
# GATE IT — OR RISK IT ™

## WHY AUTOMATED GATES ARE THE DOMINANT CAUSE OF THE DECLINE IN GRADE-CROSSING CASUALTIES

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# Abstract

Over the past 30 years, casualties from accidents at railroad grade crossings have steadily declined. It is important to know the reasons for this trend so that future resources available for grade-crossing safety will be efficiently and effectively employed. This paper identifies, analyzes, and determines the impact of eight factors that have allegedly contributed to the declining casualty rate.

Two causual factors were found to have had "major" impacts on the declining casualty rate: the installation of automated gates (always equipped with flashing lights) and the restructuring of the railroad industry -- with the former being, by far, the "dominant" positive causal factor. The closure of crossings was found to have had a "moderate" impact, and overall improvements in highway safety had a "moderate/minor" impact. Four other factors under the auspices of grade-crossing safety providers, administrators, and educators either had "minor" or "marginal" impact.

In spite of continuous gate installations funded by federal and state monies, only 26% of our nation's 145,800 public crossings, and just a handful of the 94,200 private crossings, are equipped with gates. A significant inhibitor to gate installations has been the notion that since railroads have the right-of-way at crossings, motorists are virtually at fault for all but a few accidents. Thus, rhetorically speaking, why expend money on gates when irresponsible drivers will go around them in much the same manner as they fail to yield to trains at crossings with passive warning devices? Yet, on a unit-of-traffic basis, gates are by far the safest warning device at grade crossings.

The public interest will be best served if organizations involved in grade-crossing safety acknowledge the value of gates; abandon the self-serving mantra that failure-to-yield – rather than the reason that motorists fail to yield – is the core cause of grade-crossing accidents; and promote an accelerated level of gate installations.

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# I. INTRODUCTION, METHODOLOGY AND FINDINGS

This paper is presented by Crossing To Safety® -- the educational component of The Angels On Track Foundation.[1] The Foundation is an Ohio-based, non-profit organization dedicated to the improvement of grade-crossing (railroad-highway intersection) safety in Ohio, with the hope that its efforts will serve as a model for the nation. Its motto, "Bad Crossings Kill Good Drivers,"® reflects the Foundation's emphasis on dangerous conditions at crossings, and its belief that while specialized motorist education is desirable, it is not an adequate substitute for the elimination of hazardous crossing conditions. While grade-crossing safety has improved, serious problems remain. Grade-crossing and trespassing accidents on railroad track accounted for 94% of rail-related fatalities in 2004.[2] Furthermore, the majority of the more than 246,000 grade crossings in the United States (U.S.) are still not protected with active warning devices,[3] thus compounding the dangers associated with adverse crossing conditions.

Purpose

This paper provides perspective on the efforts to improve grade-crossing safety. Failure to understand the relative contributions of these efforts is prerequisite to ineffective and inefficient use of human and financial resources in future years. Ultimately, motorists will suffer the most, for as the U.S. Department of Transportation (DOT) stated: *When a highway-rail collision occurs, the burdens in the current system are borne by the victims of the collision.*[4] Grade-crossing collisions often result in death and serious injury to motorists, but not to on-train personnel or passengers. In 2005, there were 3,010 grade-crossing collisions resulting in the deaths of 355 motorists and injury to 970 others[5]

Need

As shown below, since 1975, the number of casualties (deaths and injuries combined) resulting from grade-crossing accidents has decreased 73%.[6] Deaths and injuries are combined in that their difference is often a matter of inches and fractions of a second. Furthermore, the measure of casualties reflects the fact that grade-crossing accidents involving motor vehicles often result in more than a single death or injury. The

| Year | Casualties | Index |
|---|---|---|
| 1975 | 4,777 | 100 |
| 1985 | 3,269 | 68 |
| 1995 | 2,473 | 52 |
| 2005 | 1,325 | 27 |

favorable casualty trend has been documented, acknowledged, promoted, celebrated, and claimed. Claimants include government agencies and private sector entities – hereinafter

referred to as "insiders" -- that administer various aspects of grade-crossing safety. It is common for insiders to engage in a two-tiered deductive approach to their assertions. First, they practice "collective reciprocal appreciation," initially citing the declining casualty trend as a partnered effort, of which they are a major component. Second, they link their programs to the favorable casualty trend with the implicit assumption that each effort has been successful. The most recognized participants in the process of deductive self-adulation are individual railroads, the Association of American Railroads (AAR), the Federal Railroad Administration (FRA), and Operation Lifesaver (OL). Other insiders include the Federal Highway Administration (FHWA), state Departments of Transportation, and the National Transportation Safety Board (NTSB).

Underlying Problem

The gratifying casualty trend does not mean that each effort aimed at improving grade-crossing safety has been effective and/or efficient – that more could not have been done; that better methods could not have been employed; and, that waste wasn't incurred. In fact, the declining casualty rate could be used as a cover for bad practices, thereby providing an escape from full accountability. Consider the reactions to criticism of grade-crossing safety, as documented in a series of New York Times articles in 2004 and 2005. The railroad industry stated: *Nothing in that article can obscure the fact that grade crossings have become substantially safer, thanks to the efforts of the nation's railroads working in concert with local officials, highway safety advocates and Operation Lifesaver.*[7] The FRA noted that its employees *successfully work to prevent collisions, injuries and deaths at grade crossings,* citing a *solid record of continuous improvement* in the safety record.[8] And OLI cited the favorable safety trend and claimed that the *Federal Highway Administration credits Operation Lifesaver with preventing 11,000 deaths and 54,000 injuries*.[9] (OL's claim was subsequently denied by FHWA.)[10]

Thus, there is an underlying conundrum with the favorable casualty trend. If used improperly, it can ward off criticism of insiders and their programs, thereby masking possible bad policies, strategies and practices. And where deficiencies continue, they will probably induce higher costs to society. As the DOT Inspector General (IG) pointed out in regard to future grade-crossing improvements: *Further progress can also be expected to be more difficult and to yield incremental fewer* benefits, as past gains were akin to picking *low-hanging fruit.*[11]

Approach

This paper avoids pitfalls of the deductive approach by focusing on cause-and-effect relationships between insider activities and improvement in grade-crossing safety. An inductive approach is employed, with no assumption about insider effectiveness. Furthermore, the approach recognizes the possibility that "external" factors may also have contributed to the favorable casualty trend. Consequently, two external forces were identified as causal factors: improvement in highway safety, and the organizational

restructuring and resurgence of the railroad industry. Another causal factor that is influenced only in part by insiders is crossing closures. Other casual factors include insider efforts such as: railroad-industry initiatives, regulatory enforcement, federal and state programs to install automated gates, motorist education, and accident investigation.

A second component of the inductive approach is the goal of obtaining perspective, rather than specific mathematical measurement. Mathematical modeling (econometrics) is very limited in regard to identifying impacts of events that are part of a single result, move in the same direction, are not conducive to an assessment of quality, and lack complete quantitative description. Such is the case of the causal factors behind the declining casualty levels. Therefore, the impacts of causal factors are qualified within four broad categories: (1) major (2) moderate (3) minor, and (4) marginal. Based on a range of 0 to 100, with 0 meaning no impact and 100 meaning the greatest impact, the designation of "major" equates to 76-100; "moderate," 51-75; "minor," 26-50; and, "marginal," 0-25.

Data used and cited in this paper come from statistics gathered and published by the federal government, testimony before Congress, research studies, judicial proceedings and insider websites. Annual statistics on the number of grade crossings, accidents, and casualties were first published by FHWA and entitled, Highway Rail Crossing Accident/Incident and Inventory Bulletin. FRA replaced FHWA as the publisher, in its Railroad Safety Statistics, but stopped printing the data in 2001 in favor of website availability. The accuracy of this data are highly dependent on railroad data-collection processes. Railroads are required to report accident data on a monthly basis, but they submit inventory information on a voluntary basis. In both cases, FRA does not systematically audit the data, stating that: *It is not possible to identify reporting events that were omitted from a railroad's submission. Likewise, there may be instances when incomplete reported information passes all reviews and is accepted. Although we attempt to be as vigilant as possible in both the editing and presentation of the accident/incident data reported, errors do occasionally occur.*[12]

Conclusions

Findings regarding the eight causal factors are presented in this paper, followed by more detailed discussions of each. Overriding these findings are two broad conclusions as follows:

1. **THE INSTALLATION OF AUTOMATED CROSSING GATES HAS BEEN THE DOMINANT "MAJOR" REASON FOR THE DECLINE IN GRADE-CROSSING CASUALTIES OVER THE PAST 30 YEARS.** While accidents have occurred at gated crossings (due to activation failures and irresponsible motorists), on a unit-of-traffic basis, gated crossings have been by far the safest type of warning device at crossings.

2. **THE UNFOUNDED, BUT PERVAISIVE, ATTITUDE THAT MOTORIST "FAILURE TO YIELD" IS THE CAUSE OF CLOSE TO ALL GRADE-CROSSING ACCIDENTS, HAS RESTRICTED THE NUMBER OF GATE INSTALLATIONS.** The victim-to-blame mantra has provided insiders with a basis to advocate crossing closures and motorist education -- and not gate installations -- as the prime ways to reduce grade-crossing accidents.

The eight causal factors are identified in the graphic below, along with the primary organizations affecting their implementation, and their designated impact ratings as determined in this paper.

| CAUSAL FACTOR | ORGANIZATION | RATING |
|---|---|---|
| Installation of Automated Gates | Congress, FHWA, State Government | Major (Dominant) |
| Restructuring of Railroad Industry | Congress, ICC/STB, Rail-roads, Investors | Major |
| Closing "Redundant" Crossings | FRA, Railroads, Local Communities | Moderate |
| General Improvement in Highway Safety | Federal/State Gov. Safety Grps, Veh. Mfgs., Motorists | Moderate/Minor |
| Railroad Initiatives (Not Required by Law) | Railroads | Minor |
| Institution and Enforcement of Safety Regulations | FRA (Excludes State Regulations) | Minor |
| Specialized Motorist Education | Operation Lifesaver and Operation Lifesaver, Inc. | Marginal |
| Comprehensive Accident Investigation | FRA, NTSB (Excludes Local Authorities) | Marginal |

1. **The causal factor that has been both "major" and "dominant" is the installation of over 26,000 automated gates at public grade crossings since 1975, largely through federal funds distributed to States.** When properly working, automated gates warn motorists that trains are approaching, thereby preempting sight obstructions and failure to adequately sound locomotive warning devices. Research studies have consistently concluded that gates are the most effective warning device at grade crossings. FRA statistics show that gates are 3-4 times more effective than passive devices such as crossbucks and stop signs. While casualties per-crossing have steadily declined at public crossings, they have increased slightly at private crossings where gates are rarely found.

2. **The other "major" causal factor has been the rationalization and restructuring of the railroad industry.** Track structure has been reduced. Thousands of crossings have been eliminated. Track has been transferred from large higher-speed railroads to small lower-speed railroads. Bankrupt railroads have been merged into, or acquired by, the seven remaining Class I (largest) railroads. Railroads have experienced a substantial financial resurgence.

3. **The closure of over 121,000 grade crossings since 1975 has had a "moderate" impact, with many more closures at public crossings where traffic is greater, than at private crossings where traffic is less.** Casualties per-crossing have declined by 58% since 1975, compared with a 73% decrease in casualties at all crossings. The 21% difference between the 73% and 58% figures does not transfer to an equal impact on the casualty rate since some motorists are re-routed to adjacent, similarly dangerous crossings. Some traffic from crossing closures is also accompanied by the installation of gates at adjacent crossings.

4. **A causal factor not specific to grade-crossing safety that has had a "moderate/minor" impact is the improvement in highway safety.** Federal and state governments have increased their commitment to highway safety, resulting in additional and upgraded roadways, better traffic signals and signage, and more rational highway design. Motor vehicle acceleration, maneuverability and braking systems are more responsive to motorist decision-making. Lower tolerances for driving "under the influence" have been instituted and the social stigma associated with drinking-and-driving has spread and intensified. Since grade crossings present a different environment than highway intersections, the full benefits of improved highways has not transferred to grade crossings.

5. **Railroad initiatives aimed at reducing grade-crossing casualties have had mixed results with the overall impact being "minor."** Railroad inducements to close crossings have had a "moderate," impact, but railroads are only one entity supporting closures. Railroad involvement in motorist education has been a dubious practice with unknown consequences. Other railroad efforts are marginal and, in some cases, have negative aspects. Railroads consistently deny responsibility for identifying and rectifying dangerous crossing conditions.

6. **FRA initiatives to introduce safety regulations have had a "minor" impact on the declining casualty rate**. Enforcing federal safety laws is a requirement – not a pro-active safety program. FRA has demonstrated a

number of negative characteristics: among others, lax enforcement of safety regulations; lack of adequate grade-crossing accident investigation; and exceedingly long regulatory proceedings. The agency has not addressed such major issues as national sight-obstruction standards, uniform accident investigation, and evaluation of program effectiveness.

7. **OL programs have had a "marginal" impact on the declining casualty rate.** OL presentations are to limited audiences and given mostly by railroad and ex-railroad employees with little, if any, educational experience. OL messages have focused on motorist irresponsibility, without concern for crossing deficiencies, thereby possibly providing self-anointed good drivers with a false sense of security when approaching grade crossings. OL has proffered that "gates are not the answer," thereby giving the erroneous impression that education is far preferable to gates as a safety device at crossings. Casualties per-crossings at private crossings have trended slightly upward over the past 30 years, indicating that OL efforts have had little impact on motorists using such crossings.

8. **The inadequate number of FRA and NTSB investigations of grade-crossing collisions has rendered such investigations by the federal government as having a "marginal" impact on the declining casualty rate.** FRA has deferred to NTSB as the agency responsible for investigating grade-crossing accidents. NTSB has focused on aviation accidents and has investigated only a handful of grade-crossing accidents.

9. **A substantial underlying inhibitor to the installation of gates has been the thesis that since railroads have the right-of-way at grade crossings, motorists are "de facto" at fault for virtually all but a few accidents**. Thus, why spend money on gates when motorists have the responsibility to avoid approaching trains no matter what types of warning devices, or physical conditions, are found at grade crossings? Insiders have preached that motorists have the responsibility to stop for approaching trains no matter what the conditions at grade crossings. Railroad-generated accident reports have been inappropriately used to cite motorists as being responsible for 94% of grade-crossing accidents. Insiders imply that gates are not very effective in that accidents occur at crossings with active warning devices. Finally, in 2005 the IG of DOT recommended that FRA use a broad array of information to determine the causes of grade-crossing accidents, thereby acknowledging deficiencies in past and current accident records.

Recommendations

Government policy makers, railroads and other organizations involved in grade-crossing safety should strengthen their commitment to the installation of crossing gates. Future positive impacts on grade-crossing safety from improvements in highway safety and from a revitalization of the railroad industry cannot be expected to match past performance. Neither can the historic pace of closing redundant crossings. And motorist education pales in comparison with the protection of crossing gates. Five ways to increase the number of gates at grade crossings are as follows:

1. Congress and state legislators should increase the amount of public funds for gate installations; designate that these monies are to be used solely for gate installations; and require railroads to install gates on a cost-recovery, rather than a for-profit, basis.

2. The railroad industry should develop pro-active programs to determine where gates are needed; to help fund the installation of gates; and to install gates on a non-profit basis.

3. FRA should determine the feasibility of adopting motorist sight-obstruction standards at crossings, with the goal that if standards are adopted, illegal obstructions on railroad property will either be eliminated by the appropriate railroads or be the basis for the installation of gates.

4. State governments should require competitive bidding on gate installations; conduct audits of the charges for such installations; and account for gate components that are discarded or replaced.

5. OL should stress the importance of gates as a way of reducing casualties at grade crossings, rather than preaching that collisions also occur at gated crossings.

## II. INDEPENDENT FACTORS

Looking beyond insider efforts, two phenomena have influenced the declining casualty rate: improvements in highway safety, and the restructuring and resurgence of the railroad industry.

Improvement in Highway Safety

The accident rate on our nation's highways has declined. As shown below, fatalities decreased by 19% between 1970 and 2003, while the number of injuries dropped by 15% between 1988 (the first year published) and 2003.[13] The declines occurred in spite of significant increases in our nation's population, licensed drivers, and

| Year | Fatalities | Index | Injuries |
|---|---|---|---|
| 1970 | 52,627 | 100 | |
| 1980 | 51,091 | 97 | |
| 1988 | 47,087 | 89 | 3,416,000 |
| 2003 | 42,643 | 81 | 2,889,000 |

vehicle-miles traveled. Thus, relative traffic statistics dropped even further. Between 1970 and 2003, fatalities per-100,000 population dropped by 43%; fatalities per-100,000 licensed drivers by 54%; and fatalities per-million-vehicle-miles by 69%.[14]

It is patently obvious why highway accident rates have declined. In general, motorists are driving far better vehicles over vastly improved roadways with more sensitivity to the consequences of dangerous driving. Highway expenditures have accelerated to meet the needs of a more mobile society. New construction has improved highway access, egress, signage, and pavements. And, attention to safe driving has become a national campaign. As an example, consider the impact from the focus on driving "under the influence." The lowering of the legal standard of intoxication; the work of Mothers Against Drunk Driving and other similar organizations; and the stigma attached to drinking-and-driving as advanced in the media, by law enforcement, in schools, and in drivers' education – have all helped to lower the number of fatalities from alcohol-related crashes. As shown below, total fatalities in alcohol-related crashes have declined by 35% from 1982 to 2003.[15]

| Year | Total Fatalities in Alcohol-Related Crashes | Index |
|---|---|---|
| 1982 | 26,173 | 100 |
| 1992 | 20,960 | 80 |
| 2003 | 17,013 | 65 |

The impact of improvements in highway safety on grade-crossing safety is a matter of speculation. Complicating the determination are two conflicting demographic changes: urban sprawl into geographic areas where grade crossings are unprotected, versus urban growth where railroad crossings are often separated or protected with automated gates. Thus, the 19% drop in highway fatalities between 1970 and 2003 could logically be considered as a "ceiling" figure in regard to its impact on the declining, grade-crossing casualty rate.

Supporting a figure lower than 19% is the recognition that motorists approaching grade crossings face a far different environment than they do in approaching highway-highway intersections. As a number of research studies have discovered, motorists are often not familiar with the most popular warning device at crossings – crossbucks. State laws detail the actions motorists are to take in approaching grade crossings with different

types of warning devices, but such laws are not common knowledge. Also, it can be dangerous for motorists to quickly decelerate in traffic. And while stronger motor vehicles may have had a positive impact on the casualty rate from highway accidents, they could hardly be expected to have the same result when it comes to trains – weighing 6,000 tons or so –hitting motor vehicles weighing 3,500-6,000 pounds. If the 19% figure from general highway safety improvement was applicable to the declining casualty rate from grade-crossing accidents, its impact would have been deemed to be "major." But because some lower figure seems to be more appropriate, the designated impact is "moderate."

Restructuring and Resurrection of the Railroad Industry

The railroad industry entered the decade of the 1970s in dire physical and financial condition and talk of nationalization was common. A substantial portion of track -- especially in the East and somewhat less in the Midwest – was owned by railroads in bankruptcy. Virtually all railroads did not earn enough income to support adequate re-investment and proper maintenance of their assets. The growth of alternative forms of transportation, counter-productive economic regulation, excessive capacity and employment, and questionable management, had long ago steered the industry on a road to destruction. The development of the federal highway system – initially enacted by the Federal Aid Highway Act of 1944 and spurred by the Federal Aid Highway Act of 1956 – was a major blow to both railroad passenger and freight business. Major changes in the railroad industry's organization structure were inevitable.

The first major change in the organizational structure of the railroad industry came in 1970 with the enactment of the Rail Passenger Service Act. This Act created the National Passenger Corporation (Amtrak) to service the basic intercity rail passenger system selected by the U.S. Secretary of Transportation. By relieving railroads of passenger service, the federal government also eliminated a substantial railroad deficit. Other federal regulation geared to aiding ailing railroads was soon to follow. The National Emergency Service Act of 1970 authorized financial assistance to railroads undergoing reorganization under Section 77 of the Bankruptcy Act. The Emergency Rail Facilities Act of 1972 authorized financial assistance to railroads to restore or replace essential facilities and equipment damaged or destroyed by Hurricane Agnes. The Regional Rail Reorganization Act of 1973 created the U.S. Railway Association, in order to develop a "final system plan" for adequate and efficient railroad service in the Midwest and East. As a result, an Act of Congress formulated the Consolidated Rail Corporation (Conrail) in 1976, out of a number of bankrupt and other railroads. Also in 1976, the Railroad Revitalization and Regulatory Reform Act was enacted, reducing railroad economic regulation, expediting railroad merger procedures, creating a fund to aid railroad rehabilitation and enhancing local railroad service. Then in 1980, the railroad industry was relieved of much of its economic regulation. The Staggers Rail Act of 1980 substantially eased federal control of railroad freight rates, freight-car movement,

abandonment of service, sales of operations and track, and other areas of railroading. Federal handling of applications for railroad mergers was to be significantly expedited. The freight railroad industry in the U.S. would be unleashed to enjoy economic freedom it had long sought.

The sum total of federal promotion and regulation of railroads between 1970 and 1980 has had a substantial impact on the organizational structure of the industry. In turn, there has been a financial resurgence of the railroad industry that could be expected to have had an un-quantifiable impact on grade-crossing safety for many years to come. In fact, as stated by the U.S. DOT, *It may be expected that as the financial condition of an individual railroad deteriorates or improves, the company's commitment to grade crossing improvement financing will change.*[16] Changes from the railroads' resurgence which could be expected to have had a favorable impact on grade-crossing safety include the following:

1. Reduction in the number of Class I Railroads:[17] The number of Class I railroads has shrunk from 50 in the early 1970s to just seven today. Railroad safety is federally and state regulated, and it is logical to assume that such regulation would be applied more uniformly and stringently with a fewer number of railroads. It is also reasonable to believe that very large railroads would be more sensitive to their roles as corporate citizens and thus willing to fulfill their social responsibility to the public. After all, it was the public that awarded railroads their exclusive operating licenses, provided them huge parcels of land under land-grant legislation, gave them financial assistance ranging from low-interest loans to outright grants; protected them with unique and favorable bankruptcy protection; made them immune from anti-trust legislation applicable to other businesses; and insulated them from large-scale work stoppages.

2. Elimination of Bankrupt Railroads: Since the 1970s, bankrupt Class I railroads have been eliminated through acquisition by other railroads, transfer of lines to non-Class I railroads, abandonment of service, and merger. A number of these railroads were merged into Conrail in the 1970s (financed with billions of dollars of tax-payer money). In 1998, Conrail was merged into two other Class I Railroads: CSX Transportation (CSX) and Norfolk Southern (NS). While the bankrupt railroads deferred maintenance based on financial inadequacy, no such excuse has been available to the surviving Class I railroads.

3. Decrease of track mileage: Railroad track mileage has declined dramatically since 1970 and, in fact, since its peak in 1916.[18] For example, Class I railroad mileage decreased from 196,470 miles in 1970 to 99,126 miles in 2003.[19] In a

number of cases, parallel track has been reduced – from triple to double and/or single line, and from double to singe line. In other cases, poorly maintained track has been abandoned. The end result is that crossing risks have been reduced with fewer numbers of railroad track for motorists to cross.

4. Decrease in number of grade crossings: Tens of thousands of grade crossings were eliminated simply because the railroad industry downsized. (This issue is discussed in the following section of this paper.)

5. Transfer of track to non-Class I railroads: Beginning in the 1970s, and especially the Staggers Rail Act of 1980, there has been a major shift in the ownership of railroad operations from Class I Railroads to Regional and Local railroads. On average, Class I Railroads operate trains at faster speed than their smaller brethren. In a given year, 80-90% of grade-crossing accidents occur on Class I Railroads (including Amtrak), and half of the other accidents happen on high-speed commuter lines.[20] And yet, Class I Railroads own just 68% of railroad track.[21]

6. Improvement of financial posture: Aside from railroads ridding themselves of the passenger, other restructuring activities that have improved the railroads' financial posture are: line sales, abandonment of light-density line, acquisitions of other railroads, mergers with other railroads, economic deregulation, and government assistance. Railroad traffic, revenue and earnings have climbed upward in recent years, with the exception of several post-merger adjustment periods. Productivity is at an all-time high. Thus, railroads have had an increasing ability to eliminate deferred maintenance, improve operating practices, and employ capital expenditures for safety improvements.

There appears to be no credible way to measure the impact of the structural changes in the railroad industry on grade-crossing safety, although there is no doubt that such changes have been positive. A potential exception relates to the concentration of power within the railroad industry. The seven Class I Railroads account for 92% of the industry's freight revenue; four of the seven account for 94% of total Class I railroad freight revenue; and just two account for 55% of Class I railroad freight revenue.[22] This vast power among a handful of entities may result in relatively easy industry-wide agreement over grade-crossing matters that favor profit over safety. Still, between 1975 and 2005, the draconian changes and resurgence of the railroad industry appear to have had a "major" positive impact on the declining casualty rate from grade-crossing accidents.

# III. SEMI-CONTROLLABLE FACTOR: CROSSING CLOSURES

It can be misleading to view grade-crossing trends in absolute terms. This is especially true in the face of a continual decline in the number of existing crossings. The number of grade crossings has dropped from 361,472 in 1975 to an estimated 240,000 in 2005,[23] or 34%. To adjust for this one-dimensional decline, grade- crossing casualties can be measured on a per-crossing basis, but such a statistic also requires an understanding of its potential meaning. As shown below, casualties per-crossing also steadily declined since 1975, from .0132 to .0055 in 2005, representing a 58% drop.[24] In essence, the absolute rate of the 73% decrease in casualties translates to a decline of 58% on the basis of casualties-per-crossing. The 15 percentage point margin between the two calculations (73% and 58%) equates to a 21% difference.

| Year | Casualties Per-Crossing | Index |
|---|---|---|
| 1975 | .0132 | 100 |
| 1985 | .0100 | 76 |
| 1995 | .0092 | 70 |
| 2005 | .0055 | 42 |

At first glance, it may appear that the 21% figure represents the relative contribution of grade-crossing closures to the declining casualty trend. An implicit endorsement for such logic derives from railroads who have stated that: *Public education of grade-crossing dangers and continued elimination of crossings are the most effective way to stop the needless carnage.*[25] FRA has also provided financial incentives to local communities to close crossings,[26] and state Departments of Transportation have helped to foster such closings. And yet, since motorists previously using closed crossings are rerouted to adjacent crossings, if the newly used crossings are not safer, the closures could be expected to have no impact on casualties.

While it cannot be said for certain as to how traffic patterns have changed following the closure of over 121,000 crossings, a clue to the impact of a significant segment of the closures was provided in Congressional testimony. As stated by the North Carolina Department of Transportation:

> *We know that crossing consolidation and elimination is one of the most effective treatments when it comes to highway-rail at-grade crossing safety and have enjoyed success in collaborating with railroads and local governments in this endeavor. The safest crossing is one that is not there. Elimination of crossings can save capital investment in the local road authority and perpetual maintenance investments by the railroad while*

*rerouting traffic efficiently and safely over an alternative at-grade crossing that is safer or a grade separation of the railroad.*[27]

Experience reveals that many crossing closures have been tied to upgrades of warning devices – including the installation of gates -- at adjacent crossings. Furthermore, a number of closed crossings were arguably more dangerous than the remaining crossings. This is because deadly accidents at non-gated crossings have sometimes brought pressure on public officials to either close or gate those crossings. And finally, the majority of crossing closures have occurred at public -- as opposed to private -- crossings where the overwhelming number of casualties are experienced.[28] And finally, closure of some private crossings occurs because the railroad service or private users abandon the premises. Thus, a significant portion of the 21% difference between the absolute and per-crossing decline in casualties is probably due to crossing closures. Whether the figure is 10% or 15%, it is still at least "moderate," so its impact has been "moderate/major."

## IV. ADMINISTRATIVE (INSIDER) EFFORTS

Conventional wisdom is that insiders and their programs are responsible for the declining casualty rate. But to the extent that insiders are carrying out legislative mandates in a minimal, reactive manner, credit may be given to the U.S. Congress for enacting safety standards and regulations. The point is that in trying to gain an appreciation of the effectiveness of insiders and their programs, the perfunctory and minimal should be separated from the pro-active and material.

Railroad Initiatives

Railroads are legally required to operate their trains and maintain their rolling stock, track structure, and other facilities in a safe manner. These requirements were in effect long before the 1970s and have remained in effect – although arguably strengthened -- ever since. Specific federal regulations are published in the Code of Federal Regulations (CFR), while state requirements are part of individual State laws. When both federal and state safety regulations cover the same areas, federal law preempts state law.

Railroad industry claims as to their safety contributions provide a starting point for impact evaluation. The AAR has cited among other factors: the railroad industry's financial support of motorist education; involvement in research and development to improve methods of warning motorists; maintenance of crossing gates, signals and surfaces; support of the safety plan developed by the U.S. DOT and initiation of an advertising campaign to influence driver behavior.[29] The Association has also applauded: the Burlington Northern/Santa Fe Railroad (BNSF), *for partnering with law enforcement in a series of programs designed to raise awareness at crossings where motorists are least likely to comply with traffic laws;* the CSX Railroad for sponsoring a *cutting edge*

*public safety campaign designed to promote crossing safety and . . . a series of billboards, radio ads and public service announcements to grab the attention of motorists*; NS, for mounting *Rail View cameras on about 850 locomotives operating across the NS rail system*; and the two major Canadian railroads for helping to *identify driving behaviors at highway railroad grade crossings.*[30]

The Union Pacific Railroad (UP) has attributed its contribution to safety gains at grade crossings in the following manner:

> *Union Pacific has a comprehensive grade crossing safety program that includes system vegetation control, maintenance of grade crossing warning systems, inspection and maintenance of track and crossing panels, maintenance of locomotive horns and lights, and training and certification of train crews who operate the trains. Union Pacific has posted an 800 number on all crossings for immediate response to stalled cars or other safety risks. Additionally, Union Pacific funds public education campaigns and Union Pacific employees voluntarily contribute many thousands of hours to making safety presentations to the driving public. Union Pacific also sponsors safety programs in cooperation with police departments to enhance law enforcement at crossings where there have been violations.*[31]

BNSF has stated that: *as much as practical, BNSF's goal is to reduce vegetation and other obstructions along its right of way that would materially interfere with motorists' ability to see approaching trains.*[32] And the AAR (again) has stated that, *CSX also has a $30 million program to clear cut vegetation along railroad tracks to enhance the public's visibility at grade crossings with no active warning devices, while Union Pacific (UP) has entered into long-term, performance-based vegetation control contracts to improve sight distance.*[33]

The above-cited claims by the railroad industry may be accurate, but it is difficult to fathom how they have affected the 30-year trend in declining casualty rates. First, references to railroad employee training and maintenance of facilities are required, normal and expected practices. To take credit for such practices is akin to a store stating that it has had a positive impact on personal injuries by ensuring that its floors are not slippery. Second, the emphasis on helping to fund motorist education directed to grade crossings assumes that such education has been materially effective. Third, railroad clearance of sight obstructions has traditionally been directed to vegetation that inhibits the sight lines of railroad employees, as required by federal law[34] – for example, vegetation that blocks signals. To the extent that railroads are now clearing vegetation that blocks motorist sight lines (the extent of such programs is unclear), these efforts would be of recent vintage and thus would have had no impact on the declining casualty rate in the 1970s, 80s and 90s. Fourth, mounting cameras on locomotives is also a recent

venture, and while cameras record what train engineers see when approaching grade crossings, they do not present the perspective of motorists. And finally, supporting the DOT safety plan is a vague, gratuitous claim.

On the other side of the coin is what the railroads haven't done to enhance grade-crossing safety. In a nutshell, the industry has considered crossing safety to be a highway issue that has created problems for railroads. The AAR has stated that grade-crossing improvements are a highway responsibility *since in most cases . . . it is the highway user, not the railroad, who benefits from . . . the presence of any highway safety signals or devices such as flashing lights or crossing gates.*[35] The Association also espoused: *It's the state highway people who decided to put highways over the railroad tracks. They're the highway safety experts. We didn't put the highways in, and frankly, we would prefer that they not be there.*[36]

The mantra that grade-crossing safety is basically a highway issue has led railroads to deny responsibility for identifying and helping to rectify dangerous conditions at crossings. UP has stated that it does not have a program for employees to report dangerous conditions at grade crossings such as motorist sight obstructions.[37] In fact, UP has a written policy that it is ***not*** responsible for determining need and selection of devices at a grade crossing.[38] Similar statements have been made by other Class I railroads in judicial proceedings. Going a step further, UP has claimed that *the state has exclusive jurisdiction over the determination of the need for upgraded warning devices at grade crossings*,[39] while another Class I railroad has claimed that railroads are precluded by law from determining the need of, and funding, safety improvements at grade crossings.[40] In both cases, the truth was not served.[41] Railroads have practiced what they have preached as they have not developed independent programs to identify and rectify safety deficiencies at their grade crossings.

Railroads have also denied the existence of dangerous crossings. For example, a representative of the BNSF claimed that he never saw a crossing on his railroad's system that needed lights and gates to be safe; this is because *as long as the railroad complied with regulations and the prudent driver obeys theirs, there's no dangerous crossing that exists on BNSF.*[42] Similarly, a CSX train engineer stated: *I consider no crossing to be of any great danger.*[43] In essence, the railroad industry has historically taken the position that as long as it complies with operating regulations (speed limits, sounding warning devices, etc.) and maintenance requirements, and as long as it cooperates with government agencies that are responsible for upgrading warning devices, it has no obligation to improve safety at grade crossings. At the heart of this position is the assumption that since railroads have the right-of-way at grade crossings, it is the responsibility of motorists to yield to trains no matter what the physical limitations of the crossings.

In conclusion, while the railroad industry's support of crossing closures is in its self interest, such closures have had a "moderate/major" impact on the declining casualty rate from crossing accidents. But other railroad initiatives are dubious. Maintaining track structure and signaling systems are mandatory. Providing train counts to State DOTs is part of a federal/state program relating to potential gate installations. And stressing motorist education over eliminating such crossing dangers as sight obstructions can be counter-productive. For these reasons, railroad initiatives to improve grade-crossing safety have had a "minor" impact on the declining casualty rate.

Safety Regulatory Enforcement

The federal agency that regulates railroad safety, including grade crossings, is FRA – a component of the U.S. DOT. Along with other responsibilities, FRA is charged with enforcing federal laws published in CFR, Title 49, Chapter II. Federal legislation affecting railroad safety has been given credit for saving tens of thousands of lives and preventing hundreds of thousands of injuries during the 20th century.[44] In 2004, FRA issued an "action plan" that addressed railroad safety in general and specifically included grade crossings. After citing the favorable railroad accident trends, FRA revealed that it would build partnerships with states and local agencies, disseminate information as to its capabilities of obtaining locomotive event recorders, and arouse railroad attention to safety duties.[45] Yet, these so-called "initiatives" should be expected FRA practices. Also, the plan implicitly contained two interrelated messages: that motorists are at fault for virtually all but a few grade-crossing accidents, and that FRA has done a good job, no matter what evidence exists to the contrary. Most recently, in referring to the declining grade-crossing accident and casualty rates, the FRA Administrator stated that:

> *these advances were brought about by the collaborate efforts of railroads, rail employees, the Federal Railroad Administration, State and local governments, our partners at the Department of Transportation, Federal Highway Administration, Federal Motor Carrier Safety Administration, Federal Transit Administration, and National Transportation Safety Board, Operation Lifesaver and many other non-government groups.*[46]

In 2004 and 2005, an investigative series of articles published in the New York Times, under the overall banner of "Death On The Tracks," included criticism of FRA. In its initial article, after noting that railroads automatically blame the victims for grade-crossing accidents, the Times noted that FRA rarely investigates grade-crossing accidents.[47] In another article, the Times accused FRA of being overly tolerant of, and too close to, the railroad industry that it regulates. In particular, the Times found that the FRA Administrator had shared vacations with a major railroad lobbyist; many railroad fines for safety violations had been forgiven or substantially reduced; and, FRA had been lax in its enforcement of safety regulations.[48] The Times also noted that signal malfunctions were under-reported by both railroads and FRA, resulting in the wrong

cause of accidents being reported in some cases.[49] Subsequently, a Times editorial called for regulatory reform in order to eliminate the shoddiness of federal safety regulation.[50]

An analysis of the past 30 years of FRA efforts to improve grade-crossing safety revealed that aside from its program to inspire crossing closures, the agency appeared to have had virtually no impact on the declining casualty rate. It had not been pro-active; it had not taken up the subject of motorist sight obstructions; it had conducted overly-long proceedings that focused on improving train operations; and it had mirrored the railroad industry and OL's message in regard to automated gates. Thus, FRA appears to have had at best, a "minor" impact on the declining casualty rate from grade-crossing accidents over the past 30 years.

Installation of Gates

Automated gates are much safer than passive markers in that if properly functioning, they warn motorists of approaching trains. As a grade-crossing expert said about a crossbuck, *as a stand-alone passive device, we expect the motorist to somehow accord some deeper meaning to it. Where else in the practice of traffic control do we permit the use of the same sign to have different meanings in different applications?*[51] While the federal government didn't legislate continual funding for the upgrading of warning devices at grade crossings until 1973, two earlier studies concluded that gates were more effective than passive devices: (1) The Automotive Safety Foundation, "Traffic Control & Roadway Elements: Their Relationship to Highway Safety," U.S. Bureau of Public Roads, 1963, and (2) Alan Vorhees & Associates, "Factors Influencing Safety at Highway-Rail Grade Crossings," Highway Research Board Program Report 50, 1963. These studies were undertaken at a time when there were about 5,000 gated crossings in existence, equating to 1.4% of an estimated 370,000 total crossings, and 2.0% of an estimated 250,000 public crossings in this country. Things would soon change. The enactment of the Highway Safety Act of 1973 was the impetus.

Among other provisions, the 1973 legislation established a federal program that annually provided monies to states for the purpose of upgrading safety devices at grade crossings.[52] The federal allocation formula was, and still is: (1) 50% based on number of crossings in each state (2) 25% based on population of urban areas, and (3) 25% based on three general measures: size of area, population of rural areas, and intercity mail-route mileage.[53] Each state was to receive at least .5% of the total federal allotment, which has commonly been about $160 million annually.[54] (Note: Whereas railroads used to pay for 5-10% of the cost of gate installations, they are no longer required to do so.)[55] Furthermore, states have funded a limited number of gate installations with their own money.

As shown below, the number of automated gates has increased from 12,300 in 1975 to 38,000 in 2005, rising to 26.1% of the total number of public crossings in 2005.

| Year | Number of Public Crossings | Number of Automated Gates | Percent of Gated Crossings |
|---|---|---|---|
| 1975 | 219,161 | 12,300 | 5.6% |
| 1985 | 197,383 | 21,129 | 10.7 |
| 1995 | 163,917 | 29,912 | 18.2 |
| 2005 (Est.) | 145,800 | 38,000 | 26.1 |

As the number of gated crossings has increased, so has safety. Thirteen years after the landmark 1973 legislation inaugurating a federal gate program, FHWA concluded in a study that gates were the most effective warning device at grade crossings.[56] Furthermore, as shown below for the latest year published (2004), data reveal that gates are more than three times as effective as crossbucks, and more than eight times as effective as stop signs, in preventing grade-crossing accidents.[57]

| Type of Device | Accidents Per 1,000 Units of Average Daily Traffic |
|---|---|
| Gates | 0.51 |
| Crossbuck | 1.67 |
| Stop Sign | 4.21 |

It is also noteworthy that in general, gates have been installed at the most hazardous crossings – that is, not necessarily the most dangerous crossings to individual motorists, but the crossings that from a total societal perspective, have the highest probability of incurring accidents. States rank their crossings in what is commonly referred to as a "hazard index," based in part or in whole, on an accident prediction model developed by FRA. Known as "PCAPS" – PC Accident Prediction System – the model relies heavily on traffic levels (both train and motorist) at crossings. In essence, other things being equal, the more traffic, the greater the risk of grade-crossing accidents. In total, PCAPS incorporates the following factors: (1) average number of total through trains per day; (2) total number of railroad tracks between the warning devices at the crossing; (3) the maximum timetable (allowable) speed for train through the crossing; (4) whether or not the highway is paved on both sides of the crossing; (5) the number of highway traffic lanes crossing the tracks at the crossing; and (6) the average annual daily traffic count for highway vehicles using the crossing. [58] According to FRA, *There are also certain characteristics that are not or cannot be included in arriving at a prediction value; these include sight distance, highway congestion, buses, hazardous material traffic, local topography, passenger exposure (train and highway vehicles), etc.*[59] Some states consider PCAPS-excluded factors in their hazard index; some states use PCAPS for their traffic counts; and, some states simply use PCAPS as a guide in constructing their own hazard indexes. No matter how state hazard indexes are constructed, their use has resulted in tens of thousands of gate installations.

Since gates are rarely found at private crossings, as part of the analysis undertaken for this paper, the casualty trends (per crossing) at public crossings were compared with a similar statistic for private crossings. The results were dramatic. Using a "least-squares" statistical formula (accounting for each year's deviations from the arithmetic mean to show the overall trend in a linear fashion), reveals that casualties per-crossing at public crossings have steadily declined, while casualties per-crossing at private crossings have increased slightly. In fact, as shown below, over the past five years, casualties per-crossing at private crossings could be characterized as either flat or slightly higher. This contrast with public crossings raises some puzzling questions that challenge conventional

| Year | Number of Private Crossings | Number of Casualties | Casualties Per-Crossing |
|---|---|---|---|
| 2001 | 98,289 | 154 | .0015 |
| 2002 | 97,790 | 174 | .0017 |
| 2003 | 94,965 | 141 | .0014 |
| 2004 | 94,583 | 176 | .0018 |
| 2005 | 94,200 | 156 | .0016 |

wisdom advanced by insiders. Are the people who drive through private crossings not affected by grade-crossing education in the same manner as those who use public crossings? Don't the citizens who use private crossings also use public crossings? Do railroads maintain the track differently at public versus private crossings? Are FRA safety regulations more effective at public crossings than they are at private crossings? Does the FRA safety plan only apply to public crossings? Are NTSB recommendations only applicable to public crossings? What are the differences between the provision and administration of safety at public versus private crossings?

In regard to the last question, one answer is apparent: gates eliminate probably the major reason why responsible motorists are involved in grade-crossing accidents -- the inability to see the approaching train in time to avoid being hit. In a 1998 study undertaken by NTSB, motorist sight lines were found to be limited in 57% of the 60 accidents studied.[60] Adequate motorist sight tolerances have been recommended by FHA[61] and the American Association of State Highway and Transportation Officials. (AASHTO)[62] And yet, motorist sight-distance regulations have not been enacted into federal law. Consequently, over the past 30 years, the installation of tens of thousands of gates has not only had a "major" positive impact on the declining casualty rate, it has also been the "dominant" causal factor.

Motorist Grade-Crossing Education

In 1972, UP launched an experimental program in Idaho to promote public awareness about the dangers of grade crossings in that state. Entitled, "Operation Lifesaver," the program lasted six weeks. In ensuing years, similar efforts were instituted

and the program gradually spread beyond the States served by the railroad and throughout the country. Then in 1986, under the sponsorship of the AAR, the Rail Progress Institute (the association of railroad suppliers), and Amtrak, a national, non-profit "umbrella" organization was formed as Operation Lifesaver, Inc. (OLI) Currently, OL exists in 49 States and the District of Columbia. OLI is located in Alexandria, Virginia. Its motto is, "Look, Listen & Live."

Funded largely by the federal government (FRA, FHWA and Federal Transit Administration), and with substantial financial and human resources supplied by the railroad industry, OL has stated that it accomplishes its goals by providing, *free safety presentations for various professions and for all age groups in order to increase public safety around railroad tracks."*[63] At the heart of OL have been about 3,000 annual volunteer presentations that have mainly been given by railroad and ex-railroad employees. OLI has reported that in 2004, 48,000 presentations were given to an audience of 1.3 million people.[64]

OLI has credited itself and its "partners" with improving grade-crossing safety – the partners being, *more than 50 nationally-recognized transportation safety groups, in addition to the Federal Railroad Administration and the Federal Highway Administration*.[65] More specifically, OLI has pointed out that FHWA has credited it with *helping to prevent 10,000 deaths and 40,000 injuries since 1972.*[66] And again, OLI has stated that during the decade of the 1990s, *we have helped reduce fatalities at crossings by 42%, despite 20% increases in highway and freight rail traffic.*[67] Most recently, OLI has referenced a research paper from a university professor that it provided data to, and that concluded: *The development of Operation Lifesaver's public education campaign and the installation of ditch lights on locomotives were estimated to have led to about one-seventh of the reduction, and that Operation Lifesaver's existence averted approximately 22,045 incidents and 3,215 deaths between 1975 and 2001.*[68]

While it is extremely difficult to quantify the effects of a limited motorist education effort, OLI has not helped matters. Unfortunately, there appears to be an issue of credibility in regard to OLI's claims of importance. For example, OL has constantly implied that its initial six-week campaign in Idaho was responsible for a 43% drop in the fatality rate that year.[69] Other similar references have been made for the initial programs in Nebraska, Georgia and Kansas, *where collision rates in those states dropped between 26 percent and 75 percent in the first year after their Operation Lifesaver programs began.*[70] However, OL has not provided evidentiary support for these claims, has not provided similar comparisons for other states, has not identified other possible explanations for declining rates of grade-crossing accidents, and has stretched the limits of logic in indicating that such limited efforts could have such an enormous impact in a single year. Even more astounding is OL's claim that FHWA has credited it with preventing a significant number of deaths and injuries (see above). In fact, this claim has been refuted by FHWA who insisted, *it said no such thing.*[71] And finally, in 2005 OL

provided data to a university professor as input to a calculation of its impact on safety – a calculation touted by OL. The professor concluded that in regard to the number of OL presentations, *the amount of educational activity will reduce the number of collisions with a point elasticity of -.011, but the effect on the number of deaths cannot be concluded with statistical certainty.*[72] This conclusion in itself should serve as a "red flag" in regard to its credibility, for it suggests that the more presentations that OL gives, the greater the reduction in grade-crossing accidents, but not necessarily deaths.

The impact of OL is at best a guess, and use of mathematics to attempt such measurement is too limited to achieve credibility. First, other causal factors are so evident in their positive effect on grade-crossing safety that education is lost in the mass. Second, other motorist-education efforts have been in place at the same time as OL programs. Third, educational programs are widely sensitive to varying levels of substance and quality. OL presenters are mainly railroad and former railroad employees who are not trained as professional educators. Fourth, although state OL programs report the number of their presentations and participants to the national OLI organization, there is no assurance that these numbers are not exaggerated. Fifth, OLI has reported that 60% of the state presentations in 2004 were given to students in elementary and junior high school.[73] The impact on such youth is dubious. Sixth, casualties from grade crossings were headed downward before OL became a nation-wide organization in 1986. For example, three of the years that experienced the greatest percentage declines in grade-crossing casualties were 1980 (10.2%), 1981 (14.0%) and 1982 (20.1%).[74] It is no mere coincident that these relatively large declines followed the restructuring of Eastern and Midwestern railroads in the late 1970s, and the enactment of the Staggers Act in 1980. Thus, there is simply no reliable evidence that OL has had anything but a "marginal" impact on the declining casualty rate from grade-crossing accidents.

<u>Accident Investigation</u>

Grade-crossing accident investigation is extremely important to the goal of reducing accidents and casualties in that knowing the relative causes of such accidents is prerequisite to effective and efficient resolutions. While many accidents are investigated "on the spot" by local and/or state police, two federal agencies have responsibility for a full and complete investigation of grade-crossing accidents -- FRA and NTSB -- with NTSB investigations having priority over FRA.[75] Obviously the effectiveness and efficiency of federal programs aimed at improving grade-crossing safety require an understanding of the relative causes of accidents. Still, in 2003 only four of nearly 3,000 grade-crossing accidents were investigated by the federal government,[76] and in 2004, nine of 3,045 accidents were investigated.[77] Furthermore, as recently stated by the IG of DOT:

> *FRA officials stated that the National Transportation Safety Board (NTSB) is the lead Federal agency responsible for investigating accidents, not*

> *FRA. However, NTSB tends to investigate only major crossing collisions, and conducted just seven crossing investigations from 2000 to 2004. Because the Federal government does not independently investigate most collisions, information that FRA gets concerning the causes comes almost exclusively from self-reporting by railroads.*[78]

Thus, the combination of very few federal investigations of grade-crossing accidents and the heavy reliance on railroad-generated accident reports for data on accident causes, the causal factor of accident investigations is deemed to have had a "marginal" impact on the declining grade-crossing casualty rate.

Federal Railroad Administration

It is FRA's policy to investigate rail transportation accidents/incidents that result in the death of a railroad employee or the injury of five or more persons; other accidents/incidents are to be investigated when such investigations give promise of substantially serving railroad safety.[79] While it is rare for a grade-crossing accident to result in the death of a railroad employee or injury of at least five people, it would seem that FRA investigations could serve to promote railroad safety, but not according to FRA. As stated by FRA:

> *It is important to point out that although we use data to analyze the causes of grade-crossing accidents, the analysis over years of accidents clearly establishes there is very little variations in causal factors.* ***Approximately 94% of all grade crossing accidents, and 87% of fatalities, involve motor vehicle driver behavior as a principal factor.*** *Police reports are filed with statements from witnesses attesting to such driver actions as going around lowered crossing gates, ignoring flashing warning lights, driving into the side of a train, or racing the train to the crossing. Thus, FRA has found it far more beneficial to concentrate on preventing grade crossing collisions and the fatalities in the first place, a system which the record shows has been highly successful.*[80]

There is much that is wrong with FRA's logic. Its 94% and 87% figures derive from railroad accident reports – filled out by railroads – that overwhelmingly blame motorists for accidents. Police reports are often incomplete and do not have the depth of full investigations; also, many police do not understand all of the potential contributing factors to grade-crossing accidents. And it is unfathomable that FRA could concentrate on the "best" ways of preventing grade-crossing collisions without an extensive record of accident investigations. Furthermore, DOT's Inspector General's Office found that: *FRA did not routinely review locomotive event recorder data, police reports, and other sources of information to determine the causes of the collisions or the need for further investigation.*[81] The end result is that FRA accident investigations have had little, or no,

positive impact on the declining casualty rate over the past 30 years, and thus has been given a designation of "minor" impact.

National Transportation Safety Board

NTSB was created by Congress in 1967 as an independent agency, charged with *investigating every civil aviation accident in the United States and significant accidents in the other modes of transportation – railroad, highway, marine and pipeline – and issue safety recommendations aimed at preventing future accidents.*[82] The Board's legislative duty in regard to investigating railroad accidents, is that it:

> *shall investigate or have investigated (in detail the Board prescribes) and establish the facts, circumstance, and probably cause of a railroad accident in which there is a fatality, substantial property damage, or that involves a passenger train.*[83]

Railroads are to report grade-crossing accidents to the Board, by notifying the National Response Center (a component of the Coast Guard) by telephone, within two hours of the accident where there is a fatality, serious injury to two or more passengers or employees, the evacuation of a passenger train, or damage to a tank car in which there is a spill of hazardous materials.[84] In other cases based on damage amounts, railroads have four hours to report grade-crossing accidents to the Board.

While NTSB investigations have focused mainly on aviation accidents, it has investigated a number of railroad accidents, but few were grade-crossing collisions. Rather, the overwhelming majority have centered on collisions between two trains and train derailments.[85] On occasion, NTSB has conducted a retroactive study of a group of grade-crossings accidents, as it did in 1998 when it studied 62 collisions at passive crossings that occurred in 1996.[86] The lack of on-spot NTSB investigations of grade-crossing accidents was acknowledged by the Acting Chairman of NTSB in stating that the agency focuses on airline accidents and has neither the personnel nor budget to investigate other than a few grade-crossing accidents.[87]

In view of the paltry number of NTSB investigations, the general nature of its recommendations, and its lack of perspective regarding the relative causes of grade-crossing accidents, it is difficult to identify NTSB contributions to grade-crossing safety over the past 30 years. A recent case in point is the 2005 Congressional testimony of NTSB cited above, where three concerns were discussed. First, NTSB voiced its historic concern with the audibility of train whistles, noting that *train horns should be improved.* The agency then referenced technological analyses undertaken by DOT. Second, as a stop-gap measure at passive crossings, in 1998 NTSB recommended that *the U..S. DOT fund and the States install STOP and STOP AHEAD signs*. Yet, NTSB failed to acknowledge that based on FRA statistics, stop signs are more dangerous than crossbucks. And third, NTSB thanked Congress for holding a hearing on Positive Train

Control. The point is that NTSB has not been a major force in the arena of grade-crossing safety, and even where it has made some effective recommendations, a number have been of relatively recent vintage. Thus, NTSB has had a "marginal" impact on the declining casualty rate from grade-crossing accidents over the past 30 years.

## V. UNDERLYING INHIBITOR: FAILURE-TO-YIELD SYNDROME

While there have been over 30,000 automated gates installed at public grade-crossings in the U.S. since 1970, there have been underlying inhibitors to even more installations. Gates are installed by railroads based on sole-source contracts. Railroads have charged "additives" for such work, even if they have subcontracted it, and thus, may have profited from gate installations. Railroad invoices for gate installations have not been routinely audited by many states. Congress has not increased its funding over the past 30 years. Given inflation, the allocated monies to states have declined in "real" (constant dollar) terms. States have had the discretion of using their federal monies for grade-crossing improvements other than gate installations. When crossings with gates have been closed, or train service has been abandoned, there appears to have been no transfer of the unused safety devices for installation at other non-gated crossings. And with few exceptions, railroads have not contributed funds to install gates.

In essence, the cost of installing gates is not necessarily beyond the reach of practicality – or the perceived notion of insiders. As stated by NTSB: . . . *the average cost of adding lights and gates in 1995 was $150,000 per grade crossing, making the total cost to upgrade the almost 97,000 passive crossings on public roadways more than $14 billion.*[88] But looking at this issue in a broader context, and using hypothetical numbers for the purpose of illustration, assume that about half of the crossings needed gates in the relatively near future (the other half being in wide-open areas, with no motorist sight obstructions, and very little train and/or motor-vehicle traffic), that railroads installed the gates on a cost-recovery basis, and that available used equipment was employed. In such a case the total cost might be in the neighborhood of $5 billion (48,500 crossings times $100,000). And if railroads shared the cost – a pre-tax charge of $2.5 billion for an industry whose revenues approach $40 billion annually – then the remaining cost to the public is relatively modest, especially in comparison with other expenditures. While the above scenario can be adjusted in various ways, it does provide a comprehensive approach to addressing the issue of financing the installation of gates at railroad crossings.

Beyond the financial challenge lies an underlining attitude among insiders that appears to be the single most inhibitor to gate installations. This attitude may be described as the "failure-to-yield" syndrome. Simply stated, it is the belief that since railroads have the right of way at grade crossings, motorists are virtually at fault for

close-to-all accidents in that they failed to yield to approaching trains. Consider the position of a railroad attorney who stated in a recent judicial proceeding that: . . . *sometimes good people make bad mistakes . . . Its not if he did see or hear but if he had the opportunity to see or hear . . . you adjust to the conditions as a driver*.[89] This position is consistent with other railroad statements previously introduced in this paper (Section IV. "Railroad Initiatives), that deny the existence of dangerous grade crossings. Furthermore, the thesis of total motorist responsibility has been endorsed by OL, that has stated:

> *Highway-rail grade crossing incidents in nearly every case are caused by some type of carelessness on the part of the motorists at the crossing. Generally, the railroad is not at fault because the train has the right of way. In addition, the train usually can't stop in time for motor vehicles, so it boils down to a practical solution; autos and trucks can stop much more quickly than a train . . . Drivers can end up dead wrong.*[90]

OL has also claimed that, *driver inattention and impatience are the most common factors attributed to collisions between motor vehicles and trains at highway-rail grade crossings*[91]

The failure-to-yield syndrome has been enhanced by railroad accidents reports filed with the FRA, and which are then used to cite relative causes of accidents. For example, the railroad industry has stated that according to a June 2004 report by the U.S. Department of Transportation's Office of Inspector General, *Risky driver behavior or poor judgment accounted for 31,035 or 94 percent of public grade crossing accidents from 1994-2003*[92] Similarly, FRA stated that: *The great majority of crossing accidents result from risky behavior or poor judgment by the highway user. The DOT Office of the Inspector General audit report dated June 16, 2004, on FRA's crossing safety program states that "in 2003, we found that 2,363 or 93 percent of the 2,543 public grade crossing accidents and 242 or 83 percent of the 293 fatalities occurred because drivers engaged in risky behavior or exercised poor judgment at crossings with active and passive warnings*.[93] But while the railroads and FRA cite the IG report as the source of their accident-causal figures, the IG employed accident reports provided by the railroads themselves. As stated by the IG in testimony before Congress, *The railroad's grade crossing accident reports attributed over 90 percent of the collisions that occurred from 2000 through 2004 to motorists, but FRA did not conduct its own investigations to verify the causes.*[94]

The failure-to-yield syndrome probably inhibits the installation of gates. After all, if irresponsible motorist driving is the overwhelming cause of accidents, gates might not be any more effective than stop or yield signs at crossings. This is precisely what has been implied by insiders. OL avers that gates are not the answer in that *many drivers become impatient and drive around gates*.[95] Also, as railroads have stated:

> *Motorist error is a major problem even at crossings equipped with active warning devices. It might surprise you to know that since 1980, approximately 50 percent of all highway-rail crossing incidents involving motor vehicles, and some 48 percent of fatalities occurred at crossings equipped with active warning devices. Motorists too often drive around lowered gates, ignore flashing lights and ringing bells, and proceed through red traffic lights, often with tragic results.*[96]

However, by stressing the limitation of active warning devices, insiders inappropriately blend gated crossings with lights-only crossings, and distort the overall effectiveness of gates. Also, given the much higher levels of traffic passing through gated crossings, absolute figures are extremely limited. Furthermore, if technology and/or improved railroad maintenance resulted in fewer activation failures, and if four quadrant gates – that have been so successful on an experimental basis in North Carolina[97] – replaced the 100-year old practice of two-gate installations, automated gates would become an even more effective warning device.

## IV. FUTURE RESOURCE ALLOCATION

FHWA records reveal that its grade-crossing monies come to about $160 million annually, but states also use other federal funds, along with their own money, to improve grade crossings. Without accounting for the cost of employees devoted to grade-crossing matters, it may be that upwards of $250 million of federal/state funds are spent on grade crossings in a typical year. Railroads claim that they expend $200 million on grade-crossing maintenance, but much of this is for maintenance that would be required anyhow. OLI receives about $5 million from its donors and some state OL personnel are paid by railroads and possibly others. Countless hours are spent in grade-crossing administration, education presentations, and judicial proceedings. And in regard to the later, there have been cases where judicial decisions have resulted in adverse railroad decisions to the tune of tens of millions of dollars. Thus, it would not be surprising that if all activities were accounted for, over $500 million is expended annually on grade-crossing safety. If so, an historical emphasis on gate installations would have produced more gates at grade crossings.

In view of the substantial funding associated with grade-crossing safety, surely the casualty rate would have been even lower if more automated gates had been installed – that is, if some resources would have been re-directed. One only has to look at European countries where automated gates are standard practice at grade crossings and ask: Why is there not a similar commitment to crossings in this country? Why has the federal government not increased its "real" (accounting for inflation) budget over the past 30 years? Why do states use some of their federal grade-crossing funds for the installation of more crossbucks and other non-gated endeavors? Why does the railroad

industry not put some of its own riches into gate installations? Why don't FRA and OL not actively support programs for increased installation of gates? And why are gates not recognized by one and all, as by far, the safest warning device at grade crossings? Clearly, future optimal resource allocation would be best served if the value of automated gates was the epicenter of efforts to improve grade-crossing safety.

## FOOTNOTES

[1] The Angels On Track Foundation is located at 8286 Clover Road, N.E., Salineville, Ohio 43945, website: www.angelsontrack.org.
[2] Edward R. Hamberger, AAR., Before the U.S. House of Representatives, Committee on Transportation and Infrastructure, Subcommittee on Railroads, Hearing on Grade Crossing Safety, July 21, 2005.
[3] FRA, U.S. DOT, Railroad Safety Statistics 2003, Table No. 9-3.
[4] FRA, "Reflectorization of Rail Rolling Stock, Preliminary Cost Benefit Analysis," October 23, 2001.
[5] FRA, website: www.fra.dot.gov.
[6] Ibid..
[7] AAR, "Statement of the Association of American Railroads on New York Times Article About Grade Crossing Safety," AAR News, July 13, 2004, website: www.aar.org
[8] Letter to Editor of New York Times from Grady C. Cothern, Jr., FRA, July 16, 2004.
[9] "OLI Response to New York Times," November 14, 2004, website: www.oli.org
[10] Walt Bogdanich and Jenny Nordberg, "Highway Agency Disavows Claims of Rail Safety Group, New York Times, January 23, 2005.
[11] Kenneth M. Mead, IG, U.S. DOT, Before the Transportation and Infrastructure Committee, Railroads Subcommittee, U.S. House of Representatives, July 21, 2005.
[12] Ibid.
[13] National Highway Traffic Safety Administration, U.S. DOT, Traffic Safety Facts 2003, Table No. 2.
[14] Ibid.
[15] Ibid., Table No. 13.
[16] FHA, U.S. DOT, Railroad-Highway Grade Crossing Handbook, August 1978, p. 68.
[17] Class I Railroads constitute the largest railroads in the country. The classification is determined by the level of annual revenue (currently about $278 million).
[18] Interstate Commerce Commission, Statistics of Class I Railroads, annual publications.
[19] AAR, Railroad Facts 2004 Edition, p. 45.
[20] FRA, Railroad Safety Statistics 2004, Table No. 8-2.
[21] AAR, Ten-Year Trends 1995-2004, p. 9.
[22] Ibid., p.9 and Analysis of Class I Railroads 2004, p. 95.
[23] Accident/Incident Bulletin, op. cit.
[24] Ibid.
[25] Paul Oakley, AAR, "No Single Solution," Traffic World, March 22, 1999.
[26] Joseph H. Boardman, FRA, before the Subcommittee on Railroads of the Committee on Transportation and Infrastructure, U.S. House of Representatives, July 21, 2005.
[27] Paul C. Worley, North Carolina DOT, Railroad Division, before the Committee on Transportation and Infrastructure, Railroads Subcommittee, U.S. House of Representatives, July 21, 2005.
[28] Since 1975, about 69,000 public crossings have been closed compared with 48,000 private crossings. Accident/Incident and Inventory Bulletin and Railroad Safety Statistics, op. cit.
[29] Charles E. Dettman, AAR, Hearing Before the Subcommittee on Surface Transportation and Merchant Marine of the Committee on Commerce, Science, and Transportation, U.S. Senate, March 25, 1999.
[30] AAR, www.aar.org, December 8, 2005.
[31] UP response to July 11, 2004 article on grade-crossing safety in New York Times, www.uprr.com.
[32] BNSF, "BNSF Highway-Railroad Grade Crossing Safety, 2003 Program Fact Sheet," www.bnsf.com
[33] Edward R. Hamberger, AAR, Before the U.S. House of Representatives, Committee on Transportation and Infrastructure, Subcommittee on Railroads, Hearing on Grade Crossing Safety, July 21, 2005.

[34] Section 2131.321, "Vegetation," Code of Federal Regulations, Part 200-399, Transportation, October 1, 2000. The law states that, *Vegetation on railroad property which is on or immediately adjacent to roadbed shall be controlled so that it does not – (a) Become a fire hazard to track-carrying structures; (b) Obstruct visibility of railroad signs and signals; (c) Interfere with railroad employees performing normal trackside duties; (d) Prevent proper functioning of signal or communication lines; or (e) Prevent railroad employees from visually inspecting moving equipment from their normal duty stations.*

[35] OLI Public Service Newsletter, "AAR Lauds OLI, Criticizes Proposed Legislation," as reported in AAR, On Track, date unknown.

[36] Tom White, AAR, Steve Jordan, Omaha-World-Herald Company, September 29, 1999.

[37] Deposition of Thomas Paul Hutzler, in Lesly v. Union Pacific Railroad, in the U.S. District Court for the Southern District of Texas, Houston Division, Civil Action No. H-03-772, June 22, 2004.

[38] UP, Grade Crossing Resource Manual, Section V-C-3, August 1, 1998.

[39] Deposition of William Berki, in Williams v. Union Pacific Railroad Company, in the Circuit Court of Crittenden County, Arkansas, Case No. CV-2003-234, September 8, 2004.

[40] Deposition of Bobby Allen Pepper, in Martin Kemp v. Kansas City Southern Railway Company, in the Circuit Court of Jackson County, Missouri, June 238, 2004.

[41] The fact that railroads are not precluded from independently determining safety needs at grade crossings, and if so desired, from rectifying those needs with such actions as installing automated gates (as long as the devices are approved by State authorities), has been confirmed by State DOTs, (for example, the Arkansas State Highway and Transportation Department, in Williams v. UPRR Case. No. CV-2003-234, Circuit Court of Crittenden County, Arkansas, March 23, 2004), and when pressed in judicial proceedings, by railroads themselves (for example, the UP in Myers v. MP/UP, in the District Court of Caddo County, Oklahoma, Case No. CJ-97-49, April 1, 1999.)

[42] Deposition of Tim Hoya, BNSF, Smith v. BNSF, in the District Court of Milam County, Texas, September 20, 2004.

[43] Deposition of Charles Tackette, Young v. CSX Corporation, Civil Action No. 03C-2837, in the Circuit Court of Kanawha County, West Virginia, June 16, 2004.

[44] Charles W. McDonald, "The Federal Railroad Safety Program, 100 Years of Safer Railroads," August 1993. (affiliation unknown)

[45] FRA, "Action Plan For Addressing Continual Railroad Safety Issues," May 16, 2005.

[46] Joseph H. Boardman, FRA, before the Subcommittee on Railroads of the Committee on Transportation and Infrastructure, U.S. House of Representatives, July 21, 2005.

[47] New York Times, "In Deaths at Railroad Crossings, Missing Evidence and Silence," July 11, 2004.

[48] New York Times, "For Railroads and the Safety Oversee, Close Ties," November 11, 2004.

[49] New York Times, "Questions Raised on Warnings at Rail Crossings," December 30, 2004.

[50] New York Times, "Deadly Trains," February 9, 2005.

[51] Tom Zeinz, Proceedings, 1991 National Conference on Highway-Rail Safety, Philadelphia,, Pennsylvania, July 1991.

[52] 23 USC, Section 130 and 133.

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[54] Annual allocations provided to The Angels On Track Foundation by FHWA.

[55] The 100% federal funding was permitted with enactment of The Military Construction Appropriations Bill (Public Law 106-246, Section 2604), October 2000 – amending 23 CFR 646.212.

[56] FHA, Railroad-Highway Grade Crossing Manual, 2nd Edition, September 1986.

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[59] FRA, "Collision Prediction Report for Public at-Grade Highway-Rail Crossings, Stark County, Ohio.

[60] NTSB, Safety Study, Safety at Passive Grade Crossings, PB98-917005, NTSB/SS- 98/03, March 1998.

[61] FHA, Railroad-Highway Grade Crossing Handbook, Second Edition, September 1986.

[62] AASHTO, A Policy on Geometric Design of Highways and Streets, 2001.

[63] OLI., "What is Operation Lifesaver?" www.oli.org

[64] OLI., "Presentations Given," www.oli.org. The term "allegedly" is used because there is no verification that State OL organizations were accurate in providing presentation and attendance figures to OLI.

[65] Gerri L. Hall, OLI, Hearing on Reauthorization of the Railroad Safety Act, Subcommittee on Surface Transportation & Merchant Marine, U.S. Senate Committee on Commerce, Science and Transportation, February 25, 1998.
[66] Ibid.
[67] Gerri L. Hall, OLI, Hearing on Highway-Rail Grade Crossing Safety, U.S. Senate Committee on Surface Transportation and Merchant Marine, March 25, 1999.
[68] Gerri L. Hall, OLI, Hearing on Railroad Grade Crossing Safety Issues, Subcommittee on Railroads, U.S. House of Representatives, July 21, 2005.
[69] Ibid.
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[71] Walt Bogdanich and Jenny Nordberg, "Highway Agency Disavows Claims of Rail Safety Group," New York Times, January 23, 2005.
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[74] FRA, Accident/Incident Report, annual publications.
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[77] Assistant Inspector General for Surface and Maritime Programs, U.S. DOT, "Audit of Oversight of Highway-Rail Grade Crossing Accident Reporting, Investigations, and Safety Regulations, "Report Number: MH-2006-016, November 28, 2005.
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[80] FRA, U.S. DOT, "Grade Crossing Safety Issue Brief, Response to the New York Times Allegations.
[81] "Audit of Oversight," op. cit.
[82] NTSB, "About the NTSB, History and Mission," www. ntsb.gov.
[83] 49 USC Subchapter II, "Authority," 1131. "General Authority," (a)(1) and (c).
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[85] NTSB, "Railroad Accidents," www.ntsb.gov/publication.
[86] NTSB, "Safety Study, Safety at Passive Grade Crossings," PB98-917005, NTSB/SS-98/03).
[87] Mark V. Rosenker, Acting Chairman, NTSB, before the U.S. House of Representatives, Committee on Transportation and Infrastructure, Subcommittee on Railroads, July 21, 2005.
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[91] OLI, "What is Operation Lifesaver," September 16, 2000.
[92] Edward V. Hamberger, AAR, July 21, 2005, op. cit.
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[94] Kenneth M. Mead, IG, U.S. DOT, July 21, 2005, op. cit.
[95] OLI, Presenter's Guide, Section 6.
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[97] Paul C. Worley, op. cit.