: Urban Intersection Improvements for Pedestrian Safety: Volume IV; Pedestrian Signal Displays and Operation; RD-77-145; January 1977.

26/ NHTSA and FHWA: Urban Pedestrian Accident Countermeasures Experimental Evaluation; Volume I; Behavioral Evaluation Studies; DOT-HS-190-2-480; February 1975.

27/ FHWA: Provisions for Elderly and Handicapped Pedestrians; Volume 3; The Development and Evaluation of Countermeasures; RD-79-3; May 1980.

28/ Malfetti, J.C. and Embry, D.D.; Research Report No. 2 of the SAFE-Playing Project; University of Kansas; underwritten by a grant from the AAA Foundation for Traffic Safety, 1981.

29/ NHTSA: Conspicuity for Pedestrians and Bicyclists; Definition of the Problem Development and Test of Countermesures; Contract No. DTNH 22-80-C-07052 (Study effort now underway).

30/ FHWA: Model Pedestrian Safety Program User's Manual; IP-78-6; June 1978.

31/ FHWA: Development of Priority Accessible Networks; An Implementation Manual; IP-80-8; January 1980.

32/ NHTSA: Highway Safety Program Standards-Notice of Proposed Rulemaking; Federal Register, Vol 37, No. 150, Part II, pg. 15608, par 242.5(d); August 3, 1972.

33/ NHTSA: State Laws Allowing Drivers to Turn on Red Lights; Traffic Laws Commentary; Vol. 6, No. 1; DOT-HS-802-169; January 1977.

34/ FHWA: Right Turn on Red; Vol. II-Executive Summary; RD-76-90; May 1976.

35/ NHTSA: A Study of Bicycle/Motor-Vehicle Accidents-Identification of Problem Types and Countermeasure Approaches; DOT-HS-803-315; September 1977.

36/ Highway Safety Division of Virginia: Virginia's New Right Turn on Red Law is Effective January 1, 1977; Richmond, Virginia; 76-45-N; June 25, 1976.

37/ American Association of State Highway and Transportation Officials: Safety & Delay Impacts of RTOR; Washington, D.C.; June 1979.

38/ Insurance Institute for Highway Safety: Adoption of Right Turn on Red: Effects on Crashes at Signalized Intersections; Washington, D.C.; August 1980.

39/ Barnhart, R.A.: Federal Highway Administrator Letter to Mr. Ben Kelley, Sr. V.P., Insurance Institute for Highway Safety; Washington, D.C.; May 28, 1981.

40/ NHTSA: The Effect of RTOR on Pedestrian & Bicyclist Accidents; "Review Copy" of Final Report; Contract No. DOT-HS-6-01411; October 1981.