Report On High Risk Crossings and Mitigation Efforts by State

SUBMITTED PURSUANT TO CONFERENCE REPORT ON H.R. 2084
U.S. DEPARTMENT OF TRANSPORTATION
AND RELATED AGENCIES APPROPRIATIONS ACT, 2000

Office of Safety - Federal Railroad Administration
Office of Safety - Federal Highway Administration

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EXECUTIVE SUMMARY

The U.S. Department of Transportation, Federal Railroad Administration (FRA) and Federal Highway Administration (FHWA) were directed by Congress to undertake a study on highway-rail grade crossing safety, "...identify the 10 most deadly crossings in each state..." and establish ways these crossings could be improved or eliminated to reduce the dangers.

To meet Congress' directives for this report, FRA and FHWA worked with States to identify the ten most deadly crossings in each State and to update the USDOT Crossing Inventory. States were asked to review the FRA list of crossings, review the inventory information and update as necessary, and, if they wished, offer their own list of crossings.

Forty-four states provided updated inventory information. Twelve states provided information on additional crossings that were not on the list provided by FRA. Mitigation efforts identified by states include a whole range of initiatives that may be as simple as replacing crossbucks and adding advanced warning signs for $2,000 or as complex and expensive as $1 billion to upgrade an entire rail corridor. Forty states offered possible solutions to improve safety at the crossings, and identified an estimated $2.3 billion in costs. It should be noted that these proposed improvements, and the estimated costs, represent less than 1% of the 154,760 public grade crossings in the nation.

The Section 130 program has been the primary source for funding grade crossing improvements. However, the level of funding, $155 million per year under the 10% Safety Set Aside of the Surface Transportation Program, has been relatively unchanged since 1987. Thus, Section 130 funding has failed to keep pace with inflation, and has in fact, dropped significantly. If the program is to remain viable, an adequate funding level must be maintained. Optional Safety Funds, provided in TEA-21, are rarely used for grade crossing improvements. These funds could be channeled for grade crossing improvements, including grade separation and crossing closures. Yet in FY1999, only $26.9 million of a total $314.8 million was flexed into the grade crossing safety program.

Both FRA and FHWA agree that investments made in grade crossing safety improvements through the Section 130 program have reaped significant benefits in preventing collisions and saving lives. In 1975, there were 12,126 collisions at highway-rail grade crossings, resulting in 917 deaths. In 2000, the number of collisions shrank to 3,502 with 425 deaths. Even with a significant increase of nearly 16% in train traffic over the past decade, the number of fatalities has steadily declined from 698 deaths in 1990 to 425 in 2000.

Although we have made significant reductions, grade crossing collisions remain the second leading cause of all rail-related fatalities in the U.S., accounting for over 45% of deaths. Long-term safety trends show historical improvements, yet those gains have leveled off in recent years. The year 2000 actually saw an increase in grade crossing collisions and fatalities. Grade crossing collisions pose an especially significant risk to passengers on trains. Over the last five years 86%

of rail passengers killed in train accidents occurred at grade crossings. On March 15, 1999, an Amtrak passenger train struck a tractor-semitrailer in Bourbonnais, Illinois. Eleven passengers were killed and 122 persons injured. These statistics underscore the importance of maintaining a vital grade crossing improvement program.

An updated, accurate inventory of the nation's highway-rail grade crossings is essential in order to prioritize projects, allocate scarce funds and design appropriate engineering solutions to improve safety at grade crossings. A voluntary reporting system by the States and railroads has proven problematic. Congress may wish to consider other approaches.

No one solution, no one engineering fix will eliminate collisions and deaths at grade crossings. As both train traffic and vehicular traffic increase, we must collectively find solutions that will keep pace with an ever-changing transportation environment. Engineering improvements, increased funding, and public/private partnerships must combine to enhance safety at crossings and reduce the number of fatalities. DOT's goal of reducing collisions and fatalities at grade crossings can only be met by ever vigilant attention to programs that will meet our goals for the coming years.

INTRODUCTION

On September 30, 1999, as part of the Conference Report on H.R. 2084, the U.S. Department of Transportation and Related Agencies Appropriations Act, 2000, the Federal Railroad Administration (FRA) and Federal Highway Administration (FHWA) were instructed to undertake a study on highway-rail grade crossing safety. These agencies were directed to "...work with the states to identify the ten most deadly crossings in each state and identify ways that these crossings could be closed or reconfigured to reduce the dangers." (Appendix A, *Congressional Record, Page H9115*). This report is a collaborative effort by FRA, FHWA, and the states and has been produced in response to that request. The Conference Report also requested the FRA, FHWA and National Highway Traffic Safety Administration (NHTSA) to assess the effectiveness of state grade crossing safety laws. Such a study has been initiated with results anticipated by late 2002.

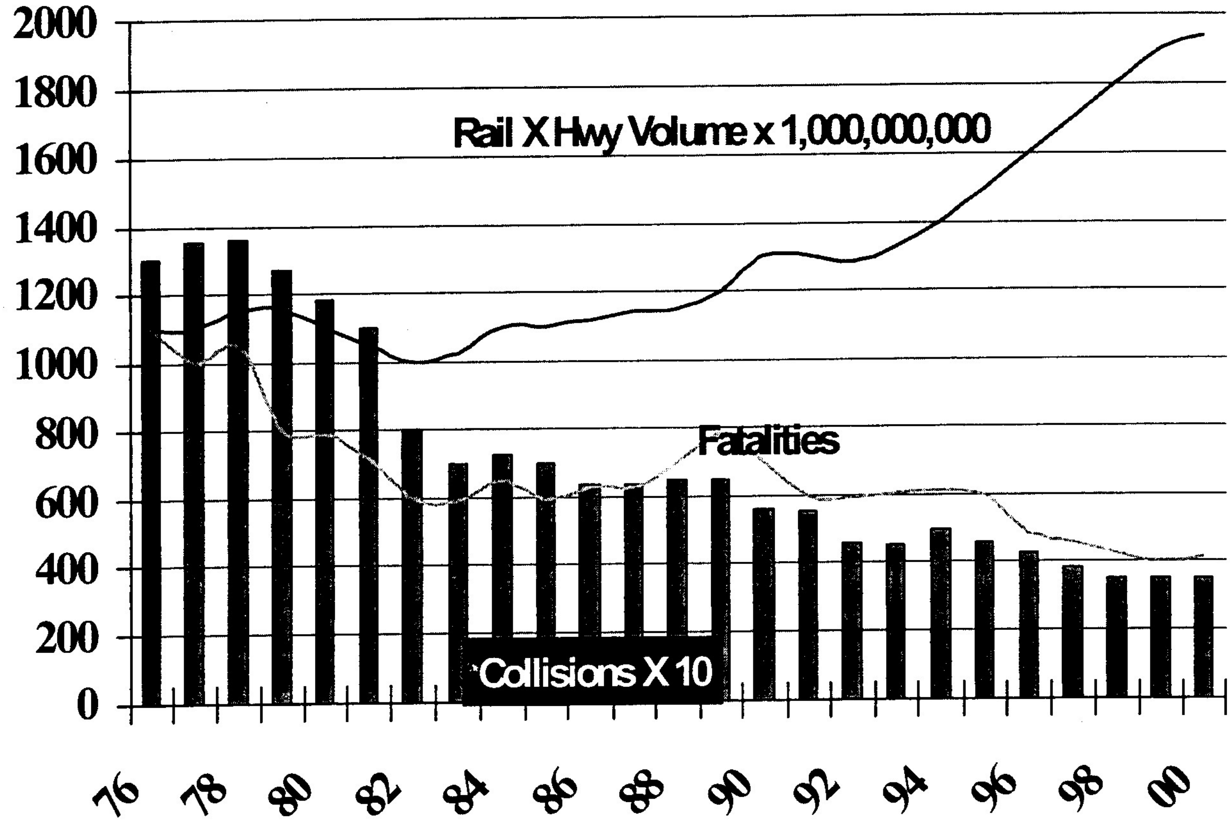
BACKGROUND

In 1972, John A. Volpe, then-Secretary of Transportation, set a goal of reducing grade crossing fatalities by 33 percent over ten years. Secretary Volpe's goal was achieved in 1982 when there were 607 fatalities as compared to 917 in 1975. Over the years there had been some level of success in improving grade crossing safety, but between the mid-1980's and early 1990's there was no significant improvement in grade crossing safety. In 1994 the U.S. Department of Transportation revitalized its efforts to improve grade crossing safety and developed its current strategy, identified in the Rail-Highway Crossing Safety Action Plan, and set its goal of reducing grade crossing fatalities by 50 percent between 1994 and 2004.

There have been many reasons for the success in reducing the number of grade crossing collisions and fatalities since the early 1970's. Congress, in establishing the Rail-Highway Crossing Program in the Highway Safety Act of 1973, created the Section 130 Program (implemented by state/local agencies and administered by the Federal Highway Administration) that continues to fund efforts to reduce collisions, injuries and fatalities at public highway-rail crossings. This includes funding the installation or improvement of signs and pavement markings, flashing light signals, automatic gates, crossing surfaces, crossing illumination, overpasses, underpasses, highway relocations and railroad relocations. Section 130 funding is also available to close crossings. The closing of crossings is the ultimate method of eliminating fatalities.

Both FRA and FHWA agree that investments made in grade crossing safety improvements through the Section 130 program have reaped significant benefits in preventing collisions and saving lives. Benefit/cost studies done by both agencies indicate that these investments have a positive benefit. The collision history also demonstrates the dramatic benefits these investments have had on the program. In 1975, there were 12,126 collisions at highway-rail grade crossings, resulting in 917 deaths. In 2000, the number of collisions shrank to 3,502 with 425 deaths. Even with a significant increase of nearly 16% in train traffic over the past decade, the number of fatalities has steadily declined from 698 deaths in 1990 to 425 in 2000. In fact, when comparing fatalities per million train miles, the accident/incident rate went from 9.39 in 1990 to 4.84 in 2000. FHWA estimates that the Section 130 program has helped to prevent the loss of approximately 10,500 lives and prevented 51,000 injuries since the inception of the program. The following chart illustrates the reduction in collisions and fatalities from 1976 through 2000.

Crossing Collision History 1976 - 2000



Although we have made significant reductions, grade crossing collisions remain the second leading cause of all rail-related fatalities in the U.S., accounting for over 45% of deaths. Long-term safety trends show historical improvements, yet those gains have leveled off in recent years. The year 2000 actually saw an increase in grade crossing collisions and fatalities. Grade crossing collisions pose an especially significant risk to passengers on trains. Over the last five years 86% of rail passengers killed in train accidents occurred at grade crossings. On March 15, 1999, an Amtrak passenger train struck a tractor-semitrailer in Bourbonnais, Illinois. Eleven passengers were killed and 122 persons injured. These statistics underscore the importance of maintaining a vital grade crossing improvement program. Adequate funding is critical to the success of the program.

The Section 130 program has been the primary source for funding grade crossing safety improvements. The program is currently funded at $155 million per year, under the 10% Safety Set Aside of the Surface Transportation Program. This level of funding has remained relatively unchanged since 1987, when the funding level was $156.8 million. The current funding level of $155 million corresponds to $102.3 million in 1987 dollars, meaning that Section 130 funding has not only failed to keep up with inflation, but has indeed dropped significantly since 1987. If the program is to remain viable, an adequate funding level must be maintained.

In 1991 Congress continued the Section 130 program in the Intermodal Surface Transportation Efficiency Act (ISTEA). ISTEA required that 10 percent of the Surface Transportation Program (STP) funds must be set aside for safety improvements, including allocations of between $140.6 and $152 million per year to be used specifically for grade crossing safety improvements under the Section 130 program. In 1999, the Transportation Equity Act for the 21st Century (TEA-21) continued funding for this program and continued to provide states with the flexibility to increase funding for grade crossing safety by giving states the ability to use safety set-a-side money for the Section 130 program.

TEA-21 includes highway-rail grade crossings as an eligible category for flexing of Optional Safety Funds within the Surface Transportation Program. Unfortunately, this eligibility is rarely used by States. In FY1999, for example, only $26.9 million of a total of $314.8 million was flexed into grade crossing safety. Flexing these Optional Safety Funds into the grade crossing safety program would be an excellent way for States to accelerate their grade crossing improvement programs, and to channel these optional safety funds into a safety program with a proven track record of preventing fatalities and injuries. These "flexed" funds may be used for grade crossing safety improvement encompassed by Section 130, up to and including grade separation.

OTHER DOT BACKGROUND ACTIVITIES
ACCIDENT PREVENTION AND HAZARD ELIMINATION

In addition to funding grade crossing improvements, investing in grade crossing safety research, and promulgating rules, regulations, and guidance, the Department concentrates on three main areas to prevent grade crossing collisions: Education, Engineering, and Enforcement. A major partner in this effort is Operation Lifesaver, Inc. (OLI), which plays a premier role in crossing safety as a nationwide highway-rail crossing education program and highway-rail grade crossing safety advocate. This non-profit organization promotes the basic principles of highway-rail safety, utilizing over 1,700 volunteer presenters in forty-nine states to carry its lifesaving message to audiences of all ages. In FY 2001, FRA and FHWA provided almost $1.5 million to OLI in support of its efforts. Additionally, many of FRA's railroad safety inspectors, and all grade crossing managers and assistant managers are certified OLI presenters.

Other educational programs include the Department's "Always eXpect a Train" marketing campaign, which broadcasts thought-provoking highway-rail safety messages in a variety of media formats. A model driver's license manual developed by the National Highway Traffic Safety Administration (NHTSA) contains a special section on highway-rail grade crossings, and targeted outreach ensures that commercial motor vehicle operators are aware of the importance of avoiding a collision between trucks and trains.

In addition to the Section 130 program, the Department is studying and deploying newer technologies to improve grade crossing safety. These include: "second train coming" signs to warn motorists of a train approaching on a second track; four-quadrant gates to prevent motorists from going around lowered crossing gates; new train detection methods for automatic warning devices; and retro-reflective tape on trains to help prevent night collisions. The Department also supports testing and demonstration of elements that may have merit for inclusion in Intelligent Transportation Systems (ITS) and is sponsoring the development of ITS standards for highway-rail intersections.

Enforcement is another important method for preventing highway-rail grade crossing collisions. The FRA's Law Enforcement Liaison Program helps bridge the gap between the FRA and law enforcement agencies by having an officer conduct outreach programs to the law enforcement and judicial communities. Outreach to the judicial community will stress the importance of enforcing existing laws pertaining to highway-rail crossing safety. Federal regulations went into effect in 1999 that increased penalties for grade crossing traffic violations by commercial drivers license (CDL) holders. These new regulations require thirty day suspensions of the CDL for the first offense and progressively stricter sanctions for repeat violators.

In addition, FHWA has a Safety Engineer in each of its State Division Offices and Resource Centers whose responsibilities include grade crossing safety. The FHWA also has in each of its Resource Centers safety engineers who are also responsible for grade crossing safety. These individuals contribute significantly to the combined efforts of the US DOT's efforts to address highway-rail grade crossing safety.

SPECIAL FACTORS AND CONSIDERATIONS

As previously stated, there are many factors that may be considered when determining the potential risk at highway-rail grade crossings and how best to improve crossing safety at specific locations. This section describes two such issues.

Private Crossings

As of 2000 there are 98,369 private crossings in the U.S. Four hundred seventy of the 3,502 vehicle-train collisions in 2000 occurred at private crossings resulting in 56 of the 425 fatalities suffered at all crossings. One such incident underscores the serious hazards associated with private crossings, especially those along passenger train routes. On June 18, 1998, a Northern Indiana Commuter Transportation District (NICTD) 2-car passenger train struck the second trailer of a longer combination vehicle that consisted of a tractor pulling two flat-bed semi-trailers loaded with steel coils at a private highway-rail grade crossing in Portage, Indiana. This collision resulted in three fatalities and five minor injuries to the 13 passengers and 2 crew members on board. Approximately 41 passenger trains (27 NICTD commuter trains and 14 Amtrak) and 60 to 70 freight trains operated by 7 railroads (not including switching movements) travel daily across this private crossing, which is the entrance to a steel company.

Private crossings are categorized as either farm, residential, recreational, or industrial. Many of these industrial or commercial crossings, and recreational crossings in public parks, are open for the public to use. However, most of them do not have basic signage (cross bucks and advance warning signs) posted to notify motorists that a railroad track is going to cross the roadway ahead. Only a few states, including Alaska and California, have acted to standardize responsibilities and treatments for private crossings. Federal funding for safety improvements are limited to public crossings, except for funding that has been set aside for the elimination of grade crossing hazards at public and private crossings on high-speed rail corridors.

In the NTSB's safety study Safety at Passive Grade Crossings, Volume 1: Analysis, the following recommendation was made to the U.S. Department of Transportation: "Determine within 2 years, in conjunction with the States, governmental oversight responsibility for safety at private highway-rail grade crossings and ensure that the traffic control on these crossings meets the standards contained in the Manual of Uniform Traffic Control Devices" (H-98-32). The Federal Highway Administration and most state and local highway agencies lack jurisdiction over private crossings. Though FHWA has not proposed previous legislation, it encourages the concept of applying MUTCD standards at private highway-rail grade crossings.

National Highway-Rail Crossing Inventory Data Files

Every highway-rail crossing in the United States has a unique ID number (six digits followed by a letter) assigned to each crossing and recorded in the National Highway-Rail Crossing

Inventory. These include public, private, pedestrian, at grade, and grade-separated crossings. The DOT crossing ID number was created so that local authorities, State and Federal agencies, and railroad companies would have a common method to refer to a particular crossing.

The Inventory Data File is a record of grade crossing characteristics (location, physical, and operational) that provide information for the administration and statistical analysis of crossings. This information is reported to the FRA on the United States Department of Transportation-Association of American Railroads (U.S. DOT-AAR) Crossing Inventory Form. FRA is the custodian of the database; however, each state and railroad is responsible for providing the appropriate information and does so on a voluntary basis.

Inventory and highway-rail crossing collision data (Railroad Accident/Incident Reports System) are used for a variety of purposes. The inventory is the only national database containing information on highway-rail grade crossings. The data is an integral part of the USDOT's accident prediction methodology. Some of the uses of the inventory include the development of Federal grade crossing safety programs; funding alternatives for crossing improvements, studies related to railroad safety programs, effectiveness of warning devices, high-speed railroad corridors, collision costs, public awareness and driver training, and other safety program development and research opportunities.

Unfortunately, the inventory data have not been kept up-to-date. Currently, information is provided on a voluntary basis, and the accuracy varies from state to state and from railroad to railroad. Along with missing information for some crossings, in some cases the existing database does not accurately reflect the current status of a crossing. For example, the average age of the annual daily vehicle traffic (AADT) data and day and night through trains data is twelve years old. Much of the data is more than twenty years old and some is even thirty years old.

With the increase of residential and industrial development near railroad tracks and an increase in registered vehicles and train movements in recent years, it is highly unlikely that the crossing inventory for many regions accurately reflects current traffic volumes. When the data are updated, the accident prediction list also changes. If this information is to be used to make sound decisions when investing Federal funds, a law is needed that would mandate initial reports and updates to key data elements in the National Highway-Rail Crossing Inventory by both the States and the railroads. Both FRA and FHWA have proposed legislation that would require periodic updating of the inventory, however no action has been taken by Congress (Appendix D).

Enacting a statutory requirement will result in more current data on highway and train traffic at crossings and provide a more accurate basis for identifying high-risk crossings that should be improved or eliminated and therefore receive Federal crossing safety funds. Such a requirement will also permit a more cost-effective use of finite Federal funds.

METHODOLOGY

FRA and FHWA wanted to find the best method for determining the ten highest risk crossings in each state. Each state has its own priority ranking system and decision-making process for determining where Federal funds will be spent for grade crossing safety improvements. Allowing each state to determine its top ten crossings using disparate methodologies would result in individual state rankings that would be virtually impossible to analyze on a nationwide basis. Therefore, FRA and FHWA developed a methodology that could be applied for all states in the selection process. The following discusses the different methodologies considered in ranking the crossings consistently for all states.

Fatal Collisions

The first method considered was to use the number of fatal incidents as the ranking factor. This methodology had the advantage of being very easy to calculate as railroads are required to report every highway-rail grade crossing collision to the FRA. FRA's Railroad Accident/Incident Reports System (RAIRS) database could be searched for fatal collision incidents by individual crossings. A report based on historical records could then be created that would rank crossings by the total number of fatal crashes. This analysis would provide a historical view of fatal collisions that could be used to determine the crossings included in the study.

However, using the number of fatal collisions as the only determining factor presents several problems. While fatal crossing collisions occur far too often, they do not occur often enough to be a statistically valid measuring tool. It would also be necessary to go back many years in order to accumulate enough incidents to make ranking decisions. Using the state of Texas as an example, ranking crossings by the number of fatal collisions for the past fifteen years results in two crossings having four fatal incidents, two crossings having three fatal incidents, and thirty-three crossings having two fatal incidents. This clearly illustrates the difficulty in using only the number of fatal incidents to determine the top ten crossings.

The use of fatal collisions as the only ranking factor is further complicated because, as older historical data are gathered for each crossing, it becomes more likely that collisions will have occurred under varying conditions at the crossings identified. For example, data collected from 15 years ago at many of the crossings would have shown crossings without lights and gates. Data collected from five years ago would have identified the same crossings with lights and gates. Many of the older fatal collision reports would therefore not reflect the conditions that actually exist at the crossings today. To include collisions that do not reflect the current status of the crossings would not produce a valid rating system. Finally, using fatal collisions as the only determining factor relies on the false assumption that past collision history is the best predictor of future events. These reasons led to the rejection of using the number of fatal collisions as the measurement tool.

Total Fatalities

The second method considered was to use the total number of fatalities at each crossing as the determinant factor in a ranking system. The same problems were encountered using this method as using the number of fatal incidents previously discussed. Another complicating factor was the incidence of collisions involving multiple fatalities. Would a crossing that had one collision with five people fatally injured be considered more hazardous than a crossing that had four single fatality incidents? The number of occupants in a vehicle is a random element and not related to the degree of hazard at the different crossings. This method was also rejected.

Accident Prediction Formula

The third method considered was to use the Department's Accident Prediction Formula (APF) to rank the crossings. APF uses a number of physical and operational characteristics of crossings, coupled with five-year collision histories to determine the probability of a collision occurring in a subsequent year. The formula includes the following factors: number of trains, number of vehicles, train speed, number of main tracks, type of warning device, paved or unpaved highway, number of highway lanes, and collision history . The formula was created by using nonlinear multiple regression techniques and is a well-recognized and widely used accident prediction formula. Many states use it as part of their priority ranking systems for crossing improvements. In addition, those states that do not use it are at least familiar with the formula.

While APF is recognized as a valid method for predicting the probability of a collision occurring at a specific crossing, there are a few issues associated with this method that are subject to debate. APF uses two independent data bases as the source for its information — the USDOT Crossing Inventory (for physical and operational data) and RAIRS for collision history. Therefore, the values calculated by the formula are only as good as the information contained in the databases. The data in the RAIRS should be accurate as railroads are required to report crossing collisions; however, the crossing inventory is a voluntary system requiring input from both the states and the railroads. FRA has recognized that in some cases the inventory contains errors that may affect the outcome of APF calculations. Another issue identified as problematic is that APF predicts the probability of a collision occurring, not the probability of a fatality. The fact that a collision occurs does not necessarily mean that there is a resulting fatality. If this were the case, there would have been at least 3,502 fatalities (the total number of highway-rail grade crossing collisions in 2000) last year instead of the 425 reported. FRA therefore determined that using the APF does not provide the information that Congress is seeking.

Fatal Accident Prediction Formula

The fourth method considered was the US DOT's Fatal Accident Prediction Formula (FAPF). This formula is a derivation of the APF and predicts the probability of a fatality occurring at a crossing by multiplying the probability of a collision occurring at the crossing (as calculated by the APF) by the probability of a fatality occurring in that collision. The probability of a fatality occurring in a vehicle-train collision has been calculated using nonlinear multiple regression techniques. The following factors are taken into consideration in determining whether a fatality occurs: maximum train speed, through trains per day, switch trains per day, and urban verses rural crossings. Train speed is the factor weighed most heavily in determining if a fatality occurs.

One of the drawbacks of the FAPF is that it also relies upon information obtained from the national crossing inventory database. This means that like the APF, the FAPF calculations are only as good as the data provided to FRA.

Prior to deciding whether to use the APF or FAPF, the Department compared the results of the two different formulas. Lists of thirty crossings with the highest prediction values using both formulas were created for five trial states: Illinois, North Carolina, Ohio, South Dakota, and Wyoming. These states were chosen as representative of states with large and small population bases and varying degrees of railroad activity. It was found that the FAPF lists contained more passive crossings (crossings equipped with crossbucks only) than the APF lists. The FAPF lists also contained more crossings with higher train speeds than the APF lists. In fact, in four of the five FAPF lists, there were no crossings that had maximum trains speeds of less than 25 mph. The APF lists, however, had an average of seven crossings per state that had maximum train speeds of less than 25 mph.

Additionally, in the three test states that had Amtrak trains, the FAPF lists contained more crossings used by Amtrak trains than the APF. It should be noted that not only are train crews and occupants of the motor vehicles endangered by vehicle-train collisions, but so are passengers of trains. There can be no better example of this than the 1999 incident in which the City of New Orleans Amtrak train struck a truck tractor-semitrailer truck in Bourbonnais, IL and 11 passengers lost their lives. Use of the FAPF resulted in identifying crossings with more passenger trains, higher train speeds, and fewer automated warning devices.

For these reasons the FRA and FHWA decided that using the FAPF would be the best method to rank the crossings in each state and would result in identifying the crossings with the highest risk of fatalities. The problems caused by using inaccurate data in the inventory could be addressed by requesting that the states provide updated inventory information. Once the inventory information was updated, the FAPF would provide a measurement tool that would rank the crossings in the state according to the probability of a fatal collision occurring. All things considered, the FRA and FHWA felt that this method would be the most responsive to Congress's request and would provide a uniform method for evaluating crossing hazards across the nation.

FRA and FHWA also recognized that many factors are used to assess risk at grade crossings and not all of these factors can be captured by a prediction formula. Some other things that should be considered at each crossing are sight distances (the ability to see down the track while approaching the grade crossing), school bus traffic, passenger and commuter rail operations, and storage space (distance between the roadway stop line at the highway-highway traffic intersection and a railroad track). Many of these factors can only be determined by site visits at the local level. As the states were in a better position to either know of these conditions or determine them by site visits, the FRA and FHWA felt it would be appropriate to ask the states to volunteer additional crossings to be included in the study.

For the foregoing reasons, the FRA and FHWA determined to use the FAPF as the most appropriate means of determining the ten crossings that had the highest probability of having vehicle-train collisions resulting in fatalities. This would provide a uniform method of looking at risk for all of the states. States were also asked to nominate crossings they felt should be included in the study. This action provided states the flexibility to use their knowledge of local conditions that might have an impact on the ranking but which may not be included in the formula.

ANALYSIS

After determining the most appropriate method to analyze crossing data, a letter dated February 18, 2000 (Appendix B) was sent to each state's Department of Transportation Director, State Section 130 Contact, and State Grade Crossing Inventory Contact. In addition, FRA Regional Administrators and FHWA Division Administrators were sent copies of the letter to foster open communication between all of the involved Federal and state agencies. The letter explained the congressional request and stated that the FRA's Crossing and Trespasser Regional Manager along with the FHWA's Division Safety Engineer would discuss possible mitigation measures for each crossing.

Each letter also included:

- A list of the 30 crossings in that state with the highest Fatal Accident Prediction Formula values and
- The current US DOT Inventory Report for each of the 30 crossings.

The states were asked to perform the following actions:

- Review the FAPF list and inventory reports,
- Make any needed corrections to the inventory report to reflect the current conditions at the crossings,
- If the state so desired, provide a list of additional crossings that the state felt had the greatest potential for a fatal collision, and
- Return all materials to FRA within 30 days.

If there was no response from a state, the information in the FRA database would be used in the report on behalf of that state. Finally, the states were informed that a report would be prepared listing the ten most hazardous crossings, proposed mitigation measures for those crossings, and cost estimates for those mitigation measures for both the FRA crossings and the state's crossings (if provided).

Any corrections of the initial 30 crossings and any state submitted crossings, which were received in the allotted time, were entered into the US DOT Inventory. The Fatal Accident Prediction Formula was used again, and the ten crossings in each state with the highest probability of having a fatal collision were selected. This new list benefitted from the use of corrected data as provided by the states.

A second letter (Appendix C) containing the new list of the ten crossings with the highest fatal collision probability values was sent out as before. Where states identified crossings they felt had higher FAPF values because of updated inventory information not possessed by FRA/FHWA, those crossings were provided in a separate list and included in mitigation reports. The letter again explained the congressional request and requested the state's assistance in providing the needed information. It stated that the FRA's Crossing and Trespasser Regional Manager and FHWA's Division Safety Engineer office staff would be contacting each of the states to discuss the mitigation measures. The states were asked to provide the following information for each of the ten crossings selected by FRA as well as any state nominated crossing:

- Type of mitigation proposed,
- Brief description of the proposed mitigation,
- Rough cost estimate for the mitigation, and
- Brief explanation, if not proposed, of why closure, separation or relocation were not recommended.

RESULTS

The responses from the states to the initial request for updating their inventory sheets for the thirty crossings were received in a variety of formats. Some states provided what was requested while others suggested ways to improve it. Overall, forty-four states responded to the initial request and provided updated inventory information. Several states provided information too late to be included in the final computer analysis used to generate the list of ten crossings in each state with the highest fatal accident prediction values. In these cases, as in the instances where the states failed to provide any updated inventory information, the list of the top ten crossings was generated using data currently on file at FRA. Twelve states took advantage of the offer to include additional crossings that were not on the list provided.

There was a certain amount of concern expressed about the study. For example, one state was concerned with the use of the US DOT inventory data stating that it was not correct and would ultimately change the results of the study. Another state, also displeased with the inventory, suggested that FRA update the entire inventory before using inaccurate data. Yet another state was concerned because four of the crossings on its list had never experienced a fatality. A problem was revealed when FRA/FHWA verified inventory data for a completely different project. In that case, FRA inspected 92 randomly selected crossings in a major metropolitan area. Based on the inspection of those crossings, FRA discovered that the US DOT Grade Crossing Inventory contained inaccurate data for 67 of the 92 crossings, including 39 that no longer existed.

These kinds of concerns are not new. Both FRA and FHWA have forwarded legislation to the Congress to require states and railroads to submit their data so that future records will be accurate (Appendix D).

The FRA/FHWA staff, concerned about the inaccuracy of grade crossing inventory data, asked the states to update the inventory for the original thirty crossings in order to increase the probability of a more accurate listing of those crossings in each state with the greatest risk. FRA/FHWA sought to balance the possible burden on states that would have to update data for a large number of crossings with the necessity of having accurate data on the crossings that were most likely to make the list of the 10 most hazardous crossings. It was determined that an analysis that included thirty crossings per state would accomplish that goal.

Some states also expressed concern about the use of the FAPF. As indicated previously, some factors not included in the FAPF are difficult to quantify,, such as sight distance and quality of crossing surface. Others, such as school bus traffic, and the number of passenger trains are not included in the prediction formulas. However, the impact of all these factors is accounted for in part by including the five year collision history.
The second request for mitigation suggestions received little or no written disagreement. The states seemed reasonably familiar with the study upon receipt of the second request, since FRA/FHWA representatives had already approached them. Many states eagerly submitted mitigation information.

Some states were reluctant to participate in providing initial proposals because they felt that they might have increased liability by being part of this process. These states were concerned that, if they publicly identified crossings with high risk, identified mitigation measures, and did not take steps to immediately remedy the situation, they could be held at fault in the event of a collision. In instances where a state chose not to participate, FRA and FHWA field personnel worked to provide suggested remedies. This was accomplished with the understanding that doing so does not take the place of a diagnostic review of the crossing. These suggestions are also made without the knowledge of local conditions that the states have.

Mitigation reports have been received for forty states. These reports follow and are grouped in two sections. The first section lists the states for which state-identified mitigation measures have been received. The second section contains the states that have not submitted mitigation reports. The crossings are listed by US DOT Inventory Crossing number. If additional crossings were nominated by the state, these are shown in the second section of the report. Implementation efforts identified by states include a whole range of initiatives that may be as simple as replacing crossbucks and adding advanced warning signs for $2,000 or as complex and expensive as $1 billion to upgrade an entire rail corridor. The total cost of mitigation identified by the states reporting mitigation costs is $2,323,841,799. Individual state costs range from a low of $290,000 to a high of $1.3 billion.

OBSERVATIONS

Several conclusions can be drawn from this study. It is evident from the state responses, regardless of whether or not they approved of the study's concept and method, that they take their safety role seriously. It is evident that a great deal of thought went into the responses and that this undertaking has been a positive exercise for those most directly involved in improving crossing safety.

States used various approaches to this study. One approach focused on mitigating risks based on the availability of Section 130 funding. This approach rarely encouraged crossing closure because of the resistance that states encounter from localities or individuals when attempting to close grade crossings. This approach also renders grade separations virtually impossible because of the high cost associated with building overpasses and underpasses. For many states the cost of an overpass/underpass exceeds the total amount of Section 130 funds it receives in a single year. (See Appendix E for FY 2001 Section 130 Allocation Tables). Other states have pursued an aggressive closure and grade separation approach and have not allowed the lack of sufficient Section 130 funding to deter them from pursuing such projects.

Many of the crossings on the FRA/FHWA-furnished list have already been addressed by the states either through their Section 130 programs or by special projects. Some of the crossings have already been improved or the improvements are in various stages of implementation.

CONCLUSION AND RECOMMENDATIONS

DOT and its partners have made significant strides in reducing the number of collisions and fatalities at grade crossings since the early seventies. In 1975, there were 12,126 collisions at highway-rail grade crossings, resulting in 917 deaths. In 2000, the number of collisions shrank to 3,502 with 425 deaths. Even with a significant increase of nearly 16% in train traffic over the past decade, the number of fatalities has steadily declined from 698 deaths in 1990 to 425 in 2000. In fact, when comparing fatalities per million train miles, the accident/incident rate went from 9.39 in 1990 to 4.84 in 2000. Although we have seen significant reductions, grade crossing collisions remain the second leading cause of all rail-related fatalities in the U.S., accounting for over 45% of deaths. DOT and its partners have made significant progress in improving grade crossing safety through numerous education, engineering and enforcement initiatives. The "Three E's", working together, have become a standard recipe for success. While each of the three ingredients is equally important in sustaining, and even improving our safety record at grade crossings, new commuter rail service, more freight service, and an increase in vehicular traffic necessitate a commitment to increased funding for grade crossing improvements.

Today, with emerging technologies and the need to maintain and improve the existing infrastructure, engineering improvements at grade crossings must play a vital role in the success of these programs. Many of these initiatives succeed through supporting new technological developments and innovative approaches to enhancing safety at grade crossings. Some States are leading the charge here, and DOT fully supports these efforts. For example, North Carolina's "Sealed Corridor" project employs the use of four-quadrant gates, longer gate arms, traffic channelization devices, video enforcement, grade separations and crossing closures in a corridor approach to reduce the risk of collisions and fatalities at crossings. Texas and Pennsylvania are participating in projects involving emergency notification systems at grade crossings. California is testing the feasibility of in-pavement illuminated devices at grade crossings to enhance warning systems at crossings.

All of these innovative projects, plus the $2.3 billion of mitigation projects identified in this report, require funding. The Section 130 program has been the primary source for funding grade crossing safety improvements. The program is currently funded at $155 million per year, under the 10% Safety Set Aside of the Surface Transportation Program. This level of funding has remained relatively unchanged since 1987, when the funding level was $156.8 million. The current funding level of $155 million corresponds to $102.3 million in 1987 dollars, meaning that Section 130 funding has not only failed to keep up with inflation, but has indeed dropped significantly since 1987.

TEA 21 includes highway-rail grade crossings as an eligible category for flexing of Optional Safety Funds within the Surface Transportation Program. Unfortunately, this eligibility is rarely used by States. In 1999, for example, only $26.9 million of a total of $314.8 million was flexed into grade crossing safety. DOT encourages flexing these Optional Safety Funds into the grade crossing safety program where crossing improvements warrant priority. This is an excellent way for States to accelerate their grade crossing improvement programs, and to channel these Optional Safety Funds into a safety program with a proven track record of preventing fatalities and injuries. These "flexed" funds may be used for grade crossing safety improvements encompassed by Section 130, up to and including grade separation.

One of the most important diagnostic tools needed in order to prioritize grade crossing improvement projects, allocate scarce funds and design the appropriate engineering solutions is an updated, accurate inventory of the nation-wide highway-rail grade crossing inventory. For example, some crossings listed as active in our inventory have actually been closed, while others have been upgraded. Without a clear picture of the current status of grade crossings it is impossible to plan appropriately–both from an engineering and funding perspective. A voluntary reporting system by the States and railroads has failed to keep pace with changes to the inventory. A mandatory reporting system should be adopted. Congress is urged to consider legislation such as that attached here as Appendix "D".

No one solution, no one engineering fix will eliminate collisions and deaths at grade crossings. As both train traffic and vehicular traffic increase, we must collectively find solutions that will keep pace with an ever-changing transportation environment. Engineering improvements, increased funding, and public/private partnerships must combine to enhance safety at crossings and reduce the number of fatalities. DOT's goal of reducing collisions and fatalities at grade crossings can only be met by ever vigilant attention to programs that will meet our goals for the coming years.