The President's 1981 Annual Report

To the Congress on the Administration of the Federal Railroad Safety Act of 1970

U.S. Department of Transportation
Federal Railroad Administration

FEDERAL RAILROAD SAFETY ACT OF 1970
Annual Reports on Implementation
(1970-1984)

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Notice

The United States Government does not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

Preface

The following is extracted from Section 211 of Public Law 91–458, dated October 16, 1970:

SEC. 211 ANNUAL REPORT.

(a) The Secretary shall prepare and submit to the President for transmittal to Congress . . . a comprehensive report on the administration of this title for the preceding calendar year. Such report shall include, but not be restricted to:

(1) a thorough statistical compilation of the accidents and casualties by cause occurring in such year;

(2) a list of Federal railroad safety rules, regulations, orders, and standards issued under this title in effect or established in such year;

(3) a summary of the reasons for each waiver granted under section 202(c) of this title during such year;

(4) an evaluation of the degree of observance of applicable railroad safety rules, regulations, orders, and standards issued under this title;

(5) a summary of outstanding problems confronting the administration of Federal railroad safety rules, regulations, orders, and standards issued under this title in order of priority;

(6) an analysis and evaluation of research and related activities completed (including the policy implications thereof) and technological progress achieved during such year;

(7) a list, with a brief statement of the issues, of completed or pending judicial actions for the enforcement of any Federal railroad safety rule, regulation, order, or standard issued under this title;

(8) the extent to which technical information was disseminated to the scientific community and consumer-oriented information was made available to the public;

(9) a compilation of—

(A) certifications filed by State agencies under section 206(a) of this title which were in effect during the preceding calendar year, and

(B) certifications filed under section 206(a) of this title which were rejected, in whole or in part, by the Secretary during the preceding calendar year, together with a summary of the reasons for each such rejection; and

(10) a compilation of—

(A) agreements entered into with State agencies under section 206(c) of this title which were in effect during the preceding calendar year, and

(B) agreements entered into under section 206(c) of this title which were terminated by the Secretary, in whole or in part, during the preceding calendar year, together with a summary of the reasons for each such termination.

(b) The report required by subsection (a) of this section shall contain such recommendations for additional legislation as the Secretary deems necessary to strengthen the national railroad safety program.

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SECTION I

INTRODUCTION

This report describes the efforts of the Department of Transportation and the Federal Railroad Administration to improve railroad safety during calendar year 1981 through administration of the Federal Railroad Safety Act of 1970 (45 U.S.C. 421 et seq).

In 1981, FRA shifted the emphasis of its safety program from a solely adversary process to a more cooperative working relationship with the railroads and their employees. FRA's new direction recognized that the ultimate success of its safety effort is determined by the effectiveness of this Government/industry relationship.

The cooperative approach is working. Train accidents and rail-related casualties decreased by 31.8 and 14.7 percent, respectively. Negotiations between labor and management instituted at FRA's behest resulted in a major breakthrough in the area of regulatory reform.

SECTION II

ACCIDENT TRENDS

The number of reportable train accidents that occurred in 1981 (5,790) represents a 31.6 percent decrease from 1980 figures (8,451). Of the total number of train accidents, 39.3 percent were track-caused accidents; human factors accounted for 27.6 percent; equipment-related accidents comprised 17.6 percent; and the remaining 15.5 percent were attributed to miscellaneous factors, including rail-highway crossing accidents, vandalism, and shifted loads.

In 1981, the number of fatalities resulting from railroad accidents/incidents was 1,284. Rail-highway crossing accidents at public and private crossings were responsible for 56.8 percent (729) of all rail-related fatalities. Trespassers accounted for 36.3 percent (466) of all rail-related fatalities.

Employee injuries accounted for 90 percent of all injuries. Figures for 1981, however, show a 14.7 percent decrease in the total number of employee injuries (46,600). The total number of rail-related injuries decreased by 14.5 percent.

The dollar amount of reportable damages to track and equipment resulting from train accidents decreased in 1981 by 13.2 percent to $237.6 million.

Releases of hazardous materials in train accidents decreased by 35.3 percent from 119 in 1980 to 77 in 1981. No fatalities resulted from hazardous materials accidents, and only three injuries were reported, compared to 38 injuries in 1980.

The industry's record is good even when adjustments are made to reflect two factors. First, total train miles nationwide declined in 1981 to about 676 million from approximately 718 million in 1980, a 5.8% decline. In addition, the dollar damage threshold for reportable accidents increased from $2,900 to $3,700 to reflect inflation.

After the necessary adjustments, accidents declined by about 24%, and injuries and fatalities decreased by about 10%, between 1980 and 1981.

Appendix A includes statistical information on railroad accidents for 1981. The tables include information on accident causes, detailed casualty statistics, and accident damage figures.

SECTION III

RULES AND REGULATIONS

At FRA's request, rail labor and management presented a joint proposal to FRA to change FRA's safety rules and regulations. The Railway Labor Executives' Association (RLEA) and the Association of American Railroads (AAR) recommended changes in the power brake regulations, track standards, and the Safety Appliance Acts covering the movement of defective railway cars. The RLEA and the AAR believe that these proposals will reduce the regulatory burden and improve safety.

A list of the Federal regulations and orders issued under the provisions of the Federal Railroad Safety Act of 1970 and in effect during 1981 is contained in Appendix B.

The following section summarizes the regulatory actions taken by FRA during 1981.

Safety Improvement Program for DOT 105 Tank Cars (HM-174)

A final rule was issued in the Federal Register (45 FR 48671) on January 26, 1981, regarding construction and maintenance standards for DOT Specification 105 and other tank cars used to transport hazardous materials. All DOT Specification 105 tank cars must be retrofitted with a coupler restraint system. New DOT Specification 105 tank cars that are built to carry flammable gases, ethylene oxide, or anhydrous ammonia must be equipped with tank head puncture-resistance systems, thermal protection systems, and safety relief valves, as appropriate.

State Safety Participation Regulations

A Notice of Proposed Rulemaking (46 FR 32888) was published in the Federal Register on June 25, 1981 to broaden the scope of State participation in the safety area. State inspectors would be allowed to monitor railroad's compliance with rules governing appliances, locomotive and power brakes, operating practices, and signal and train controls. On July 30, 1981, a public hearing was held on the proposed rulemaking.

Railroad Safety Inquiry

On August 3, 1981, a hearing notice was published in the Federal Register (46 FR 39461) to initiate a Railroad Safety Inquiry to assist FRA's evaluation of its safety regulatory program applicable to small railroads. The information gathered at a series of public hearings will also aid in meeting the goals of the Regulatory Flexibility Act by defining the economic impact of existing regulations on small railroads.

SECTION IV

WAIVER PETITIONS

The FRA received 70 petitions during 1981 to waive specific requirements of FRA safety regulations under the provisions of Section 202(c) of the Federal Railroad Safety Act of 1970. Table 1 summarizes the results which are detailed in Appendix C.

Table 1

WAIVER PETITIONS

Category	Petitions Received in 1981	Petitions Approved in 1981 1/
Track Safety Standards (49 CFR 213)	8	7
Railroad Freight Car Safety Standards (49 CFR 215)	2	0
Railroad Operating Rules (49 CFR 218)	6	6
Radio Standards & Procedures (49 CFR 220)	1	2
Rear End Marking Devices (49 CFR 221)	2	2
Safety Glazing Standards (49 CFR 223)	51	97
TOTAL	70	114

1/ The number of petitions acted upon in 1981 exceeded the number of petitions received in 1981, since there was a backlog from 1980.

SECTION V

EVALUATION OF COMPLIANCE

The railroad industry posted a significant and substantial reduction in the number of accidents, injuries, fatalities and releases of hazardous materials during 1981. This commendable achievement was due in large part to an increased awareness by labor and management of the importance of good safety practices, and improvements to plant and equipment. A similar reduction in the number of accidents, injuries and fatalities at railroad grade crossings resulted from the installation of warning devices and other improvements, and a nation-wide industry-Government-National Safety Council educational program.

The personal involvement of top rail industry management in the effort to improve compliance with safety standards, including cooperation with FRA's safety assessment program, significantly contributed to the reduction in accidents. Working with FRA, top management developed specific programs to correct programs voluntarily.

Continuing investment in equipment, maintenance and rehabilitation of track resulted in noticeably improved compliance with Federal safety standards. In the last three years approximately 270,000 new or rebuilt freight cars and 5,500 new or rebuilt locomotives have been added to the railroad fleet. In addition, the industry has spent over $18 billion on equipment maintenance and over $15 billion on maintenance-of-way and structures -- a significant commitment to improving and rehabilitating the U. S. rail system.

With the cooperation and support of state and local highway officials the industry installed nearly 3,000 warning devices at rail-highway grade crossings. Although installation of these devices is funded primarily from the Highway Trust Fund (administered by the Federal Highway Administration), the major burden falls upon the railroad industry, which spent an estimated $257 million to maintain grade crossings in 1981.

The industry also contributed to grade crossing safety by completing physical improvements which included improved visibility, illumination of the crossing environment, rehabilitation of the crossing surface and improved track detection circuitry.

Four regional grade crossing workshops were conducted by the Association of American Railroads in 1981, bringing together those involved with grade crossing safety to analyze and evaluate efforts to reduce accidents. A railroad employee in each state serves as the AAR state representative with the mission of monitoring grade crossing programs in that state.

The industry also actively supports "Operation Lifesaver" programs in effect in 30 states to educate the motoring public to the hazards of grade crossings and to their responsibility to reduce accidents. Railroad involvement in Operation Lifesaver includes financial contributions and, in some states, management of the state program. State programs are coordinated on the national level by the National Safety Council, and the national program received financing from AAR and Amtrak in 1981.

Increased compliance contributed to a sharp drop in civil penalties in 1981. The FRA collected $1,329,967 for all Federal rail safety rule violations. The 1981 figures include $347,162 for violations arising under the Federal Railroad Safety Act of 1970, $314,850 for violations of the Hazardous Materials Transportation Act, and $667,955 for all other violations. Several judicial actions, described in Section VIII, remained pending under these and other statutes during 1981.

SECTION VI

PROBLEMS CONFRONTING THE FEDERAL RAILROAD ADMINISTRATION

FRA considers that there are three special problem areas in its efforts to enforce Federal safety laws and to reduce accidents:

- Railroad employee training
- Alcohol and drug abuse
- Trespasser accidents

Training

Accidents attributable to human factors result in more fatalities than accidents caused by track or equipment defects. In 1981, 29 percent of all railroad accidents (other than those at rail-highway grade crossings), 54 percent of fatalities, and 42 percent of injuries were attributed to human factors.

Investigations indicate that the majority of employee casualties result from a failure to follow established operating rules. The most effective way to reduce such accidents is through improved railroad industry training programs coupled with strict industry enforcement of operating rules.

Primary responsibility for the development and implementation of effective employee training and testing programs is on the railroad industry itself. Railroads are currently required by FRA to instruct employees periodically on the meaning and application of operating rules and to conduct periodic operational tests and inspections to determine the extent of compliance with those rules. If FRA monitoring or assessment of railroad training and testing programs indicates problems or deficiencies, the agency works cooperatively with the railroad to improve the situation.

In 1981, FRA analyzed the operational testing programs of 308 carriers to determine the extent of their compliance with codes of operating rules, timetables, and timetable special instructions. FRA also conducted 1,163 inspections of train operations to observe compliance with operating rules.

FRA is also funding a joint labor-management research program begun by the Brotherhood of Locomotive Engineers and the Louisville and Nashville Railroad to improve locomotive engineer training. Tests will continue to validate the effectiveness of this model engineer training program, and training needs for other railroad occupations will be evaluated.

Alcohol and Drug Abuse

Although seldom reported specifically as a causal factor in railroad accidents, alcohol and drug abuse affects a large number of railroad employees and is a major concern to FRA.

Lack of information about the problem, and about the effectiveness of efforts to deal with it, however, has handicapped the agency. If more reliable information can be developed, FRA and the industry will be in a better position to devise measures for dealing with the problem and to evaluate the effectiveness of those measures.

Working with railroad labor and management, FRA is attempting to quantify the relationship between the alcohol and drug abuse problem, and safety and productivity. FRA has commissioned a survey of policies, programs and procedures used by individual railroads to deal with the problem. FRA will also examine individual labor and management approaches to alcohol and drug-related accident prevention and will evaluate the effectiveness of each type of program.

In 1981, FRA conducted four separate projects in this area. FRA worked with the Milwaukee Road to help develop a program to reach the on-the-job drinker before the problem becomes critical. FRA assisted Amtrak with a program that trained some 1,300 persons in peer intervention techniques that resulted in doubling the number of individuals referred for alcohol and drug abuse counseling. FRA also assisted in presenting seminars at the Houston and St. Louis terminals and in the New England area to increase understanding and awareness of the problem. The New England labor-management task force hired a full-time coordinator to help railroads establish and strengthen employee assistance programs, and to train personnel in alcohol abuse detection and referral.

Trespassing

Despite an overall reduction in railroad fatalities during 1981, the number of persons killed while trespassing on railroad property increased from 566 in 1980 to 582. Trespasser deaths comprise over 45 percent of the total number of railroad fatalities.

Despite the fact that the potential for FRA action is limited, a determined effort is underway to reduce the number of trespasser fatalities. A major portion of this effort is devoted to educational programs undertaken by the industry involving visits to schools and other facilities located near railroad lines. In these visits students and others are warned of the dangers of trespassing on railroad property.

The industry also has a vigorous enforcement program aimed at preventing trespassing. In 1981 railroad security forces arrested almost 40,000 people and warned over 400,000 for trespassing violations.

Fencing is being installed in areas where it is economically feasible, and signs are also being installed, although weathering, vandalism, and changes in land use or site visibility may reduce the effectiveness of signs unless they are frequently replaced.

SECTION VII

RESEARCH AND TECHNICAL ADVANCES

FRA's research budget has been re-oriented to focus on safety. The major areas of safety-related research during 1981 were equipment safety, human factors in railroad operations, rail-highway crossing safety, vehicle inspection, track safety and inspection, and improved passenger systems.

Equipment Safety

The equipment safety program includes research on hazardous materials, equipment components, braking systems, and track-train dynamics.

Work in the hazardous materials project consisted of testing thermal protection for tank cars, testing and analysis of tank car steels and safety valves involved in accidents, and developing procedures for post-accident response to hazardous materials accidents. Work was completed on performance specifications for safety relief valves and a methodology for the safe routing of spent radioactive fuel shipments. The cost-beneficial retrofit designs on DOT Specification 112 and 114 tank cars are the result of a joint industry/Government research effort on basic metallurgical and thermal resistance.

The continuing goals of the equipment components project are to reduce the number and severity of railroad accidents resulting from the failure of critical railcar components such as wheels, axles, bearings, side frames, and bolsters. A wheel failure program was developed to test railroad wheels under simulated operating conditions. A small-scale wheel testing program identified several concepts for improvements in wheel geometry and materials. An analytical model was also developed to predict wheel failure. At the Facility for Accelerated Service Testing of the Transportation Test Center in Pueblo, Colorado, rolling stock component experiments included freight car fatigue testing, wear tests on conventional and steerable trucks, and wheel and wear index experiments.

The FRA continued to participate in the joint Track-Train Dynamics Program with the member railroads of the Association of American Railroads, the Railway Progress Institute, and the Transportation Development Center of Canada. Projects were completed on dynamic properties of rail vehicles and computer programs designed to predict train behavior.

The Rail Dynamics Laboratory's (RDL) demonstration program completed its testing and data collection. This program demonstrated RDL capabilities to test and evaluate the dynamic stability safety characteristics of a 100-ton, high-side gondola car and an 89-foot flatcar.

Human Factors

Work continued on the fabrication of a Research Locomotive and Train-Handling Evaluator. When fully operational, the facility will be an experimental tool for evaluating train accidents influenced by human factors. Experiments simulating in-service conditions will permit evaluation of the effects of train handling in different locomotive cab environments, and with varying train-handling controls and techniques.

The FRA continued supporting a joint venture of the Brotherhood of Locomotive Engineers and the Louisville and Nashville Railroad to evaluate locomotive engineer training and to develop recommendations for improved training programs. Working with the safety directors of several railroads, FRA is developing guidelines for employee safety programs.

Rail-Highway Crossing Safety

Under the Rail-Highway Crossing Safety Program, research continued to seek a means of enhancing train visibility at rail-highway crossings. Several studies dealt with alternative train detection systems, minimizing the severity of injuries from accidents, and allocating capital resources at crossings. Field data collection and testing concerning train visibility involved cooperative efforts with the Canadian Transport Commission's Railway Transport Committee and the Boston and Maine Corporation.

Operation Lifesaver, sponsored cooperatively by State and local Government agencies, civic organizations, and the Nation's railroads, is a public education program designed to reduce the number of accidents, deaths, and injuries at railroad-highway intersections. FRA served as a principal sponsor of the Operation Lifesaver Symposium held in August 1981 by the National Safety Council. The symposium was attended by representatives from 23 railroads, seven States, the Canadian Government, and a variety of interest groups such as private consultants, local police officials, labor organizations, railroad suppliers, and insurance firms.

Track Safety and Inspection

The track safety and inspection program develops and demonstrates cost-effective techniques to reduce track-caused accidents. Knowledge and techniques produced by this program are: 1) voluntarily applied by the railroads, or 2) promulgated by FRA's Office of Safety as revised performance standards.

During 1981, specific tests were completed in four areas:

rail restraint -- the ability of rail/ties/fasteners to restrain heavier trains at higher speeds;

panel restraint -- the ability of track to resist buckling due to thermal and train action loads;

rail integrity -- detection of rails that break because of fatigue or material and weld defects; and

track geometry -- prevention of wheel climb, wheel lift, and vehicle motion derailments at various speeds.

Improved Passenger Systems

Tests were completed in the improved passenger systems program to determine the effects of operating passenger equipment through curves at higher cant deficiency. An LRC (light, rapid, comfortable) locomotive and coach, an AEM-7 electric locomotive, and an Amfleet coach were tested. Data analysis indicates that the allowable cant deficiency can be increased for these vehicles. The LRC trainset has tilt-body capability and can negotiate curves at higher speeds without increasing passenger discomfort.

SECTION VIII

JUDICIAL ACTIONS

The following is a brief description of judicial actions that were completed or pending under the Federal Railroad Safety Act of 1970 and other statutes.

Fort Worth & Denver Railway v. Goldschmidt, 518 F. Supp. 121 (N.D. Tex. 1981). This case was brought by 25 railroads and the Association of American Railroads to set aside portions of the revised Railroad Freight Car Safety Standards (49 CFR 215), which became effective on March 1, 1980. Plaintiffs contended that the standards were not valid because they enunciate a rule of strict liability. Plaintiffs also challenged, on substantive and procedural grounds, the schedule of civil penalties that was issued to implement the revised standards. On June 23, 1981, judgment was rendered in favor of the Government. The railroads and the AAR have filed an appeal with the United States Court of Appeals for the Fifth Circuit. Oral argument was held on March 30, 1982.

Brotherhood of Railroad Signalmen v. Lewis, United States District Court for the District of Colorado, Civil Action No. 81-1131. This suit involves the application of Section 3A of the Hours of Service Act (45 U.S.C. 63) to track patrolmen. The case is in the pleadings stage.

Brotherhood of Locomotive Engineers v. Lewis, United States District Court for the Southern District of Texas, Civil Action No. H-1883. The Hours of Service Act, as interpreted by FRA, requires that suitable food and lodging be available at designated terminals. Plaintiffs, in an action for mandamus, argued that the Act was being violated by the railroad's releasing crews at a point with no such facilities, and then transporting them to adequate facilities up to twenty miles away. After the case had been fully briefed by both sides, plaintiffs offered to dismiss the case without conditions. Pursuant to stipulation, the court dismissed the case without prejudice in February 1982.

United Transportation Union v. Lewis, United States District Court for the District of Columbia, Civil Action No. 81-06-0633. The judge filed an order on November 13, 1981, granting the Government's motion for summary judgment. The judge's memorandum opinion upholds FRA's opinion that the use of uncoupling hooks in the hump operations at the Seaboard Coast Line's Rice Yard in Waycross, Georgia, is lawful. The plaintiffs have appealed the decision to the D.C. Circuit.

United Transportation Union and James W. Buck v. Lewis, United States District Court for the Central District of Illinois, Springfield Division, C.A. No. 81-3368. This case presents the following issues: (1) whether the provision of sleeping quarters for railroad crews at a commercial facility within a half-mile from yard switching operations, under a contract where the railroad leases all of the available rooms in the facility, is prohibited under the Hours of Service Act (45 U.S.C. 62), and (2) whether the circumstances at this facility amount to an emergency situation that, when combined with FRA's alleged failure to act, gives rise to the private right of action authorized by the Federal Railroad Safety Act of 1970 (45 U.S.C. 432(e)). FRA has filed a motion to dismiss the plaintiffs' complaint.

United Transportation Union and O. L. Macks v. Lewis, United States District Court for the Southern District of Alabama, Southern Division, C.A. No. 81-0733. The union alleged that conditions at employee sleeping quarters in Magnolia, Alabama constituted an emergency situation under the Federal Railroad Safety Act (45 U.S.C. 432) and a violation of the Hours of Service Act (45 U.S.C. 62). On November 10, 1981, the court ruled for the Government, holding that sleeping quarters were not a proper subject for an emergency order and that the plaintiffs were required to seek enforcement of the Hours of Service Act through the United States Attorney before seeking judicial relief. The plaintiffs appealed to the Eleventh Circuit in December 1981. In their brief, filed in April 1982, the plaintiffs asked the court of appeals to reverse the district court on both issues and to remand for appropriate proceedings. FRA's brief, filed May 7, 1982, calls for affirmance of the district court's dismissal of the emergency order claim, but on procedural grounds, and for reversal of its dismissal of the Hours of Service Act claim.

SECTION IX

INFORMATION DISSEMINATION

The FRA-sponsored Railroad Research Information Service (RRIS) is a comprehensive source of information on rail transportation. RRIS has more than 21,500 records which represent railroad research information from all over the world.

Appendix D lists the technical studies on railroad safety research published by FRA during 1981. These studies are available to the public through the National Technical Information Service in Springfield, Virginia.

FRA also makes available to consumers through its Office of Public Affairs a limited number of publications explaining the operations of the agency and related matters and participates with the Federal Highway Administration and other agencies in Operation Lifesaver, a cooperative effort aimed at the reduction of railroad grade crossing accidents and fatalities.

SECTION X

STATE PARTICIPATION PROGRAM

The FRA's administration of the State Participation Program follows the directives of Section 206 of the Federal Railroad Safety Act of 1970. While the FRA provides financial assistance to States contributing to the program, FRA retains the enforcement responsibilities of the statute.

Current salary levels continue to make it difficult for many States to attract and retain highly qualified candidates for inspector positions. Although 31 States participated in the program during 1981, there were only 94 State inspectors. These State inspectors participated in the track (63) and freight car (31) inspection disciplines.

The FRA continued to provide 100 percent funding for State inspector training at DOT's Transportation Safety Institute (TSI) in Oklahoma City, Oklahoma. TSI offers orientation, guidance, and training in a classroom atmosphere for State and Federal inspectors.

The Federal Railroad Safety Authorization Act of 1980 (P. L. 96-432) directed the Secretary of Transportation to expand the program, as may be appropriate, to include additional inspector disciplines. As described in Section III, revised State Participation Regulations (49 CFR 212) were developed during 1981 and a Notice of Proposed Rulemaking was issued on June 21, 1981.

Table 2 lists the participants in the State Participation Program at the end of 1981.

TABLE 2

STATE PARTICIPATION PROGRAM

(Calendar Year 1981)

State	Track Inspectors	Equipment Inspectors
Alabama	2	2
Arizona	2(1*)	1
California	2	1
Connecticut	1	
Florida	3	2
Illinois	4	
Iowa	3	
Kansas	1	
Louisiana	1	
Maryland	2	2
Michigan	4	1
Minnesota	2	
Missouri	3	
Nebraska	1	1
Nevada	1	
New Hampshire	1	
New Jersey	1	
New York	4(3*)	3
North Carolina	2(1*)	
Ohio	2	3
Oklahoma	2	
Oregon	2	2
Pennsylvania	3	3
Rhode Island	1*	1
Tennessee	2*	2*
South Carolina	1	1
Utah	1	1
Vermont	1	
Virginia	2*	
Washington	2	2
West Virginia	4	3
TOTAL	63	31

* Denotes trainee.

SECTION XI

LEGISLATIVE RECOMMENDATIONS

In 1981 FRA consulted with rail labor and management on appropriate changes in rail safety statutes and regulations. The Railway Labor Executives' Association and the Association of American Railroads recommended that existing law be amended to permit a receiving carrier to accept and haul, for purposes of repair, a car with defective brakes or safety appliances.

In April 1982, FRA proposed an amendment to the Railroad Safety Act which would carry out this recommendation.

APPENDIX A

TOTAL NUMBER OF TRAIN ACCIDENTS (1980 & 1981)

CAUSES	Number of Accidents		Damages ($)		Fatalities		Injuries		Hazmat Releases*	
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
TRACK, ROADBED, & STRUCTURES										
Roadbed Defects	156	111	10,402,491	3,778,706	2	0	8	1	3	0
Track Geometry Defects	1,575	1,050	48,442,881	33,579,724	2	0	55	59	24	13
Rail & Joint Bar Defects	911	571	39,202,727	29,206,500	0	1	89	24	19	13
Frogs, Switches, & Track Appliances	808	509	10,075,158	9,805,964	0	0	11	21	11	3
Other Way and Structure	21	24	385,396	911,908	0	0	0	3	0	0
Signal & Communication Failures	21	12	330,736	2,719,693	0	0	2	11	0	0
Subtotal	3,492	2,277	108,839,389	80,002,495	4	1	165	119	57	29
MECHANICAL & EQUIPMENT FAILURES										
Brakes	176	112	5,148,276	4,623,182	0	0	13	9	2	2
Trailer or Container on Flat Car	9	12	196,318	293,042	0	0	5	4	2	0
Body	141	98	6,386,813	4,207,695	0	0	10	3	4	3
Coupler & Draft Systems	181	130	4,673,388	4,932,008	0	0	1	2	6	1
Truck Components	314	194	9,771,772	9,795,060	0	0	9	11	1	1
Axles & Journal Bearings	200	151	10,538,863	15,383,835	0	0	5	4	18	6
Wheels	283	205	15,638,203	13,822,945	0	0	15	2	7	5
Locomotives	117	83	3,428,432	6,326,940	0	0	11	9	0	0
Doors	8	15	60,234	644,110	0	0	0	0	0	0
Other Mechanical & Electrical Failures	29	18	896,425	426,619	0	0	0	1	0	0
Subtotal	1,458	1,018	56,738,724	60,457,436	0	0	69	45	32	18
TRAIN OPERATIONS — HUMAN FACTORS										
Use of Brakes	343	234	9,347,599	6,589,320	2	0	41	21	2	0
Employee's Physical Condition	6	4	126,697	917,800	0	0	2	2	0	0
Flagging, Fixed, Hand, & Radio Signals	77	62	11,587,417	4,298,332	6	1	118	19	1	2
Other Rules & Instructions	651	445	11,449,294	11,032,252	3	0	87	61	4	1
Speed	216	158	8,342,635	8,971,415	0	2	46	29	0	3
Use of Switches	393	289	5,891,598	5,521,635	2	0	21	15	2	0
Miscellaneous Human Factors	637	406	16,375,802	11,220,932	0	4	38	30	7	3
Subtotal	2,323	1,598	63,121,042	48,551,686	13	7	353	177	16	17
MISCELLANEOUS										
Collision with Hwy. User at Crossing	246	199	6,483,234	15,412,078	68	50	195	144	1	0
Vandalism	171	150	5,619,524	6,704,693	0	0	11	23	1	2
Load Shifted	71	38	2,423,211	2,299,388	1	0	5	1	1	2
Interaction of Lateral/Vertical Forces	162	162	7,282,683	7,647,815	0	0	6	9	3	2
Other Causes	528	348	23,397,533	16,511,312	11	5	56	43	8	7
Subtotal	1,178	897	45,206,185	48,575,278	80	55	273	220	14	13
TOTAL...	8,451	5,790	273,905,340	237,586,895	97	63	860	561	119	77

* Hazardous materials releases.

SUMMARY OF ALL CASUALTIES BY TYPE OF ACCIDENT/INCIDENT & TYPE OF PERSON (1980 & 1981)

Type Accident/Person	%of Total 1980	%of Total 1981	Total Cases 1980	Total Cases 1981	Fatalities 1980	Fatalities 1981	Injuries 1980	Injuries 1981	Illnesses 1980	Illnesses 1981
Train Accident Casualties										
EMPLOYEE ON DUTY.....	.90	.73	571	395	28	8	525	378	18	9
EMPLOYEE NOT ON DUTY.	.00	.01	1	3	---	1	1	2	---	---
PASSENGER ON TRAIN...	.17	.02	106	10	1	---	105	10	---	---
NONTRESPASSER.....	.02	.02	13	11	---	---	13	11	---	---
TRESPASSER.....	.00	.01	3	7	---	3	3	4	---	---
CONTRACTOR EMPLOYEE..	---	.00	---	1	---	---	---	1	---	---
Subtotal.....	1.09	.79	694	427	29	12	647	406	18	9
Train Incident Casualties										
EMPLOYEE ON DUTY.....	13.38	12.45	8,519	6,758	43	34	8,269	6,567	207	157
EMPLOYEE NOT ON DUTY.	.02	.05	14	25	1	1	13	23	---	1
PASSENGER ON TRAIN...	.40	.31	254	168	3	4	251	164	---	---
NONTRESPASSER.....	.11	.13	73	72	7	11	66	61	---	---
TRESPASSER.....	1.35	1.70	860	925	440	445	420	479	---	1
CONTRACTOR EMPLOYEE..	.01	.02	9	12	2	1	7	11	---	---
Subtotal.....	15.28	14.66	9,729	7,960	496	496	9,026	7,305	207	159
Nontrain Incident Casualties										
EMPLOYEE ON DUTY.....	74.13	74.83	47,193	40,632	26	22	45,705	39,529	1,462	1,881
EMPLOYEE NOT ON DUTY.	1.03	1.13	657	614	2	---	647	605	8	9
PASSENGER ON TRAIN...	.33	.43	213	231	---	---	213	231	---	---
NONTRESPASSER.....	.49	.47	314	257	9	4	305	252	---	1
TRESPASSER.....	.11	.17	68	94	17	17	51	77	---	---
CONTRACTOR EMPLOYEE..	.11	.12	72	63	5	4	65	59	2	---
Subtotal.....	76.21	77.15	48,517	41,891	59	47	46,986	40,753	1,472	1,891
Rail-Highway Crossing Accident/Incident Casualties (Excluded from above categories.)*										
EMPLOYEE ON DUTY.....	.23	.24	145	132	---	2	145	126	---	4
EMPLOYEE NOT ON DUTY.	.00	.01	3	5	1	---	2	5	---	---
PASSENGER ON TRAIN...	.04	.01	24	4	---	---	24	4	---	---
NONTRESPASSER.....	6.58	6.56	4,188	3,563	723	618	3,465	2,952	---	1
TRESPASSER.....	.57	.58	363	317	109	117	254	200	---	---
CONTRACTOR EMPLOYEE..	---	.00	---	1	---	---	---	1	---	---
Subtotal.....	7.42	7.41	4,723	4,022	833	729	3,890	3,288	---	5
TOTALS BY TYPE OF PERSON										
EMPLOYEE ON DUTY.....	88.64	88.24	56,428	47,917	97	66	54,644	46,600	1,687	1,251
EMPLOYEE NOT ON DUTY.	1.06	1.19	675	647	4	2	663	635	8	18
PASSENGER ON TRAIN...	.94	.76	597	413	4	4	593	409	---	---
NONTRESPASSER.....	7.21	7.19	4,588	3,903	739	625	3,849	3,276	---	2
TRESPASSER.....	2.03	2.47	1,294	1,343	566	582	728	760	---	1
CONTRACTOR EMPLOYEE..	.13	.14	81	77	7	5	72	72	2	---
TOTAL.....	100.00	100.00	63,663	54,300	1,417	1,284	60,549	51,752	1,697	1,264

* Rail-highway crossing casualties include those occurring at both public and private crossings.

APPENDIX B

Regulations and Orders Issued Under the Provisions of the Federal Railroad Safety Act of 1970

State Participation Regulations (49 CFR 212)
Authority: Sections 202 and 206, 84 Stat. 971; 45 U.S.C. 421 et seq.; 49 CFR 1.49(n).
Source: 40 FR 55511, November 28, 1975.

Track Safety Standards (49 CFR 213)
Authority: Section 202 and 209, 84 Stat. 971 and 975; 45 U.S.C. 431 and 438, and 49 CFR 1.49(n).
Source: 36 FR 20336, October 20, 1971.

Railroad Freight Car Safety Standards (49 CFR 215)
Authority: Sections 202 and 209, 84 Stat. 971 and 975; 45 U.S.C. 431 and 438, and 49 CFR 1.49(n).
Source: 44 FR 77340, December 31, 1979.

Railroad Operating Rules (49 CFR 218)
Authority: Section 202, 84 Stat. 971; 45 U.S.C. 431 and 49 CFR 1.49(n).
Source: 44 FR 2175, January 10, 1979.

Radio Standards and Procedures (49 CFR 220)
Authority: Sections 202 and 209, 84 Stat, 971 and 975; 45 U.S.C. 431 and 438; and 49 CFR 1.49(n).
Source: 42 FR 5065, January 27, 1977.

Rear End Marking Device - Passenger, Commuter, and Freight Trains (49 CFR 221)
Authority: Section 202, 84 Stat. 971; 45 U.S.C. 431 and 49 CFR 1.49(n).
Source: 42 FR 2321, January 11, 1977.

Safety Glazing Standards - Locomotives, Passenger Cars, and Cabooses (49 CFR 223)
Authority: Section 202, 84 Stat. 971; 45 U.S.C. 431 and 49 CFR 1.49(n).
Source: 44 FR 77352, December 31, 1979.

Emergency Orders in Effect During 1981

Emergency Order No. 1: Prohibits the use of certain "Mark III and Mark IV Flexi-Van" cars after 12:01 a.m. on September 27, 1972. This order is required because these cars frequently contain cracked center-sill members, a condition that could lead to an extremely dangerous accident.

Emergency Order No. 2: Prohibits the use of certain UTLX tank cars after 12:01 a.m. on December 21, 1972. This order is required because these cars are structurally defective resulting in tank shell cracks and the possible leakage of hazardous lading.

Emergency Order No. 7: Restricts the use of freight cars with 70-ton, one-percent carbon wheels. Published on March 27, 1978, the order prescribes a mandatory program for locating and removing these wheels by January 1, 1979, from all cars in service. Shipments of hazardous materials in cars with high-carbon wheels were prohibited after March 31, 1978. This order is required because during heavy braking these wheels were found to have a high failure rate due to cracking or other thermal abuse.

APPENDIX C

WAIVER PETITIONS GRANTED

Track Safety Standards (49 CFR 213)

Approved July 2, 1981

RST-80-2: The Illinois Central Gulf (ICG) Railroad requested an extension of a waiver granted on November 12, 1980. That waiver exempted crossties on the East Cairo District of the ICG to permit operation without rehabilitation until a court decision was made on abandonment. The original waiver had seven conditions. The extension was granted subject to an additional condition to clear vegetation on and adjacent to the track.

Approved August 6, 1981

RST-81-1: The National Railroad Passenger Corporation (Amtrak) requested a waiver of certain provisions of the standards for equipment operated on curves between New Haven, Connecticut, and Boston, Massachusetts. A temporary conditional waiver was granted including a formula for speed limits on that section. The waiver applies only to LRC trains, and there were three conditions. The waiver expires on December 31, 1982.

Approved October 14, 1981

RST-81-2: The Delaware and Hudson Railway Company requested a waiver of three provisions of the standards on its Washington, D.C. and Salem branches. Approximately eight trains operate each month on this track at speeds not exceeding 10 mph. The waiver was granted subject to ten conditions.

Approved April 17, 1981 and October 28, 1981

RST-79-4: The Union Pacific Railroad Company requested extensions of a waiver of certain provisions of the standards pertaining to crossties. The original waiver was extended to April 1, 1982.

Approved November 13, 1981

RST-81-4: The Farmrail Corporation requested a waiver of certain provisions of the Track Safety Standards pertaining to crossties on a segment of track between Hydro and Elk City, Oklahoma. The waiver was granted subject to four conditions, and expires on February 28, 1982.

Approved December 2, 1981

RST-79-4: The Burlington Northern requested extension of a waiver of certain provisions of the standards pertaining to crossties. The original waiver was extended to April 1, 1982.

Approved December 18, 1981

RST-80-5: The Atchison, Topeka and Santa Fe Railway Company requested an extension of a waiver for trackage between Atchison, Kansas, and St. Joseph, Missouri, which was formerly owned by the Chicago, Rock Island and Pacific Railroad. The waiver extension pertains only to Section 213.113 of the regulation and is subject to ten conditions, including an operating speed limit of 10 mph over defective rail between Mile Posts 519.4 and 498.3.

Railroad Operating Rules (49 CFR 218)

Approved January 19, 1981

RSOR-80-3: The Chessie System requested a waiver of certain provisions of the rules on work performed at a locomotive repair facility in Cumberland, Maryland. Approval was granted to waive blue signal protection only on tracks 2, 3, and 4 within the Cumberland diesel shop building. The waiver was granted subject to two conditions.

Approved March 3, 1981

RSOR-81-1: The Chicago South Shore and South Bend Railroad requested a waiver of certain provisions of the rules concerning the coupling of electric MU commuter car consists on the main track between Gary and Michigan City, Indiana. Investigation revealed that operations had been safely run without incident for a number of years, a train crew member is required to be in full view of the engineer, and no movement is initiated without the knowledge and approval of the terminal carman. The waiver was granted, subject to two conditions.

Approved May 4, 1981

RSOR-80-2: The Southern Pacific Transportation Company (SP) requested a waiver of the rule to retain SP Operating Rule 93 in its present form but with safety modifications. The SP proposed to amend its signal and operating rules to control train movements through yard limits. The waiver was granted, subject to ten conditions.

RSOR-81-2: The Southern San Luis Valley Railroad Company (SSLV) sought relief from the requirements of the Railroad Operating Rules, Blue Signal Protection, and Radio Standards and Procedures. The railroad has one full-time employee, a traffic manager, who handles billing and accounting. The carrier owns one piece of equipment, a locomotive operated part-time by an employee of Colorado Aggregate, a mining company. The part-time employee handles cars to and from the connection with the Denver & Rio Grande Western Railroad, performs required locomotive maintenance, and performs track maintenance when required.

Since the railroads's operation is limited, and the part-time employee is the only employee involved in railroad operations, the safety of operations would not be jeopardized.

Approved May 26, 1981

RSOR-76-3: The Consolidated Rail Corporation requested a waiver of certain provisions of the rule regarding blue signal protection. Application of locking devices or derails would automatically block several tracks when protection is required on another track because of multiple route switches and signals which govern routes into tracks other than track numbers 123-126. A set of lights is provided on tracks where entry cannot be secured in compliance with the rule. The waiver was granted in part, subject to two conditions.

Approved August 28, 1981

RSOR-77-32: The Consolidated Rail Corporation requested a waiver of certain provisions of the rule regarding blue signal protection. Investigation revealed that the protection procedures used at Paoli Yard comply with the rules. The waiver approved for operations at the Powelton Avenue Yard is subject to one condition, and the approval for Penn Station is subject to five conditions.

Radio Standards and Procedures (49 CFR 220)

Approved October 28, 1981

RSOR-81-4: The Detroit and Toledo Shore Line Railroad Company (DTS) requested relief from the requirements of the Radio Standards and Procedures when verbal authority for the movement of a train or an engine is issued by radio, in compliance with DTS operating rule 42.

To comply with 49 CFR 220, verbal instructions issued by a train dispatcher authorizing a train to pass an automatic block signal which displays a "stop aspect" are not considered as train orders and need not comply with 49 CFR 220.61. These radio transmissions must comply with all other requirements of the regulation.

RSOR-81-3: The Grand Trunk Western Railroad Company (GTW) requested relief from the requirements of the rules when verbal authority for movement of a train or engine is made by radio, in compliance with GTW operating rule 42. Items 2 through 5 of the petition were dismissed. These radio transmissions must comply with all other requirements of the regulation.

Rear End Marking Devices (49 CFR 221)

Approved January 19, 1981

RSRM-80-3: The Maryland and Pennsylvania Railroad requested a waiver from the rule for each of the single trains operating on the two branch lines out of York, Pennsylvania. At no time does the carrier operate more than one train on either of the branches. Trains operate under train orders and are restricted to a 10 mph speed limit. The waiver was approved subject to one condition.

Approved May 4, 1981

RSRM-78-14: The Chicago and North Western Transportation Company (CNW) requested additional time to bring its freight cabooses into compliance with the rules because the supplier could not deliver the necessary portable devices. A total of 392 cabooses will be retrofitted. The waiver was approved until September 30, 1981, subject to one condition.

Safety Glazing Standards (49 CFR 223)

Approved May 18, 1981

The following railroads were granted waivers of certain provisions of the standards for commuter passenger equipment. The waivers allow these carriers to operate cars equipped with existing glazing material on end doors, as long as the cars are operated between other equipment and not at the end of a train. These railroads were also advised to report immediately any casualties on cars equipped with the existing glazing materials.

RSGM-80-39: The Chicago and North Western Transportation Company

RSGM-80-41: The Illinois Central Gulf Railroad

RSGM-80-42: The Chicago, Milwaukee, St. Paul and Pacific Railroad

RSGM-80-43: Burlington Northern

Approved June 5, 1981

RSGM-80-53: Amtrak was granted a waiver of compliance with certain provisions of the standards for existing, new, or rebuilt passenger cars. Amtrak may continue to operate passenger cars with existing glazing materials that withstand ballistics impacts of 850 feet per second and 945 feet per second. The waiver applies only to end-facing doors and side-facing doors of passenger cars.

The FRA Railroad Safety Board conditionally approved the following petitions for waivers of compliance to allow locomotives to operate with existing glazing materials. All glazing materials must, as a minimum, be shatterproof. Waivers were approved for carriers where there was little or no history of vandalism, and a majority of the railroads were operated in isolated or sparsely populated areas.

Approved January 13, 1981

RSGM-80-13:	Moscow, Camden and San Augustine Railroad
RSGM-80-20:	Pearl River Valley Railroad Company
RSGM-80-23:	Texas Central Railway Company
*RSGM-80-25:	Cambria and Indiana Railroad Company
*RSGM-80-26:	Conemaugh and Black Lick Railroad Company
RSGM-80-27:	Patapsco and Back Rivers Railroad Company
RSGM-80-28:	Philadelphia, Bethlehem and New England Railroad Co.
RSGM-80-30:	Steelton and Highspire Railroad Company
*RSGM-80-32:	Pittsburgh and Shawmut Railroad Company
RSGM-80-33:	Tuscola and Saginaw Bay Railway Company
RSGM-80-34:	Sabine River and Northern Railroad Company
RSGM-80-37:	Wyandotte Southern Railroad Company
*RSGM-80-38:	Newburgh and South Shore Railway Company

Approved January 14, 1981

*RSGM-80-18:	Chicago Short Line Railway Company

Approved March 13, 1981

RSGM-80-16:	Pickens Railroad
*RSGM-80-19:	Chicago, Madison and Northern Railway Company
*RSGM-80-24:	The Duluth and Northeastern Railroad Company

Approved March 24, 1981

*RSGM-80-09:	Colorado and Wyoming Railway

Approved May 21, 1981

RSGM-80-05:	Bath and Hammondsport Railroad Company
RSGM-80-14:	Sandersville Railroad Company
RSGM-80-29:	South Buffalo Railway Company
RSGM-80-35:	Dansville and Mount Morris Railroad Company
RSGM-80-44:	Georgetown Railroad Company

* Also includes cabooses.

*RSGM-80-45: Bangor and Aroostook Railroad Company
RSGM-80-47: Pittsburgh and Ohio Valley Railway Company
RSGM-80-49: Chattahoochee Industrial Railroad
RSGM-80-50: Iowa Terminal Railroad Company
*RSGM-80-54: Genesee and Wyoming Railroad Company
*RSGM-80-56: Aroostook Valley Railroad Company
RSGM-80-57: Arcade and Attica Railroad Corporation
RSGM-80-59: East Erie Commercial Railroad

Approved June 24, 1981

RSGM-80-63: Laurinburg and Southern Railroad Company
RSGM-80-64: New York and Lake Erie Railroad Company
RSGM-80-65: Skaneateles Short Line Railroad Corporation
RSGM-80-68: Minnesota Transfer Railway Company
RSGM-80-69: Cedar Rapids amd Iowa City Railway Company
RSGM-80-72: Hillsdale County Railway Company
RSGM-80-73: Winchester and Western Railroad Company
*RSGM-80-78: Santa Maria Valley Railroad Company

Approved June 26, 1981

RSGM-80-74: Port Utilities Commission of Charleston, South Carolina
RSGM-80-75: East Cooper and Berkeley Railroad Company
RSGM-80-76: Port Terminal Railroad of South Carolina
RSGM-80-79: Montpelier and Barre Railroad Company

Approved July 23, 1981

RSGM-80-87: Ontario Central/Ontario Midland Railroads

Approved August 19, 1981

RSGM-80-67: Manufacturers Junction Railway Company
RSGM-80-70: Alexander Railroad Company

Approved September 23, 1981

RSGM-80-80: Claremont and Concord Railway Company
RSGM-80-82: Greenville and Northern Railway Company
*RSGM-80-83: McCloud River Railroad Company
RSGM-80-85: Pittsburgh, Allegheny and McKees Rocks Railroad Co.
RSGM-80-89: Detroit and Toledo Shore Line Railroad Company
RSGM-80-90: Octoraro Railway, Inc.
RSGM-80-91: Lamoille Valley Railroad Company
RSGM-81-01: Fore River Railroad Corporation

* Also includes cabooses.

*RSGM-81-03: Oregon, California and Eastern Railway Company
RSGM-81-06: Madison Railway
RSGM-81-07: Grafton and Upton Railroad Company
RSGM-81-08: Lackawaxen and Stourbridge Railroad Corporation
RSGM-81-09: Cooperstown and Charlotte Valley Railway Corporation
RSGM-81-10: Fonda, Johnstown and Gloversville Railroad Company

Approved September 24, 1981

RSGM-80-46: West Virginia Northern Railroad Company

Approved October 28, 1981

*RSGM-80-84: Belfast and Moosehead Lake Railroad

Approved October 29, 1981

RSGM-80-88: North Stratford Railroad Corporation
RSGM-81-02: East Camden and Highland Railroad
RSGM-81-11: Central New York Railroad Corporation
*RSGM-81-12: Arkansas and Louisiana Missouri Railway Company
RSGM-81-13: Little Rock Port Railroad
*RSGM-81-14: Lancaster and Chester Railway Company
*RSGM-81-15: Carbon County Railway Company
RSGM-81-16: Amador Central Railroad Company
RSGM-81-17: Chestnut Ridge Railway Company
*RSGM-81-18: South Branch Valley Railroad
RSGM-81-19: North Stratford Railroad Corporation
RSGM-81-20: Black River and Western Corporarion
RSGM-81-21: Maine Central Railroad Company
*RSGM-81-22: Livonia, Avon and Lakeville Railroad Corporation
RSGM-81-23: Yreka Western Railroad Company
*RSGM-81-24: City of Prineville Railway
RSGM-81-25: Moshassuck Valley Railroad Company
RSGM-81-26: San Francisco Belt Railroad
**RSGM-81-27: California Western Railroad Company
RSGM-81-29: South Central Tennessee Railroad Company, Inc.
RSGM-81-30: Bellefonte Central Railroad Company
*RSGM-81-31: Green Mountain Railroad Corporation
RSGM-81-32: Pend Oreille Valley Railroad, Inc.

Approved December 2, 1981

RSGM-81-05: Lenawee County Railroad Company, Inc.
RSGM-81-28: Wolfeboro Railroad Company, Inc.
RSGM-81-33: Maryland and Pennsylvania Railroad Company
*RSGM-81-34: Gettysburg Railroad Company

* Also includes cabooses.
** Includes a caboose and two self-propelled rail cars.

The FRA Railroad Safety Board conditionally approved petitions for waivers of compliance to allow a specific number of commuter passenger cars to operate with existing glazing materials, as long as the cars are operated between other equipment and rear doors are not exposed to projectiles.

Approved May 18, 1981

RSGM-80-48: Chicago, South Shore and South Bend Railroad

Approved May 21, 1981

RSGM-80-66: Norfolk and Western Railway

The Federal Railroad Safety Board granted a permanent waiver for four locomotives owned by the Cincinnati, New Orleans and Texas Pacific Railway. These four locomotives are used only for inspection trips, private transportation, and as helper locomotives for steam engine excursion service. The FRA Railroad Safety Board granted the railroad a temporary waiver for 139 locomotives that are being gradually withdrawn from service. This waiver expires on December 31, 1985. A waiver has also been granted for the porthole window at the end of cabooses built before July 1, 1980. No injuries have occurred as a result of projectiles entering porthole windows equipped with existing glazing materials.

Approved October 29, 1981

RSGM-81-04: Southern Railway System

APPENDIX D

Technical Report and Studies

Alternate Method for Separable Body Center Plate Replacement
Technical Note No. 81/05

Axle Alignment Measurements on Cars in the FAST Radial Truck Experiment
Technical Note No. 81/04

Constant Warning Time Concept Development for Motorist Warning at Grade Crossings
Report No. FRA/ORD-81/07

Cyclic Inelastic Deformation and Fatigue Resistance of a Rail Steel: Experimental Results and Mathematical Models
Report No. FRA/ORD-81/29

Description of Selected FAST Truck Measurements, First Truck Experiment
Technical Note No. 81/01

Engineering Analysis of Stresses in Railroad Rails
Report No. FRA/ORD-81/51

Engineering Data Characterizing the Fleet of U.S. Railway Rolling Stock, Volumes 1 and 2
Report No. FRA/ORD-81/75

Fatigue Crack Growth Properties and Rail Steels
Report No. FRA/ORD-81/30

Improvement in Magnetic Techniques for Rail Inspection
Report No. FRA/ORD-81/49

Mechanics of Ballast Compaction
Report No. FRA/ORD-81/16, Volumes 1 to 5

A Metallurgical Analysis of an ASTM A212-B Steel Tank Car Head Plate
Report No. FRA/ORD-81/32

A Metallurgical Evaluation of Two AAR M-128 Steel Tank Car Head Plates Used in Switchyard Impact Tests
Report No. FRA/ORD-81/33

The Non-Steady Outflow of Propane Vapor from a Railroad Tank Car
Report No. FRA/ORD-81/35

Prediction of Fatigue Crack Growth in Rail Steels
Report No. FRA/ORD-81/31

A Prototype Maintenance-of-Way Planning System Volumes I, II, III, and IV
Report No. FRA/ORD-80/47

Radial Truck Experiment - Restart at FAST
Technical Note No. 81/02

Rail-Highway Crossing Resource Allocation Model
Report No. FRA/RRS-81/001

Railroad Car Coupling Shock, Vertical Motion, and Roller Bearing Temperatures
Report No. FRA/ORD-81/13

Railroad Classification Yard Technology: Assessment of Car Speed Control Systems
Report No. FRA/ORD-80/90

Railroad Electromagnetic Compatibility - Locomotive, Volume 1 - Summary of E-60 CP Electromagnetic Emission Yard Measurements
Report No. FRA/ORD-80/66.1

Railroad Electromagnetic Compatibility - Locomotive, Volume 2 - Summary of E-60 CP Road Test Electromagnetic Emission Measurements
Report No. FRA/ORD-66.2

Railroad Electromagnetic Compatibility - Locomotive, Volume 3 - Summary of AEM-7 Electromagnetic Emission Measurements
Report No. FRA/ORD-80/66.3

Railroad Electromagnetic Compatibility - Proceedings of a Symposium Sponsored by the Railroad EMC Working Group
Report No. FRA/ORD-80/46

Single Axle and Articulated-Supporting Truck Test Results
Report No. FRA/ORD-81/59

TDOP Phase II Report: Performance Specification for Type II Trucks
Report No. FRA/ORD-81/36.1

Wheel Flange Cracks Evaluation, First Experiment
Technical Memoranda No. 81/01

Reports may be ordered from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginal 22161.