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RAILROAD SAFETY

Status of Efforts to Improve Railroad Crossing Safety





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**Resources, Community, and
Economic Development Division**

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The Honorable Richard G. Lugar
United States Senate

The Honorable Dan Coats
United States Senate

As requested, we are reporting on federal efforts to improve safety at the nation's railroad crossings. Within the Department of Transportation, the Federal Railroad Administration (FRA), the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), and the National Highway Traffic Safety Administration (NHTSA) have programs and activities that affect railroad crossing safety. This report notes recent efforts by these agencies and contains recommendations to further reduce accidents at railroad crossings.

As arranged with your office, unless you publicly announce its contents earlier, we will make no further distribution of this report until 7 days after the date of this letter. At that time, we will send copies to the appropriate congressional committees; the Secretary of Transportation; and the Administrators of FRA, FHWA, FTA, and NHTSA. We will make copies available to other interested parties upon request.

If you or your staff have any questions, please call me on (202) 512-2834. Other major contributors to this report are listed in appendix II.

A handwritten signature in cursive script that reads 'Kenneth M. Mead'.

Kenneth M. Mead
Director, Transportation Issues

Executive Summary

Purpose

Accidents at railroad crossings are the leading cause of deaths associated with the railroad industry; almost half of all rail-related deaths in the United States are the result of collisions of trains and vehicles at public railroad crossings. In 1993, these collisions killed 517 people and injured 1,677 people.

Concerned about an increase in railroad crossing accidents in Indiana, Senators Richard G. Lugar and Dan Coats requested that GAO examine the status of railroad crossing safety nationally. Specifically, this report (1) analyzes the progress made in reducing accidents and fatalities at crossings; (2) discusses federal and state strategies—for distributing funds, developing technologies, and educating the public—that have the potential for reducing railroad crossing accidents and fatalities; and (3) assesses the Department of Transportation's (DOT) progress in implementing its action plan for improving railroad crossing safety.

Background

The Congress enacted the Highway Safety Act of 1973, which led to the establishment of the Rail-Highway Crossing Program, also known as the section 130 program. The program's goal is to provide federal funds for the states' efforts to reduce the incidence of accidents, injuries and fatalities at public railroad crossings. The program provides the states with railroad crossing funds as part of a 10-percent set-aside of the states' Surface Transportation Program funds. In fiscal year 1994, the Congress appropriated \$149 million for the section 130 program. The states use the funds to build underpasses and overpasses, install passive or active warning devices, and improve pavement surfaces and markings. Between 1974 and 1994, the states completed over 28,000 projects under the program.

DOT oversees rail safety, administers the section 130 program, and funds highway education programs. State and local governments plan, select, and design crossing projects, while the railroads perform much of the actual construction. The railroads also operate and maintain existing warning devices. Operation Lifesaver, a nonprofit, nationwide public information and education organization, also is prominent in rail crossing safety efforts.

Results in Brief

Since 1974, when the Rail-Highway Crossing Program began, the yearly number of accidents and fatalities at public railroad crossings has declined by about 61 percent and 34 percent, respectively. The more significant

reductions in railroad crossing accidents and fatalities were achieved during the first 10 years of the program, when the states improved the most dangerous crossings. Since 1985, progress has been limited.

DOT and the states are using a variety of strategies to improve safety at railroad crossings. DOT is developing alternatives to the formula used to distribute section 130 funds that would target funds to those states with the most crossings, fatalities, and accidents. It is also funding the development of advanced technologies that can be used at the most dangerous crossings and encouraging improvements to crossings along specific rail corridors. The states are working to close more crossings and strengthen public education and law enforcement efforts to change motorists' dangerous behavior.

DOT has developed a Rail-Highway Crossing Safety Action Plan that sets a national goal of reducing railroad crossing accidents and fatalities by 50 percent from 1994 to 2004. Whether DOT attains the plan's overall goal will depend, in large part, on how well it coordinates the efforts of the states and railroads, whose contributions to implementing the 55 separate proposals are critical. The success of the plan will also depend on DOT's efforts to determine the plan's costs, arrange for financing, and develop an evaluation component to assess the effect of the actions taken.

Principal Findings

Significant Reduction in Accidents and Deaths

Since the Rail-Highway Crossing Program began in 1974, the federal government has appropriated nearly \$5 billion (in constant 1994 dollars) to improve safety at railroad crossings. In 1994, DOT estimated that since its inception, the program had saved more than 7,600 lives and prevented about 33,500 nonfatal injuries. The number of accidents and fatalities at public railroad crossings has declined dramatically since 1975 (the year the Federal Railroad Administration began using its current methodology for calculating these statistics). A significant part of this decline occurred between 1975 and 1984, when accidents declined by 42 percent—from 10,925 to 6,370 per year—and fatalities declined by 31 percent—from 788 to 543 per year. DOT officials attributed this decline to improvements at many of the most dangerous crossings early in the program. Since the beginning of 1985, the program's progress has been less pronounced. Deaths at railroad crossings fluctuated between 466 and 682 per

year—with little real decline—while accidents declined by 30 percent—from 6,093 to 4,240 per year. The limited progress in reducing fatalities between 1985 and 1993 was concurrent with two other events: (1) a 16-percent decline in the total number of crossings and (2) an increase in the level of exposure to accidents at the remaining crossings, primarily the result of increased highway traffic.

Strategies for Improving Railroad Crossing Safety

Maximizing the return from federal funds requires targeting them to the greatest need. GAO's analysis of the 1995 section 130 apportionments found anomalies among the states in terms of the funds they received in proportion to three key factors: accidents, fatalities, and total crossings. For example, while California received 6.9 percent of the section 130 funds, it had only 4.8 percent of the nation's railroad crossings, 5.3 percent of the fatalities, and 3.9 percent of the accidents. DOT is aware of these anomalies, and as part of its action plan, it is assessing alternative formulas that would better target state funds on the basis of these three factors.

The most effective way to improve railroad crossing safety is to close the crossing. In 1992, the Federal Railroad Administrator recommended the closure of 25 percent of the nation's railroad crossings because these crossings were considered to be redundant or unnecessary. However, local opposition and the unwillingness of localities to make a required 10-percent match in funds has made it difficult for the states to close as many crossings as they would like. Where closure is not possible, the states are using a variety of technologies to warn motorists of oncoming trains. Traditional technologies, such as lights and gates, improve safety but are not foolproof, since almost half of all fatalities occur at crossings that use these devices. New technologies that prevent vehicles from entering the crossing when trains approach may be more effective, but they are also more costly and thus are reserved for particularly dangerous crossings. The states are also using the corridor approach, through which they improve a series of crossings along a segment or stretch of a rail corridor. This approach has enabled the states to improve safety while reducing the costs of equipment, procurement, labor, and administration.

Drivers' inappropriate behavior, such as ignoring active warning devices, is a major cause of railroad crossing accidents and fatalities. Consequently, technological solutions alone will not resolve the safety problems at railroad crossings. To augment the effectiveness of technological solutions, some states use public education and law

enforcement efforts. For example, by establishing active law enforcement and educational programs, Ohio has been able to reduce accidents at crossings with active warning devices from 377 in 1978 to 93 in 1993—a 75-percent decline. Despite the benefits of education and enforcement, federal and state funding and program emphasis in these areas have been limited. For example, in fiscal year 1993, DOT's State and Community Highway Safety Grant Program, also known as the section 402 program, provided about \$190,000—about two-tenths of 1 percent of the \$106 million program—for railroad crossing education programs through Operation Lifesaver. Program officials recognized the benefits of education and enforcement but stated that railroad crossing safety has not received more emphasis because other priority areas, such as compliance with seat belt laws and drunk driving educational campaigns, provided greater benefits.

Action Plan Significant but Needs Cost Information and Evaluation Component

In response to railroad crossing accidents, DOT has developed an action plan that specifies 55 actions that federal, state, and local governments and railroads can take to improve crossing safety and sets a goal of reducing yearly accidents and fatalities by 50 percent—to fewer than 2,500 and 300, respectively, by the year 2004. The plan, a significant DOT initiative, elaborates the need for cooperation among government, industry, and private organizations on railroad crossing safety. However the plan does not identify the costs of implementation. For example, the proposal to eliminate railroad crossings on the National Highway System could cost federal and state governments between \$4 billion and \$11 billion to implement—an enormous commitment compared with the current level of federal and industry funds available each year. Also, DOT has not developed an approach to evaluate the safety impact of the plan's initiatives. Without such information, DOT cannot assess the plan's cost and effectiveness.

Recommendations

To strengthen the DOT action plan and improve railroad crossing safety, GAO recommends that the Secretary of Transportation, in cooperation with the states,

- develop cost estimates and identify funding sources for action plan proposals and
- evaluate the cost and effectiveness of the action plan as it is implemented.

Agency Comments

GAO provided copies of a draft of this report to the Department of Transportation for its comments. DOT officials—including the Associate Administrator for Safety of the Federal Railroad Administration, the Acting Division Chief of Safety and Management Programs in the Federal Highway Administration’s Office of Highway Safety, the Branch Chief for Federal Aid Programs in the Federal Highway Administration’s Office of Engineering, and officials from the National Highway Traffic Safety Administration’s Office of State and Community Services and the Secretary’s Office of Programs and Evaluation—provided oral comments on the draft. These officials generally concurred with the report’s findings.

The agency did not comment on GAO’s recommendations but provided the following information. The Federal Highway Administration stated that GAO’s draft report was an accurate statement of the conduct of the section 130 program. The Federal Highway Administration and Federal Railroad Administration believed that the report should (1) more clearly emphasize the success of the section 130 program, (2) emphasize that the large amount of funds spent in the early years of the program influenced the program’s success, and (3) take into account accident exposure trends in assessing the current level of safety. The National Highway Traffic Safety Administration stated that the draft should emphasize the importance of the states’ role in selecting priorities under the section 402 program. The Federal Railroad Administration also believed the report should clearly indicate the significant accomplishment that DOT has made in developing and implementing the action plan.

Where appropriate, GAO modified the final report’s discussion of the success and funding of the section 130 program, added information on accident trends, and clarified the role of the states under the section 402 program. While GAO agrees that the action plan is a major intermodal departmental initiative, the Department is still in the process of implementing and seeking congressional approval for some initiatives. The value of the plan ultimately lies in its impact on safety, and it is too early to assess the effect of the initiatives in reducing accidents.

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Abbreviations

AAMVA	American Association of Motor Vehicle Administrators
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
DOT	Department of Transportation
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FY	fiscal year
GAO	General Accounting Office
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
MUTCD	Manual on Uniform Traffic Control Devices
NHS	National Highway System
NHTSA	National Highway Traffic Safety Administration
PRL	Principal Railroad Line
SMS	Safety Management Systems
STP	Surface Transportation Program

Introduction

Almost half of all rail-related deaths in the United States are the result of collisions of trains and vehicles at railroad crossings. In 1993, these collisions killed 517 people and injured 1,677 at public railroad crossings. Many of the deaths should have been avoided, since nearly one-half of all railroad crossing deaths occurred at crossings where flashing lights or flashing lights and descending gates warned motorists of the approaching train.

The Rail-Highway Crossing Program Focused Attention on the Problem

The Highway Safety Act of 1973 proved to be pivotal in rail-highway crossing safety because it led to establishment of the Rail-Highway Crossing Program (also known as the section 130 program). The goal of this program is to provide federal support for the states' efforts to reduce the incidence of accidents, injuries, and fatalities at public railroad crossings.

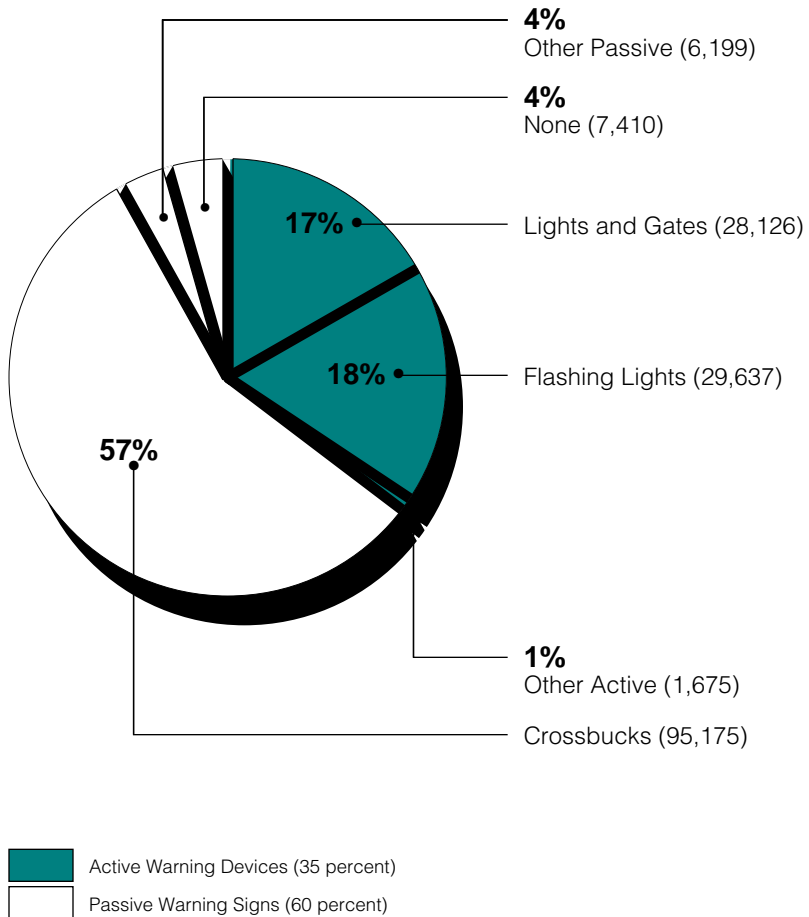
The potential for railroad crossing problems is significant—the United States has over 168,000 public highway-rail intersections on approximately 160,000 miles of rail rights-of-way.¹ The level of warning provided motorists at these crossings differs widely—from no visible warning devices to active devices such as lights and gates. According to the Department of Transportation (DOT), the very existence of these crossings poses a major challenge to growing rail traffic and higher speeds for both passenger and freight rail operations.

To deal with these problems, the states can use funds they receive under the section 130 program to improve railroad crossings using a variety of methods. They can separate railroad crossings by building overpasses and underpasses, install passive (crossbucks or surface markings) or active (flashing lights and gates) warning devices, or improve the pavement surface. Since the Rail-Highway Crossing Program began, states have undertaken more than 28,600 improvement projects—primarily by installing signs and markings, flashing light signals, and automatic gates and improving crossing surfaces. In addition, there are about 35,000 grade separations—bridges with the roadway above or below the railroad—located on public crossings.

¹In addition, there are approximately 108,000 private railroad crossings in the nation. These crossings do not involve a public road; access is generally determined by the railroad and the private landowner. Section 130 funds are not used at these locations. Private crossings are predominantly at farm and industrial locations—about 66,000 private crossings are on farms and 25,000 are on industrial property. Relatively fewer accidents and fatalities occur at private crossings than public crossings. In 1993, there were 455 accidents at private crossings, which resulted in 42 fatalities.

According to the Federal Railroad Administration (FRA), the basic levels of safety devices in the order of their increasing effectiveness are passive warning devices, automatic flashing lights, automatic flashing lights with gates, and grade separations (underpass/overpass). As shown in figure 1.1, about 60 percent of all public crossings in the United States have only passive warning signs—typically highway signs known as “crossbucks.” Other passive warnings include familiar traffic signs, such as the stop sign. In contrast, about 35 percent of all crossings have active warning signals—flashing lights and gates activated by the approach of a train. National statistics do not fully reflect the variations found across the nation because states can differ widely in the type of warning typically found at crossings. For example, as of October 1994, 63 percent of the crossings in New York had active signals while 79 percent of the crossings in Kansas had passive signs.

Figure 1.1: Railroad Crossings Categorized by Highest Level of Warning Device, October 1994 (Total Devices)



Note: Percentages may not add due to rounding.

Source: GAO's Analysis of Federal Railroad Administration's (FRA) data.

Public-Private Involvement in Railroad Crossing Safety

Railroad crossing safety demands considerable cooperation among federal, state and local agencies; railroads; and private organizations. At the federal level, three DOT agencies are responsible for railroad crossing safety: the Federal Highway Administration (FHWA) administers the section 130 program; FRA is responsible for overseeing railroad safety; and the National Highway Traffic Safety Administration (NHTSA) funds highway education programs designed to influence driving behavior. State and local governments have significant roles in planning, selecting, and engineering

safety projects, while the railroads perform much of the actual construction. In addition, Operation Lifesaver, a private organization made up of 49 state chapters, is a leader in safety education efforts.

Public and private funds support railroad crossing improvements. In 1994, the federal government obligated about \$311 million to construct improvements to railroad crossings. The railroad industry contributed an additional \$146 million for railroad crossing improvements and maintenance.

The Federal Government Funds Safety and Education

DOT's four surface transportation agencies—FHWA, FRA, NHTSA, and the Federal Transit Administration (FTA)—all have roles in improving railroad crossing safety. FHWA administers the section 130 program—the federal government's primary source of funding for railroad crossing safety. The program provides all states with railroad crossing funds as part of a 10-percent set-aside of their Surface Transportation Program (STP)² funds. FHWA also administers funds that the Congress appropriates for specific railroad crossing elimination projects. In 1994, the states obligated a total of about \$311 million from section 130 and other federal aid programs for railroad crossing safety projects.

FRA is not directly involved in funding railroad crossing improvement projects, but it has an important role in maintaining the only nationwide inventory of railroad crossings—an inventory that the states use to plan their section 130 programs. FRA also collects accident data that railroads submit to serve as the basis for assessing the overall level of rail crossing safety nationwide. During 1994, FRA hired a railroad crossing manager in each of its eight regional offices to promote railroad crossings safety, coordinate with federal, state, and local officials; and educate the public on safety issues. These managers expand FRA's traditional role as an agency responsible for regulating the safe operation of the railroads.

NHTSA is involved in rail crossing safety through its State and Community Highway Safety Grant Program (also known as the section 402 program). Begun pursuant to the Highway Safety Act of 1966, the program provides funds to states for innovative programs aimed at reducing highway crashes, injuries, and fatalities. The states apply to NHTSA for grants through their Highway Safety Plans, which identify the states' key highway safety problems and specific approaches to address these problems. The

²STP (part of the 1991 Intermodal Surface Transportation Efficiency Act) provides federal funds that can be used by states and localities on any federal aid road.

section 402 program also promotes safety through nine national priority program areas—Occupant Protection, Alcohol and Other Drug Countermeasures, Police Traffic Services, Emergency Medical Services, Traffic Records, Motorcycle Safety, Speed Control, Pedestrian and Bicycle Safety, and Roadway Safety. NHTSA is responsible for six of these priority programs, while FHWA oversees the Roadway Safety program. FHWA and NHTSA jointly oversee the Pedestrian and Bicycle Safety program and the Speed Control program.

FTA, which carries out the federal mandate to improve public mass transportation, is the principal source of federal financial assistance to communities for planning, developing, and improving public transportation systems. FTA's safety program is designed to support state and local agencies in fulfilling their responsibility for the safety and security of urban mass transportation facilities and services. FTA's role in DOT's action plan is to review light rail safety statistics and conduct investigations of warning systems at light rail crossings.

State and Local Governments Play Critical Roles

The states are key players in making decisions about which railroad crossings to improve and what level of protection is needed. Under the section 130 program, the states are responsible for planning and setting priorities for railroad crossing projects. They also enforce state highway safety laws. FHWA's regulations also require each state to develop a system that ranks each of its public railroad crossings by its potential accident risk. The priorities in the railroad crossing list enable the states to decide how best to spend available railroad crossing improvement dollars.

The states and localities are also important financial contributors to railroad crossing safety. For example, states such as California and Illinois fund crossing improvement projects with state funds alone. While FHWA does not collect annual national statistics on the states' expenditures for railroad crossings improvements, a 1989 FHWA report estimated that the states and localities spend about \$184 million each year for crossing safety. The section 130 program also requires 10 percent in local matching funds when improvements are made at the crossing. However, projects to install active and passive warning devices are eligible for 100 percent federal funding.

Railroads and Private Groups Promote Railroad Crossing Safety

Railroads and private organizations play an important role in improving railroad crossing safety. The states generally contract with railroads to construct crossing improvements, particularly if the improvement requires

the installation of gates and signals. The lights and gates found at crossings are typically on railroad property, and the maintenance of these highway traffic warning devices is the railroads' responsibility. Based on an estimate from the Association of American Railroads (AAR) and 1993 data from the Interstate Commerce Commission, the major railroads spend about \$146 million annually on railroad crossings—about \$89 million for improvements and \$57 million for operation and maintenance.

Railroad crossing safety is a particular concern of the railroads because highway-rail collisions and trespassing on rail properties are the first and second leading causes of death in the entire railroad industry—surpassing employee or passenger fatalities. In addition, recent court decisions raised the railroads' concerns about their legal liability when people are killed or injured at crossings.

Private efforts raise public awareness of railroad crossing safety through education and safety campaigns. Prominent among these efforts is Operation Lifesaver, Incorporated, a private, not-for-profit organization supported by federal and railroad funds and dedicated to improving safety through education and improved law enforcement. Operation Lifesaver programs are currently operating in 49 states. The organization's Alexandria, Virginia, headquarters functions as a support and referral center and an information clearinghouse for the independent state programs. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 authorized \$300,000 for Operation Lifesaver's headquarters for each fiscal year from 1992 to 1997. For fiscal year 1995, the Congress appropriated \$300,000 for Operation Lifesaver. In addition, according to DOT officials, FHWA and FRA provided the organization an additional \$100,000 and \$150,000, respectively. The states' Operation Lifesaver programs are funded separately, either by states or railroads.

In response to continuing problems at railroad crossings, DOT issued a Rail-Highway Crossing Action Plan in June 1994. The plan established a national goal of reducing crossing accidents and fatalities by 50 percent from 1994 to 2004. The plan illustrates that responsibility for railroad crossing safety requires a partnership among federal, state, and local governments as well as with the railroads and private, nonprofit organizations.

Objectives, Scope, and Methodology

Concerned about the increase in railroad crossing accidents in Indiana, Senators Richard G. Lugar and Dan Coats asked us to examine the status of railroad crossing safety nationwide. This report (1) analyzes the progress made at reducing accidents and fatalities at crossings; (2) discusses federal and state strategies—funds distribution, technologies, and education—that have the potential for reducing railroad crossing accidents and fatalities; and (3) assesses DOT’s progress in implementing its action plan for improving railroad crossing safety.

We conducted our review at FHWA, FRA, and NHTSA headquarters and field offices. We reviewed railroad crossing programs in five states—California, Illinois, Indiana, Ohio, and Texas—and met with responsible state transportation and regulatory authorities in these states. The selected states had the highest number of rail crossing fatalities in the United States during 1991 through 1993 and were among the top seven states in the number of accidents during the same period. Together, they accounted for 27 percent of the nation’s railroad crossings in 1994. We also interviewed representatives of AAR, who provided us with information on railroad expenditures, and Operation Lifesaver, who provided information on their education and law enforcement expenditures.

To determine federal funding and railroad trends that have affected railroad crossing safety, we analyzed crossing accident and fatality trends, as well as federal funds apportioned to the section 130 program. The FRA accident and fatality statistics used in this report refer only to public railroad crossings because section 130 funds may be used only at public crossings. Furthermore, accident and fatality statistics in this report refer only to motor vehicle accidents at public railroad crossings. FHWA and FRA provided us with data on the section 130 funds apportioned, as well as accident and fatality statistics. We used the Gross Domestic Product Price Deflator to calculate inflation adjustments over time. The results of our analyses are discussed in chapter 2.

To determine what strategies—funds distribution, technologies, and education—DOT and the states are currently using that may contribute to reducing railroad crossing accidents and fatalities, we compared the federal funds apportioned to the states under the Rail-Highway Crossing Program to the total crossings, accidents, and fatalities in each state. Furthermore, to examine engineering strategies, we obtained information from FHWA on the states’ obligations of federal funds for various types of improvements. To analyze the closing of railroad crossings, we reviewed information from FRA and the American Association of State Highway and

Transportation Officials (AASHTO). We also obtained data from FRA on the costs associated with four innovative technologies: four quadrant gates, friendly mobile barriers, dragnet arrestor nets, and low-cost grade separations. We also collected information from DOT agencies and state officials on the corridor approach—an innovative approach to targeting railroad crossing improvements that is currently used by the railroads and in some states. The results of our analyses are discussed in chapter 3. We also met with FHWA officials responsible for administering the Rail-Highway Crossing Program as well as officials in the selected states who were responsible for rail crossing improvements.

To determine the extent to which educational and law enforcement strategies have improved safety at crossings, we met with NHTSA officials and state officials responsible for the section 402 program. We reviewed the safety plans to determine the extent to which the grant money was funding the states' efforts to educate the public on the dangers at railroad crossings. We met with Operation Lifesaver officials to document the types of educational programs they supported nationally and in the five states we visited. In assessing the benefits of education and enforcement programs, we reviewed Ohio, a state with active railroad crossing education and enforcement programs and a full-time Operation Lifesaver Coordinator since 1978. The results of this review are presented in chapter 3.

To determine what actions DOT can take to improve its rail crossing safety program, we determined the roles of federal agencies, state agencies, and railroads in improving rail crossings. In addition, we monitored DOT's progress in implementing the six initiatives and 55 proposals included in the Rail-Highway Crossing Safety Action Plan. Our assessment of the DOT action plan is found in chapter 4.

We conducted our review from April 1994 through May 1995 in accordance with generally accepted government auditing standards. We obtained comments on a draft of the report from DOT officials from the Office of the Secretary, FRA, FHWA, and NHTSA. Where appropriate, we incorporated their comments into the report.

Railroad Crossing Accidents and Fatalities Have Declined Significantly, But Problems Still Persist

Since 1974, when the Rail-Highway Crossing Program began, the number of accidents and fatalities at public railroad crossings has declined by 61 and 34 percent, respectively.³ However, a significant portion of the progress made in reducing crossing accidents and fatalities was realized during the first 10 years of the program. Since the beginning of 1985, progress in reducing fatalities has been limited, and little real decline has occurred. Although the number of accidents has continued to decline, the decline has been at a slower rate. The limited progress in reducing fatalities between 1985 and 1993 occurred at the same time as two other factors: (1) a 16-percent decline in the total number of public railroad crossings and (2) increased exposure to accidents at the remaining crossings. Furthermore, crossing safety problems are more prevalent in some states than others.

Early Years of Program Yielded Significant Reductions in Deaths and Accidents

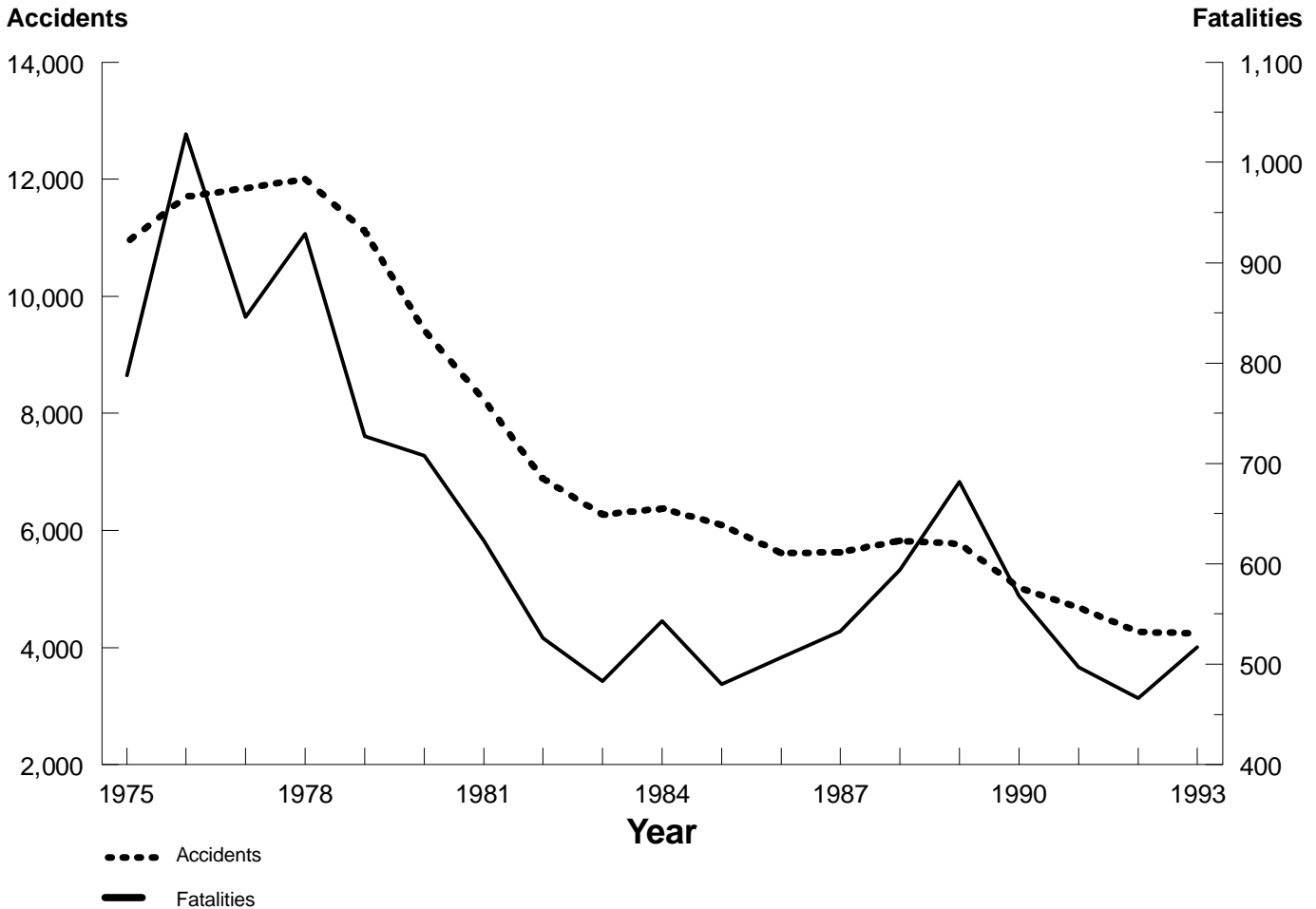
In May 1994, FHWA issued a report to the Congress on the effectiveness of the Rail-Highway Crossing Program. According to FHWA, the program had prevented more than 7,600 fatalities and 33,500 nonfatal injuries and had completed over 28,000 railroad crossing projects since its inception in 1974. FHWA estimated that it costs about \$112,000 to prevent a railroad crossing accident and about \$542,000 to prevent a fatal accident under the program. When warning devices (lights and gates) are installed at a crossing, FHWA estimated that society has received benefits about three times the costs of the Rail-Highway Crossing Program. FHWA reached this conclusion by comparing the benefits of the estimated deaths and injuries prevented to the total funds spent on rail highway improvements under the section 130 program.

Although significant accomplishments have been achieved during the life of this program, much of the progress made in reducing accidents and deaths occurred in the early years. As figure 2.1 shows, in 1975 there were 10,925 motor vehicle accidents and 788 deaths involving motor vehicles at railroad crossings. The high number of accidents and fatalities continued through 1979, averaging 11,516 accidents and 864 deaths each year. However, beginning in 1979, the number of crossing accidents and fatalities began to decline sharply. A 43-percent decline in accidents occurred between 1979 and 1984, while railroad crossing fatalities declined by 25 percent.

³After 1974, FRA changed the method by which it calculated the number of accidents and fatalities at railroad crossings. Therefore, our analysis of accident and fatality trends uses 1975 as a base year so as to accurately determine the effects of the Rail-Highway Crossing Program over time.

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Railroad Crossing Accidents and Fatalities
Have Declined Significantly, But Problems
Still Persist

Figure 2.1: Accidents and Fatalities at Public Railroad Crossings, 1975-93



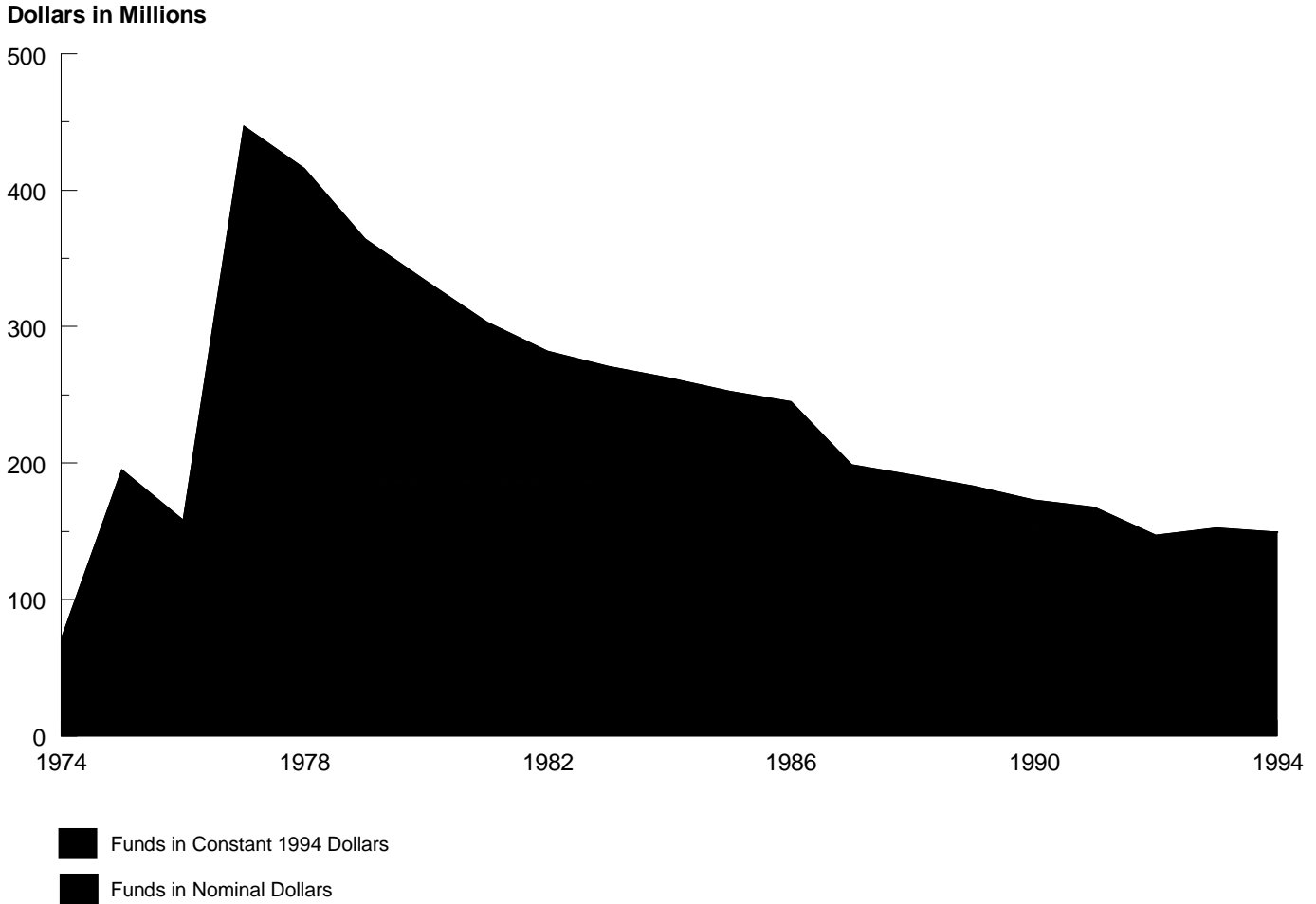
Source: GAO's analysis of FRA's data.

This period of decline in accidents and deaths began when the Congress authorized the Rail-Highway Crossing Program in 1974 and appropriated about \$4.9 billion (constant 1994 dollars) over the next 20 years. In fiscal year 1994, Congress appropriated \$149.3 million for the section 130 program. As shown in figure 2.2, congressional appropriations for the rail

Chapter 2
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crossing program were highest in the late 1970s and early 1980s in both nominal and constant dollars. Funding in nominal dollars did not greatly decline over this period. However, in real terms (1994 constant dollars), funding was highest in the early years of the program and peaked at about \$447 million in 1977. According to DOT officials, the higher federal funding in the early years of the program allowed the states to first improve their most dangerous crossings, thereby contributing to the significant reductions in accidents and fatalities.

Figure 2.2: Rail-Highway Crossing Program Funds Apportioned/Allocated, Fiscal Year 1974-94



In constant fiscal year 1994 dollars.

Source: GAO's analysis of FHWA's data.

The Decline in Accidents and Fatalities Has Slowed in Recent Years

As figure 2.1 shows, since 1985 the number of railroad crossing fatalities has fluctuated between 466 and 682 and little real decline has occurred, while the decline in crossing accidents has slowed. For example, deaths at crossings decreased 31 percent (from 788 to 543) in the first 10 years of the program compared to a 5-percent decline (from 543 to 517) in 1985

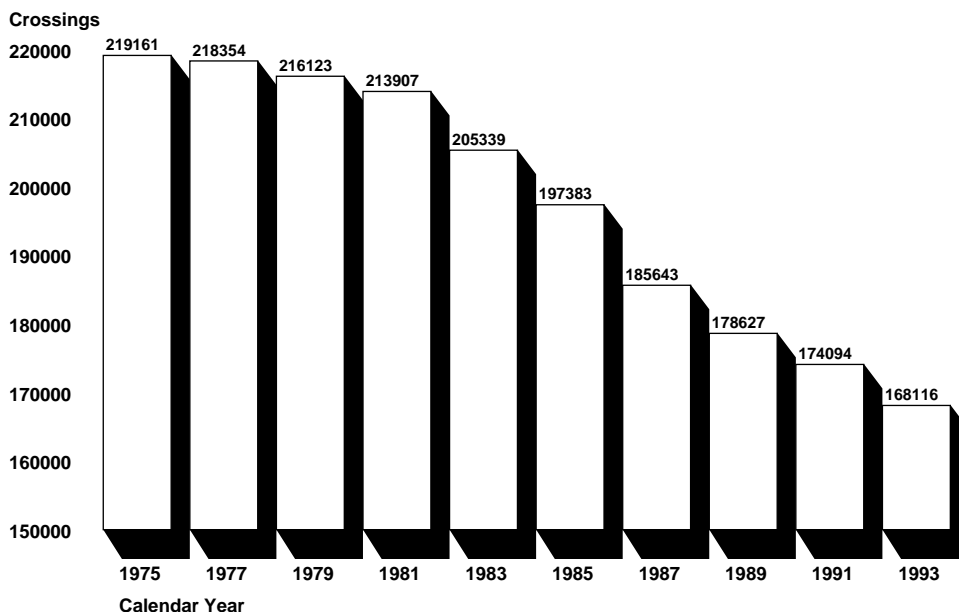
through 1993. For accidents, the 42-percent decline (from 10,925 to 6,370) that occurred in 1975 through 1984 compares to a 30-percent decline (from 6,093 to 4,240) in 1985 through 1993.

The limited recent progress in reducing railroad crossing deaths has occurred despite recent declines in the total number of crossings. As shown in figure 2.3, the number of public crossings dropped from 219,000 crossings in 1975 to 168,000 crossings in 1993—a 23-percent decline. The decline occurred primarily as a result of the industry’s consolidations and line abandonments.⁴ The decline in railroad crossings was most pronounced in 1984 through 1993—a 16-percent reduction. With fewer railroad crossings, the chances for crossing fatalities would be expected to decline as well.

However, counterbalancing the decline in the number of crossings is a likely increase in the exposure to accidents at the remaining crossings. Accurate data on traffic across railroad crossings do not exist for the entire nation. However, the total amount of road traffic, as measured by vehicle miles travelled, rose from about 1.8 trillion to 2.3 trillion from 1985 through 1993. During the same period, railroad traffic, as measured by train miles travelled, fluctuated between about 571 million and 621 million. FRA’s accident exposure index, a product of train miles traveled times vehicle miles travelled, rose about 39 percent between 1985 and 1993. DOT officials commented that it is likely that increased exposure to accidents at crossings has negatively affected safety and is a partial explanation of the current trend.

⁴In 1975 through 1993, the number of Class I railroads declined from 73 to 12, while the total miles of track declined from 311,000 miles to 186,000 miles.

**Figure 2.3: Public Railroad Crossings
 (1975-93)**



Source: GAO's analysis of FRA's data.

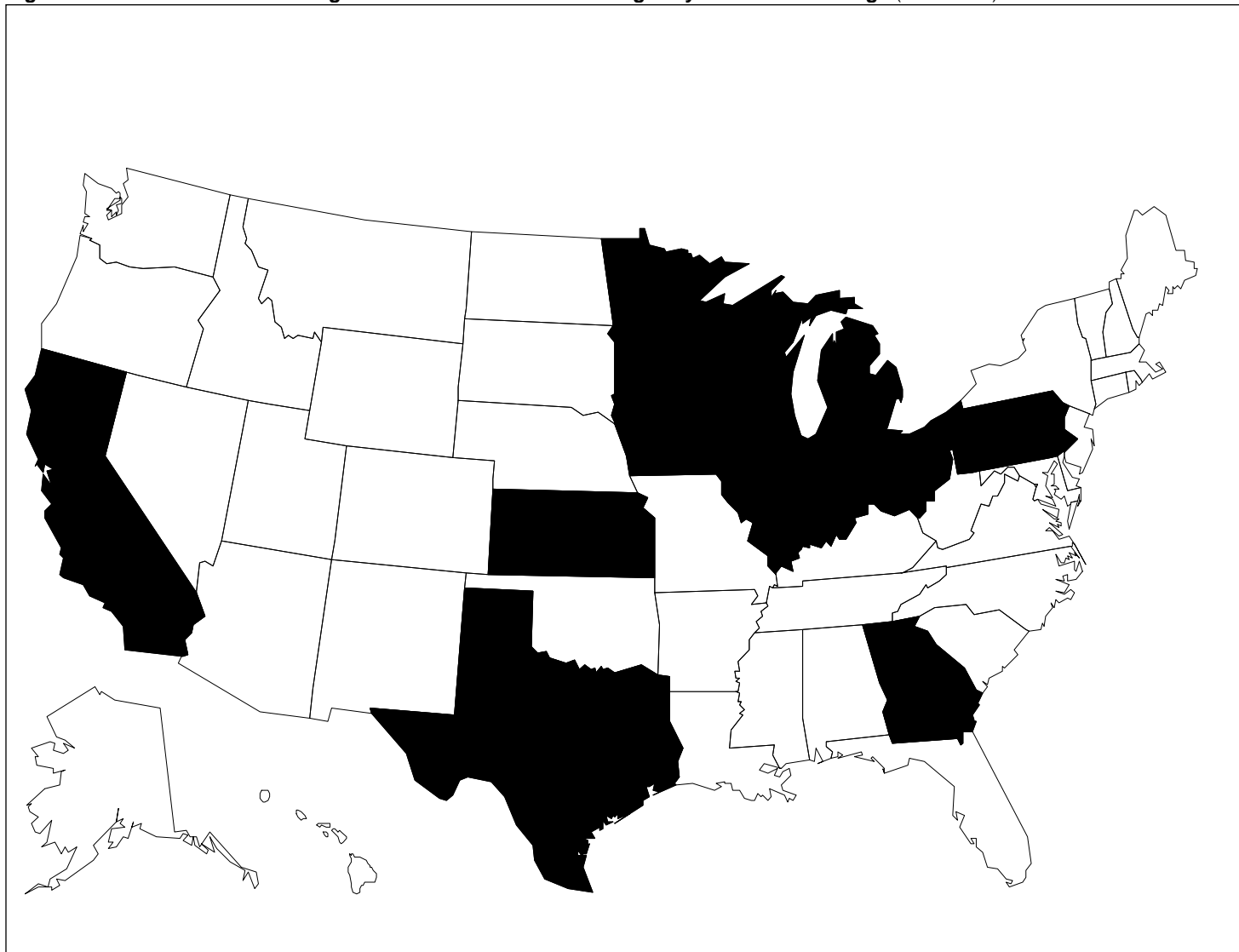
Railroad Crossing Safety Problems Concentrated in Certain States

Although the national railroad crossing safety picture has shown overall improvement, certain states have the highest incidence of problems. As figure 2.4 shows, one-half of the nation's 168,000 public railroad crossings are located in 12 states. In addition, these states accounted for half of all accidents and fatalities at railroad crossings in 1993. Texas, with 12,950, and Illinois, with 10,343, have the most crossings. Together with California, Ohio, and Indiana, these five states account for over one-fourth of the total number of crossings in the United States. Similarly, these five states accounted for 38 percent of the deaths and 32 percent of the accidents at public crossings in 1991 through 1993.⁵ Figure 2.4 also shows that railroad crossing safety is a particular concern for states located in the Midwest and Great Lakes regions.

⁵Kansas has more railroad crossings than Indiana and Ohio but relatively fewer accidents and fatalities.

Chapter 2
Railroad Crossing Accidents and Fatalities
Have Declined Significantly, But Problems
Still Persist

Figure 2.4: 12 States With the Largest Concentration of Public Highway Railroad Crossings (Oct. 1994)



Source: GAO's analysis of FRA's data.

Conclusions

The states have received, in constant 1994 dollars, about \$4.9 billion in section 130 funds to improve thousands of railroad crossings since the Rail-Highway Crossing Program was established in 1974. Combined with a decline in the total number of crossings, the two-decade investment in railroad crossing safety has resulted in significant reductions in accident

and fatality rates since attention was first drawn to the problem in 1974. However, since 1985, progress in reducing crossing deaths has been limited. Federal dollars available for railroad crossing improvements have declined in real terms since 1977, and in all likelihood, this trend could continue. Consequently, the question for railroad crossing safety in the future may focus on how best to target available dollars. The following chapter discusses strategies and options for maximizing the return from railroad crossing expenditures.

Agency Comments

FHWA commented that the report was an accurate statement of the conduct of the section 130 program over the past 20 years. However, FHWA and FRA commented that the report did not sufficiently convey the success of the section 130 program in reducing accidents and the report should more clearly emphasize that the large amounts spent in the early years influenced the program's success. Both agencies agreed that accident exposure needed to be considered more directly in our analysis of accident trends. We modified the report to highlight the positive effect of the section 130 program since its inception. We have also added information on accident exposure to the report to emphasize this factor and enhanced our discussion of safety trends.

Strategies to Improve Railroad Crossing Safety

Trends in public railroad crossing safety suggest that certain approaches have more positive effects on reducing accidents and fatalities than others. For example, closing a crossing is more effective than installing active warning devices, such as lights and gates. However, trends also suggest that no single strategy by itself will reduce fatalities below the level maintained since 1985 and that a combination of strategies and approaches is needed to achieve further improvements to railroad crossing safety. Strategies DOT and the states are using that have the potential to improve safety include targeting federal funds to states with the highest incidence of accidents and fatalities; closing more railroad crossings; installing advanced technologies at the most dangerous intersections; concentrating crossing improvements and closings on specific rail corridors; and improving public education and law enforcement to change motorists' dangerous behavior.

Funds Not Targeted to Address Risk Factors

Maximizing the return from federal funds requires that they be targeted to areas with the greatest risk. Currently federal funds for state railroad crossing improvements are included in a 10-percent set-aside of the state's STP apportionment. The apportionment does not include factors related to railroad crossing safety such as accidents and fatalities. Our analysis of 1995 section 130 apportionments found anomalies among the states in terms of the funds they received in proportion to three key risk factors: accidents, fatalities, and the total number of crossings. FHWA has recognized this problem and is working to develop alternative apportionment formulas that would include these risk factors.

Current Funding Is Not Related to Risk Factors

Table 3.1 compares the 1995 apportionments for the five states that had the highest number of fatalities in 1993 to the number of crossings in 1994 and accidents and fatalities in these states between 1991 and 1993. The table shows differences among the five states in the distribution of funds relative to crossings, fatalities, and accidents. For example, while California received 6.9 percent of the section 130 funds in 1995, it had only 4.8 percent of the nation's railroad crossings, 5.3 percent of the fatalities, and 3.9 percent of the accidents. Illinois, on the other hand, received 5.4 percent of the funds but had 6.2 percent of the nation's crossings, 8.4 percent of the fatalities, and 6.3 percent of the accidents.

Table 3.1: Comparison of Five States' Apportionments, Public Crossings, Fatalities, and Accidents

State	Percentage of total for each category			
	Funding	Crossings	Fatalities	Accidents
Texas	7.4	7.7	10.7	10.2
California	6.9	4.8	5.3	3.9
Illinois	5.4	6.2	8.4	6.3
Ohio	4.3	4.1	8.5	6.1
Indiana	3.4	4.0	5.9	6.1

Note: Data in table include states' FY 1995 allocation for the section 130 program, railroad crossings in 1994, and accidents and fatalities from 1991 to 1993.

Source: GAO's analysis of FHWA's and FRA's data.

Similar anomalies appeared for the five states—Alaska, Delaware, Hawaii, Nevada, and Rhode Island—that had the fewest number of crossings. In total, these states received 3.1 percent of the section 130 funds in 1995. However, they accounted for only about one-half of 1 percent of the total number of crossings, accidents, and fatalities in the nation in 1991 through 1993. Alaska, for example, received 1.7 percent of program funds in 1995 but had only 0.1 percent of the crossings, 0.2 percent of the fatalities, and 0.2 percent of the accidents. Hawaii, with only six crossings and no accidents or fatalities, received about \$400,000 for railroad crossing safety.

These anomalies occur because the states' apportionments are derived from the STP formula, which does not include factors related to crossing safety, such as accidents and fatalities. Instead, the formula is based on a percentage share of the funds the states had previously received in fiscal years 1987 through 1991 for their federal-aid highway program. For this reason, every state received section 130 funding.

FHWA Is Developing Alternative Apportionment Formulas

FHWA officials stated that they had observed anomalies similar to those we observed in section 130 apportionments. FHWA and FRA are reviewing the current apportionment process to define a “more appropriate method of distributing section 130 funds, possibly on the basis of the number of crossings and accidents in each state.” In May 1995, FHWA officials stated that DOT had developed a funding formula that proposed to distribute railroad crossing improvement funds to the states on the basis of four risk factors, including each state's proportion of accidents, fatalities, total public crossings, and total public crossings with passive warnings.

DOT has assessed changes in the states' annual apportionments using different formulas that would vary the weights assigned to each risk factor. In one alternative formula, FHWA would weight risk factors equally so that each factor would contribute to 25 percent of the state's total apportionment. On the basis of our analysis of DOT's preliminary results in applying this alternative, we found that 28 states would have received less section 130 funds in fiscal year 1995, while the remaining states would have received more funds. As indicated in table 3.2, there are notable differences for the five states with the highest number of crossings under existing and alternative funding formulas.

Table 3.2: Comparison of Fiscal Year 1995 State Apportionments Under Current and Proposed Apportionment Formulas

State	FY 1995 actual apportionment	FY 1995 comparative apportionment	Difference
Texas	\$10,906,280	\$12,099,114	\$1,192,834
California	10,182,716	5,925,646	(4,257,070)
Illinois	7,926,261	8,703,731	777,470
Ohio	6,301,744	7,540,429	1,238,685
Indiana	4,962,375	6,635,387	1,673,012

Note: Data in the table are based on a formula FHWA proposed to distribute section 130 funds.

Source: FHWA data.

The alternative formula would address some of the anomalies that we found with funds apportioned to the five states we reviewed. For example, California, which received a higher proportion of section 130 funds in comparison to its proportion of crossings, accidents, and fatalities, would receive less funds under a proposed formula. Similarly, Illinois and Indiana, which received a lower proportion of section 130 funds in comparison to their proportion of crossings, accidents, and fatalities, would receive more section 130 funds. Pennsylvania, Mississippi, and Arkansas would have received the greatest percentage increases (between 52 and 79 percent), while Alaska, New York, and Maryland would have received the greatest percentage of decreases (between 48 and 76 percent) in their section 130 funds. Changing the weights would, of course, change the allocations.

Engineering Strategies: Traditional and Innovative Approaches

States can consider a range of engineering strategies—traditional technologies, crossing closures, and innovative technologies—in investing funds to improve railroad crossing safety. Making effective investments requires ensuring that the most appropriate engineering strategy is chosen for the specific problem.

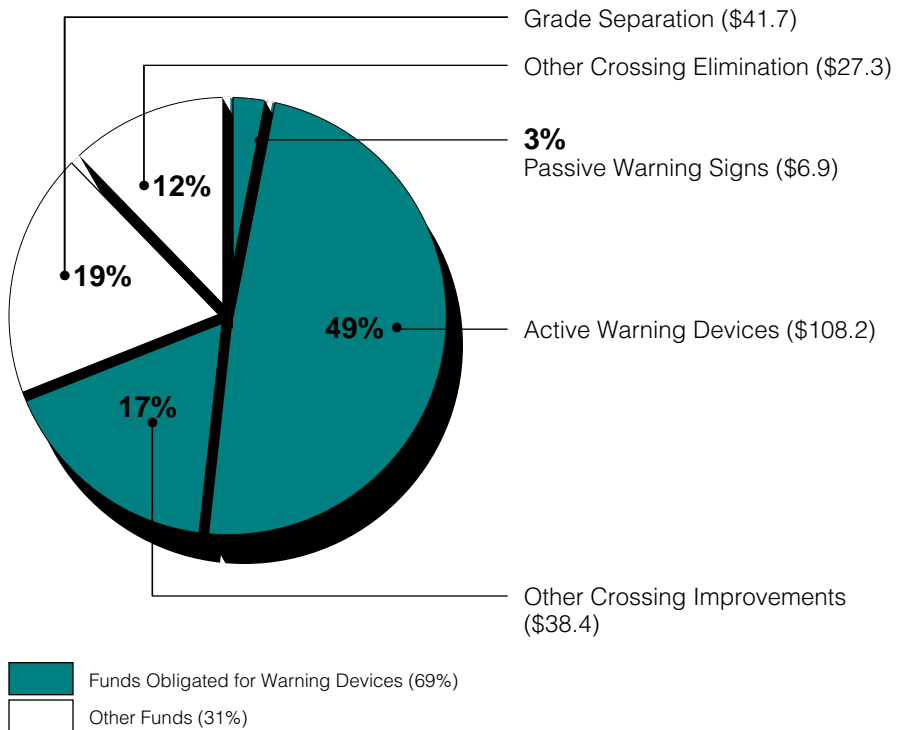
Traditional Approaches Prove Effective in Many Applications

Lights and gates remain the practical engineering solution to railroad crossing dangers, although states can use their railroad crossing program funds to purchase a range of engineering solutions. These engineering solutions include grade separations, active and passive warning devices, and improvements to the crossing surface. FHWA's regulations require the states to make available at least 50 percent of their section 130 funds for the installation of active and passive protective devices (23 C.F.R. sec. 924.11(c)), such as crossbucks, flashing lights, or flashing lights and gates.⁶ As shown in figure 3.1, the states obligated 69 percent of federal railroad crossing funds to install warning devices in fiscal year 1991.⁷

⁶According to FHWA's Federal-Aid Policy Guide, protective devices include railroad crossing projects to install standard signs and pavement markings, active warning devices, and crossing illumination, as well as crossing surface improvements, and general site improvements.

⁷Since 1991, FHWA no longer collects national data on specific railroad crossing projects. As a result, more recent information that details the types of improvement is not available. FHWA officials stated that the trend detailed in figure 3.1 would not have changed substantially for fiscal years 1992 and 1993.

Figure 3.1: Federal-Aid Highway Funds Obligated for Rail-Highway Crossing Improvements, Fiscal Year 1991
 (Dollars in Millions)



Source: GAO's analysis of FHWA's data.

Funds for active warning devices, such as flashing lights and gates, accounted for 71 percent of the funds obligated for these devices. FHWA's and the industry's analyses have shown that active warning devices are more effective than passive warning devices, such as crossbucks. For example, FHWA reported in 1989 that active warning devices reduced accident rates by at least 64 percent, and in some cases by as much as 97 percent. In addition, FHWA's 1994 Annual Report on Highway Safety Improvement Programs found that since 1974, installing active warning devices had reduced rates for railroad crossing accidents that result in injuries or fatalities by 69 percent and fatal railroad crossing accident rates by 89 percent.

Grade separations accounted for nearly one-fifth of state obligations in fiscal year 1991. The construction of these overpasses and underpasses

effectively eliminates the risk of accidents. However, grade separations are more expensive than active warning devices, and accordingly their use is often limited. For example, in 1991 the states obligated \$108 million in federal funds to install active warning devices, such as flashing lights or lights and gates, at 2,400 crossings. In that same year, the states obligated \$42 million in federal funds to partially pay for grade separations at 75 crossings. Because grade separations are costly, states often pay for them through federal-aid highway programs other than the section 130 program.

Crossing Closures Are Effective but Controversial

The states' actions to close crossings reduce railroad crossing fatalities and accidents. Although crossing closures eliminate the safety problem, this approach has raised intensive opposition at the local level.

In 1992, the Federal Railroad Administrator recommended the closure of 25 percent of the nation's railroad crossings because the crossings were either redundant or unnecessary. Reducing the number of railroad crossings is a goal also endorsed by DOT, AAR, AASHTO, the National Association of Regulatory and Utility Commissioners, and Operation Lifesaver. In 1994, AASHTO found that the nation had two railroad crossings for every mile of track and that in heavily congested areas, the average approached 10 crossings every mile.⁸ AASHTO noted that many of these crossings were unnecessary and could be consolidated with little or no adverse impact on the traveling public. A closed crossing effectively eliminates the risk of motor vehicle accidents and fatalities. It also eliminates the future costs of maintaining the crossing or upgrading the crossing's protection when increased traffic volume necessitates greater protection.

However, closing crossings often becomes a matter of considerable local debate. For example, in 1994 FRA found that in 11 states, local opposition was the greatest impediment to closing crossings. This problem was consistently cited among state transportation officials in the five states we reviewed. In general, local opposition centers on several issues. Businesses near the crossing fear financial losses, particularly if public access would be cut off in one direction. Citizens raise concerns about fire, police, and ambulance response time, and farmers oppose closures that alter access to their fields. Finally, state officials cite financial disincentives to closing crossings. While railroad crossing improvements such as lights and signals are eligible for 100-percent federal funding, the

⁸Highway-Rail Crossing Elimination and Consolidation, 1994 AASHTO-National Conference of State Railway Officials.

costs associated with closures require a 10-percent local match—a match that some localities have been unwilling to make.

In response to the financial disincentives to closing crossings, DOT proposed in 1994 to eliminate the local match and give local communities up to a \$15,000 award for closing public railroad crossings. The section 130 program would provide one-half of the up to \$15,000 award, and the railroads would provide the other half. However, state officials we interviewed stated that the \$15,000 incentive was too low to be effective. FHWA officials responded that states have used both section 130 and other federal-aid funds to help pay for closures and noted that if the incentive is coupled with the elimination of the local match required for closure projects, more local communities may be induced to close crossings.

Although DOT's proposal may provide greater financial incentives to close crossings, the authority to open and close crossings remains a state and local responsibility. The federal government exercises no regulatory authority in this area. Currently, there are no federal standards or guidelines that describe under what circumstances a crossing should be closed. Therefore, a state body with the authority and willingness to close crossings often becomes the key factor to successful closings. The Illinois Commerce Commission provides a good example of what can be accomplished over time by aggressive state action. The Commission has had the authority to order crossings closed for safety reasons alone, following a public hearing. In 1955 through 1993, the Commission closed 678 public railroad crossings—about 17.4 closed crossings each year. This number compares to the national average of about five crossings closed per state each year, which is based on a 1994 Alabama Highway Department survey of states with active closure initiatives. Greater state action to close crossings is therefore an important element in the overall approach to reducing railroad crossing fatalities and accidents.

DOT Is Funding Innovative Technologies

Innovative technologies offer useful options to improve railroad crossing safety, particularly in rail corridors (along a specific train route, highway, or geographic boundary) and at the most dangerous rail-highway crossings. DOT is supporting the development of several innovative technologies for railroad crossings through FRA's High-Speed Rail program. These technologies represent the next step in improving safety at crossings. Some of these systems are designed to positively prevent a motor vehicle from entering the crossing; therefore, they provide a higher level of safety than warning lights and gates. However, innovative

technologies are likely to cost more than active warning devices, the most common engineering solution to crossing problems. Although their costs limit widespread application under the Rail-Highway Crossing Program, these technologies are generally less expensive than grade separations.

Table 3.3 compares the costs of two standard methods the states use to improve crossings—grade separations and flashing lights and gates—to the four innovative technologies sponsored by DOT. The four innovative technologies—Four Quadrant Gates, Friendly Mobile Barriers System, Low-Cost Grade Separation, and Dagnet Vehicle Arresting Barrier—are at different stages of development or deployment and have projected costs of between \$500,000 and \$1 million per crossing.

Table 3.3: Cost Comparison of Railroad Crossing Safety Technologies

Type of improvement	Estimated costs per crossing
Standard Grade-Separation	\$3,000,000
Flashing Lights and Gates	\$ 150,000
Improved Four Quadrant Gates	\$1,000,000
Friendly Mobile Barrier	\$1,000,000
Low-Cost Grade Separation	\$ 950,000
Vehicle Arrestor Net	\$ 500,000

Source: FRA's, FHWA's, states', and GAO's analyses

The Four Quadrant Gates technology is an ongoing project in Connecticut. The approach installs four gates, rather than the traditional two gates, at a crossing. In addition, advanced circuitry in the gates and along the rail lines provide an early warning system for the engineer of any oncoming trains. If the gates are malfunctioning or a vehicle is stuck between the four gates, the system warns the engineer in time to stop the train before it reaches the crossing. FRA currently estimates this system will cost \$1 million per crossing.

The Friendly Mobile Barriers system, being developed in Virginia, consists of a barrier wall that rises up from the roadway after standard gates have come down. The barrier effectively prevents a vehicle from entering the crossing by blocking the road. The system is designed to absorb the energy of a vehicle which strikes it, thus averting fatal injury to the occupants. FRA currently estimates the cost to install this system at one crossing at \$1 million.

The Low-Cost Grade Separation Project in Florida is an attempt to develop a grade separation that can be constructed at less cost and in half the time of conventional grade separations. The new design will use soil rather than concrete to shore up the walls supporting the bridge portion of the separation. FRA estimates that a Low-Cost Grade Separation will cost \$950,000 per crossing; however, costs may vary at different locations.

The Illinois Dagnet Vehicle Arresting System augments existing crossing gates with a net restraining barrier lowered from roadside towers. The net, designed to stop a moving vehicle, uses technology currently in place in Chicago to prevent vehicles from improperly entering reversible highway lanes. The Dagnet Vehicle Arresting Barrier test cost \$950,000, but Illinois DOT officials estimate that the system will cost \$500,000 per crossing when it is commercially deployed.

The innovative technologies are unproven and will cost more than existing flashing lights and gates, which cost about \$150,000 for each crossing. Furthermore, the states' section 130 apportionments are too small for widespread application of these technologies. For example, the \$1 million needed to deploy four quadrant gates at a single crossing would deplete the annual section 130 apportionments of nine states. On the other hand, as an alternative to the estimated \$3 million cost of a grade separation, innovative technologies may prove useful to improve safety at dangerous crossings that continue to have accidents despite the presence of traditional lights and gates.

Grade separations are generally more expensive than many of these innovative technologies, but the costs differ throughout the nation. A 1993 state engineering study of 60 grade separations along a rail corridor between Chicago and St. Louis found an average cost of \$3 million per separation; the costs ranged between \$2 million and \$5.4 million. The range resulted from differences in the number of highway lanes, railroad tracks, and bridge length. According to FHWA officials, the high costs explain why few grade separations are funded with section 130 funds; 31 states receive annual program allotments of less than \$3 million—the average cost of one separation. As a result, grade separations often must be cost-justified on a basis other than the safety impact on accidents, fatalities, and injuries. Although the states are developing engineering techniques to reduce the costs of grade separations, active warning devices will remain the engineering solution of practical choice for most states to resolve railroad crossing safety problems.

Engineering Strategies Are Being Applied Using a Corridor Approach

The corridor approach can allow states to more efficiently improve crossings along a specific train route, highway, or geographic boundary, rather than improving individual crossings scattered throughout a state. The best mix of closings and engineering solutions can be applied to an entire corridor. With the identification of Principal Rail Lines by FRA and the National Highway System (NHS) by the Congress, natural candidates for corridor reviews may soon exist.

Analyzing railroad crossing corridors offers the states and railroads many advantages in assessing railroad crossing safety. For the states, the corridor approach allows diagnostic teams to perform more on-site reviews of crossings and to identify and improve potentially hazardous crossings before they become high-risk situations. Corridor reviews can identify redundant crossings as candidates for closure in conjunction with safety upgrades of the remaining crossings. In addition, both the states and the railroads benefit from reduced paperwork since they can develop a single master agreement to cover improvements at several crossings. For the railroads, the advantages include (1) designing and installing signal circuits in a common and comprehensive way, rather than customizing each signal circuit; (2) reducing labor costs through the more efficient scheduling of work crews and reduced travel time; and (3) reducing procurement and shipping costs by ordering equipment and materials in larger quantities. These advantages can reduce project costs for the states.

A drawback to the states' use of the corridor approach is that a state could spend a large portion of its railroad crossing dollars in a specific geographic area. This could be at the expense of other parts of the state that also have relatively hazardous crossings but do not have defined corridors. The problem is complex because the section 130 program requires the states to develop and use a priority ranking system that numerically orders each crossing on the basis of the potential risk of an accident. Under the corridor approach, teams review all the crossings for improvement or closure, even those which are not high on the priority ranking. As a result, by applying a corridor approach, a state can achieve wider coverage of improvements and discover candidates for closing, but it will not always improve those crossings with the highest rankings.

While FHWA has encouraged the use of the corridor approach by the states, we found that the states used different methods in selecting corridors for crossing improvements. For example, Indiana solicited requests from local governments for corridor improvement projects, while Ohio selected corridors that included crossings near the top of the state's priority

ranking list. While FHWA officials believed some variation of a corridor approach was common among the states, they did not know how many states actually used the corridor approach nor in what form.

The corridor approach may become more important because of DOT's actions defining rail corridors and expected congressional action defining the NHS. FRA has defined a national network of existing Principal Rail Lines. Principal Rail Lines carry passenger traffic and the heaviest rail traffic and will correspondingly have higher potential for crossing accidents. In addition, the Congress will designate the NHS in 1995. The NHS, composed of the nation's interstate system and other high-volume highways, will carry over 40 percent of all vehicle miles travelled and 70 percent of commercial truck traffic. The confluence of these systems will define geographic areas in the states that combine heavy vehicle and rail traffic and thereby produce greater potential for crossing accidents and fatalities. These areas may offer the starting point for applying the corridor approach to improving railroad crossing safety. In addition, DOT has proposed eliminating all railroad crossings on the NHS and establishing a \$15 million incentive program to encourage the states to use the corridor approach more extensively. The \$15 million would be funded from the STP and would be in addition to the section 130 funds. This would eliminate the competition between higher-hazard individual crossings and corridors.

Education and Enforcement Can Change Motorists' Dangerous Behavior

Motorists' behavior is an important factor in railroad crossing accidents and fatalities. For example, nearly 50 percent of all crossing fatalities in 1993 occurred at crossings where active warning devices had been installed to warn motorists about the approaching dangers. To address motorists' behavior, the states have successfully used greater education and law enforcement programs.

Education/Enforcement Programs Reduce Fatalities at Railroad Crossings

Although current and proposed technologies may reduce the number of accidents and fatalities, engineering solutions alone will not change human behavior that leads a motorist to ignore flashing lights and drive around descended gates. Federal and state transportation officials have found that education and enforcement efforts can aid states' efforts to further reduce accidents and fatalities by alerting motorists to the dangers at railroad crossings.

Many states, particularly those with many railroad crossings, face a dilemma. In October 1994, 35 percent of railroad crossings in the United

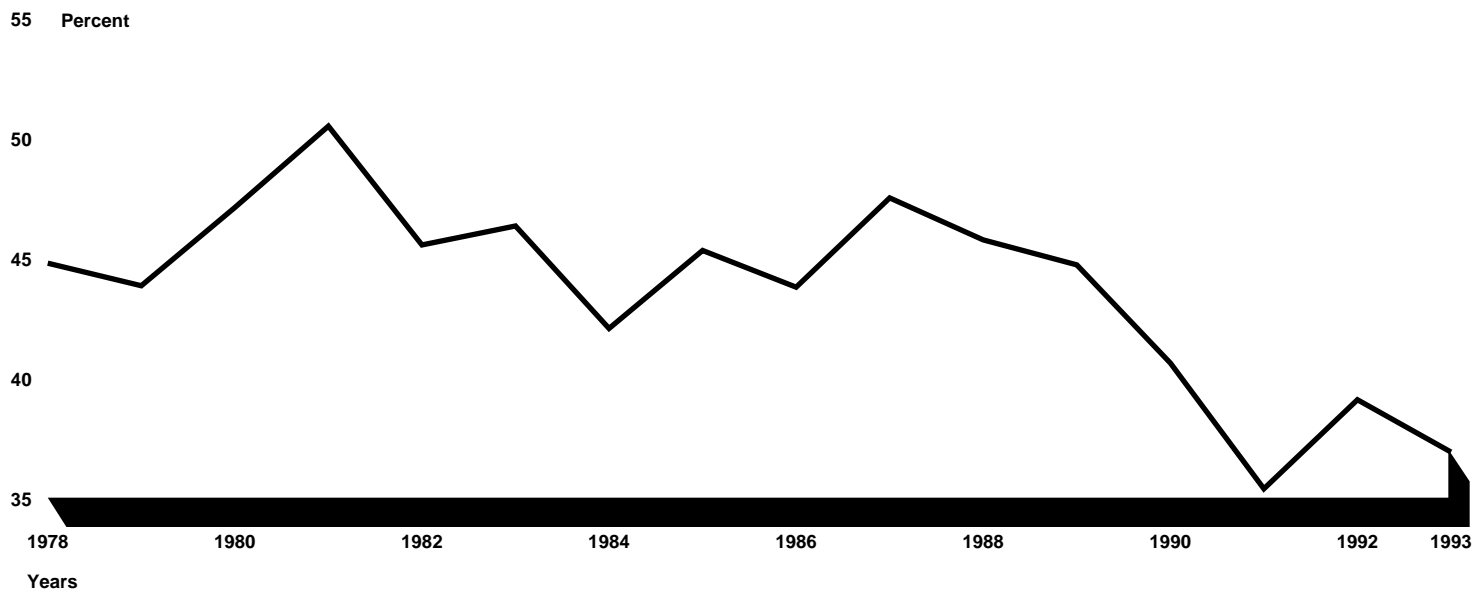
States had active warning devices, but in 1993—the most current data available from FRA—50 percent of all crossing fatalities occurred at these locations. For example, Texas and Illinois have installed active warning devices at 34 and 47 percent, respectively, of their railroad crossings. However, over one-half (54 percent) of the fatalities in Texas and two-thirds (68 percent) of the fatalities in Illinois occurred at crossings with flashing lights or lights and gates. Officials in these states, as well as federal officials, stated that greater public education on railroad crossing dangers is needed to help change motorists' reckless behavior.

Our review of a state with an active education and enforcement program—Ohio—found that the state had reduced accidents at crossings with active warning devices from 377 in 1978 to 93 in 1993—a 75-percent decline. During the same period in Ohio, the proportion of accidents at crossings with active warning devices declined by 8 percent, from 45 to 37 percent of total accidents, as figure 3.2 indicates.

Ohio demonstrates how states with a relatively high number of accidents can successfully use education and enforcement programs to improve railroad crossing safety. Ohio's Operation Lifesaver was established in 1978 in an attempt to employ educational events and enhanced law enforcement as a means to reduce railroad crossing accidents and fatalities. The program has a full-time coordinator and 280 volunteers. Its education and enforcement efforts have helped Ohio reduce accidents at railroad crossings, especially those with active warning devices.

Ohio focuses on educating certain segments of the populace on the consequences of violating railroad crossings warnings. To change potentially dangerous behavior, Ohio has used three approaches—Officer-on-the-Train, Trucker-on-the-Train, and mock train crashes—as education and enforcement tools. During Officer-on-the-Train events, law enforcement officials and the media ride in the train's cab to observe numerous motorists who try to cross despite an approaching train. When motor vehicle violations occur, such as cars going around a descended gate, participating law enforcement officials radio vehicle descriptions to local and state police situated near the crossings. The police officers, in turn, cite the motorist for the violation—a maximum of a \$100 fine and 2 points on the motorist's drivers license for a first offense. A second offense within 1 year will result in a maximum \$250 fine, 2 points on the motorist's drivers license, and 30 days in jail.

Figure 3.2: Proportion of Motor Vehicle Accidents in Ohio That Occurred at Crossings With Active Warning Devices, 1978-93



Source: GAO's analysis of FRA's data.

Trucker-on-the-Train uses the same approach to demonstrate railroad crossing safety problems but invites commercial vehicle operators in the train's cab to observe railroad crossing activity. In addition, Operation Lifesaver uses mock train crashes to visibly demonstrate the severity of train and motor vehicle collisions to school age children. State transportation and Operation Lifesaver officials in Ohio said that these events have contributed directly to reducing railroad crossing accidents and fatalities in the state.

Railroad Crossing Safety Is Not a Priority Education Program

Although federal and state highway officials agree that programs to educate motorists about the hazards at railroad crossings reduce accidents, this area has not received the same emphasis as other highway safety education programs. There are several reasons for this lack of emphasis. First, the Congress did not identify railroad crossing safety as a priority under NHTSA's section 402 program, and NHTSA officials stated that

the states we visited have generally not added optional program proposals in this area. Second, NHTSA officials do not believe that states would receive the same benefits from railroad crossing safety efforts as they would with other safety programs, such as increasing seat belt usage. As a result, other safety programs have higher priority than railroad crossing programs.

NHTSA's highway safety programs focus on improved vehicle safety and behavioral changes to improve the safety of drivers, passengers, and pedestrians. NHTSA's section 402 program is the federal government's basic formula grant program to support and improve state highway safety activities related to drivers' behavior. In fiscal year 1995, the Congress appropriated \$123 million for NHTSA's section 402 program.⁹

Under the section 402 program, the states may flexibly allocate their grants among nine national priority areas. The states may also use section 402 funds for projects in other areas, such as railroad crossing safety, if they provide documented evidence for the problem to NHTSA. The priority areas are intended to (1) enhance the safety of vehicle occupants; (2) reduce driving impaired by alcohol and drug usage; (3) reduce the hazards involved in operating motorcycles; (4) improve highway safety and the driving environment through highway design; (5) improve police traffic services; (6) improve emergency medical services and trauma care systems; (7) increase the safety of pedestrians and bicyclists; (8) improve traffic record systems; and (9) reduce speed-related crashes. Reducing speed-related crashes is a new priority that was added in December 1994.

NHTSA officials stated that the benefits associated with programs to reduce accidents and fatalities at railroad crossings are relatively small compared to the benefits associated with driver education programs that focus on areas such as complying with seat belt laws and avoiding drunk driving (both priority programs). As a result, railroad crossing safety is not a section 402 priority program. NHTSA does not maintain information on whether the states had used section 402 funds for railroad crossing safety initiatives. However, we did obtain limited information from Operation Lifesaver, Incorporated. In 1993, Operation Lifesaver reported that 13 states had used about \$189,500 of their section 402 funds to support their

⁹FHWA also is responsible for administering an engineering-related roadway safety program under section 402. FHWA funds are spent in four areas: the identification and surveillance of accident locations; highway design, construction, and maintenance; traffic engineering; and roadway aspects of pedestrian and bicycle safety. In 1995, the Congress appropriated a separate \$10 million for the FHWA portion of section 402.

Operation Lifesaver programs. This total represents less than two-tenths of 1 percent of the \$106 million allocated to the states under section 402 programs in 1993. The grants for Operation Lifesaver ranged from \$2,500 to \$50,000 in each state. Of the five states with high accident rates that we reviewed, in 1993 only Indiana spent any NHTSA section 402 funds for additional railroad crossing education and enforcement, a total of about \$2,200.

According to a NHTSA regional official, the modest expenditures on railroad crossing safety programs may reflect the states' inability to decide which actions would best address their railroad crossing safety problems or the fact that railroad crossing accident casualties are relatively few, compared to other highway accidents. In addition, the low expenditures may also be attributed to the fact that NHTSA had not in the past emphasized railroad crossing safety. In November 1994, as part of the Department's action plan, NHTSA instructed its field staff to advise the states that section 402 funds could be used to address "significant rail crossing problems." However, the NHTSA memorandum does not define what would constitute a significant rail crossing problem that would allow the states to use section 402 funds.

Conclusions

Given the limited resources available for railroad crossing safety, it is crucial that available funds be targeted to the most cost-effective approaches. The first means to target limited resources is to review the current method DOT uses to apportion section 130 dollars to the states. DOT is currently exploring different funding formulas that would allocate money based on risk. The second means to target railroad crossing resources is to focus available dollars on strategies that offer the greatest benefits for reducing railroad crossing accidents. Traditional lights and gates have been shown to be cost-effective when installed, yet they provide only a warning, not positive protection at the crossing. For this reason, new technologies, although more expensive, may be justified where accidents persist at signalled crossings or where danger to rail passengers becomes an issue. In addition, the states can do more than rank individual crossings, as FHWA requires. They can close more crossings and, where appropriate, apply the corridor approach.

Although engineering solutions are part of the overall strategy to reduce accidents and fatalities, there will always remain the problem of motorists disregarding warning signals. Therefore, affecting drivers' behavior through greater education and enforcement is a critical strategy.

Emphasizing railroad crossing safety under section 402 is one means by which railroad crossing education becomes an institutional part of a state's highway safety program.

Agency Comments

The National Highway Traffic Safety Administration commented that the role of the states in defining section 402 programs needed to be emphasized in the report. We have modified the report where appropriate and have clarified the importance of the states.

DOT's Action Plan

DOT sets an ambitious agenda for improving the safety of the nation's railroad crossings in its Rail-Highway Crossing Safety Action Plan. Its goal is to reduce the number of railroad crossing accidents and fatalities by 50 percent between 1994 and 2004 by coordinating the resources of the federal government, states, and private sector. DOT is making progress in carrying out many of these proposals. However, a number of the proposals are dependent on the actions of states or the Congress to ensure full implementation. In addition, DOT does not have an estimate of how much the plan's proposals will cost. Without this information, it will be difficult to determine and arrange for financing to implement the proposals and to assess the cost-effectiveness of the implemented actions. In addition, DOT has not developed an evaluation approach to assess the impact of the plan in contributing to railroad crossing safety.

Action Plan Requires Coordination Among Many Stakeholders

Many groups play essential roles in railroad crossing safety. In recognition of the seriousness of the problem, the Secretary of Transportation directed the four surface transportation administrations (FHWA, FRA, FTA, and NHTSA) to collaborate in the development of a plan to address the problem. DOT's Rail-Highway Crossing Safety Action Plan, issued in June 1994, proposes to coordinate efforts to achieve the goal of reducing yearly accident and fatality totals to less than 2,500 and 300, respectively, between 1994 and 2004. The action plan contains 55 action proposals for improving railroad crossing safety. These proposals can be organized into three broad lines of effort that exemplify the need for cooperation among the major stakeholders in railroad crossing safety¹⁰:

Engineering: Thirty-two proposals concentrate on improving railroad crossing safety through applying various engineering solutions. DOT proposes that the Congress allow financial incentives to close crossings and establish separate funding to improve rail corridors. FHWA and FRA will provide guidance to states on how to conduct corridor reviews and close crossings. DOT also proposes working with the states to upgrade existing signs and markings and in the long term eliminate 2,250 high-volume crossings. FRA will work with the railroads and the states to more systematically and accurately update the U.S. DOT/AAR National Highway Rail Crossing Inventory. The plan also explores a number of new engineering technologies for improving railroad crossing safety under development by FRA and FHWA.

¹⁰Only 50 proposals target improving motor vehicle safety, while five proposals focus on trespasser problems. In addition, some action plan proposals are counted twice since they address more than one line of effort, such as law enforcement and education.

Education: Sixteen proposals relate to educating motorists, truck drivers, and others about the dangers present at railroad crossings. For example, NHTSA, FHWA, FTA, FRA, and Operation Lifesaver will meet and develop materials to promote the public's and youth's awareness of hazards at railroad crossings. NHTSA will work with the American Association of Motor Vehicle Administrators (AAMVA) to review driver training materials, and a DOT interagency group will develop new and updated materials. FRA, Amtrak, the American Trucking Association, and Operation Lifesaver will work together to develop a "Trucker on the Train" program to educate commercial drivers on hazards at railroad crossings. Finally DOT proposes that the Congress increase Operation Lifesaver funding by up to \$200,000 per year.

Law Enforcement: Thirteen of the proposals enhance federal, state, and local law enforcement efforts. For example, FHWA and NHTSA will work with the National Traffic Law Center to provide materials and technical assistance to prosecutors and judges on railroad crossing issues. The Transportation Research Board, under the direction of FRA, will develop an information package that will provide model rules for the states to follow in allowing photo enforcement at railroad crossings. FHWA will also work with AAMVA to propose making railroad crossing offenses a serious traffic violation.

FRA has taken the lead in coordinating the action plan and has responsibility for reporting progress to the Office of the Secretary. FRA and FHWA are the key agencies for implementing the plan; they are responsible for 40 of the proposals. As of May 1995, DOT agencies were making progress in implementing 39 of the 50 proposals. Seven of the 39 proposals are complete, although some of the remaining 32 were intended to be continuing efforts. However, in order to fully complete the plan, DOT must rely not only on cooperation among its own modal agencies, but on the cooperation of state and local governments, Operation Lifesaver, and the railroads.

DOT Cannot Independently Implement Several Proposals

The success of some proposals in the plan depends on how well DOT can encourage states, either with or without incentives, to complete or take advantage of them. The success of others depends on whether DOT can obtain the required congressional approval to use existing funds in new ways.

Success of DOT's Action Plan Relies on States' Decisions

DOT's ability to secure the benefits of its action plan will depend, in large part, on the Department's ability to encourage the states to implement the plan's actions. DOT does not have the authority to direct states to implement many of the plan's proposals, regardless of how important they are to achieving DOT's goal. Therefore, to give these actions the best chance of success, DOT must rely on either providing incentives to states to complete them or presenting strong cases for why each is in the states' best interest.

For example, DOT plans to encourage the states to use NHTSA section 402 funds on activities directed at improving railroad crossing safety. In November 1994, NHTSA advised the states that they could use section 402 funds to target public education, engineering, and law enforcement strategies to address significant local railroad crossing problems. However, it is still the states' decision to designate section 402 funds for railroad crossing safety programs. If railroad crossing safety remains a relatively low priority at the state level, allowing the states more flexible use of section 402 funds could have little impact on helping DOT meet its goal.

The success of federal efforts to ensure the accuracy of the DOT/AAR National Highway-Rail Crossing Inventory also depends on the states' cooperation. This inventory of all the crossings in the United States contains information describing the physical characteristics of the crossings and the volume and frequency of train and motor vehicle traffic occurring at the crossings. As required by FHWA, the states must maintain an inventory of all the crossings located within their boundaries. However, the states that maintain their own inventories are not required to update the national inventory. Consequently, although the inventory is the only national resource of its kind, portions of it are out of date, as DOT noted in its action plan. While FRA has begun a rulemaking to require the railroads to update rail operations data and provide the information to the states, there is no requirement that the states update the highway traffic data needed to complete the inventory. DOT's success in fully carrying out this proposal depends on how effectively it can convince the states to keep FRA's inventory up to date.

Finally, DOT will encourage the states to upgrade signing and markings at crossings, consider installing STOP signs where warranted, and clear vegetation obstructing motorists' view of approaching trains. All of these actions hold the potential for improving safety by making drivers more

aware of the potential dangers at crossings. However, these actions will compete for financial resources against all other state highway priorities.

DOT Needs Congressional Approval for Key Proposals

DOT is seeking the congressional authority to implement five key proposals because DOT seeks to allocate and use STP funds in a manner not currently allowable under ISTEA. The five proposals would (1) change the method used to apportion section 130 funds to the states, (2) use STP funds to pay local governments a bonus to close railroad crossings, (3) eliminate the local match for the costs associated with closing crossings, (4) establish a \$15 million program to encourage states to improve rail corridors, and (5) use STP funds to increase federal funding of Operation Lifesaver.

DOT's action plan proposes that FRA and FHWA initiate a study of the effectiveness of the method used to apportion section 130 funds to the states. DOT is evaluating alternative criteria that would change the apportionment formula. Although the action plan called only for DOT to issue its recommendations for changing the apportionment method, DOT cannot implement these recommendations unless the Congress passes legislation changing ISTEA.

Congressional action would also be needed to implement two crossing closure proposals. In June 1994, the administration submitted legislation to the Congress that would (1) allow Rail-Highway Crossing Program set-aside funds to be used as bonuses to local governments when they closed crossings and (2) made closure costs eligible for 100 percent federal funding. The bonus initiative would provide local governments \$7,500 in federal funds and an additional \$7,500 from the railroad for each crossing closed. The local government would then use the federal bonus portion for other transportation safety improvements. The second feature of the legislation called for modifying ISTEA to include crossing closure projects among those STP projects eligible for 100 percent federal funding. According to DOT's action plan, a state or local matching requirement for a closure project amounts to a disincentive to close the crossing, because no matching requirement exists for installing lights and gates under section 130. Currently, DOT cannot allow STP funds to be used as bonuses or incentives.

The fourth proposal requiring legislative action would establish an incentive program to encourage the states to use the corridor approach. The proposed incentive program would set aside \$15 million from STP funds each year and be distributed to states with aggressive corridor

programs. For the same reasons that DOT has concluded it cannot use STP funds as incentives to close crossings, DOT also is seeking the authority to create this incentive program set-aside.

For the fifth proposal, DOT has not increased Operation Lifesaver funds from the current ISTEA authorized level of \$300,000 to the action plan proposal of \$500,000. Although the action plan proposes a number of actions to educate truck and bus drivers about the dangers present at crossings, it relies heavily on Operation Lifesaver to educate the general public. Currently, FHWA funds Operation Lifesaver through its Administration and Research budget. Although the action plan proposed to use STP funds to pay for this increase, DOT does not have the authority to use STP dollars to fund Operation Lifesaver. The Congress approved a \$100,000 increase for Operation Lifesaver in FHWA's fiscal year 1995 budget. However, additional funds to reach the goal of \$500,000 would need further congressional approval.

Action Plan Needs Cost Data and Evaluation Component

DOT has not specified the full costs and financing associated with the proposals contained in its action plan. Of particular concern is that DOT has not determined the cost of the proposal to eliminate crossings where the proposed NHS intersects Principal Rail Lines (PRL). In addition, DOT has not developed a way to systematically evaluate various proposals to determine their effectiveness.

Cost Data Would Clarify Implementation Requirements

While progress has been made toward implementing many of the action plan's proposals, the plan requires additional information to determine the effectiveness of many of the proposals. DOT has not developed an overall cost estimate for completing the plan or determined how the plan would be financed. Specifying this information is critical to determine whether adequate funding exists to carry them out. Although most proposals rely on reallocating existing staff and funding, others will require additional resources and are potentially costly.

For example, one of the key action proposals in the plan includes a long-term goal of eliminating the estimated 2,250 crossings where the proposed NHS intersects with PRLs. The NHS and PRLs are high-volume roadways and rail corridors, respectively. Because the NHS and PRLs are vital to the nation's interstate commerce, closing these crossings is generally not feasible. The alternative is to construct a grade separation—an overpass or underpass. While the action plan cites

eliminating crossings as a goal, it does not estimate the cost to separate the grades at NHS/PRL intersections. In chapter 3, we found that grade separation costs could vary between \$2 million to \$5 million at individual crossings. Therefore, the cost of grade-separating all NHS/PRL crossings would be between \$4.5 billion and \$11.3 billion. While eliminating these crossings is a long-term goal, grade separations will constitute a major infrastructure investment commitment.

**Evaluation Component
Would Help Assess
Effectiveness of Initiatives**

The action plan also lacks a process for assessing the effectiveness of ongoing or completed proposals in reducing accidents. Lacking such a process, DOT risks (1) spending its resources on proposals of questionable value at the expense of potentially more useful actions and (2) missing opportunities for improving ongoing proposals. Follow-up studies, qualitative or quantitative, could help DOT evaluate whether

- the \$15,000 incentive is high enough to entice localities to agree to close crossings, how many crossings the incentives helped close, and the cost savings and risk reductions these closures achieved;
- efforts to promote corridor reviews were leading to increases in the number of crossings being improved or closed;
- educational proposals were improving motorists' behavior at railroad crossings;
- motorists were obeying railroad crossing traffic laws as a result of enhanced law enforcement efforts; and
- research efforts were developing and implementing cost-effective proposals for improving railroad crossing safety.

Evaluation can identify mid-course corrections needed to make initiatives more effective. For example, as discussed in chapter 3, DOT's plan proposed providing local governments a \$15,000 cash incentive to close crossings. However, state officials indicated that the incentive may be too low to prompt local jurisdictions to close crossings. If this proposal is instituted, the DOT plan includes no means to identify how many crossing closures result or whether the amount of the incentive should be changed.

DOT also proposes a number of efforts directed at educating truck and bus drivers about the dangers present at railroad crossings. However, at present, the action plan includes no way of determining the results of these efforts. Although evaluating each of these proposals individually may be difficult, groups of proposals could be analyzed by DOT to determine whether motorists' awareness or behavior changed as a result

of implementing these actions. DOT could then use this information to decide whether more educational efforts are needed or certain efforts should be dropped. DOT officials stated during our exit conference on this report that they were beginning discussions among the modes responsible for the action plan as to how an evaluation component could be incorporated into the action plan proposals.

Conclusions

DOT's Rail Crossing Safety Action Plan, has laid out a series of federal/state/private sector partnerships across a spectrum of issues critical to rail crossing safety. DOT has made progress in implementing many of the proposals cited in its plan. However, to complete the plan, DOT depends not only on the active support of its modal agencies but on the support of the states and the Congress as well. The success of key proposals in the plan, such as better targeting of funds to the states, increased use of the corridor approach, and closing unneeded and redundant crossings, hinges, in large part, on how well DOT can work with the states and the Congress to help it implement the proposals. Only through a genuine partnership can federal and state governments and the rail industry achieve a significant improvement over current levels of safety.

To clarify the nature of this partnership and the level of commitment needed to achieve the plan's goal of reducing accidents and fatalities by 50 percent before 2004, it is critical for DOT to develop cost estimates and to arrange for funding sources for its proposals. Before undertaking goals requiring long-term financial support and policy changes, DOT should establish the level of resources required from the Congress to meet the objectives. Similarly, follow-up information is needed to assess the proposals' effectiveness in meeting the goal. Until DOT has (1) identified clearly the costs associated with the plan, (2) developed a strategy to assess the impact and effectiveness of the initiatives in improving railroad crossing safety, and (3) arranged for financial resources and policy changes needed to implement the initiatives, DOT's success in achieving the goals set forth in its action plan will remain uncertain.

Recommendations

To strengthen the DOT action plan and improve railroad crossing safety, we recommend that the Secretary of Transportation, in cooperation with the states,

-
- develop cost estimates and identify funding sources for action plan proposals and
 - evaluate the cost and effectiveness of the action plan as it is implemented.

Agency Comments

FRA believed the tone and content of the report did not give adequate credit to DOT for developing and implementing the action plan. We have modified the report where appropriate. While we recognize that the plan is an important DOT initiative, the value of the plan ultimately lies in its success in reducing accidents. Because DOT is still in the process of gaining congressional approval and implementing the plan, we could not yet assess the impact of all the initiatives on safety. Implementing our recommendations should enhance the plan by providing important information on funding sources and the plan's effectiveness in achieving its goals.

Descriptions of Action Plan Proposals Directed at Railroad Crossing Safety by Lead Agency, and Status as of May 23, 1995

Seventeen Proposals Led by the Federal Railroad Administration

Rules of Evidence: The Federal Railroad Administration (FRA) will monitor the Transportation Research Board's efforts to help the states redefine their rules of evidence for traffic cases by developing model rules that would allow traffic citations to be issued and enforced on the basis of photographs or video images obtained from unmanned cameras. Effort: Law enforcement; Status: Ongoing.

Compilation of State Laws and Regulations on Matters Affecting Highway-Rail Crossings: FRA, with the cooperation of the Federal Transit Administration (FTA), National Highway Traffic Safety Administration (NHTSA), and Federal Highway Administration (FHWA), will begin updating the Compilation of State Laws and Regulations on Matters Affecting Rail-Highway Crossings, last published by FHWA in 1983. Effort: Law enforcement; Status: Ongoing.

Safety Inquiry (Enforcing Railroad Operating Rules): FRA will hold a meeting to discuss ways to enforce railroad operating rules for trains, locomotives, or cars standing: (1) within a specified distance of a multitrack passive crossing or (2) on warning device track circuits not equipped with time-out equipment. Effort: Law enforcement; Status: Not started.

Principal Railroad Lines (PRL): FRA will nominate PRL corridors for review by considering current and projected highway and rail traffic densities and accident experience. Effort: Engineering; Status: Ongoing.

Responsibilities for Selection and Installation: FRA will review the present system of allocating responsibility for selecting and installing signal devices at public railroad crossings. The Department of Transportation will review the need for nationally uniform standards for establishing the need for, and appropriate type of, warning devices at all public crossings. Effort: Engineering; Status: Ongoing.

Crossing Consolidation and Closure Case Studies: FRA will prepare three studies on closing crossings. The first report will be a "how-to" guide on closing crossings. This guide, geared toward state and railroad officials, will be a compilation of the successful strategies for closing crossings derived from a number of case studies. The second report will illustrate the consolidation process through describing a limited number of case studies. The third report will recommend options to increase the rate of crossing consolidation. This study will be based on an analysis of case studies and suggestions of railroad and state officials who have been

actively involved in crossing consolidation projects. Effort: Engineering; Status: Ongoing.

National and Community Service: Pursuant to the National and Community Service Trust Act of 1993, FRA will explore the possibility of assigning national service participants to support Operation Lifesaver State Coordinators. Effort: Education and law enforcement; Status: Not started.

Define Categories: FRA will define four categories of private crossings: farm, residential, recreational, and industrial. Subcategories may also be defined, and a general approach and schedule will be developed for addressing each. As appropriate, FRA will define minimum safety requirements, warning device standards, and responsibilities beginning with the category with the most severe problems. Effort: Engineering; Status: Ongoing.

Safety Inquiry (Defining Minimum Safety Standards at Private Crossings): FRA will hold a meeting to consider defining minimum safety standards for private crossings or certain categories of private crossings, up to and including standards for closure and consolidation under certain conditions. The meeting will address allocating responsibilities and costs among the parties associated with private crossings and resolving potential ensuing disputes. Effort: Engineering; Status: Not started.

Locked Gate at Private Crossings: FRA will contract to investigate and possibly demonstrate the feasibility of placing gates with remotely activated cipher locks at private crossings. Effort: Engineering; Status: Ongoing.

Research Workshop: FRA will plan a workshop to bring together highway safety, law enforcement, and rail and transit industry officials; governors' highway safety representatives, academia; consultants; and federal researchers to discuss current and projected research and needs. Effort: Education, law enforcement, and engineering; Status: Completed.

Defense Conversion Fair: FRA will plan an exchange program to introduce defense-oriented research firms to highway-rail crossing technology and research needs. Effort: Engineering; Status: Ongoing.

Train Horns: FRA, with the Association of American Railroads' (AAR) assistance, will study the safety impact of whistle bans nationwide to

consider whether federal action is required. FRA will sponsor research at the Volpe National Transportation Systems Center to develop a locomotive warning signal that minimizes noise for communities. The Volpe Center also will investigate alternative systems, such as audible warning devices installed directly at crossings. In addition, FRA and the Volpe Center will continue to monitor other public and private efforts and explore the possibility of providing test and evaluation support for these efforts. Effort: Engineering; Status: Ongoing.

Locomotive Conspicuity: FRA will issue final regulations specifying locomotive lighting standards to enhance the visibility of trains. Effort: Engineering; Status: Ongoing.

Automated Video Image Analysis: FRA will explore the potential for using live, computer-monitored video images to detect intrusions onto rail rights-of-way at railroad crossings and ensure warning devices are functioning properly. Effort: Law enforcement and engineering; Status: Ongoing.

1-800 Computer Answering System: FRA will develop an automated, pc-based telephone answering and message forwarding system to field calls concerning crossing signal malfunctions or other problems at crossings. The system will use the U.S. DOT/AAR National Highway-Rail Crossing Inventory numbering system for locating crossings. FRA will hold a meeting to consider requiring the display of the U.S. DOT/AAR inventory number and a toll-free 1-800 telephone number at all crossings to facilitate notification. Effort: Engineering; Status: Ongoing.

Resource Allocation Procedure: FRA will update the accident prediction, severity prediction, and resource allocation formulas it provides to states and railroads to account for more recent data, such as costs and accident experience. Effort: Engineering; Status: Ongoing.

Twenty-One Proposals Led by FHWA

Commercial Driver's License: FHWA will work with the American Association of Motor Vehicle Administrators to survey how states currently treat violations of railroad crossing traffic laws and examine the need for rulemaking to make such violations "serious traffic violations" on a Commercial Driver's License. Effort: Law enforcement; Status: Ongoing.

The National Highway System (NHS): FHWA will encourage that Statewide Transportation Improvement Programs and Safety Management Systems

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(SMS) fully address the upgrading or elimination of railroad crossings on the NHS and give priority to the long-term goal of eliminating NHS/PRL crossings. Effort: Engineering; Status: Ongoing.

Upgrade Signing and Marking: FHWA will work with FRA and the states to increase the visibility of signs and markings at railroad crossings by encouraging the widespread use of high-grade, long-lasting reflective materials. Effort: Engineering; Status: Ongoing.

STOP Signs: FHWA, with the aid of FRA, will encourage state and local governments to consider installing STOP signs at railroad crossings where warranted and provide them listings of candidate crossings. FHWA will clarify current federal regulations to indicate that federal funds are eligible to install STOP signs at multitrack crossings. Effort: Engineering; Status: Ongoing.

Payments from Section 130 to Locals for Closures: DOT will propose legislation to allow states to use Surface Transportation Program funds set aside for the Rail-Highway Crossings Program to pay localities to close crossings. States could spend up to \$7,500 per crossing, but the amount paid would have to be matched by the railroad(s) involved. Also, the federal funds could be used only for other transportation safety improvements. Such a program could be implemented only after a state has established a state-wide procedure for reviewing the need for any new public railroad crossings. Effort: Engineering; Status: Legislation needed.

Make Closures Eligible for 100 Percent Federal Funding: DOT will propose legislation to modify Title 23 U.S.C. 120(c) to include crossing closure projects among those STP projects that are eligible for 100 percent federal funding. Effort: Engineering; Status: Legislation needed.

Checklist: FHWA, with FRA's assistance, will develop a "checklist" of items to be considered in a corridor analysis. This checklist will include warning device and crossing improvement options, as well as a discussion of crossing consolidation. Effort: Engineering; Status: Ongoing.

Highway-Rail Crossing Handbook: FHWA, with the cooperation of FTA, NHTSA, and FRA, will start updating the Railroad-Highway Crossing Handbook, last published by FHWA in 1986. Effort: Engineering; Status: Not started.

Corridor Review Participation: DOT will propose legislation to establish an incentive program for state and local governments to participate in reviews and safety improvements on a corridor basis. One possible scenario would set aside \$15 million of STP funds each year, in addition to the existing Rail-Highway Crossings Program funds, as an incentive fund pool. This pool fund would be distributed to states with aggressive corridor programs to off-set corridor improvement costs—either on a first come/first served basis or in amounts proportional to total corridor improvement costs incurred by the participating states. Effort: Engineering; Status: Legislation needed.

Distribution of Funds: FHWA, in cooperation with FRA, will begin studying the formulas for distributing Rail-Highway Crossings Program set-aside funds to states to define a more appropriate method, possibly based on the number of crossings and accidents in each state. Effort: Engineering; Status: Legislation needed.

On-Guard Notice: FHWA will publish and distribute to all 270,000 interstate motor carriers an On-Guard notice to alert the truck and bus industry of the dangers present at crossings. Effort: Education; Status: Completed.

Advisory Bulletin: FHWA will send an advisory to the trade press about the danger of accidents at crossings. Effort: Education; Status: Completed.

Public Service Print Advertisements: FHWA will prepare public service print advertisements on truck and bus accidents at railroad crossings for the trade journals. Attention will be given to ensuring that the articles reach state and local trucking association newsletters. The public service messages will be published and distributed to 4,500 potential carriers. Effort: Education; Status: Completed.

“Trucker on the Train” Program: FHWA will work with Amtrak, the American Trucking Association, Brotherhood of Locomotive Engineers, Operation Lifesaver, and FRA to create a “Trucker on the Train” program where motor carrier executives and drivers accompany train engineers on the engine of a train to view first-hand dangerous railroad crossings. Effort: Education; Status: Ongoing.

Operation Lifesaver: FHWA will encourage Operation Lifesaver staff to meet with trucking companies and associations to discuss the dangers present at railroad crossings. Effort: Education; Status: Ongoing.

National Safety Organizations: FHWA will address railroad crossing safety at meetings of national safety organizations, such as the International Association of Chiefs of Police. The agency will also discuss the issue with industry executives at the next National Motor Carrier Advisory Committee meeting. Effort: Education; Status: Ongoing.

On-Site Compliance Reviews: FHWA's Office of Motor Carriers field staff and state personnel will inform motor carriers of the risks at railroad crossings during on-site compliance reviews. Effort: Education; Status: Ongoing.

Operation Lifesaver Matching Funds: DOT will propose legislation to increase FHWA's grant to Operation Lifesaver to an amount not to exceed \$500,000 annually. Any portion of the funding in excess of the current grant of \$300,000 would be available to Operation Lifesaver only if it matches the increased amount through its own fund-raising mechanisms outside of the public sector. The entire amount of the FHWA funding would come from STP funds set aside for the Rail-Highway Crossings Program. Effort: Education, law enforcement; Status: Legislation needed.

Signs and Signals: FHWA, in coordination with FRA, will start to conceptualize a number of new railroad crossing warning devices, such as devices informing motorists in advance of whether an active or passive warning system is located at the crossing ahead, and devices informing motorists of the direction from which a train is approaching the crossing. Effort: Engineering; Status: Not started.

Manual on Uniform Traffic Control Devices (MUTCD): FHWA, FRA, and FTA will begin work to propose changes and additions to the MUTCD dealing with each of the following:

- Warrants for warning devices to be used at crossings hosting high-speed rail operations;
- A new passive sign for high-speed rail crossings;
- Standards for temporarily closing a road (e.g., signing needed to accommodate the placing of a barrier in the road);
- A supplementary multitrack plate for STOP and YIELD signs;
- Work zone and traffic control standards for highway projects that include railroad crossings;
- A four-quadrant gate standard;
- Warning device standards unique to light rail operations; and

- A design standard for displaying the U.S. DOT/AAR Inventory number at each crossing.

Effort: Engineering; Status: Ongoing.

The Inventory: FHWA will begin exploring ways to encourage the states to update the U.S. DOT/AAR National Highway-Rail Crossing Inventory on a more systematic or cyclic schedule. The states will be encouraged to use the SMS as a means of ensuring that inventory data are updated. Additional methods of transmitting updates to FRA electronically will be explored. Effort: Engineering; Status: Ongoing.

Five Proposals Led by NHTSA

Section 402 Funds: NHTSA and FHWA will allow the states to spend section 402 funds on education, engineering, and law enforcement approaches to resolve significant local railroad crossing problems. Effort: Education, law enforcement, and engineering; Status: Ongoing.

Marketing Materials Plan: NHTSA, FHWA, FTA, FRA, and possibly Operation Lifesaver will meet periodically to develop programs and material promoting public and youth awareness of hazards present at crossings. When products are available, NHTSA regional staff will promote this material through Governors' Representatives to the appropriate organizations and officials. The states may use section 402 program funds to purchase or reproduce materials as well as to implement programs. Effort: Education; Status: Ongoing.

Driver Training Materials: NHTSA and the American Association of Motor Vehicle Administrators will review current driver training material relevant to crossing safety. NHTSA, FHWA, FTA, FRA, and possibly Operation Lifesaver will work together to select the best of this material, develop new and updated material, if necessary, and disseminate this material to the states. Effort: Education and law enforcement; Status: Ongoing.

Demographics: NHTSA will develop demographic data on those who die in highway-rail crossing accidents and help arrange and conduct "focus group" sessions in locales with high incident rates. Effort: Education; Status: Completed.

Accident Severity: NHTSA will investigate the cause of the trend toward increasingly severe crossing accidents, as well as countermeasures that might reverse the trend. NHTSA will use both their Fatal Accident Reporting

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System and FRA's Accident and Inventory data bases. Effort: Engineering; Status: Completed.

Three Proposals Led by FTA

Light Rail Crossing Gates for Left Turn Lanes: FTA will investigate applying railroad crossing gates and "pop up" barriers at crossings where motorists make left turns from streets running parallel to the tracks. Effort: Engineering; Status: Not started.

Radar Actuation System for Light Rail Crossing Warning Devices: FTA will investigate the limitations of existing speed detection equipment used for activating warning devices and evaluate the feasibility of and possibly demonstrate a radar-based system. Effort: Engineering; Status: Not started.

Light Rail Accident Statistics: FTA will modify current safety data reporting requirements to document light rail crossing accidents. Effort: Education, law enforcement, and engineering; Status: Ongoing.

Two Joint FRA/FHWA-Led Proposals

Integrated Intermodal Transportation Planning: FRA and FHWA will sponsor a series of seven meetings to be attended by state DOT, metropolitan planning organization, and railroad industry officials to encourage cooperation. These meetings will address issues of mutual interest, including railroad crossings. Effort: Engineering; Status: Completed.

Vegetation Clearance: FRA will include a provision addressing the need to maintain rail rights-of-way adjacent to crossings free of sight-obstructing vegetation in its Notice of Proposed Rulemaking on track standards. FHWA will explore ways through the SMSS to encourage the states to clear vegetation on highway rights-of-way. Effort: Engineering; Status: Ongoing.

Two Joint FRA/NHTSA-Led Proposals

Police Officer Detail: NHTSA will help identify a police officer for a 1-year detail with FRA and Operation Lifesaver to reach out to the law enforcement community. Effort: Law enforcement; Status: Ongoing.

Outreach to Judiciary: NHTSA will publish an article in the National Traffic Law Center newsletter. FRA will prepare crossing safety material for the newsletter. Traffic Law Center staff will use DOT materials to answer questions from prosecutors and judges and provide these officials with technical assistance as needed. Effort: Law enforcement; Status: Ongoing.

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