U.S. Department of Transportation
Federal Railroad Administration

Rail-Highway Crossing Safety
Action Plan Support Proposals

Federal Highway Administration
Federal Railroad Administration
Federal Transit Administration
National Highway Traffic Safety Administration

25-Research & Development
Management

June 13, 1994

ACTION PLAN

Highway-Rail Crossing Safety

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Executive Summary

This *Action Plan* presents a multi-faceted, multi-modal approach for improving safety at our Nation's highway-rail crossings and for the prevention of trespassing on the rights-of-way of our Nation's railroads. It is multi-faceted in that it presents enforcement, engineering, education, research, promotional and legislative initiatives addressing crossings of both light and conventional rail rights-of-way by public and private streets and highways. It is multi-modal in that contributions to its preparation have been made by four U.S. Department of Transportation (DOT) administrations, i.e., the National Highway Traffic Safety Administration (NHTSA), the Federal Transit Administration (FTA), the Federal Highway Administration (FHWA) and the Federal Railroad Administration (FRA), working together with the same interest, safety at crossings. We have also received, considered and often incorporated or adapted, in whole or in part, ideas from many outside sources, individuals, railroads and States.

The *Action Plan* identifies six major initiatives encompassing 55 individual proposals. The major initiatives are:

I. Increased Enforcement of Traffic Laws at Crossings
II. Rail Corridor Crossing Safety Improvement Reviews
III. Increased Public Education and Operation Lifesaver
IV. Safety at Private Crossings
V. Data and Research
VI. Trespass Prevention

These are followed by Recommendations and a Goal and two Appendixes.

The essence of the *Action Plan* lies in fifty-five proposals. They can generally be divided into two groups: 1) Those which describe programs targeting individual needs; and 2) Those which will enable or provide incentives for a program's advancement.

Of those in the first category, highlights would include initiatives to:

- Establish the goal of eventual crossing elimination or warning device upgrades at all National Highway System crossings.
- Increase truck and bus driver awareness of crossing safety through education and consideration of revocation of the Commercial Driver's License for crossing violations.
- Emphasize state traffic law enforcement programs through NHTSA Section 402 funds, as well as police and judicial education and outreach on crossing safety.
- Consolidate state crossing safety assessments to emphasize corridor review, and integrate intermodal planning to bring together railroads, MPOs and state DOTs to insure emphasis on crossing issues.
- Expand Operation Lifesaver (OL) through new community assistants sponsored by the Corporation for National Service, upgrade OL advertising and public awareness efforts and implement new regional trespass prevention programs.
- Enhance research and data collection in such areas as accident severity, prediction formulas, crossing inventories, reporting requirements, and safety and demographic data.
- Demonstrate and encourage new technologies, such as vehicle detection and four quadrant gates, automated malfunction report handling, and new lighting and marking systems.
- Work with States to develop model codes for state laws for crossing and trespass prevention, along with information package on rules of evidence.

Taken together, these initiatives represent a comprehensive Departmental effort, elevating highway-rail crossing safety, and adopting a uniform strategy across the modal administrations to deal with this important issue.

The *Action Plan* proposes some major legislative initiatives. These proposals include:

- Establishing fiscal incentives to states for crossing consolidations.
- Establishing fiscal incentives to states for participating in corridor reviews and projects.
- Increasing Operation Lifesaver funding from the Department to $600,000 per year.
- Including trespass prevention programs within the scope of Operation Lifesaver funding.

In 1972, then Secretary of Transportation John A. Volpe declared a goal of reducing the number of highway-rail crossing accidents and fatalities by one third within ten years. The meeting of that goal was clearly attributable to Congress' endorsement and support in the establishment in 1973 of the Highway-Rail Crossing Safety Improvement program, a program which has been continuously funded and supported (by Congress, States and industry) to this day. Concurrently, Operation Lifesaver made its debut in Idaho. With funding support from Congress, Operation Lifesaver programs have become very effective.

The continuation and renewal of this partnership, between Congress, the Department of Transportation and the modal administrations, the States, the industry and Operation Lifesaver, as proposed in this *Action Plan*, will produce similar results, i.e., a further reduction in accidents and fatalities at highway-rail crossings of at least fifty percent over the next ten years. Before the year 2004, accidents per year should be less than 2,500 and fatalities less than 300.

Objectives

Develop an action plan to reduce the number of highway-rail crossing accidents and casualties while not impeding, but facilitating, the contribution potential of the highway and rail infrastructure on the Nation's economy.

The plan must consider the need for, and the crossing safety implications of, high speed inter-city, intermodal freight and passenger service as well as single-city commuter and intra-urban service.

Current Statistics

Crossing statistics include all conventional rail and "some" light rail. Accident and fatality data is for conventional rail only. See Figures 1 and 2.

At-Grade Crossings

	Active	Passive	Total
Public[1]	59,182	111,440	170,622
Private	923	108,958	109,881
Total	60,105	220,398	280,503

1993 Accidents

	Active	Passive	Total
Public	2,207	2,230	4,437
Private	32	423	455
Total	2,239	2,653	4,892

1993 Fatalities

	Active	Passive	Total
Public	320	264	584
Private	2	40	42
Total	322	304	626

[1]Active crossings are those equipped with motorist warning devices automatically activated by approaching trains, i.e., flashing lights or flashing lights with gates. Passive crossings are provided with signs only and occasionally with continuously flashing lights.

Public crossings are generally defined as those for which the roadway approaches are open to public travel and are maintained by a public highway authority. Many exceptions exist.

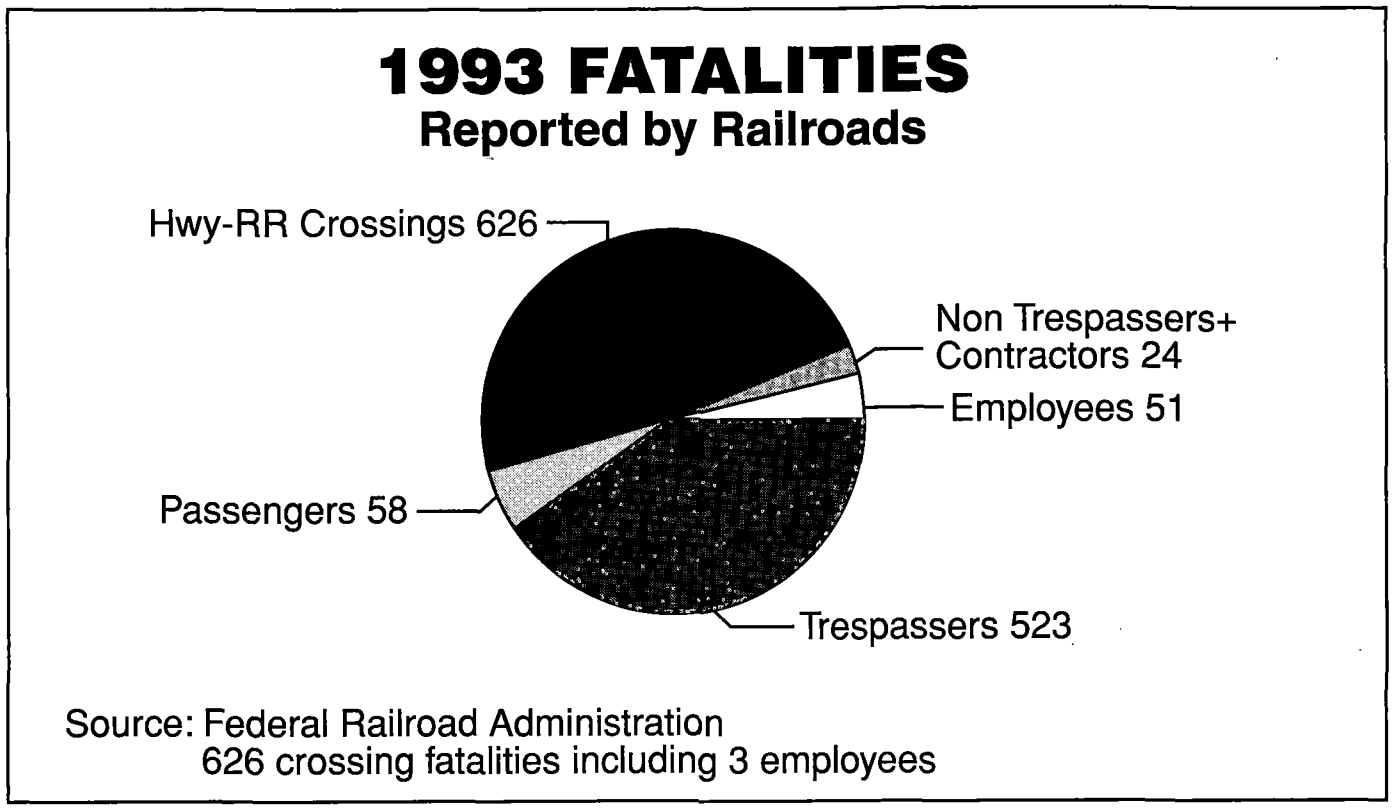

Figure 1

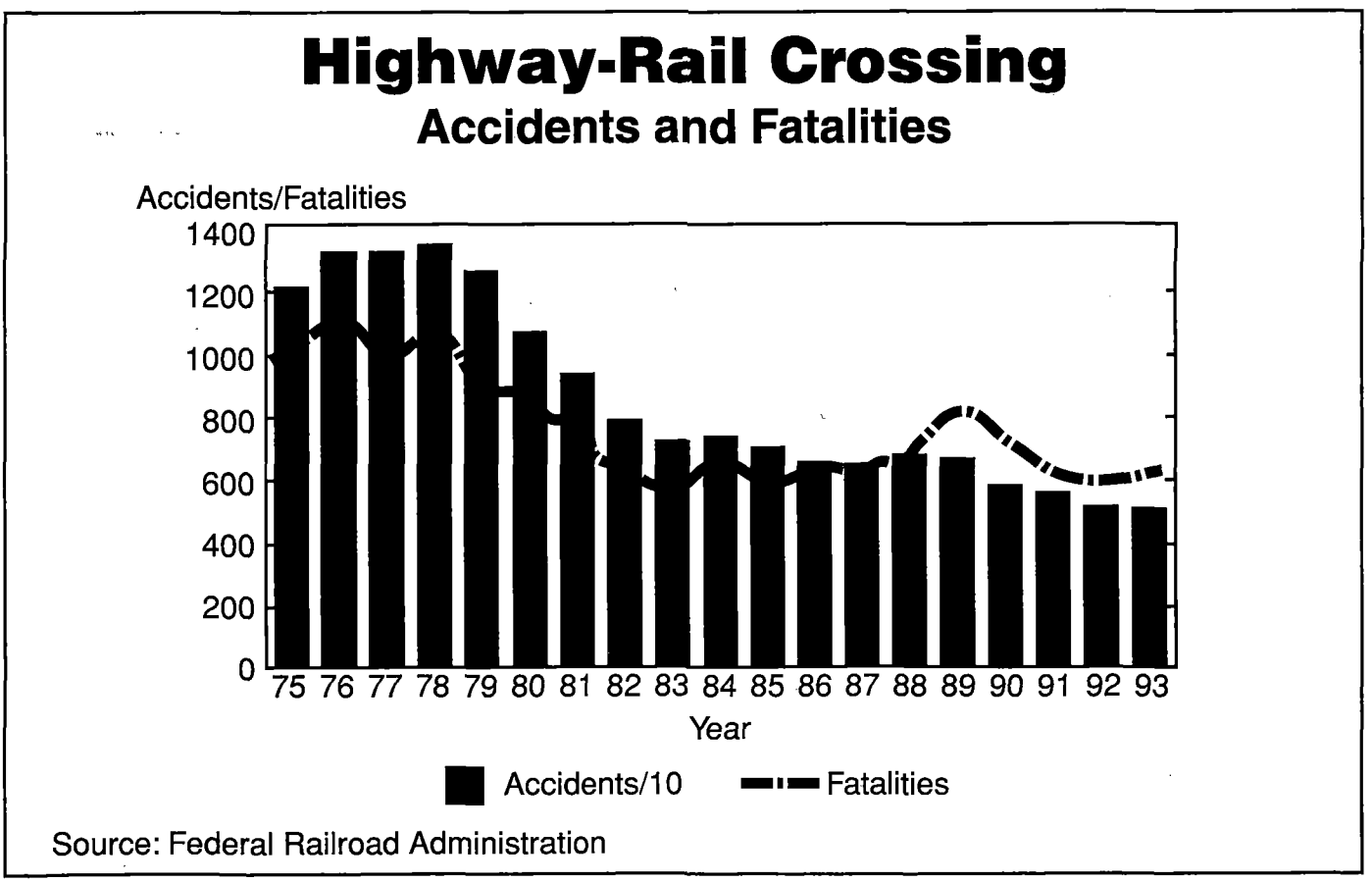

Figure 2

Initiatives

Six major initiatives are detailed on this and the following pages. These proposals constitute the Department's Action Plan for addressing highway-rail crossing safety and trespass prevention for the remainder of the decade. The Department and four modal administrations within the Department — the Federal Highway Administration, the Federal Transit Administration, the Federal Railroad Administration and the National Highway Traffic Safety Administration — will target these initiatives as resources permit. A joint task force will promote and coordinate these initiatives and will oversee the progress of individual projects.

To be successfully implemented, the Action Plan initiatives will require the active involvement, oversight, support and endorsement of the United States Congress, state and local governments and the railroad and transit industries.

I. Increased Enforcement of Traffic Laws at Crossings

Experience has shown that visible, high profile, law enforcement programs reduce the numbers of highway traffic violations. Programs targeting traffic violators at highway-rail crossings are also effective. The media has shown a willingness in the past to report on such programs.

The need is to develop small and large package programs (to include such milestones as officer-on-the-train, roll-call videos, railroad training, dispatcher coordination, etc.) and then to convince and encourage police and civic officials to adopt the programs. They must be convinced of the programs' relevance in their communities and of the potential effectiveness of the recommended programs. They need to be encouraged to program resources for the effort.

Such an effort will be more easily promoted if police and local officials (and the public) are already familiar with the problem and with available programs. In addition to a national program for the general public, an effort must be made to reach local civic and police officials where they work and meet, and in what they read, view and hear. Print materials for their "trade" periodicals, direct mailings, presentations and displays where they meet, nationally, regionally and locally, all would make some contribution.

In order to be successful, judicial officials must not be overlooked. They too must be convinced of the programs' relevance and seriousness. An enforcement program will end quickly if judges do not understand and support it.

A serious impediment exists to expanding programs such as the photo-enforcement program currently being demonstrated in Los Angeles and previously demonstrated in Jonesboro, Arkansas by the Burlington Northern Railroad (and in common use in Europe). Rules of evidence in most states disallow the introduction of photo-evidence not corroborated by a police officer eye witness. (This also impedes the expansion of unmanned photo-radar enforcement.) In this era of limited law enforcement resources such a restriction on the application of proven technology appears unreasonably narrow. State legislatures need to be encouraged to review the rules of evidence for traffic law enforcement.

By increasing enforcement and judicial support, the number of traffic law and warning device violations at highway-rail crossings will decrease. The Department proposes to establish an expanded and pro-active outreach program to our Nation's traffic law enforcement community, from the patrol

officer to the judges who enforce our traffic laws. The following actions will be initiated:

A. Section 402 Funds

NHTSA/FHWA will advise states that where problem identification data indicate that highway-rail crossings are a significant local problem, Section 402 funds could be requested to promote targeted public education, engineering and law enforcement strategies within a comprehensive program approach to the problem. By August 1994, the NHTSA and FHWA will meet to develop a joint directive for their grant approving officials (NHTSA Regional Administrators, FHWA Division and Regional Administrators) to support this approach. Before December 1994, NHTSA and FHWA field offices will contact the states and will support this approach in discussions on development of Highway Safety Plans (HSP) for FY 1996.

B. Police Officer Detail

NHTSA will assist FRA in identifying and detailing a police officer with training background interested in working on a year detail with FRA and OLI in developing an outreach to the enforcement community.

A search will be initiated this Summer with procurement action to begin in the Fall. The assignment should begin in April 1995.

C. Outreach to Judiciary

As part of an outreach to judicial officials NHTSA and FHWA will prepare and publish an article in the National Traffic Law Center (NTLC) newsletter by August 1994. NTLC staff will assemble materials obtained from DOT to answer questions from prosecutors and judges. NTLC staff will provide technical assistance as requested from judicial officials beginning no later than August.

D. Rules of Evidence

An information package will be developed to assist states in redefining their rules of evidence for traffic cases. The package will provide model rules, with annotations, that would allow traffic citations to be issued and enforced based on photographs or video images obtained from unmanned cameras. Research will be conducted, and a first draft of model rules of evidence should be available in 1995.

E. Commercial Driver's License

FHWA will: Meet with the American Association of Motor Vehicle Administrators (AAMVA) to discuss making grade crossing violations a serious traffic violation on a driver's Commercial Driver's License (CDL); Conduct a survey of state traffic laws to document how states treat this offense now; Propose, through the AAMVA committee structure, making grade crossing offenses a serious traffic violation; Evaluate the need for rulemaking on CDL serious traffic violations.

The FHWA met with the AAMVA Executive Board in January 1994. The AAMVA in cooperation with FHWA will complete a survey of state practices in Summer 1994. A decision from the AAMVA committee on CDL serious violations will be reached at the AAMVA International meeting August 1994. The FHWA will evaluate the need for rulemaking in the Fall of 1994.

F. Compilation of State Laws and Regulations on Matters Affecting Highway-Rail Crossings

FRA, with the cooperation of FTA, NHTSA and FHWA, will initiate an effort in 1995 to update the *Compilation of State Laws and Regulations On Matters Affecting Rail-Highway Crossings*, last published by FHWA in 1983.

G. Safety Inquiry

The FRA will hold an informal safety inquiry (meeting) to discuss ways and means to enforce railroad operating rules regarding trains, locomotives or cars standing: (1) within a specified distance of a multi-track passive crossing or (2) on warning device track circuits not equipped with time-out equipment. (The

latter situation, i.e., spotting cars on active warning device track circuits, is addressed in the just published Notice of Proposed Rulemaking regarding warning device Inspection, Testing, Maintenance and Timely Response. See Section 234.209 of the NPRM.) (Also, see Safety Inquiry in sections on Private Crossings and Data and Research (the Inventory).)

II. Rail Corridor Crossing Safety Improvement Reviews

The most efficient way to accomplish a comprehensive engineering review of highway-rail crossings is to examine all crossings, public and private, in a corridor or jurisdiction with a multi-disciplinary team, i.e., a diagnostic team. This has been called the "systems approach." This process is currently underway where the Intermodal Surface Transportation Efficiency Act (ISTEA) Section 1010 corridors are concerned, but in these efforts the goal is far more than crossing safety improvements, but rather the realization of high speed rail operations (necessitating significant safety improvements at crossings, often elimination). These Section 1010 corridors address only a very small part of the problem, i.e., not quite 2,800 crossings on only 4,200 km (2,600 mi) of track right-of-way. The total rail system in this country is comprised of over 273,000 km (160,000 mi) of right-of-way which is crossed at-grade nearly 283,000 times by public and private roads and designated pedestrian pathways.

Obviously, addressing just the 1010 corridors (less than two percent of the total right-of-way or crossings) is not adequate. Attempting to target the whole system is too ambitious. However, a core exists, defined by reviewing current Amtrak, intermodal (trailer or container on flat car) freight and coal and grain flow maps. These are the more heavily used freight and passenger routes. These are the routes where a thorough analysis of crossings along designated segments (corridors) has the potential of rendering maximum safety return (i.e., frequent fast trains, high passenger exposure). These are the routes where a corridor analysis will allow a credible review of crossing consolidation or elimination possibilities, of track circuit improvement needs (to include constant warning time equipment (in order to accommodate variable speed trains) and signal event recorders (to facilitate rapid response to and diagnosis of signal malfunctions), as well as signs, signals, surfaces, sight distance improvements and illumination possibilities, etc.

In the absence of a corridor or systems approach, highway-rail crossings are selected by highway authorities for safety improvements one at a time based on the crossing's accident experience and highway and rail traffic counts. This fosters a bias toward urban areas and main roads where traffic densities are high. This process currently excludes all private crossings, most low density crossings and often those already equipped with automatic devices. In many cases, the excluded crossings are those that would benefit from low cost improvement or could be consolidated.

Crossing consolidation is the surest way to reduce the potential for highway-rail crossing collisions. Although crossing consolidation is an effective and low cost method to improve crossing safety, this option has not been widely utilized. Closing a crossing generally requires affirmation from the local political subdivision (if public) or concurrence of the easement holder (if private). The difficulty of securing approval to consolidate crossings has discouraged pursuit of this option for improving crossing safety.

Railroad and state officials, who are responsible for crossing projects and who recently participated in an FRA case study project, repeatedly emphasized the need for Federal guidelines for closing crossings. In order to be an effective adjunct to the closing process, the Federal guidelines would have to

be visible and definitive. That is, guidelines should unequivocally represent Federal policy and provide an objective standard for judging the need for a specific crossing.

Interest in high-speed trains, increased emphasis on crossing safety, the limits of available resources and the signalization of many high volume crossings have led many state transportation agencies and railroads to assign crossing consolidation and closure a higher priority than it has received in the past. However, the number of crossings closed, public or private, on active rail lines remains relatively small and well below the number of unnecessary crossings that are candidates for closure. Federal and state leadership is required to give consolidation the priority it warrants. Otherwise, consolidation will remain a minor factor in crossing safety improvements.

In this context (i.e., the need for a Federal initiative), the concluding observation of the Missouri Executive Summary[2] is particularly pertinent: "If in fact this is a national initiative, then there must be participation on the part of the 'national government.'"

A nationwide effort to review crossings in corridor groups is needed. The Department will promote comprehensive and systematic corridor reviews of highway-rail crossings, especially those over our nation's Principal Railroad Lines[3] (PRLs), and will encourage the elimination of little used and redundant crossings within corridors where alternatives exist, especially those on the National Highway System[4] (NHS). It is estimated there will be approximately 4,500 at-grade crossings on the NHS, about half of which will be at intersections with the PRLs. State and local highway authorities will be encouraged to upgrade signs and signals at all crossings, taking full advantage of available state-of-the-art technology. The following initiatives will be established:

A. Principal Railroad Lines

Principal Railroad Line corridors will be nominated for review by considering current and projected highway and rail traffic densities and accident experience. Facilitated by FRA's new Regional Program Managers, these corridor reviews should begin no later than the last quarter of 1994.

B. The National Highway System (NHS)

The FHWA will encourage that Statewide Transportation Improvement Programs and Safety Management Systems fully address the upgrading or elimination of at-grade crossings on the NHS, and give priority to the long-term goal of eliminating NHS intersections with the PRLs.

C. Upgrade Signing and Marking

The FHWA will work with FRA and the states to increase the conspicuity of signs and markings at highway-rail crossings by encouraging the widespread use of high-grade, long-lasting reflective materials. This promotion will be initiated immediately.

D. Responsibilities for Selection and Installation

The Department will review the present system of allocating responsibility for selection and installation of signal devices at public

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[2] *Executive Summary of the Missouri Grade Crossing Closure Study,* Missouri Division of Transportation Staff, January 1994, page 5.

[3] The FRA has defined a core railroad system of approximately 80,000 miles known as the Principal Railroad Lines. These lines have one or more of the following attributes: Amtrak service; defense essential; or, annual freight volume exceeding 20 million gross tons.

[4] The National Highway System will consist of an interconnected system of principal arterial routes to serve major population centers, intermodal transportation facilities and other major travel destinations; meet national defense requirements; and serve interstate and interregional travel.

Figure 3

The Federal Railroad Administration Principal Rail Network

highway-rail grade crossings. The Department will review the need for nationally uniform standards for establishing the need for, and appropriate type of, warning devices at all public highway-rail grade crossings.

E. STOP Signs

In response to Section 1077 of ISTEA, the Manual on Uniform Traffic Control Devices (MUTCD) was revised to grant states and local governments discretionary authority to install STOP or YIELD signs at highway-rail crossings that do not have active warning devices and where two or more trains operate daily. On July 8, 1993, the FHWA and FRA issued a joint memorandum to their respective field offices offering guidance for installing STOP signs and encouraging cooperation among states, communities and the railroads for the development of programs to install these signs. FHWA and FRA will work together to insure that state and local governments consider the installation of STOP signs at highway-rail crossings where warranted.

Listings produced from the Inventory which select and categorize crossings most likely to fit established criteria and to benefit from STOP sign installation will be provided to states and railroads. FHWA will issue a clarification to current Federal regulations indicating that Federal funds are eligible to install traffic control devices, including STOP signs, at multi-track crossings.

F. Incentives for Crossing Consolidation

1. Legislation will be proposed to allow, under certain conditions and at a state's discretion, cash payments from the SurfaceTransportation Program (STP) set-aside funds reserved for carrying out Title 23—United States Code (U.S.C.) Section 130 (the crossing safety improvement program) to local jurisdictions for the permanent surrendering of a crossing easement, i.e., the state could use Federal funds to pay for a crossing closure. The amounts paid would be limited to $7,500 and the amount paid would have to be matched by the railroad(s) involved. The Federal funds could only be used 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 at-grade crossings. This would be in accord with a recently adopted resolution of the National Conference of State Rail Officials (NCSRO) and the American Association of State Highway and Transportation Officials (AASHTO).

2. Legislation will be proposed to modify 23 U.S.C. 120(c) to include crossing closure projects among those STP projects which are eligible for 100 percent Federal funding, i.e., along with signs, signals and pavement markings. (The current situation, where a state or local match is required for a closure project, but not for warning devices, amounts to a disincentive to close.)

G. Crossing Consolidation and Closure Case Studies

Based on the case studies conducted by FRA, FRA is now preparing three reports on crossing consolidation and closure. The first report, to be available this Spring, will be a "how-to" guide on closing crossings for state and railroad officials. The guide will be a composite of the successful strategies for closing crossings and rules of thumb derived from the case studies. The second report, also available this Spring, will consist of a limited number of case studies that would demonstrate the consolidation process through the example of actual projects. A third report will recommend options to increase the rate of crossing consolidation, based on analysis of the case studies and suggestions of railroad and state officials who have been actively involved in crossing consolidation projects. The recommendations will be completed by early Summer.

H. Integrated Intermodal Transportation Planning

The Department of Transportation is sponsoring a number of outreach efforts to assist those implementing ISTEA. Of particular interest to those concerned with highway-rail crossing safety is the series of meetings FRA and FHWA are sponsoring between State Departments of Transportation, Metropolitan Planning Organizations (MPOs) and the railroad industry. This series of seven meetings, begun in Arlington, Texas (March 30 — April 1), encourages cooperation between the transportation planning community and the railroads by addressing issues of mutual interest, including grade crossings.

I. Check List

FRA and FHWA will develop a "check list" of items to be considered in a corridor analysis. This will include warning device and site improvement options (e.g., adequacy of warning devices and circuits, horizontal and vertical approach angles, surfaces, volume, type and flow of rail and highway traffic, etc.) as well as the consolidation of crossings. The check list should be developed and distributed during the last quarter of 1994.

J. Highway-Rail Crossing Handbook

FHWA, with the cooperation of FTA, NHTSA and FRA, will initiate an effort in 1995 to update the *Railroad-Highway Crossing Handbook,* last published by FHWA in 1986.

K. Vegetation Clearance

FRA's NPRM on track standards will contain a provision addressing the need to maintain rail rights-of-way adjacent to highway-rail crossings free of sight-obstructing vegetation. The FHWA will explore ways and means through the Safety Management Systems (SMS) to encourage that vegetation on highway rights-of-way be kept cleared.

L. Corridor Review Participation

Legislation will be proposed to established a jointly administered incentive program for state and local governments to participate in reviews and safety improvements on a corridor basis. One possible scenario would set aside $15,000,000 of STP funds each year (from an STP program of $23.9 billion), **in addition to the existing Section 130 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 serve basis or in amounts proportional to total corridor improvement costs incurred by the participating governmental entities.

M. Distribution of Funds

FHWA and FRA will initiate a study of the formulas used to distribute to states the crossing safety improvement funds authorized in Section 1007 of ISTEA. An assessment will be made to define a more appropriate method of distributing improvement funds, possibly on the basis of the number of crossings and accidents in each state.

III. Increased Public Education and Operation Lifesaver

Since 1973, more than $2.8 billion of Federal-aid funds has been spent by states for safety improvements at highway-rail crossings. Over half of this was for automated warning devices. However, half of all collisions occur at crossings so equipped. To realize full benefit from the public investment in these devices, motorists must be educated in their responsibilities at all types of crossings.

Operation Lifesaver (OL) is an active, continuing public information and education program to help prevent and reduce crashes, injuries and fatalities and improve driver performance at our Nation's 280,000 public and private highway-rail crossings. Operation Lifesaver, Inc. (OLI) is a tax exempt, non-profit corporation which coordinates and facilitates state and local OL programs nationwide.

OLI needs to supplement its Federal funds with funds from other sources. This would serve the dual purpose of providing additional funds in the near term for the promotion of the OL message and would establish a cushion should Federal funding be reduced or eliminated in the future.

The success and effectiveness of OL state programs at getting the OL message out is directly dependent on the capabilities of the OL State Coordinator. In some cases this individual is a state employee, sometimes a railroad, railroad association or railroad supply industry employee (ranging from executive to locomotive engineer), sometimes a local or state police officer or official and sometimes an employee of a safety or highway oriented group (e.g., American Automobile Association, a state safety council, a school bus driver, etc.). Many carry out the function of State Coordinator as an "additional duty." Many are volunteers, receiving no remuneration for their effort, and little support. Many of the State Coordinators need assistance, i.e., considerable additional man-hours. The credibility of the program suffers when the public reaches only a message machine at the State Coordinator's office. Scheduling, coordination, support and material functions must often wait until the weekend or until the State Coordinator returns. If an assistant were available, their involvement would expand the presence, visibility and outreach of the program in communities throughout the U.S.

The Department proposes to work with Operation Lifesaver, states and industry advocates to facilitate delivery of the OL message at the state and local levels and thus to increase public awareness of hazards at crossings and of motorist responsibilities.

A. Marketing Materials Plan

NHTSA, FHWA, FTA, FRA and possibly OLI will work together in periodic meetings to develop programs and material to promote public and youth awareness. A marketing materials plan will be developed. When products are available, NHTSA Regional staff will promote this material through Governors' Representatives to appropriate organizations and officials. States may use Section 402 funds to purchase or reproduce materials as well as to implement programs.

B. Driver Training Materials

NHTSA, working with the AAMVA, will review current driver training material relevant to highway-rail crossing safety and will determine what material(s) may need updating and where gaps exist. NHTSA, FHWA, FTA, FRA and possibly OLI will work together to select the best of these materials, develop new and updated materials, if necessary, and disseminate this information to the states. An interagency working group will be established. Draft materials will be completed by Winter, and final products will be available by Summer 1995.

C. National and Community Service

For FY 96, pursuant to the National and Community Service Trust Act of 1993, FRA will explore the possibility of assigning national service participants to support OL State Coordinators.

D. Truck and Bus Involved Accidents

In the near-term the FHWA will take the following actions to improve highway-rail crossing programs with respect to commercial motor vehicles.

1. On-Guard Notice

   Publish an On-Guard notice to alert the truck and bus industry of the dangers at crossings. This was mailed to all 270,000 interstate motor carriers on our records. The notice was written, printed and distributed in February 1994.

2. Advisory Bulletin

   Send an advisory bulletin to the trade press about the danger of accidents at

crossings. The bulletin was released to all motor carriers in February.

3. Public Service Print Advertisements
   Prepare public service print advertisements for the trade journals on truck and bus accidents at highway-rail crossings. Attention will be given to ensuring the articles reach state and local trucking association newsletters. The public service messages will be published and distributed to 4,500 potential carriers in June.

4. "Trucker on the Train" Program
   Work with Amtrak, the American Trucking Associations (ATA), OLI 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 highway-rail crossings. FHWA and FRA representatives have recently begun meeting with the ATA and Amtrak officials on this program.

5. Operation Lifesaver
   Encourage OLI staff to meet with trucking companies and associations regarding this problem. An OL spokesperson addressed the ATA Safety Management Council in February. The ATA Safety Management Council reminded their members and drivers in a January letter of crossing dangers.

6. National Safety Organizations
   Address the issue at meetings of national safety organizations such as the International Association of Chiefs of Police (IACP). Discuss the issue with industry executives at the next National Motor Carrier Advisory Committee meeting.

7. On-Site Compliance Reviews
   Ensure that at each on-site compliance review conducted by the Office of Motor Carriers field staff and state personnel, the motor carrier is informed of the risks at highway-rail crossings.

E. Operation Lifesaver Matching Funds

Legislation will be proposed to increase the FHWA grant to OLI to an amount not to exceed $500,000 annually, but any portion of the funding in excess of the current grant of $300,000 (and $100,000 from FRA) would be available to OL only if OLI 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 a draw-down of the STP funds set aside for highway-rail crossing safety.

Failure to secure additional funding for OL will hamper the organization's ability to expand its activities to adequately support the Federal effort in this area.

IV. Safety at Private Crossings

There are 110,000 private highway-rail crossings in the United States. More than 400 accidents and 40 deaths occur at these crossings every year. In most years, the number of deaths which occur at private crossings exceeds the number of on-duty deaths among railroad employees in all rail operations.

Private crossings are categorized as either farm, residential, recreational or industrial. Nearly two-thirds are farm crossings. However, most accidents occur at industrial crossings.

FRA has traditionally taken the position that private crossing matters should be settled by the private parties involved. However, from a safety perspective, this approach has proven inadequate. A few states, including Alaska and California, have also reached this conclusion and have acted to standardize responsibilities and treatments for private crossings. Despite this, the overall national result is that responsibilities are most often undefined or are inconsistently acknowledged and applied.

Type Private Crossing	Crossings	1993 Accidents	Accident Rate	Killed	Injured
Farm	66,725	142	.002128	23	32
Residential	12,876	74	.005747	13	21
Recreational	1,649	11	.006671	0	3
Industrial	25,703	157	.006108	10	23
Unknown	2,928	19	n.a.	1	6

Similarly, traffic control or traffic warning standards have been defined in only a few instances and are not consistently applied. The FHWA lacks jurisdiction, as do most state and local highway departments. FHWA has endorsed the concept of applying MUTCD warning device standards to private highway-rail crossings, but lacks the jurisdiction to follow through.

Responsibilities and standards need to be developed and defined.

Private crossings on high speed rail lines present a special problem. And yet, most private crossings on high speed rail lines will require either safety enhancements or elimination before high speed service can be initiated. Traditional sources of public funding for safety improvements are limited to public crossings. However, attention is beginning to be directed to private crossings on designated high speed corridors. Section 1010 of ISTEA authorizes $30 million for the elimination of grade crossing hazards at public and private crossings on the five Section 1010 corridors. Oregon has recently enacted legislation to give the state jurisdiction over private crossings on high speed rail lines. Eligible improvements under the proposed high speed rail legislation include private crossings (including payments to property owners to close such crossings where appropriate). Private crossings will be considered in the incentive/award program for state participation in corridor review programs proposed above.

There is a need to either identify a different or new source of funding, or to make private crossings (at least those on DOT designated high speed rail corridors) eligible for funding from the traditional sources. Further, there is a need to establish "condemnation" and "buy out" authority, of private crossings, at least those on DOT designated high speed rail lines. The proposed high speed rail legislation, when enacted, will address both of these needs.

The Department proposes to develop and provide national, minimum safety standards for private crossings and to eliminate the potential impediment to high speed rail operations posed by private crossings. The following actions are proposed:

A. Define Categories

Operational definitions will be developed for each of the four categories. Sub-categories may also be defined (e.g., industrial/commercial crossings open to public use; farm crossings on high speed corridors; recreational crossings in public parks; etc.), and a general approach and schedule will be developed for addressing each. As appropriate, minimum safety requirements, warning device standards and responsibilities will be defined beginning with the category(ies) with the most severe problems, i.e., probably with Private Industrial Crossings.

B. Safety Inquiry

FRA will hold an informal safety inquiry to further review the concept of defining minimum safety standards for private crossings, or for certain categories of private crossings, up to and including standards for closure and consolidation under certain conditions. The inquiry will address the allocation of responsibilities and costs associated with private crossings and the need for dispute resolution mechanisms regarding that allocation. (See also Safety Inquiry in Sections on Data and Research (the Inventory) and Enforcement.)

C. Locked Gate at Private Crossings

The feasibility of placing gates with remotely activated cipher locks at private crossings will be investigated and possibly demonstrated. In this scenario, the gate would normally be closed and locked. A potential user would call the railroad dispatcher, possibly from a special call box at the crossing. When a window of opportunity occurs, the dispatcher would enable the requestor to unlock and open the gate. The gate would be interlocked with the railroad's signal system.

V. Data and Research

Progress towards maximizing the effectiveness of our resources is most often achieved through research and innovation. However, for highway-rail crossing issues, institutional concerns regarding costs (research and potential implementation), liability and current convention often impede progress. The Department's involvement and leadership have the potential of promoting research and championing plausible innovation while overcoming these obstacles.

Research regarding alerting lights, retro-reflective materials, illumination and horns is currently being conducted by the John A. Volpe National Transportation Systems Center (VNTSC) in Cambridge, MA, with FRA sponsorship, to enhance conspicuity of trains at or approaching crossings for highway users, especially during hours of darkness. FHWA and some state efforts are also investigating the efficacy of innovations in highway traffic signs.

Similarly, good data is also an essential ingredient to good decision making. Research and data processing and analysis must ensure that timely and accurate information needed by decision makers is available.

To address these needs the Department proposes to:

A. Host Research Roundtables/ Workshops

1. Research Workshop

   The goals, procedures and findings of Federal crossing related research are always of interest to the industry, state officials and academia. Government sponsored research, and the researchers involved, can also benefit from an exchange of ideas, i.e., topical workshops (not just a series of briefings), with the affected industry and interest groups. A workshop will be planned to bring together highway safety, law enforcement, rail and transit industry officials, governors' highway safety representatives, academia and consultants with Federal researchers to discuss current and projected research and needs.

2. Defense Conversion Fair

   Numerous contacts have been made on behalf of defense oriented research firms seeking to bring their talents and capabilities to bear on transportation related issues. A tremendous talent pool exists. However, these firms are not familiar with transportation industry needs. A fair, complete with DOT displays and seminars, could be used to focus this potential resource on transportation, on safety and on

highway-rail crossing problems. Fresh thinking and new (defense developed) technology may generate some innovative solutions to old problems. An exchange program will be planned to introduce Defense oriented research firms to railroad technology and research needs.

B. Demographics

NHTSA will develop demographic data on those who die in highway-rail crossing accidents and will assist in arranging and conducting "focus group" sessions in locales with high incident rates.

C. Accident Severity

NHTSA will investigate the increasing severity of crossing accidents and attempt to determine why the trend is increasing and what countermeasures might reverse it. NHTSA will use both their Fatal Accident Reporting System (FARS) and FRA's Accident and Inventory data bases.

D. Signs, Signals, Lights and Markings

The FHWA, FTA and FRA will work together to examine the potential of providing additional information to the motorist through innovative signs, signals, lights and markings.

1. Signs and Signals

   The FHWA, in coordination with FRA, will initiate conceptual studies of a number of new highway-rail crossing warning devices, such as devices to inform motorists in advance whether there is an active or passive warning system at the crossing and devices that would provide positive information about the direction from which a train is approaching the crossing.

2. Train Horns

   The FRA is working with the Association of American Railroads (AAR) to study the safety impact of whistle bans nationwide. This will aid FRA in determining if nationwide Federal action is required.

   The FRA is also sponsoring research by the VNTSC to develop an optimal warning signal for locomotive whistles, which minimizes noise for communities while not compromising safety. VNTSC also is investigating potential alternative systems, such as audible warning devices installed directly at crossings. (A cooperative effort involving the state of Nebraska, the City of Gering, the Union Pacific Railroad and a private firm has produced some field testing of an Automated Horn System (AHS) mounted at the crossing. The Los Angeles County Transportation Commission is also considering a similar device offered by another firm.) Some Los Angeles County commuter trains have been equipped with an innovative train whistle device, somewhat toned down and mounted lower on the locomotive in order to minimize impacts on neighboring communities, but still meeting minimum FRA standards. FRA (and VNTSC) will continue to monitor these efforts.

   FRA is also exploring the potential for what amounts to a noncontractual cooperative effort among interested parties. If the Union Pacific Railroad, City of Gering, the Nebraska Department of Transportation and others with a particular interest in testing a second-generation AHS can install the device(s) at highway-rail crossings selected as test sites, and conduct neighborhood surveys, FRA, through VNTSC, will make the necessary acoustical measurements and analyses, record and analyze before and after behavior of motorists, design needed surveys, train local personnel to

conduct the surveys, and analyze survey results. Work may begin this Summer.

3. Light Rail Crossing Gates for Left Turn Lanes

   A large number of train/vehicle collisions take place at grade crossings where there are streets running parallel to light rail transit or railroad tracks, and motorists are permitted to make left turns across the tracks. Standard railroad crossing gates are not fully effective at crossings of this type. Where the crossings are controlled by traffic signals only, some light rail transit systems have experienced numerous train-vehicle collisions.

   Calgary Transit (Canada) has installed railroad crossing gates on the left turn lanes at two grade crossings where there are heavy left turn traffic volumes. The FTA proposes to investigate the application of railroad gates and other types of "pop up" barriers (for U.S. locations where there is not adequate space to install railroad crossing gates) for left turns made from streets running parallel to the tracks at grade crossings.

4. Locomotive Conspicuity:

   On February 3, 1993, FRA issued interim standards regarding locomotive lighting to enhance conspicuity of trains. A second interim rule was published May 13, 1994. The Congressionally mandated schedule requires the FRA to initiate rule making for final regulations no later than June 30, 1994. Final regulations will be issued by June 30, 1995.

5. The Manual on Uniform Traffic Control Devices (MUTCD)

   FHWA, FTA and FRA will begin work immediately to develop proposed changes and additions to the MUTCD dealing with each of the following. Proposals should be available in the third quarter of 1994, and changes to the MUTCD should be proposed during the fourth quarter.

   a. Warrants for warning devices to be used at crossings hosting high speed rail operations;

   b. New passive sign for high speed rail crossings;

   c. Standards for temporary closure of road, i.e., the signing needed to accommodate the placing of a barrier in the road;

   d. Supplementary multi-track plate for STOP and YIELD signs;

   e. Work Zone Traffic Control standards for highway projects which include highway-rail crossings;

   f. Four-quadrant gate standard;

   g. Warning device standards unique to light rail operations (The National Committee on Uniform Traffic Control Devices is currently drafting proposals regarding traffic control and light rail.); and

   h. A design standard for display of the Inventory number at each crossing.

E. Innovative Technology

FRA and FTA will cooperate to review available automated presence and intrusion detection hardware and the potential effectiveness of existing and proposed technology for conveying emergency messages.

1. Automated Video Image Analysis

   Available technology will be explored regarding the potential use of live

video images monitored by computers to detect intrusion onto the rail right-of-way at highway-rail crossings (or anywhere else) and to ensure that warning devices are functioning properly. In theory, when intrusion or a warning device failure is detected, an alert, maybe an image, could be provided to the dispatcher and possibly to the locomotive.

2. Radar Actuation System for Light Rail Crossing Warning Devices

   Warning equipment at grade crossings is typically activated by track circuits. For certain applications, these circuits need to be designed to detect train speed. These applications include innovative active warning signs or devices (such as horns mounted at the crossing or warning messages) that will be effective only if activated for a limited number of seconds in advance of when trains actually arrive at the crossing.

   Where the rails are part of the traction power system (as is typical for light rail systems), speed detection equipment based on track circuit technology (referred to as crossing predictors or motion sensor) does not work in a reliable manner. A low cost alternative to determine the speed of trains is needed for light rail transit operations.

   This project would investigate the limitations of existing speed detection equipment and evaluate the feasibility of a radar-based system. If the approach were determined to be feasible, a demonstration of the radar actuation system would also be undertaken as part of this project.

F. 1-800 Computer Answering System

In 1983, the Texas Legislature initiated (and pioneered) a statewide alert or early warning system designed to inform railroads of warning device/signal problems at crossings. Signs have been placed at each crossing equipped with an automated device instructing the reader:

TO REPORT MALFUNCTION OF THIS RAILROAD SIGNAL CALL TOLL FREE 1-800-772-7677 GIVE THIS LOCATION # _ _ _ _ _ _ _

An impediment to more widespread adoption of this "early warning" system is the perceived resource impact, i.e., Who will answer and forward telephone calls? An automated, pc-based computer system could receive, catalogue and forward telephone calls from the concerned "public" regarding problems with specific highway-rail crossing signals.

This concept is well within currently available "off the shelf" hardware capabilities. Preliminary discussions with individuals familiar with current procedures in Texas indicate this would be a welcome capability.

An automated telephone answering and message forwarding system will be developed for handling calls concerning malfunctions or problems at highway-rail crossings. The system will be founded on the U.S. DOT/AAR Inventory numbering system.

G. Light Rail Accident Statistics

FTA's Safety Management Information Statistics (SAMIS) was devised to reflect an accurate picture of transit safety. Casualty figures include pedestrians, people in other vehicles, employees, etc., as well as patrons. Incidents are collected during revenue and nonrevenue periods, so an all-inclusive view is provided. The FTA will investigate broadening current data reporting to include specific data on shared rights-of-way accidents involving light rail vehicles.

H. Resource Allocation Procedure

The computer model currently made available by FRA to states and railroads needs to be rebuilt in order to account for more

recent realities, i.e., accident experience, available data and costs. The imbedded accident prediction formulas also need to be recalculated. Procurement action for this work has begun.

I. The Inventory

The U.S. DOT/AAR National Highway-Rail Crossing Inventory was developed to serve as a data base of all highway-rail crossings in the United States. The FRA is the custodian of this computer-based file. The FRA processes more than 80,000 changes and updates voluntarily submitted by the states and railroads, each year. Though the Inventory is the only national resource of its kind and is widely used, portions of it are not being updated.

FHWA will immediately initiate efforts to explore possibilities for encouraging updating of the Inventory on a more systematic or cyclic schedule. States will be encouraged to use the Safety Management System as a means of ensuring that Inventory data is updated. Additional methods of transmitting updates to FRA electronically will be explored.

FRA will hold an informal safety inquiry to consider requiring the display of the U.S. DOT/AAR Inventory number and a toll free phone number at all crossings to facilitate Emergency Notification. (See also Safety Inquiry under Private Crossings and Enforcement preceding.)

VI. Trespass Prevention

Trespasser defined: A person who is on that part of railroad property used in railroad operations and whose presence is prohibited, forbidden or unlawful. For purposes of this plan, and to avoid double counting, persons at highway-rail crossings are excluded from trespasser counts, regardless of the types of warning devices at the crossing.

The focus of the Federal effort regarding trespassing on railroad rights-of-way is to **prevent** trespassing from occurring in the first place, not to make trespassing safe. Trespassing on rail rights-of-way is illegal and dangerous and should not be condoned or facilitated.

Trespassing on rail rights-of-way results in more than 1,000 deaths and injuries each year. In 1990, (and in each year since then), the number of trespassers who died on rail rights-of-way exceeded 500 for the first time. To the industry, this presents a true Gordian knot. Trespassers are not a single, cohesive group. Their one common attribute is the illegality of their act (trespassing). Because of this diversity, it is not likely that trespassers will respond to a single national initiative. Regional programs have more promise. The Department of Transportation will target this problem. Our goal is to raise public and police awareness of the illegality of, dangers inherent in, and the extent of, trespassing on railroad right-of-way.

A related issue is vandalism. Railroads are reporting nearly 200 incidents per month of vandalism to automated warning devices at highway-rail crossings. This figure does not include vandal-caused damage to other railroad facilities, equipment and lading. Various provisions of Federal law address crimes directed at railroad equipment, passengers and employees. See 18 U.S.C. 1991 (entering a train to commit a crime), 18 U.S.C. 1992 (wrecking trains), and 15 U.S.C. 1281 (destruction of property moving in interstate commerce). While in many instances, vandalism to warning devices at highway-rail crossings may be considered to be within the scope of one of the above statutes, there is no Federal statute dealing directly with vandalism of these devices. Many states have similar statutes to the ones listed above.

The following actions are proposed:

A. Demographic Survey

FRA has requested FY 95 funds to initiate a study of trespasser problems and potential

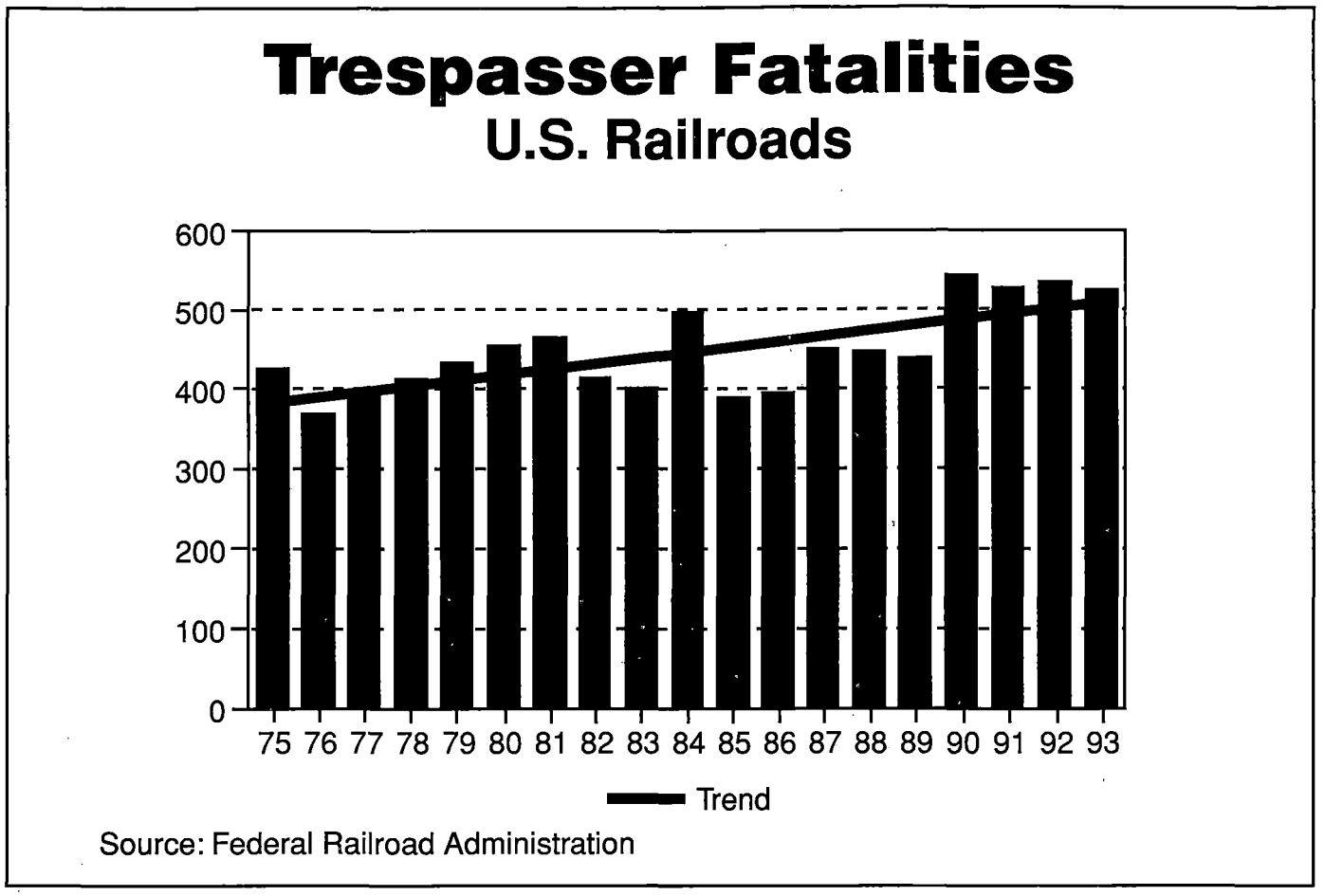

Figure 4

solutions. This effort will start with a survey and determination of the types of individuals and activities which are involved or result in trespasser casualties.

B. Trespasser Casualty Reporting

FRA is in the process of developing an NPRM addressing railroad accident reporting. FRA will propose gathering information from the railroads regarding the circumstances of the incident. This proposal will be published this year.

C. Workshop on Trespass Prevention

FRA will work with the railroad industry, railroad police and Operation Lifesaver to plan and host a second Workshop on Trespass Prevention. (The first was held in 1992.) The workshop will be held this year.

D. Regional Campaigns

Working with OL of Southern California, the FRA will develop a low-cost public service announcement (PSA) for television which addresses, in thirty seconds, the stark reality of trespasser casualties. FRA will work with the Congress, the Federal Highway Administration, the Association of American Railroads and OLI to clarify OLI's role in trespass prevention.

E. Model Trespass Prevention Code

FRA will work with rail industry police and legal staff to synthesize existing state and Federal code regarding trespass and vandalism prevention and to develop proposed code (model legislation) for consideration by state legislatures.

Recommendations/ Goals

In summary, current safety programs have resulted in a significant reduction in highway-rail crossing accidents and fatalities. In 1993, 626 people died as a result of accidents at highway-rail crossings; this is half the number of annual fatalities 20 years ago. This has occurred despite increases in rail traffic over the same period.

The development and expansion of high speed rail service on existing railroad rights-of-way will further increase the potential for, and severity of, collisions at highway-rail crossings unless mitigating steps are taken. The Department is committed to continuing the trend of reducing these collisions. Improvement funding is available under ISTEA and additional funding will be available under our high speed rail legislative proposal. We are also undertaking a program of research, development and demonstration of next generation grade crossing safety systems designed to ensure absolute protection at high speed crossings which are not closed.

This Action Plan identifies a wide variety of initiatives, beginning with efforts to reach and involve the law enforcement community. Further research is called for. Incentive programs are suggested. Special provisions are urged for the National Highway System and for the Principal Railroad Lines. Finally, a revenue neutral funding plan is proposed which could make these initiatives possible.

Only through partnership can we hope to progress these initiatives. The Department, along with the FHWA, FTA, NHTSA and FRA, the United States Congress, the railroad and transit industries, states and associations, and Operation Lifesaver, working together, can advance these recommendations and can achieve the goal.

A. Recommendations

To assure that the downward trend in crossing accidents and fatalities continues, we must work together to:

1. Establish an expanded and pro-active outreach program to our Nation's traffic law enforcement community ranging from patrol officers to judges.

2. Reduce the number of traffic law and warning device violations at highway-rail crossings by increasing enforcement and judicial support.

3. Promote comprehensive and systematic corridor reviews of highway-rail crossings, especially those over our nation's Principal Railroad Lines (PRLs).

4. Eliminate little used and redundant crossings within corridors where alternatives exist, especially those on the National Highway System (NHS).

5. Upgrade signs and signals at all crossings, taking full advantage of available state-of-the-art technologies.

6. Increase public awareness of 1) hazards at crossings and, 2) motorist responsibilities at crossings.

7. Develop and provide national, minimum safety standards for private crossings.

8. Eliminate the impediment to high speed rail operations posed by private crossings.

9. Enhance the effectiveness of our resources through research and data analysis.

10. Promote research and champion plausible innovation.

11. Ensure that timely and accurate information needed by decision makers is available.

12. Raise public and police awareness of the unlawfulness of, and dangers inherent in trespassing on railroad rights-of-way.

13. Develop and make available sufficiently detailed information to prepare and focus trespass prevention campaigns.

Only if we all move forward together with these Initiatives can the Nation enjoy a balanced transportation system. Only if we move forward can we end the loss of life, health and property at highway-rail crossings.

B. Goal

We must continue the downward trend in accident and casualty trends. If current programs are continued and these recommendations are implemented, a reduction by at least 50 percent or more is possible in the decade ahead, i.e., by 2004.

Appendix I

Historical Background

In 1877, the U.S. Supreme Court discussed the duties, rights and obligations of railroad companies vis-a-vis those of the highway user at highway-rail crossings and found that they were "mutual and reciprocal." The Court went on to say that a train has preference and the right-of-way over crossings because of its "character," "momentum" and "the requirements of public travel by means thereof," but that the railroad is bound to give due, reasonable and timely warning of the train's approach. The Court stated that "those who are crossing a railroad track are bound to exercise ordinary care and diligence to ascertain whether a train is approaching." (*Continental Improvement Company* v. *Stead*, 95 U.S. 161(1877))

The Accident Reports Act of 1910 requires rail carriers to submit accident reports. Included in this requirement are those accidents which occur at grade crossings.

The Federal-Aid Road Act of 1916 made Federal funds available for "rural post roads." Crossing safety improvement projects were eligible on a 50-50 cost sharing basis.

In 1928, reported fatalities at grade crossings reached a peak of 2,568 individuals. An additional 6,666 were reportedly injured.

In 1934, Federal funds were authorized for crossing safety improvements from the National Industrial Recovery Act of 1933. No match was required, and all public crossings were eligible.

In 1935, the U.S. Supreme Court commented on changes in responsibilities regarding the funding of a grade separation (a bridge) at a crossing in order to eliminate the hazards and delay inherent at an at-grade (level) crossing: "The railroad has ceased to be the prime instrument of danger and the main cause of accidents. It is the railroad which now requires protection from dangers incident to motor transportation. Prior to the establishment of the Federal-aid [highway] system . . . highways . . . served in the main, local traffic. The long distance traffic was served almost wholly by the railroads and the water lines. Under those conditions the occasion for separation of grades was mainly the danger incident to rail operations; and the promotion of safety was then the main purpose of grade separations. Then, it was reasonable to impose upon the railroad a large part of the cost of eliminating grade crossings; and the imposition was rarely a hardship. . . . the separation of grade crossings was a normal incident of the growth of rail operations; and as the highways were then feeders of rail traffic; . . . every improvement of highway facilities benefitted the railroad. The effect upon the railroad of constructing Federal-aid highways . . . is entirely different. They are not feeders of rail traffic. They deplete the existing rail traffic and the revenues of the railroads. Separations of grade serves to intensify the motor competition and to further deplete rail traffic. The avoidance thereby made possible of traffic interruptions incident to crossing at grade is now of far greater importance to the highway users than it is to the railroad crossed. (*Nashville, C. & St. L. Ry.* v. *Walters*, 294 U.S. 405, 422-423)

In 1964, a "finding" of the Interstate Commerce Commission (ICC) extended the Court's 1935 rationale to warning devices: "That highway users are the principal recipients of the benefits flowing from rail-highway grade separations and from special protection at rail-highway grade crossings. For this reason the cost of installing and maintaining such separations and protective devices is a public responsibility and should be financed with public funds the same as

highway traffic devices." (ICC Report No. 33440, January 22, 1964)

In 1970, Congress, counting on the cooperation of industry, Federal and state officials, included in both the Highway and Rail Safety Acts of 1970 a provision that the Secretary study the problems of highway-rail crossings and report back to the Congress with recommended solutions. A two volume Report to Congress was prepared. The first recounted the extent of the problem. The second, submitted to Congress in 1972, included recommendations which called for the Federal funding of safety improvements at highway-rail crossings, improvements in accident reporting and the establishment of a national data base of crossing information.

Also in 1972, Idaho State and Union Pacific Railroad officials cooperated in the promotion of a public education and enforcement program to reduce the number of crossing accidents in Idaho. The program was called, "Operation Lifesaver" (OL). Others states and railroads quickly followed.

Finally, in 1972, Secretary of Transportation John A. Volpe declared a goal, the reduction of 500 fatalities a year and the elimination of 4,000 accidents a year within ten years. About 12,000 accidents and 1,500 fatalities per year were then occurring.

The Highway Safety Act of 1973 funded (from the Highway Trust Fund) a $175 million dollar program over three years ($25M/$75M/$75M) for safety improvements at highway-rail crossings on the Federal-aid highway system. The Federal money was distributed to states in a fashion similar to other Federal-aid highway funds and required a 10% match. At least half the funds had to be used for the installation of warning devices at crossings. The Act also required that each state establish and maintain a survey of crossings.

A joint industry/state/Federal effort, in response to the Congressional mandate that each state establish a survey of crossings, promoted a national Inventory pointing out that the state "surveys" should be uniform. The Inventory was begun.

The Highway Safety Act of 1976 continued the Federal funding begun in 1973 by providing $250 million over 27 months for on-system crossings and $168.75 million for crossings not on the Federal-aid system, a first.

In 1977, the National Transportation Safety Board (NTSB) recommended that the National Safety Council establish a national OL program.

The Highway Safety Acts of 1978 and 1982 established and continued four-year, $190 million per year programs, dropped all distinction between crossings on and off the Federal-aid system and changed the distribution of funds to include a 50 percent consideration based on the number of crossings in each state.

In 1986, OL came out from under the auspices of the National Safety Council (NSC initiated the separation) and was incorporated as an independent entity.

The Surface Transportation and Uniform Relocation Assistance Act of 1987 continued the crossing safety improvement program at $160 million per year for five years, through FY 1991. The Act also charged the Secretary with conducting a study of national highway-railroad crossing improvement and maintenance needs. The report was due in two years, a follow-up to the 1971-72 Reports to Congress. The Act also set aside $250,000 per year for driver education (a euphemism for OL), a first.

In April 1989, the Secretary of Transportation forwarded a report to the Congress, titled: *Rail-Highway Crossings Study*. This study summarized crossing needs to the year 2005.

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 continued the crossing safety program at the same funding level nationwide as the 1987 Act, but with the potential for increased funds at a state's discretion. Also, the 1991 Act significantly broadened the allowance for 100 percent financing of certain improvements under the Section 130 Program.

Appendix II

Status of Current Programs

A. Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA)

Most of the funds for crossing improvements come through the Federal Highway Administration (FHWA). In 1973, Congress established and funded a categorical Highway Trust Fund program for improving highway-rail crossing safety. The crossing safety program has been funded continuously since then. Most recently, through passage of the ISTEA, the Congress authorized to states over $3.4 billion in Fiscal Year (FY) 1992 and nearly $4.1 billion per year for surface transportation programs in FYs 1993 through 1997. Of this amount, ten percent is set aside for safety programs, including crossing safety.

1. ISTEA, Section 1007

   Of the ten percent set-aside for safety programs, states must spend $149 million on highway-rail crossing improvements. At least 50 percent of these funds must be spent on the installation or upgrading of warning devices, and the remainder may be spent on additional warning devices or on other means of eliminating crossing hazards. The specific amounts received by each state are determined by a Congressionally mandated formula which considers the number of crossings, highway route miles, geographical area and population. (Significantly, the numbers of crossing accidents and casualties do not enter into this formula.) States also receive over $116 million in the set-aside amount which can be spent on hazard elimination at crossings or on highways. Optional amounts for each state range from $0 to $10.6 million.

   All public highway-rail crossings are eligible. Projects may include the installation of train-activated warning devices (traditional lights and/or gates), signs and pavement markings, crossing closures, signal circuit upgrades, illumination (street lights), crossing surfaces, the building of grade separations (bridges), sight-distance improvements and other highway approach modifications.

2. ISTEA, Section 1010

   This section authorized $30 million over six years for the elimination of hazards at both public and private highway crossings in up to five high speed corridors. The five corridors include: The Northwest (Vancouver, British Columbia to Eugene, Oregon via Seattle and Portland); California (San Diego to the Bay Area via Los Angeles and the San Joaquin Valley with a connection to Sacramento); Chicago (with spokes to Milwaukee, St. Louis and Detroit); Florida (Tampa to Miami via Orlando); and the Mid-Atlantic (Washington to Charlotte, North Carolina via Richmond).

Corridor	Length in Kilometers (miles)	Estimated Number of Crossings
California	1,054(655)	600
Chicago Hub	1,041(647)	815
MidAtlantic	769(478)	585
Northwest	747(464)	475
Florida	576(358)	315

The initial $5 million has been obligated and the second year funding requests are under review by FRA and FHWA. States are developing long range plans for treatment of corridor crossings and initiating projects to specific crossings. Projects being undertaken involve both existing and advanced technologies. For example, four quadrant gates will be installed and evaluated, as will an arrestor net system designed to safely restrain vehicles from entering the crossing when a train is approaching.

Two other high speed rail corridors exist or are being developed under other authorities. These include completion of the Northeast Corridor from New York City to Boston, MA and the Empire Corridor from New York City to Schenectady, NY via Albany, NY.

3. ISTEA, Section 1036

Section 1036(c) calls for a technology demonstration program which will facilitate the establishment of high-speed rail service. Of four projects selected for demonstration to-date, three address highway-rail crossings. These are:

(A.) Installation of an obstacle detection system with four-quadrant gates at a highway-rail crossing. The Connecticut Department of Transportation will demonstrate an advanced crossing protection system using four-quadrant gates with a transponder-based system which will detect an obstacle between the gates and will notify the locomotive engineer should the warning devices not work or if the crossing is blocked, enabling the train to stop in time to avoid an accident. Two or three Amtrak locomotives will be retro-fitted with the necessary cab signals to receive signals from the new vehicle detection system. The new system will overlay the existing warning system and will relay information to the engineer via cab signals.

(B.) A consortium of four firms, a university and Virginia's Center for Innovative Technology will demonstrate a "friendly mobile barrier" (FMB). The FMB is a crash attenuation device that rises from a vault in the roadway behind crossing gates after the gates have come down. The FMB will block access to the tracks for approaching highway vehicles and will stop a passenger car or light truck while averting both fatal injury to occupants and damage to the barrier. The FMB will also prevent a large truck from gaining access to the tracks at truck speeds up to 80 kph (50 mph), though damage to both the truck and barrier could be severe.

(C.) The Florida Department of Transportation (FL DOT) will demonstrate a low cost grade separation structure and process. Total cost and time of construction is expected to be approximately fifty percent less than the time and cost of a traditional pile supported, concrete wall and beamed structure. The proposed structure will use either a culvert style approach or "two vertical walls of reinforced concrete covered by a deck (to be designed by the FL DOT)." The FL DOT will "compete" the options.

4. ISTEA, Section 1072

Section 1072 requires the Department to coordinate field testing of a Vehicle Proximity Alert System (VPAS) to determine feasibility for use by priority vehicles (emergency, police, school buses, hazmat) as an effective highway-rail grade crossing safety device. A special public announcement on 26 July 1993 solicited information for any existing designs for possible test and

evaluation (T&E). Eleven formal responses involving different technologies were received and evaluated. Four systems, representing three basic design concepts, were tentatively selected.

The current program effort is to provide a test site(s) (currently the Pueblo Transportation Test Center), test plan, data collection and evaluation for the selected systems that have operational prototypes. The test and evaluation will include a representative design from each of the three design concepts. Those systems that successfully pass initial testing and have promise will receive a thorough field operational evaluation to verify the reliability and overall performance in real-life conditions.

The cost for testing and evaluation should be under $1,000,000, and FHWA has identified approximately $1,000,000 of IVHS (Intelligent Vehicle Highway System) funds which have been transferred to VPAS for the T&E effort. The FRA Office of Railroad Development (High Speed Rail Corridor Project) will have funds available in FY 1995 to help support the T&E effort.

5. ISTEA, Section 1077

Section 1077 required revision of the Manual on Uniform Traffic Control Devices (MUTCD) to grant states and local governments the discretionary authority to install STOP or YIELD signs at any highway-rail grade crossing without automatic traffic control devices with two or more trains operating across the highway-rail grade crossing per day. To implement Section 1077 the FHWA published on November 6, 1992 a Final Rule 92-11 in the *Federal Register* (57 FR 53029). This Final Rule incorporated standards into Section 8B-9 of the MUTCD.

The rule was effective upon issuance. In addition, on December 30, 1992, the FHWA issued an interpretation which defined "two or more trains a day" to mean: an average of two or more trains operating over the crossing each day for a period of one year prior to the installation of the STOP or YIELD control sign.

FRA and FHWA have developed a list of considerations to assist in the selection of crossings where it would be most appropriate to install such signs first. We have encouraged states, communities and railroads to develop a rational program for the installation of STOP or YIELD signs.

The following factors are suggested for consideration when reviewing a crossing for possible STOP or YIELD sign installation:

a. Will local law enforcement officials enforce the traffic control message?;

b. Volume, type and speed of highway traffic;

c. Frequency, type and speed of trains;

d. Number of tracks and the intersection angles;

e. Adequacy of stopping sight distances;

f. Need for more active control devices; and

g. Crossing accident history.

Crossings which should be considered first for STOP sign installations should

be those where most of the following factors are met:

a. Local and/or state police and judicial officials will commit to a continuing program of enforcement.

b. The highway is secondary in character with low traffic counts. Recommended maximum of 400 Annual Average Daily Traffic (AADT) in rural areas, and 1,500 AADT in urban areas.

c. Highway traffic mix includes buses, hazardous materials carriers and/or large (trash or earth moving) equipment.

d. Train speeds exceed 30 mph and/or train movements are 10 or more per day, 5 or more days per week.

e. Rail line is used by passenger trains and/or a significant incidence of hazardous material lading.

f. Crossing is multiple track and/or approach is at a skewed (other than 90 degree) angle.

g. The line of sight from an approaching highway vehicle to an approaching train is restricted.

h. Installation of a STOP sign would not occasion a more dangerous situation than would exist with a YIELD sign.

STOP or YIELD signs shall not be used at crossings with active traffic control devices. STOP AHEAD or YIELD AHEAD Advance Warning Signs should also be installed. The placement of a STOP or YIELD Sign at a crossing shall conform to the requirements of MUTCD Section 2B-9 *Location of STOP Sign and YIELD Sign.*

The FRA has developed software and made available lists which group "passive" crossings, i.e., those without active warning devices, into categories based on information taken from the U.S. DOT/AAR (Department of Transportation/Association of American Railroads) National Highway-Rail Crossing Inventory and the objective criteria from the foregoing factors. The top categories include those crossings which should be reviewed and considered first for STOP signs (i.e., those most likely to realize a safety benefit). Several states and railroads have acquired these listings.

B. High Speed Rail

The FRA's Office of Safety has established guidelines for crossings on high speed rail corridors.

If rail speeds are to exceed 200 kph (125 mph), no at-grade (level) crossings, public or private, will be permitted across the rail right-of-way. All crossings in such high speed rail corridors must be closed or grade separated (a bridge built).

1. Public Crossings:
   Where trains will be operating at speeds between 176 and 200 kph highway-rail crossings must be equipped with impenetrable barriers capable of precluding intrusion onto an operating track, i.e, stopping highway vehicles short of fouling the operating track(s). Such a barrier must be operated in conjunction with intrusion detection and train stop technology. This implies track circuits of sufficient length that logic circuitry can verify and communicate to the locomotive that: 1) the barriers are closed; and, 2) the crossing is clear of vehicles, while the

train is still a sufficient distance from the crossing that a full service brake application (non emergency) would bring the train to a stop before reaching the crossing if either indicator was not favorable. (See requirement for "grade crossing **protection**" in the context of operating speeds above 110 mph (49 CFR 213.9(c)).)

In this context, the term "grade crossing **protection**" is separate and distinct from conventional "warning devices." Warning devices, which are defined by the Manual on Uniform Traffic Control Devices (MUTCD), are intended to warn motorists of the presence of a crossing and of impending rail activities for the purpose of highway traffic control at and over the crossing. Concerns for the safety of the motorist and the efficiency of highway traffic flow are the motivating factors, and the FHWA has taken the lead in establishing requisite standards. However, these concerns pale in comparison to concern for the safety of the rail operation (for passengers, crews and trains) where rail speeds exceed 176 kph. Conventional warning devices do not protect the integrity or safety of the rail movement at any speed, and this failure would be catastrophic at speeds above 176 kph. Thus, "protection" is defined to mean an effective barrier, i.e., one which precludes intrusion onto the rail right-of-way. The closest parallel to this situation currently addressed within the MUTCD is the reference to "resistance gates" for closing roads on approaches to movable bridges. See MUTCD Section 4E-13. The role of "highway traffic control" in such a setting is to alert the highway vehicle driver that an obstruction or barricade lies ahead, i.e., that the road is temporarily closed. The MUTCD currently defines the necessary elements for properly closing and/or barricading a road.

For new service on designated corridors at or above 128 kph (80 mph) to 176 kph, FRA's guidelines call for the completion of a corridor analysis leading to elimination of not less than 25% (50% as the target) of crossings, with separation or active warning devices, to include gates, at the remainder. Constant warning time upgrades would be required, where not present. As warranted at selected crossings, encourage use of median barriers, special signing (e.g., active advance) and/or four quadrant gates.

If lightweight train sets are introduced, additional protection might be required for rail movements.

2. Private Crossings:
We recommend that private crossings be individually analyzed, and closed as warranted. In addition, private crossings should be subject to safety measures comparable to public crossings and equipped with manual gates (normal position being closed and locked).

   For train speeds from 176 to 200 kph, accidental intrusion on the rail right-of-way must be absolutely precluded. This means that private crossings must be equipped with locked gates linked to the train signal and control system, along with telephones and a fail safe vehicle (obstruction) detection at the crossing. Gates should be substantially constructed, i.e., able to absorb a moderate speed collision from vehicles likely to be using the crossings without fracturing. If the gate/barrier is opened (e.g., to accommodate an emergency) it can not be done until track clearance has been received from the railroad and trains in the territory have been advised.

Where passenger trains are scheduled to operate at speeds from 128 to 176 kph, private crossings should either be closed, grade separated, provided with a secured barrier, or equipped with automatic visual and audible traffic control devices which provide a minimum of 20 seconds warning of the impending presence of a train to users of the crossing. The traffic control device should include a full barrier gate system (covering all lanes, approach and exit) on each side of the rail right-of-way. The barrier (gate) will normally be closed (down) and will open on request (manually or automatically), if no train is approaching, for a period of time sufficient for the crossing user to negotiate the crossing.

C. Light Rail

Many metropolitan areas are addressing transportation needs by establishing light rail transit systems or reestablishing street cars or trolleys. Light rail transit systems currently exist in eighteen cities in the United States and Canada. New operations often share existing streets with highway traffic. Sometimes they use medians or closely parallel existing streets; operate in exclusive rights-of-way; or share a right-of-way, and sometimes track, with

Rail Speed KPH	Public Crossings	Private Crossings
128 (80) to 176 (110)	Eliminate all redundant or unnecessary crossings. Install most sophisticated traffic control/warning devices compatible with the location, e.g., median barriers, special signing (possibly active advance warning), four-quadrant gates. Automated devices should be equipped with constant warning time equipment.	Close, grade separate, and provide a secured barrier or automatic devices for private crossings. Device or barrier should extend across the entire highway on both sides of the track, should normally be closed and opened on request, if no train is approaching, for a period of time sufficient to cross the track(s).
177 (111) to 200 (125)	Protect rail movement with full width barriers capable of absorbing impact of highway vehicle. Include a fail safe vehicle detection capability between barriers. Notify approaching trains of warning device or barrier failure or of an intruding vehicle in sufficient time for the train to stop short of the crossing without resorting to emergency brake application.	Protect rail movement with full width barrier or gate, normally closed and locked, capable of absorbing impact of a highway vehicle. Gate lock or control should be interlocked with train signal and control system and released by a railroad dispatcher. A fail safe vehicle detection or video system should monitor the area between the barriers. The crossing should be equipped with a direct link telephone to the railroad dispatcher.
Above 200 (125)	Close or grade separate all highway-rail crossings.	Close or grade separate all highway-rail crossings.

conventional rail operations. In some instances, light rail transit systems may employ a combination of these scenarios.

Most systems have some grade crossings. Not surprisingly these corridors generate relatively large numbers of crossing and pedestrian incidents and casualties. New operations have quickly discovered that the most prevalent safety problem, and the one that draws the most public concern, is light rail versus motor vehicle collisions.

Some communities have operated light rail and commuter rail systems for many years, e.g., New Jersey Transit and San Francisco MUNI. Newer systems are experiencing grade crossing accidents and increasing public concern as a result of these incidents. Most of these accidents are not the result of unsafe operation of the rail vehicle, but rather a lack of education about the dangers of attempting to cross the tracks while a rail vehicle is approaching. The cultural diversity of the surrounding community, language barriers and the unfamiliarity with living in an environment with light rail vehicles at grade crossings also have an impact on the number of grade crossing accidents.

1. Metro Blue Line Grade Crossing Safety Program

   In the three years since the opening of the Los Angeles Metro Blue Line (MBL), a 22 mile light rail system, there have been 182 train-vehicle and 24 train-pedestrian collisions resulting in 16 fatalities and numerous injuries (as reported through June 1993). There are 100 grade crossings on the MBL.

   Officials from the Los Angeles County Metropolitan Transportation Authority (MTA) are taking an aggressive and innovative approach to finding solutions.

   The MBL Grade Crossing Safety Program was initiated in March 1993 to evaluate various means to discourage or prevent illegal movements being made by motor vehicles at grade crossings that are causing train-vehicle accidents. While the program is focused primarily on evaluating measures to decrease train-vehicle accidents, the safety program is also concerned with improvements that will reduce train-pedestrian accidents.

   The MTA is seeking to apply innovative equipment and safety methods developed for street and highway traffic applications. These engineering improvements will address the unique characteristics of grade crossings and improve public safety. The program includes four elements:

   Enforcement using sheriff's deputies and photo enforcement systems.

   Engineering improvements including use of Intelligent Vehicle Highway Systems (IVHS) technology, warning devices, and street and traffic signal improvements.

   Legislation to establish higher fines and statewide rail safety educational programs.

   Bilingual public information and safety education.

   The photo enforcement program has been extremely successful in terms of reducing the numbers of motorists who are violating grade crossings. Over a four month period, a photo enforcement demonstration project resulted in an 84 percent reduction in the number of violations occurring at two targeted crossings.

Their efforts are worthy of emulation, as they have had success in reducing accidents. The FTA, in collaboration with the FHWA and FRA, provided funding to the MTA to test and evaluate technologies that will support the enforcement of traffic laws and decrease the frequency of grade crossing violations and accidents.

2. Integration of Light Rail into City Streets

Through the Transit Cooperative Research Program (TCRP), the FTA funded a research project to improve the safety of light rail operations in shared rights-of-way and to provide guidelines that may be used in updating the Manual on Uniform Traffic Control Devices (MUTCD).

Korve Engineering, Inc. of Oakland, California is the recipient of a $250,000 TCRP contract to (1) identify problems and potential solutions, and 2) conduct in-depth behavioral analysis of the most significant issues that impact integration of light rail transit into city streets. The anticipated products from this project are (1) identification of methods now in use to mitigate hazards of light rail transit operations, (2) calculation of measures of effectiveness, (3) recommendations for additions to the MUTCD, (4) demonstration of at least one proposed technique to improve safety, and (5) recommendations for future research.

Using a hazard analysis approach, the project will identify the most effective control devices, public education techniques and enforcement techniques to improve safety for rail passengers, motorists and pedestrians. The project will identify the most promising techniques to address problems such as:

Lack of pedestrian awareness of approaching light rail vehicles.

Unsafe pedestrian activity in close proximity to tracks, stations and intersections.

Motor vehicles operating parallel to light rail tracks turning into the path of light rail vehicles.

Failure of motor vehicles to yield right-of-way to light rail vehicles at street crossings.

Motor vehicles obstructing tracks.

Motor vehicles driving around closed railroad gates.

Nonstandard crossing configurations (e.g., light rail vehicles that turn in intersections, skewed intersections).

Techniques to be analyzed will include passive and active signs; traffic signalization (including light rail indications); pavement marking, texturing and striping; geometric improvements; channelization; audible warning devices (bells, whistles, horns, etc.); intersection illumination; illumination and marking of light rail vehicles for better nighttime visibility; moveable traffic barriers; application of advanced technology; enforcement; and education.

An additional objective is to provide material for possible use in the Manual on Uniform Traffic Control Devices (MUTCD). The MUTCD addresses traffic control for highway-rail crossings, but light rail vehicles interact

with motor vehicles and pedestrian traffic in more complex ways than do traditional railroads.

3. State Safety Oversight

   Section 28 of the Federal Transit Act, as amended (FT Act) directs the FTA to issue a rule requiring states to oversee the safety of rail fixed guideway systems not regulated by the FRA. A Notice of Proposed Rule Making (NPRM) was published in the Federal Register on December 9, 1993. The NPRM proposes the FTA's State Safety Oversight Program, which should improve the safety of light rail fixed guideway systems.

   Section 28 requires each state to designate a state oversight agency to be responsible for overseeing the rail fixed guideway system's safety practices. FTA may withhold Federal funds if a state fails to implement the oversight program.

   More specifically, the statute describes the responsibilities of the state, the agency the state designates to provide oversight, and the type of activities the agency is expected to carry out. In most instances, this entity will be an agency of the state because most rail fixed guideway systems operate only in one state. Where a rail fixed guideway system operates in more than one state, however, the statute permits the affected states to designate any entity, other than the transit agency itself, to oversee that rail fixed guideway system.

D. Crossing Consolidation and Closure

A March 4, 1993 memorandum from FHWA's Associate Administrator for Safety and System Applications to the FHWA Regional Administrators provided direction: "When considering [highway-rail crossing] improvement options, the ultimate solution to train-vehicle collisions is to eliminate the crossing by constructing a grade separation or closing the crossing. . . . In addition to considering the closure of unnecessary grade crossings, states and local communities should make every effort to minimize the number of new crossings." Implementation is left to the FHWA Region and Division offices working with FRA Region offices.

FRA has an ongoing project designed to encourage railroads and state transportation agencies to consolidate and close unnecessary crossings. Case studies of two dozen crossing consolidation and closure projects were prepared. The case studies highlight effective strategies that have been used to consolidate crossings, and the lessons that can be learned from unsuccessful closure projects. Case studies were selected to reflect the diversity of state law on the subject of crossing closure and the range of crossing consolidation experience on freight and commuter railroads in rural and urban areas.

In February 1993, Operation Lifesaver, Inc. (OLI) subscribed to the general notion of closing crossings for safety: "To enhance highway-rail grade crossing safety, Operation Lifesaver, Inc. endorses the concept of reducing the number of crossings through consolidation, elimination, grade separation and restricting the number of new crossings." Several state level OL programs are promoting crossing closure.

The Association of American Railroads (AAR) and the American Association of State Highway and Transportation Officials (AASHTO), working through the National Conference of State Rail Officials (NCSRO), have established an ad hoc committee to address the promotion of crossing closure programs. Both the FHWA and FRA are supporting this effort co-chaired by individuals from the Iowa Department of Transportation and the Union Pacific Railroad. The goal is to publish a report outlining the rationale for crossing closure, a compendium of state laws

regarding crossing closures and openings, a series of "provisions" that might be incorporated in new state legislation to promote closures and limit openings (selection of provisions would depend on the structure of state government) and to provide some tools to promote progress (e.g., procedures, pamphlets, possibly a video). The committee is promoting a study by the National Cooperative Highway Research Program (NCHRP) to develop an analytical procedure for assessing a group of crossings (a corridor) and developing criteria for weighing the pros and cons of closing specific crossings within the group.

In August 1993, at the annual NCSRO meeting, the Safety Committee proposed a resolution which was positively received, to wit, that cash incentives to local governments for crossing closure should be permitted (at state discretion) from the Federally funded (Highway Trust Fund) crossing safety improvement program. Such a provision would have to be sanctioned by Congress. As proposed by NCSRO, the local jurisdiction receiving these funds would have complete latitude in their use. However, they could be used for some items or indirect costs which cannot be paid with Federal funds. Examples from FRA's case studies include landscaping and the extension of a water line to a new fire hydrant necessitated by the closure.

This resolution has been approved by both NCSRO and AASHTO state officers and was formally forwarded to the Department by AASHTO on May 12, 1994.

The FHWA will currently allow Federal funds to be used for purchasing a property "right" from a private entity for public purposes, but has not extended that allowance to a public entity.

Such a program will be needed, if not for all railroads' right-of-way, at least for high speed corridors.

Several railroads have established their own programs to promote crossing closure. Burlington Northern Railroad (BN), Conrail (CR), CSX Transportation (CSX), Norfolk Southern Corporation (NS) and Union Pacific Railroad (UP) are examples. They use different approaches, each with varying success, but learning as they go. For example, in Florida, CSX, "which represents 60 percent of the rail mileage in Florida, has agreed to be the applicant on crossing closures on their system, pay 100 percent of the cost of closure and share the costs associated with roadway improvements required as a result of the crossing closure."[5] UP is working through their OL presenters and is willing to match the Nebraska cash incentive for local communities. (UP and BN have both agreed to match state incentive payments in Missouri as well, if the state approves a program.)

The legislatures of Kentucky, Missouri and Illinois have each recently enacted crossing closure initiatives. Missouri and Illinois have tasked rail offices in their respective states with studying the closure alternative. In the case of Missouri, the Missouri Division of Transportation has reported back and recommended a crossing closure plan describing both procedures and funding.[6] In Illinois, they are to publish specific criteria which will be considered when weighing the retention of an existing crossing or the opening of a new crossing. Authority to close crossings is (and was) vested in the Illinois Commerce Commission. In Kentucky, the Transportation Cabinet has been given the authority to close crossings used by less than

[5]*Report to the Governor and the 1994 Florida Legislature on the Safety and Security of Railroad-Highway Grade Crossings*, January 21, 1994,

[6]*Executive Summary of the Missouri Grade Crossing Closure Study,* Missouri Division of Transportation Staff, January, 1994.

4,000 vehicles per day. The existence of this authority has led to many cooperative (between local communities, the Commonwealth and the railroads) ventures resulting in the closing of several crossings. The Cabinet has not yet had to exercise the "authority" in order to consummate a project. Florida DOT "discourages the opening of new public grade crossings." In fact, Florida's Secretary of Transportation has placed a moratorium on new at-grade crossings on Florida's Section 1010 corridor.[7]

Currently, there are no Federal restrictions or standards on how many or what types of crossings should be consolidated within a given area. However, some jurisdictions have found the following criteria useful for selecting crossings for consolidation:

1. Consolidate crossings where there are more than four per mile in urban areas, and one per mile in rural areas and an alternate route is available;

2. Consolidate crossings which have fewer than 2,000 vehicles per day and more than two trains per day and an alternate route is available;

3. Eliminate crossings where the road crosses the tracks at a skewed angle or where the track is curved;

4. Link construction work with eliminations. This linkage will be especially important when upgrading rail corridors for high speed trains;

5. When improving one crossing (by grade-separation or installation of automated warning devices), consider eliminating adjacent crossings and rerouting traffic from these crossings to the improved crossing;

6. For every new crossing built, consolidate traffic from two or three other crossings; and

7. Eliminate complex crossings where it is difficult to provide adequate warning devices or which have severe operating problems (e.g., multiple tracks, extensive switching operations, long periods blocked, etc.).

Before consolidation, identify alternate routes for ambulances, fire, and other emergency vehicles. Past experience shows that even when communities support crossing consolidation, they may oppose proposed changes in traffic patterns. In these cases, "trade-offs," such as upgrading other crossings in the area of the targeted closure, have been successful.

When set against the backdrop of current high speed rail proposals, all this is particularly timely. Crossings are the major impediment to the realization of true wide spread high speed rail operations, both passenger and intermodal, in this country. The crossing problem must be solved, or we will not realize full potential. Consolidating crossings is the safest and only long term solution. The momentum which now exists must be nurtured.

E. Corridor Reviews

For the last 20 years, states have been able to identify and improve many hazardous highway-rail crossings, most often by installing train-activated warning devices with Federal-aid highway safety funds. Today, many of the most hazardous crossings have been improved. There is some concern, however, that too little attention has been paid to the less expensive safety improvements that are needed at a far greater number of crossings, including private crossings.

[7]Florida *Report,* page 11.

Under the current program, low-volume crossings are seldom reviewed by diagnostic teams and any work done at these crossings is usually limited to the installation of passive warning devices. Statistics show that more than half of the fatalities resulting from highway-rail crossing accidents occur at low-volume crossings where active warning devices may never be installed.

Actions have been taken over the years to encourage states to expand their programs to encompass significantly more crossings each year and emphasize low-cost improvements at crossings not often addressed by diagnostic teams. In a June 1983 memo, the FHWA's Office of Highway Safety urged its field offices to encourage states to consider a number of low-cost projects that had the potential to improve safety at crossings without active warning devices. Such projects included: (1) vegetation clearing and other means of improving sight distance; (2) installing standard signs and pavement markings; (3) improving roadway approach grades and alignment; (4) improving crossing surfaces, and (5) closing unnecessary crossings.

It was pointed out that these low-cost improvements could frequently best be carried out if all the crossings along a railroad corridor or in a given area, such as an urban area or a highway district, were analyzed at the same time for possible improvement. This method of analyzing crossings is especially important in determining which crossings can be closed. The memo further pointed out that Federal-aid highway funds are eligible for making improvements in these corridors even if every crossing in the corridor does not appear on the state's high priority list of crossings.

In 1986, the FHWA published a report titled *Demonstration Project No. 70, Railroad Crossing Corridor Improvements,* which presented a model program combining the benefits of individual high-risk crossing programs with those of a corridor approach. The report also spelled out specific aspects of a corridor approach that should be emphasized to maximize a state's crossing safety effort.

In March 1993, FHWA's Associate Administrator for Safety and System Applications issued a memo reminding FHWA field offices that the ultimate solution to train-vehicle collisions is to eliminate crossings by constructing grade separations or closing the crossings. Again, these are the types of actions that can best be analyzed by looking at numerous adjacent crossings in a corridor or systems approach to crossing improvements.

F. Operation Lifesaver™ (OL) and OL, Inc. (OLI)

Operation Lifesaver™ is an active, continuing public education program designed to reduce the number of crashes, deaths and injuries at highway-rail intersections. It is sponsored cooperatively by Federal, state and local government agencies, highway safety organizations and the nation's railroads.

1. Education

   Operation Lifesaver's success lies in educating people of all ages as to just how potentially hazardous grade crossings can be. Methods used to reach the public include civic presentations, early elementary and driver education curriculum activities, school bus driver programs, industrial safety, law enforcement programs and media coverage. Both OLI and FRA have produced Public Service Announcements (PSAs) for television and radio. Some state programs have also produced PSAs, including some in Spanish.

2. Enforcement

   Nearly 50 percent of all highway-rail crossing accidents occur at crossings equipped with automated warning devices, indicating that some members of the public ignore the devices. This

statistic underscores the need for increased enforcement.

The DOT does not enforce traffic laws at crossings, which is why the support of state, local, and railroad enforcement officers is so critical. The DOT and OLI work with state and local police, highway, and judicial authorities to promote broader enforcement programs and imposition of stiff fines for disregarding warning devices and STOP signs at highway-rail crossings. State and local law enforcement agencies are urged to "crack down" on motorists and pedestrians who disregard these laws and jeopardize their own as well as the lives of others. FRA/OLI are making available the Law Enforcement Television Network series, "On-Track," for training of police officers regarding enforcement of crossing safety laws. FRA, sometimes jointly with OLI, has set up crossing safety and trespass prevention displays at national meetings of the International Association of Chiefs of Police, the National Fraternal Order of Police and the National Sheriffs' Association.

Vandalism of active warning devices at highway-rail crossings is also a problem which can be aided by police involvement. Approximately one in twenty warning device failures is reportedly attributable to vandalism, and vandalism is suspect in many more.

3. Engineering

   The public is made aware of Federal, state and railroad programs that plan, install and maintain grade crossings. FRA/FHWA/OLI offer technical training to employees of railroads and state and local governments in crossing improvement and safety programs.

4. Funding

   Operation Lifesaver, Inc. receives nearly 60 percent of its funding on a national level from FHWA ($300,000) and FRA ($100,000) grants. Private corporate sources providing funding include the Association of American Railroads (AAR), the National Railroad Passenger Corporation (Amtrak) and the Railway Progress Institute (RPI), with individuals providing small levels of support through individual and small corporate donations. As a 501(c)3 organization, OLI is federally tax-exempt, and all donations to it are tax-deductible, based on current IRS regulations for charitable deductions.

   State and local programs are funded from myriad sources including state and corporate contributions. Some assistance, mostly non-financial, is provided by OLI. Many state programs are incorporated in a fashion similar to OLI.

5. Staffing

   Located in Alexandria, Virginia, just outside of Washington, D.C., the National Support Center (NSC) serves first and foremost as a central coordinating point for all OL activities nationwide (national headquarters office). The headquarters employs three full-time staff members: Executive Director, Communications Director and Executive Assistant. The NSC functions on a full-time basis five days per week. OLI also employs a full-time individual designated as the National Field Coordinator (NFC), whose primary role is to offer direct technical assistance to the state OL programs. Working from a field office in Phoenix, Arizona, the NFC assists state programs, reorganizes dormant programs, helps maintain

current programs and establishes new programs. The NFC provides the training necessary to have individuals certified as Operation Lifesaver Presenters.

There is an OL State Coordinator for each state (except Hawaii). This individual promotes and coordinates crossing safety and enforcement programs within the state, coordinates speakers for events, prepares and displays exhibits at state and county fairs and special events, responds to and initiaties media coverage, attends public hearings/meetings and, develops and/or distributes promotional materials, etc.

G. Research

1. Locomotive Conspicuity

Many railroads have equipped locomotives with alerting lights (such as ditch lights, strobe lights, oscillating lights, low-level additional headlights, and flood lights) to make them more visible at night. In 1983, the FRA conducted a benefit-cost analysis of alerting lights and concluded that a Federal requirement that all railroads use such lights on every leading railroad car could not be justified. After comparing the safety records of railroads that equipped locomotives with alerting lights to those of railroads that did not equip their locomotives with such lights, the FRA found no evidence that alerting lights reduced highway-rail crossing accidents. The FRA determined, in light of this information and the maintenance and reliability problems found, that the costs of requiring alerting lights would far exceed the benefits. The 1983 report stated if the FRA issued such a regulation under these circumstances, railroads would be compelled to reallocate resources from programs already proven successful in reducing rates for crossing accidents to a less effective approach.

However, two years ago, in light of improved device reliability and in frustration with the continuing toll of crossing accidents, the FRA asked VNTSC to again research this option. In recent legislation, specifically the Amtrak Authorization and Development Act passed in 1992, the Congress directed the Secretary of Transportation to complete research by the end of 1993 and to issue final rules before July 1995 requiring "enhanced locomotive conspicuity measures." The legislation defines this as any "enhancement of day and night visibility of the front-end unit of a train, by means of lighting, reflective materials, or other perspective of drivers of motor vehicles at grade crossings."

2. Reflectorization of Rail Cars

In 1982, the FRA studied the safety potential of requiring some reflective patches on the sides of rail cars. Principally because of the rapid degradation of available materials at that time, the FRA concluded that such a requirement was not cost-effective.

However, in recognition of recent improvements in retro-reflective materials (more reflective ability and surface coatings that resist dirt accumulation and afford some ultra violet protection), the FRA is reconsidering this option.

Tests have been conducted at the Transportation Test Center in Pueblo, Colorado, to measure performance and to establish the optimal size and position of the materials on freight cars. Full scale testing (in revenue service), with the cooperation of three major railroads, is now underway in Alabama, Alaska,

Georgia, Illinois, Indiana, Kentucky, Minnesota, Ohio, Tennessee, and Virginia. As part of the overall effort, accident experience and data will be reviewed. Human factors, specifically motor vehicle operator recognition, comprehension and response, will be assessed. Upon completion of these tests in FY 1994, the FRA will re-examine its policy on this matter.

3. Illumination

   VNTSC is developing illumination standards for street lights at highway-rail crossings. The purpose of such lighting is twofold: to provide advance notice to the approaching motorist of the existence of a crossing, and to illuminate a train when one is in the crossing. FRA is sponsoring this effort. VNTSC will consider in its evaluation a cost comparison of solar-powered and commercially-powered illumination systems and applicability of standard highway illumination. A draft report and illumination guidelines have been circulated for peer review and is projected to be available to FRA by Summer 1994.

   While illumination has failed to gain widespread recognition as a safety improvement option, it has several benefits. Illumination is a low-cost improvement, especially if commercial power is already available. In addition, placement, operation, and maintenance can be effected with only minimal railroad involvement. States may use Federal funding for such projects through ISTEA.

4. Train Horns

   The FRA is working with the Association of American Railroads (AAR) to study the safety impact of whistle bans nationwide, to determine if nationwide Federal action is required. Federal noise standards for railroads are established by the Environmental Protection Agency (EPA) and enforced by the FRA. However, because of their primary use as safety devices, locomotive horns and whistles are exempt from the EPA noise emission standards. The FRA is sponsoring research by the VNTSC to develop an optimal warning signal for locomotive whistles, which minimizes noise for communities while not compromising safety. VNTSC also is investigating potential alternative systems, such as audible warning devices installed directly at crossings. (A cooperative effort involving the State of Nebraska, the City of Gering, the Union Pacific Railroad and a private firm has produced some field testing of an Automated Horn System (AHS) mounted at the crossing. The Los Angeles County Transportation Commission is also considering a similar device offered by another firm.) Some Los Angeles County commuter trains have been equipped with an innovative train whistle device, somewhat toned down and mounted lower on the locomotive in order to minimize impacts on neighboring communities, but still meeting minimum FRA standards. (VNTSC and FRA are monitoring these efforts.) A final report with research project results is anticipated to be available in 1994.

5. Signing Innovation

   The FHWA, the Ohio Department of Transportation (ODOT) and Texas A&M University (on behalf of the State of Texas) have been pursuing research regarding innovative signing for use at highway-rail crossings.

a. The FHWA has recently concluded an effort to contrast the recognition and interpretation of various proposed passive signing configurations. Signs considered included the Canadian and Buckeye Crossbucks as well as traditional and modified YIELD signs. A report of this study was published in December 1993.

b. ODOT has in progress a massive field experiment and comparison of a new crossbuck and YIELD sign configuration, called the Buckeye Crossbuck. Half of the crossings in Ohio which are not equipped with automated devices are now being equipped with the new sign, while the other half are being provided new, but conventional, crossbuck signs. Subsequent statistical assessments, two to five years after installation is complete, will provide conclusions regarding the efficacy of the proposed sign. Crash testing is also being planned, i.e., staged and monitored vehicle collisions with the new Buckeye Crossbuck.

c. The Texas Transportation Institute (TTI), part of Texas A&M University, has developed and has recently been experimenting with an innovative advanced warning sign for use at highway-rail crossings. Field and driver recognition and response experimentation has recently been completed. A report is being prepared.

6. Loss of Shunt

The FRA is conducting a joint research project with the Association of American Railroads to study the reliability of train detection track circuits and to document potential or probable conditions contributing to "loss of shunt".

The safety and reliability of highway-rail crossing warning devices are a major concern of both the railroad industry and the FRA. The primary activation of a crossing warning device is through vehicle wheel sets which apply a shunt between the two rails along a designated section of track. This shunting action causes track circuit voltage to short-circuit and prevent electrical energy from reaching the control relays. This activates the relays which control the proper functioning of signals and highway-rail crossing gates and flashers.

It has been suggested that a loss of shunt may be occurring at certain locations, causing premature release of crossing warning systems. The inability to properly shunt the track circuit could be due to a number of individual parameters, or a combination of factors. Some suggested conditions leading to improper shunting include films or contamination at the wheel/rail interface; light axle loads; changes in the wheel/rail contact patch due to rail grinding practices or different wheel profiles; and truck hunting or irregular wheel rail surface. The exact combination of the above conditions that could lead to loss of shunt is not fully known, nor is it certain that these are the only items that adversely influence shunting.

This research program is intended to collect sufficient field data to document the occurrence of inadequate shunting and to document as fully as possible the conditions of both track and equipment that existed at the time the loss of shunt was experienced.

7. Photo-Enforcement
   FHWA, FTA and FRA are jointly funding an evaluation of a photo-enforcement demonstration being conducted by the Los Angeles County Transportation Commission. Early results at two crossings equipped with active photo-enforcement equipment indicate an 84 percent reduction in motorists driving around down gates. Crossing accidents along that portion of the light rail line where the devices have been installed are down 60 percent.

8. High Speed Rail Surveys
   FRA has initiated investigation of hazard elimination alternatives at highway-rail crossings. FRA has also contracted for an investigation of current and new technologies for use at high speed rail crossings. Two contractors are involved:

   Applied Systems Technologies, Inc. (ASTI) is investigating hazard elimination needs and options on the ISTEA Section 1010 corridors as well as the Northeast Corridor north end and the Empire Corridor. The research includes review of existing conditions on proposed high speed rail corridors and defines the problems with respect to the magnitude of the crossings affected, risk analysis of crossing warning devices proposed, overall view of current and innovative warning devices, prominent jurisdictional issues and any recommendations to resolve the identified problems. The contract was recently modified to identify and determine the degree to which liability issues may or have impeded progress in the crossing hazard elimination area.

   Battelle Laboratories of Ohio is investigating the world-wide status of current and innovative technologies for use at high speed rail crossings. The research includes determining the feasibility and cost of each technology. Areas of concern include signal and train control, obstruction detection devices and active and passive warning devices. Another area of research involves development of a methodology to assess alternative grade crossing technology for use on the proposed U.S. high speed rail grade crossings.

H. Truck and Bus Involved Accidents

A review of the data available on truck accidents at highway-rail crossings indicates a general decline in these accidents. In 1982 there were 555 truck-trailer and bus accidents representing less than eight percent of total highway-rail crossing accidents. These accidents resulted in 26 fatalities, four percent of total fatalities at public highway-rail crossings. In 1992, 385 truck-trailer and bus accidents occurred at public highway-rail crossings accounting for less than nine percent of the accidents at these crossings. Thirteen fatalities resulted, two percent of total crossing fatalities. These figures do not diminish the seriousness of these accidents. Truck collisions with trains often derail the trains and have catastrophic potential.

It is unknown at this time how many states consider driving around gates which are down a serious driving offense, especially by a driver operating with a Commercial Driver's License.

I. Regulation

1. Inspection, Testing, Maintenance and Timely Response:
   On January 20, 1994, FRA published a Notice of Proposed Rule Making (NPRM) (59 FR 3051) in which FRA proposed specific maintenance, inspection and testing requirements for

active highway-rail crossing warning systems. FRA also proposed to require that railroads take specific and timely actions to protect the travelling public and railroad employees from the hazards posed by malfunctioning highway-rail crossing warning systems. This action was taken in response to a statutory requirement that FRA "issue rules, regulations, orders, and standards to insure the safe maintenance, inspection, and testing of signal systems and systems at railroad highway grade crossings." FRA also solicited comments on whether the parking of idle rail equipment or switching operations on track circuits which activate highway-rail crossing warning devices should be addressed, and how.

2. Locomotive Conspicuity

In October 1992, the Amtrak Authorization and Development Act was signed into law. This legislation required the Secretary to complete locomotive conspicuity research no later than December 31, 1993. It also provided that interim regulations be issued identifying ditch lights, crossing lights, strobe lights and oscillating lights as interim locomotive conspicuity measures, and authorizing and encouraging installation and use of such devices. Any locomotive equipped with such interim conspicuity devices on the date of issuance of final regulations will be considered in full compliance until four years after issuance of the final regulations.

As required by the statute, FRA issued, on February 3, 1993, interim standards regarding locomotive lighting to enhance conspicuity of trains. (58 FR 6899, to be codified at 49 C.F.R. 229.133) This interim rule identifies several auxiliary external lighting arrangements as acceptable interim locomotive conspicuity measures. This rule encourages the installation on locomotives of such lighting arrangements as are now widely used and available. This action is intended to increase the visibility of locomotives to motorists and thereby reduce the incidence of accidental collisions between motor vehicles and locomotives at highway-rail crossings. Lighting devices installed in conformance to acceptable current practice will not be immediately rendered obsolete when FRA issues final standards in this area.

A second interim rule was published May 13, 1994. This second interim regulation relaxes the dimensional standards for placement of the various auxiliary external lights on locomotives.

The statute also requires the FRA to initiate rule making for the final regulations no later than June 30, 1994. The final regulations are to be issued by June 30, 1995. Compliance is to be industry wide no later than December 31, 1997. This effort is on schedule.

3. Vegetation Clearance

Visibility up and down the track is critical for motorists approaching highway-rail crossings, especially at those crossings without automated warning devices. (Warning devices are often installed to compensate for sight obstructions, particularly for those which are seasonal and/or outside the control of railroad and highway authorities.) Maintaining clear sight distance on both highway and rail rights-of-way, i.e., clearing vegetation, is often a seasonal necessity. The FRA is considering the addition of a provision within revised track standards (currently being developed) requiring that the rail right-of-way on either side of highway-rail crossings be kept clear of vegetation.

4. Standing Trains, Locomotives or Cars

   Most railroads have operating rules which address the standing, spotting or parking of trains, locomotives and rail cars near public highway-rail crossings. These rules often stipulate that parked rail cars should be a minimum distance (e.g., 300 feet) from a highway crossing, and that if a train, locomotive or car is stopped where it may obscure the view of train movements on adjacent tracks, provision must be made to protect highway traffic. These rules also stipulate that equipment should not stand "longer than necessary," or switches be left open, where automatic warning devices will continue to operate because of such a presence.

   In its recently issued grade crossing NPRM, FRA has requested public comment on the need to address situations where standing railroad equipment results in the continuous activation of warning devices.

5. Violation of Down Gates

   The FHWA recently met with the American Association of Motor Vehicle Administrators (AAMVA) to discuss making grade crossing violations a serious traffic violation on a driver's Commercial Drivers License. A survey of state traffic laws will be conducted to document how states treat this offense now. A proposal to make grade crossing offenses a serious traffic violation will be addressed through the AAMVA committee structure. We expect a decision from the committee in August 1994.

J. Horns and Bans

Federal regulations currently require that each lead locomotive be equipped with an audible device that meets specific performance standards. However, Federal regulations neither prohibit nor mandate the sounding of train whistles. All the major railroads have an operating rule that requires their engineers to blow the horn at highway-rail grade crossings as a warning to drivers and pedestrians.

As documented by the FRA study entitled "Florida's Train Whistle Ban," train horns are an effective safety device. The study indicates that after Florida communities implemented nighttime whistle bans, accident rates nearly tripled at the impacted crossings. When state and local governments failed to repeal the bans, the FRA issued an emergency order requiring the use of train horns along the impacted rail corridor in Florida.

As a result of petitions received following our Emergency Order a series of remedial measures were defined with the involvement of state, Federal and city highway authorities. An amendment was issued in August 1993. Should these measures be implemented, the use of train horns may be suspended.

The measures include the "treatment" of all crossings in a "quiet zone" at least one-half mile in length with one of the following alternatives:

1. Permanently close the highway-rail crossing.

2. Close the crossing to highway and pedestrian traffic during ban (nighttime) hours.

3. Install sufficient gates at a crossing to fully block highway traffic from entering a crossing when the gates are lowered.

4. Install median barriers at a crossing which prevent highway traffic from driving around lowered gates.

5. Make adjacent street into one-way pairs and modify and/or relocate existing gates to completely block approaching lanes of traffic.

For safety reasons, the FRA will not endorse any proscription which encumbers the industry's practice of using train whistles or horns at highway-rail crossings unless remedial actions have been accomplished. The FRA is conducting a nationwide study, similar to the Florida Whistle Ban Study, to determine if Federal regulations addressing whistle bans should be initiated.

Accident figures recently compiled from data submitted by the Florida East Coast Railway (the railroad affected by Florida's whistle ban) for the 24 months before and after the FRA issued its emergency order indicates that night-time (10 p.m. to 6 a.m.) accidents at impacted crossings decreased 68.6 percent, from 51 to 16. By comparison, day time (16 hours) accidents at the same crossings (horns were never banned during the day) decreased in the same period by only 8.8 percent, from 34 to 31.

K. The Manual on Uniform Traffic Control Devices (MUTCD)

The MUTCD, published by the FHWA, "presents traffic control device standards for all streets and highways open to public travel. . . ." Part VIII of the MUTCD addresses "Traffic Control Systems for Railroad-Highway Grade Crossings."

A number of actions and developments have occurred or evolved over the last several years which are not addressed within the MUTCD. Among these are the advent of high speed rail and the overall resurgence of higher speed trains, passenger and intermodal freight, the reemergence of intra-city light rail operations and recognition of the specialized needs of traffic control in highway work zones which include a highway-rail crossing.

L. Training

1. National Highway Institute Program

   In 1986, a Rail-Highway Grade Crossing Improvement Course was developed by the FHWA and made available through FHWA's National Highway Institute (NHI). It was designed to be introductory in nature. Between 1988 and 1991 more than 25 highway-rail courses were presented to approximately 1,000 employees of state agencies, railroad companies, local governments, Federal agencies and the railroad supply industry. Evaluations revealed that future training courses should be made available to short line and regional railroad operators.

   The FRA and FHWA jointly sponsored the updating of the course to be more technical and include "good" and "bad" practices in the installation and maintenance of grade crossing warning systems; to address crossing design, warrants for warning system types, selection of crossing surfaces and geometric design and priority index calculations. NHI is offering the revised training course to interested parties.

2. LETN Series

   FRA promotes training of police officers regarding enforcement of crossing safety laws and crossing accident investigations. By Fall 1994, FRA and Operation Lifesaver, Inc. will be making available a condensed version of the Law Enforcement Television Network (LETN) series, "On-Track," originally sponsored and aired by the FHWA, FTA and FRA in 1991 for training police officers. The new version will include four segments covering enforcement and accident investigation techniques, trespassing, vandalism and other railroad related crimes, safety and outreach programs, and issues concerning electric trains and mass transit.

3. *Highway-Rail Grade Crossing Handbook*

   The *Handbook*, a joint effort of FHWA and FRA, is a general reference guide

on highway-rail crossings, including characteristics of the crossing environment and users, and the physical and operational improvements for safe and efficient use by both highway and rail traffic. The second edition was published in 1986. Information on state programs in the Handbook was taken from a 1984 survey of states. Since the last edition was published, two major transportation bills have been enacted that impact the highway-rail crossing safety program. Also, there have been changes to the MUTCD, major research projects have been carried out relevant to highway-rail crossings, there has been a landmark decision by the Supreme Court that affects grade crossing responsibilities, and there have been a number of technological advances in traffic control devices and crossing surface products. Much of the information in the *Handbook* is in need of updating.

4. *Compilation of State Laws and Regulations On Matters Affecting Highway-Rail Crossings*

   The current *Compilation*, a joint effort of FHWA and FRA, is a general reference guide and cross reference to state laws and regulations affecting highway-rail crossings. It was published in 1983 and is outdated.

M. Failure/Emergency Notification

In 1983, the Texas Legislature initiated (and pioneered) a statewide alert or early warning system designed to inform railroads of warning device/signal problems at crossings. Signs have been placed at each crossing equipped with an automated device instructing the reader:

TO REPORT MALFUNCTION OF THIS RAILROAD SIGNAL CALL TOLL FREE 1-800-772-7677 GIVE THIS LOCATION # _ _ _ _ _ _ _

The telephone is answered by the Texas Department of Public Safety (DPS) (state police). The crossing location number is the U.S. DOT/AAR National Highway-Rail Crossing Inventory number. The location number is then checked against a master list and the maintaining railroad is notified of the malfunction. In 1989, on average more than 14 calls per day were recorded by the DPS. Every motorist, law enforcement officer and highway maintenance worker is a potential participant.

The FRA has favorably evaluated this system and has recommended its adoption by other jurisdictions. Railroads operating in Texas have stated that at least half of the calls received from the DPS are for problems of which they (the railroads) were not already aware. Both Connecticut and Delaware have established variations. In Connecticut, signs instruct observers to call "911." In Delaware, only automated Conrail crossings (81 percent of Delaware's automated crossings are Conrail's.) are equipped with signs, and the telephone number is a Conrail 1-800 number. Several railroads have also adopted versions: some with and some without signs, some available to the public, and some promoted only to state, county and city officials.

The basic element of any system to notify public and railroad officials of a potentially dangerous situation at a highway-rail crossings is the identity of the crossing itself. As part of the U.S. DOT/AAR National Highway-Rail Crossing Inventory program, most every crossing in the Nation was assigned a unique number. In most cases, these numbers were placed at the crossings; however, this was originally done in the mid-1970s. Many, but not all, states and railroads have retained this system and have kept the number posted at the crossing. Others have continued alternative, usually state, systems which predated the National Inventory. A few have allowed at least the on-site numbering to deteriorate. The result is that the Inventory

numbering system is in jeopardy as a national system and resource.

See also Section Q.4 regarding malfunction reporting to FRA by railroads.

N. Private Crossings

There are nearly 110,000 private highway-rail crossings on the U.S. rail system. Casualties and property losses resulting from accidents, and the ever present potential of a major railroad catastrophe, at these crossings is a continual concern. At present, responsibilities for private crossings are neither clearly understood nor consistently applied. This is an institutional problem which has impeded safety improvement programs at private crossings. Over the last decade, 1983 through 1992, accidents at private highway-rail crossings have vacillated between a high of 648 (in 1984) and a low of 445 (in 1992). Though the overall trend regarding accidents at private crossings has been favorable, it has not been as dramatic as improvements at public crossings. In most years, deaths at private crossings exceed the combined total of railroad related deaths from all causes except for trespassers and deaths at public highway-rail crossings.

The U.S. DOT/AAR National Highway-Rail Crossing Inventory recognizes four categories of private crossings, i.e., farm, industrial, recreational and residential. Nearly two-thirds of the 109,881 private crossings catalogued in the Inventory are in the first group, farm crossings. Nearly a quarter are industrial. Industrial crossings generate the most accidents with farm crossings a close second. But, on a per crossing basis, industrial crossings have the highest accident frequency, with recreational and residential crossings following a close second and third. Farm crossings are last by this measure.

1. Guidelines

   Early in 1993, the FRA circulated a draft set of preliminary guidelines addressing the safety of private highway-rail crossings. This draft set forth definitions and general responsibilities. It suggested criteria for closure, basic signage and engineering, the use of train horns and treatments for private crossings in high speed rail corridors.

   A public meeting was held in July, 1993, to discuss both the general issue of FRA involvement and the specifics raised by the guidelines. Participants differed regarding their views as to Federal involvement in this area. Some parties emphasized their view that if guidelines or rules are issued, rule making procedures should be followed.

   FRA is currently reviewing the comments and materials received during and subsequent to this July meeting.

2. Snowmobile Crossings:

   A recently enacted law of the Wisconsin legislature allows the creation of new crossings of railroad tracks for snowmobiles without the permission (or involvement) of the host railroad. Authority for issuing regulations pertaining to these crossings has been vested in the State's Department of Natural Resources (DNR). The law would allow "volunteers" to build and maintain snowmobile crossings.

   The FRA is monitoring developments.

O. FRA's Regional Program Managers

FRA's regional and headquarter's efforts regarding highway-rail crossing (and trespasser) programs have been hampered by under-staffing. Prior to FY 1994, the headquarters division promoting crossing programs had a staff of five, all taken from related functions within the Office of Safety when the Division was created in 1991. Regional office efforts have fallen in the category of "additional duties."

The FY 1994 budget will augment this staffing by the addition of eight regional program managers, one for each region, and two additional personnel for the headquarters Division.

Once these individuals are on board, projected for August, they will provide program support, coordination and promotion to states, local governments and railroads with emphasis on:

Corridor Improvement Programs;
Operation Lifesaver;
Accident investigation; and
Trespass prevention.

FRA was also given authority to hire eight additional signal inspectors to help enforce the proposed inspection, testing and maintenance regulations as well as existing signal standards.

P. Integrated Intermodal Transportation Planning

ISTEA requires States and Metropolitan Planning Organizations (MPOs) to develop intermodal transportation plans, with new emphasis on considering freight and railroad issues. ISTEA further requires states to develop six management systems, including the highway Safety Management System (SMS), to facilitate more effective intermodal planning. The SMS, as defined in the implementing regulation, 23 CFR 500.103, is "a systematic process that has the goal of reducing the number and severity of traffic crashes by ensuring that all opportunities to improve highway safety are identified, considered, implemented as appropriate, and evaluated in all phases of highway planning, design, construction, maintenance and operation and by providing information for selecting and implementing effective highway safety strategies and projects." The regulation specifically addresses consideration of highway-rail crossings in the system, including developing data relating to highway-rail crossings, identifying hazardous highway-rail crossings and maintaining and upgrading safety hardware at highway-rail crossings.

The highway SMS, by fully considering all elements of highway safety, will provide a mechanism for evaluating the effectiveness of different safety strategies and guide the selection of safety measures. This provides an opportunity to consider highway-rail crossings in a broader context than crossing improvements alone. The cost and safety impact of consolidating grade crossings should now be considered in developing overall plans to improve highway safety.

Those implementing ISTEA in the State Departments of Transportation, MPOs and railroads, especially where planners are required to cross modal lines, are looking to the U.S. Department of Transportation for assistance and guidance.

Q. Data

1. Accident Reporting

   Railroads are required (by the Federal Railroad Safety Act of 1970 and the Accident Reports Act) to report all accidents and incidents arising from the operation of a railroad that results in an impact occurring between on-track railroad equipment and an automobile, bus, truck, motorcycle, bicycle, farm vehicle, pedestrian or other highway user at a highway-rail crossing.

   Railroads report this data monthly. Uses include safety and economic analyses to develop and target counter measures to include personnel resources and regulatory and research initiatives. FRA compiles and issues an annual bulletin tabulating and summarizing accident reports.

2. The Inventory

   In response to the Federal Railroad Safety Act of 1970, a joint government/industry effort to compile a national inventory of highway-rail

crossings was initiated in 1972 and completed in 1976. The Inventory contains data regarding more than 70 physical and operational characteristics of all highway-rail crossings in the United States (more than 402,000 in 1976), including public and private, at-grade and grade separated, even pedestrian crossings. Each crossing was assigned a unique number which was displayed at the crossing. Although this was (and continues to be) a volunteer effort, every state, the District of Columbia and Puerto Rico participated, as did all railroads.

The FRA is custodian of this computer based file. In this role, the FRA processes changes and updates, more than 80,000 per year, which originate from railroads and states. As a volunteer program, continuing participation by states and railroads has not been universal. There have been periods of high activity and periods of slack participation. Some railroads and some states participate more than others, and often, as management and priorities have changed, railroads and states have changed from non-participatory to active participant and vice-versa.

Railroads and states may obtain from the FRA a personal computer based software package known as the *GX System* which facilitates the update process and eliminates the bureaucratic exchange of paper. There is no cost to the railroad or state. The GX System is a self contained package allowing the user to retrieve records, update them, sort and print records and summary reports, and produce a magnetic disc with current update information for submittal to the National Inventory File. Each GX System request is answered with a custom database containing the requestor's crossings and necessary cross-reference and decode files. A second version of this package, now available, has the ability to accept and apply mass updates, e.g., train counts for all crossings on a given rail line.

The Inventory, as a national resource, is available to all, and the FRA actively promotes its continued application and maintenance. It is widely used by FRA and FHWA, Federal research programs, safety and economic analyses, program management and assessment, by states and railroads, by universities and consultants and by litigants. Though the lack of universal and consistent updating is a drawback, the Inventory remains a unique and useful resource.

3. Resource Allocation Procedure (RAP)

A software package has been developed and is available to railroads and states which combines accident histories (derived from accident reports) and Inventory data to make accident predictions. The predictions are then combined with cost and effectiveness information and available budget thresholds to develop warning device improvement programs which maximize the safety benefit realized per budget dollar expended. "Safety benefit" may be defined in terms of accident or fatality or casualty (fatality and injury) reduction.

This software was last revised in 1986-87. *A User's Guide (Third Edition)* was published in August 1987. Every second year, through a rather cumbersome process, constants within the accident prediction programs are adjusted to reflect accident experience of the most recent five years. Every three months new master files are created using current Inventory data. These files are used to respond to state and railroad

requests for RAP data. Cost and effectiveness default constants have not been adjusted since the 1986-87 revision. (The defaults are only used if the requestor does not specify alternative values.)

This DOT program is not the only one available. Though widely used, many states and railroads have developed their own. Some use the DOT program as a "second opinion." Some have modified or adapted the DOT procedures for their own applications.

4. Malfunction Reporting

In 1992, the FRA initiated rules requiring railroads to report warning device malfunctions, both failures to activate (report within 15 days) and false activations (report in the month following occurrence), to the FRA. If an accident occurs coincident with a failure, a report must be submitted by telephone within 24 hours. The requirement to report false activations (but not failures to activate nor failures concurrent with an accident) will "sunset" in 1994.

Reporting has exceeded expectations, reaching nearly 4,000 per month. Though more than expected, this figure must be considered within the context of the nation's more than 60,000 crossings equipped with automated warning devices which activate well in excess of 650,000 times per day, more than 19 million times per month.

These reports have assisted the FRA in developing proposed inspection, testing, maintenance and timely response regulations.

5. SAMIS

The Federal Transit Administration (FTA) is a grant-making organization. From 1978 to 1989, safety statistics were collected from only 13 heavy rail transit agencies nationwide and only on a voluntary basis. The Safety Information Reporting and Analysis System (SIRAS) published these statistics annually. Mass transit safety statistics are collected through the authority of Section 15 of the Federal Transit Act, and in 1990, the first Safety Management Information Statistics (SAMIS) Annual Report was published. SAMIS statistics are solicited from nearly 600 transit agencies. Safety information is collected on a wide variety of mass transit modes: automated guideway, commuter rail, demand responsive, light rail, motorbus, rapid rail and vanpool. For an incident to be reportable, it must involve a transit vehicle or occur on transit property, and result in death, injury or property damage in excess of $1,000. Section 15 reporting requirements do not currently distinguish among light rail, rapid rail or commuter rail accidents and do not identify location, e.g., at grade crossings.

Safety statistics are collected on Form 405 of the Section 15 reporting system, and the data is entered into the system for analysis and production of the SAMIS report. SAMIS statistics measure how many incidents, injuries and fatalities a transit agency experiences vis-a-vis collisions, derailments/left roadway, personal casualties and fires. These statistics are measured separately for every transit mode an agency operates.

Now that the FTA has collected three years of safety data, trend analysis will also be published in the next SAMIS Annual Report. Modifications to the Section 15 reporting requirements, e.g., security data, are being reviewed for inclusion in the Section 15 report.

6. The Railroad Network GIS

The FRA has developed a Geographic Information System (GIS) that replicates the United States Railroad, Highway and Waterway Networks on a personal computer. It will be used to analyze railroad issues as they relate to the entire transportation system, such as the traffic flow simulation of different commodities and intermodal movements. The highway and waterway networks were provided by FHWA and the U.S. Coast Guard respectively.

The Railroad Network, created by FRA, represents all routes in the United States (160,000 miles) owned by over 500 railroads. It includes line specific information such as ownership, trackage rights, traffic volume and passenger service. It is maintained by FRA and is available to the public (except proprietary information). Among FRA's applications for this network is the flowing of hazardous material shipments and the subsequent study of the routes currently being used.

All highway-rail crossings in the U.S. DOT/AAR National Highway-Rail Crossing Inventory System are not yet located in the GIS. However, that effort is currently in progress. Its completion will allow a broad systems approach to future national grade crossing analysis.

R. Trespass Prevention

The trespass problem has grown worse in recent years. Trespasser fatalities have exceeded 500 deaths per year each year since 1990. The Department of Transportation and the industry have recognize the need for a focused effort.

1. The Workshop

In March 1992 the FRA hosted the first Workshop on Trespasser Prevention, a one day meeting in Washington, D.C. The meeting was well attended. Fifteen railroads, three Federal agencies and two associations met. Topics addressed included definitions and available data, the homeless as trespassers, illegal immigrants as trespassers, hobos as trespassers and the potential of involving Operation Lifesaver, Inc. (OLI). Other presentations dealt with measures which have worked in reducing trespassing (e.g., involving the local community), and those which have not (e.g., signs along the right-of-way).

The Workshop concluded with a consensus that: 1) better data is needed; 2) because of the diversity of regional trespass problems, programs should be developed on a regional basis; 3) programs should promote community involvement, targeted media campaigns, legislation authorizing enforcement and civil fines, and peer counseling (re the psychological handling of traumatic events) for those who must deal with trespass casualties; and, 4) OLI should receive guidance on how best to utilize their resources.

Minutes of the Workshop are available.

2. Data

From monthly Injury and Illness Summary Reports currently submitted by railroads, the FRA is able to cull the following data regarding trespasser casualties:

Month of Occurrence (based on month for which report is submitted);
Railroad reporting;
Age of casualty; and,
State in which casualty occurred.

Noticeably absent is information related to the setting in which the casualty occurred, the date, day and time of

occurrence and the person involved and their activities at the time of the incident.

FRA has begun to segregate, tabulate, analyze and publish the available data. FRA covered 1991 calendar year statistics in the first annual *Trespasser Bulletin.*

The 1992 Bulletin indicates that, over a ten year period, based on fatalities per 100 right-of-way miles, fifteen states and the District of Columbia have above average rates. Seven of these and the District of Columbia exceed the average by a factor of at least two. The seven include California, Connecticut, Florida, Maryland, Massachusetts, New Jersey (highest) and New York. This same bulletin also indicated that for the last ten years, more deaths occurred to individuals aged 21 to 25 than in any other 5-year age group.

The National Center for Health Statistics (NCHS) in Atlanta, Georgia collects data from Death Certificates. Attempts have been made by the U.S. Centers for Disease Control to reconcile the FRA and NCHS data bases, but these were hampered by varied definitions, e.g., what is "railroad related," and by resource limitations of both agencies.

3. OLI Grant

In FY 93, OLI accepted a $50,000 grant from the FRA to develop a campaign to discourage trespassers and vandalism on railroad property. A campaign plan has been developed which will target the sixteen states with the highest incidence of trespasser and vandalism problems. This campaign will include radio public service announcements, brochures and palm cards, posters and letters to selected organizations. Activity should initiate in June 1994.

OLI currently limits their trespass oriented activities to the fulfillment of his grant obligation.

4. Related FRA Activities

FRA has prepared and continues to distribute a pamphlet targeting law enforcement officials, titled, "The Safety Enforcement Initiative." The pamphlet stresses that "FRA is working to improve crossing safety **and prevent trespassing.**" It goes on to develop the point that the "FRA does not have jurisdiction over traffic and 'no trespassing' laws. That's why we need the support of state, local, and railroad enforcement officers." It then addresses the question of "What can you do to prevent trespassing?" This pamphlet has been well received and widely distributed.

FRA has become a regular displayer at national police meetings, specifically the International Association of Chiefs of Police (IACP), the National Sheriffs' Association (NSA) and the National Fraternal Order of Police (NFOP). In this way we are reaching state and city police chiefs (IACP), county sheriffs (NSA) and the officer on the street (NFOP). The first two of these are annual meetings. The NFOP meets every two years. OLI often participates with FRA, sharing space and jointly manning our displays.

FRA has requested $82,000 for FY95 with which to conduct a study of the demographics of trespasser fatalities and potential counter measures. This research will start with a survey and determination of the types of individuals and activities which are involved or result in trespasser casualties.

5. Vandalism

Railroads are reporting nearly 200 incidents per month of vandalism to automated warning devices at highway-rail crossings. This figure does not include vandalism caused damage to other railroad facilities, equipment and lading. Various provisions of Federal law address crimes directed at railroad equipment, passengers and employees. See 18 U.S.C. 1991 (entering a train to commit a crime), 18 U.S.C. 1992 (wrecking trains), and 15 U.S.C. 1281 (destruction of property moving in interstate commerce). While in many instances, vandalism to warning devices at highway-rail crossings may be considered to be within the scope of one of the above statutes, there is no Federal statute dealing directly with vandalism of these devices. Many states have similar statutes.

6. Railroads and others

Several railroads have initiated, or are in the process of establishing, activities of their own. In 1992, the Long Island Railroad successfully involved communities in an aggressive campaign to reach potential trespassers and law enforcement officials with effective warning messages. In 1991, twelve railroads in the U.S. southwest teamed together with the U.S. Immigration and Naturalization Service, the Drug Enforcement Agency, the U.S. Border Patrol, the U.S. Customs, and the U.S. Army in a successful interdiction effort, apprehending over 12,000 illegal immigrants and seizing 1,200 pounds of marijuana and cocaine. Norfolk-Southern Corporation is currently preparing a video on trespassers and vandalism which will be compatible with the planned OLI campaign.

A 1990 Florida statute limits liability of railroads and landowners concerning trespasser deaths and injuries. The statute grants immunity in those situations where the trespasser was impaired by alcohol (.10 bac or higher) or illegal chemical substances at the time of the accident.

Rail-Highway Crossing Safety Action Plan Support Proposals, U.S. DOT, FRA, 1994
25-Research & Development Management