

Federal Railroad Safety Act -- Administration

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PRESERVATION**

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THE 1992 REPORT OF THE
PRESIDENT

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

U.S. Department
of Transportation

Federal Railroad
Administration

Office of Safety

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MANDATE

The relevant portions of section 211 of the Federal Railroad Safety Act of 1970 (Public Law 91-458, as amended, 45 U.S.C. 440), require the following:

SEC. 211. ANNUAL REPORT

(a) The Secretary shall prepare and submit to the President for transmittal to Congress on or before July 1 of each year 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.

INTRODUCTION

The 1992 Report of the President describes the efforts of the Department of Transportation (DOT), Federal Railroad Administration (FRA), to improve railroad safety through the administration of the Federal Railroad Safety Act (FRSA) of 1970 (45 U.S.C. 421, 431 et seq.) during calendar year (CY) 1992.

Section I

ACCIDENT TRENDS

The FRA uses train accidents, casualties, and accident and casualty rates to measure safety performance. Any collision, derailment, or other event involving the operation of railroad on-track equipment resulting in damages that exceed the reporting threshold of \$6,300 (for 1992) are counted as train accidents. A highway-rail crossing accident is any impact which occurs between railroad on-track equipment and an automobile, bus, truck, motorcycle, bicycle, farm vehicle, pedestrian, or other highway user at a highway-rail crossing. Most accidents that occur at highway-rail crossings between the highway user and on-track equipment would not qualify as a train accident. In 1992, there were 132 highway-rail crossing accidents that would also count as train accidents (damages exceeding \$6,300). In the first table, these accidents are counted in both the Train Accidents column and the "Xing" Accidents column. The second table removes the highway-rail accidents from the Train Accidents, Accident/Million Train Miles, Hazardous Materials Releases, Injuries, and Casualties/Million Train Miles columns.¹

In 1992, the safety performance of the railroad industry continued to be within the range of its all-time safest years. Train accidents (without highway-rail crossing accidents) decreased 11.96 percent from the previous year. Employee fatalities remained at 35, which continues to be the lowest number of fatalities since these statistics were collected. Hazardous material releases due to a train accident decreased 42.6 percent. Train accidents that result in a release of hazardous materials are of great concern to the FRA. Another important concern is highway-rail crossing accidents, which account for approximately half the fatalities due to railroad operations.

¹FRA has no jurisdiction over highway users at highway-rail crossings; counting train accidents due to a collision at a highway-rail crossing with a highway user double counts the same accident and skews the number of train accidents and the train accident rate per million train miles.

The following tables clearly demonstrate the positive trend since 1978--the worst year on record under the current reporting requirements:

Train Accidents With Highway-Rail Crossing Accidents

	<u>Train</u> <u>Accdnts</u>	<u>Accdnts/</u> <u>Million</u> <u>Train</u> <u>Miles</u>	<u>Hwy</u> <u>Rail-</u> <u>Xing</u> <u>Accdnts</u>	<u>HazMat</u> <u>Re-</u> <u>leases</u>	<u>Nonfatal</u> <u>Casualties</u>	<u>Casualties/</u> <u>Million</u> <u>Train</u> <u>Miles</u>
1978	11,277	15.00	13,316	138	72,545	98.66
1979	9,740	12.76	12,509	105	74,126	98.97
1980	8,451	11.78	10,611	119	62,246	88.71
1981	5,781	8.55	9,295	77	53,003	80.28
1982	4,589	8.00	7,748	59	40,275	72.19
1983	3,906	7.00	7,161	52	34,819	64.30
1984	3,900	6.58	7,281	54	38,570	67.19
1985	3,430	6.01	6,919	54	34,304	61.90
1986	2,761	4.87	6,396	51	26,923	49.40
1987	2,647	4.55	6,391	50	26,033	46.79
1988	3,051	5.01	6,615	44	27,054	46.37
1989	3,080	4.96	6,525	56	26,715	45.18
1990	3,045	5.00	5,713	35	25,143	43.43
1991	2,814	4.88	5,386	47	23,468	42.75
1992	2,510	4.22	4,900	27	21,223	37.63
Change from 1978	-78%	-72%	-63%	-80%	-71%	-62%

Train Accidents Without Highway-Rail Crossing Accidents

	<u>Train Accdnts</u>	<u>Accdnts/ Million Train Miles</u>	<u>Hwy Rail- Xing Accdnts</u>	<u>HazMat Re- leases</u>	<u>Nonfatal Casualties</u>	<u>Casualties/ Million Train Miles</u>
1978	10,991	14.62	13,316	136	68,097	91.33
1979	9,492	12.43	12,509	105	69,748	92.08
1980	8,205	11.43	10,611	118	58,356	82.13
1981	5,582	8.25	9,295	77	49,710	74.33
1982	4,411	7.69	7,748	57	37,638	66.54
1983	3,776	6.76	7,161	50	32,196	58.57
1984	3,712	6.26	7,281	52	35,660	61.18
1985	3,275	5.74	6,919	53	31,617	56.18
1986	2,620	4.62	6,396	51	24,465	43.98
1987	2,512	4.32	6,391	47	23,604	41.54
1988	2,854	4.68	6,615	44	24,465	40.99
1989	2,898	4.67	6,525	55	23,847	39.27
1990	2,879	4.73	5,713	33	22,736	38.33
1991	2,658	4.61	5,386	46	21,374	38.06
1992	2,340	3.93	4,900	26	19,253	33.35
Change from 1978	-79%	-73%	-63%	-81%	-72%	-63%

Fatalities

	<u>Employees on Duty¹</u>	<u>Highway Rail Crossing (Nontres- passers)</u>	<u>Tres- passers</u>	<u>Highway Rail Crossing- (Tres- passers)</u>	<u>Employees Off-duty Passengers (Nontres- passers)</u>	<u>Total</u>
1978	122	969	403	89	63	1,646
1979	101	779	421	95	33	1,429
1980	97	723	457	109	31	1,417
1981	65	611	466	116	26	1,284
1982	78	516	414	87	24	1,119
1983	61	502	400	72	38	1,073
1984	59	555	499	89	45	1,247
1985	46	497	391	83	19	1,036
1986	57	493	398	121	22	1,091
1987	55	491	453	131	35	1,165
1988	43	539	448	150	19	1,199
1989	49	597	441	200	37	1,324
1990	40	536	543	157	21	1,297
1991	35	468	524	139	28	1,194
1992	35	461	533	113	27	1,169
Change from 1978	-71%	-52%	32%	27%	-57%	-29%

Only 3 percent of all rail-related fatalities in 1992 involved employees on duty.

¹Of the 35 on-duty employee fatalities in 1992, 2 were associated with highway-rail crossing accidents and 23 with other train movements.

Section II

RULES AND REGULATIONS

Appendix B lists the Federal regulations issued under the provisions of the FRSA that were in effect during CY 1992.

The following regulatory actions were taken by FRA during 1992. Publication, where referenced, was in the *Federal Register*.

RULEMAKINGS

Postponement of International Application. This FRA final rule delayed, for the third time, application of random drug testing requirements (49 CFR Part 219) to railroad personnel based outside the United States. The compliance date was extended to January 2, 1995, to provide additional time for negotiations with foreign governments.

Alcohol Testing. On December 15, 1992, FRA proposed in a notice of proposed rulemaking (NPRM) to amend its current alcohol and drug regulations (49 CFR Part 219) to comply with the requirements of the Omnibus Transportation Employee Testing Act of 1991. FRA proposed preemployment and random alcohol testing, mandatory reasonable suspicion testing, new definitions and procedures, and fine-tuning adjustments based on program experience.

Management Information System. In this NPRM published on December 15, 1992, FRA proposed a comprehensive plan to obtain and analyze employer drug program data that would conform to the Department's proposed reporting system and replace existing FRA drug program recordkeeping requirements contained in 49 CFR Part 217.

International Application. On December 15, 1992, FRA published this advance notice of proposed rulemaking (ANPRM) seeking comment on issues arising from the international application of the new requirements of the Omnibus Transportation Employee Testing Act of 1991.

Random Testing Rate. This ANPRM, which was jointly issued on December 15, 1992, by the Office of the Secretary of Transportation and the modal administrations, sought comment on whether there are less costly alternatives to the current random testing program (49 CFR Part 219) that can maintain an adequate level of deterrence and detection of illegal drug use.

Bridge Worker Safety Standards. Pursuant to authority granted in the Rail Safety Improvement Act of 1988, FRA published the Bridge Worker Safety Standards (49 CFR Part 214, Subpart B) in June 1992, for the protection of the employees of railroads and railroad contractors who work on railroad bridges. The rule establishes requirements for fall protection, personal protective equipment, and protection for persons working over water. It also clearly delineates the areas of respective responsibility of FRA and the Occupational Safety and Health Administration (OSHA) in all areas of occupational safety and health of railroad bridge workers.

State Safety Participation Regulations. In June 1992, FRA published a final rule that expands the existing state participation program governed by 49 CFR Part 212 to include the enforcement of the Federal Hazardous Materials Regulations by state hazardous materials inspectors. The rule sets forth qualification requirements that each apprentice and hazardous materials inspector must meet.

Railroad Operating Practices and Radio Standards Procedures. On October 19, 1992, FRA published an NPRM proposing to remove the requirements in 49 CFR Parts 217 and 220 that railroads file their respective operating rules, radio rules, and related documents with FRA in Washington, D.C. Under the new proposal, railroads would retain these records and make them available upon request for inspection by FRA personnel during regular business hours. FRA held a public hearing to consider the proposal on December 14, 1992.

Power Brake Regulations. Congress enacted Public Law 102-365, the Rail Safety Enforcement and Review Act (RSERA) in September 1992. Section 7 of the Act requires the Secretary of Transportation to conduct a review of the rules with respect to railroad power brakes and, not later than December 31, 1993, shall revise such rules based on such safety data as may be presented during that review. Congress gave the following specific directions as to what must be addressed:

- (a) Prescribe standards regarding dynamic brakes.
- (b) Require two-way end-of-train devices under certain conditions.
- (c) Review and modernize the rules.

FRA initiated proceedings to revise the power brake regulations in 49 CFR Part 232 by publication of an ANPRM on December 31, 1992. The ANPRM also announced plans to conduct four 1-day technical workshops in 1993 to discuss power brake issues.

Grade Crossing Signal System Safety. On June 29, 1992, FRA published an NPRM to require that railroads take specific and timely actions to protect the traveling public and railroad

employees from the hazards posed by malfunctioning highway-rail grade crossing warning systems. FRA held a public hearing concerning this issue on September 15, 1992. In that same month, Congress passed the RSERA, one provision of which removed any doubt as to the need to issue rules on the maintenance, inspection, and testing of active warning devices at grade crossings. On November 12, 1992, FRA held an open meeting to consider the clear mandate to issue rules on that subject, and timely response to the malfunction of such devices.

Event Recorders. On November 23, 1988, FRA published an ANPRM seeking information to determine whether FRA should require the presence of event recorders on trains. Following a review of technical comments and an evaluation of regulatory and policy issues, FRA published an NPRM on June 18, 1991. Public hearings were held August 22 and October 24, 1991, and comments were due October 30, 1991.

Track Safety Standards. FRA began proceedings to revise the Track Safety Standards in 49 CFR Part 213 with the publication of an ANPRM on November 16, 1992. The revision is pursuant to the RSERA's mandate to review the existing track regulations by September 1994. Also, the proceeding was begun in response to a 1990 petition from the Brotherhood of Maintenance of Way Employees (BMWE) for revision and expansion of the track regulations. The ANPRM posed 51 questions for comment from those involved in the railroad industry. It also announced FRA's plans to conduct four 1-day technical workshops in 1993 for industry and government professionals to discuss and exchange ideas about particular issues of track safety.

Blue Signal Protection for Utility Employees. On September 10, 1992, FRA published an NPRM to amend the regulations governing blue signal protection of railroad workers (49 CFR Part 218, Subpart B). The NPRM proposed to amend the rule by including a provision covering the protection of utility employees. The proposed rule would allow utility employees to join train or yard crews as temporary crew members and, thus, operate under the same exception from blue signal requirements provided for train or yard crews. A public hearing was held on October 16, 1992, in Washington, D.C.

Texas Train à Grande Vitesse (TGV) Rule of Specific Applicability. FRA is responsible for developing safety regulations for the operation of the planned Texas TGV high-speed passenger rail system. Several meetings were held in 1992 between the FRA and the system developer for FRA to learn how the developer plans to build and operate the system, and for the system developer to understand FRA's general approach to development of this unique rule. The system developer supplied the detailed technical information necessary for rulemaking. A first draft of the rule was completed. Some modification of the

existing French TGV train set will probably be required for the equipment to meet U.S. safety standards.

Locomotive Crashworthiness. Section 10 of RSERA requires the Secretary of Transportation to conduct research to determine the cost and benefits of several locomotive crashworthiness features specified in the Act. During their investigations of collisions involving locomotives, FRA field inspectors will collect information that could affect the analysis of those features. Special data collection forms have been made available to FRA inspectors to guide them in conducting accident investigations. FRA's Office of Research and Development contracted for an analytical study and computer simulation of locomotive crashworthiness. Future rulemakings will be based on the results of these studies.

EMERGENCY, COMPLIANCE, AND DISQUALIFICATION ORDERS

Compliance Order No. 2. As a result of investigations conducted by FRA inspectors and New York State inspectors at the Consolidated Rail Corporation's (Conrail) Frontier Yard in Buffalo, New York, FRA concluded that initial terminal air brake tests at Frontier Yard were too often skipped altogether or performed in a manner which was in violation of Federal safety regulations. Failure to conduct proper initial terminal train brake tests can allow freight cars to enter the stream of transportation with ineffective or inoperative brakes, a defect that causes a train to require greater stopping distance and may cause the engineer to experience difficulty in handling the train.

On September 20, 1992, the FRA Administrator issued a compliance order against Conrail in order to ensure that the railroad improves its compliance with the regulations regarding railroad power brakes at Frontier Yard. The railroad, through its chairman and president, consented to the issuance of the order. The order required Conrail to conduct quarterly training meetings to instruct mechanical employees at Frontier Yard about the regulations relating to initial terminal air brake tests. It also charged Conrail employees responsible for conducting initial power brake tests and inspections to record the dates and times of such tests and to complete a signed affirmation that the tests were properly performed. Conrail was required to prohibit expressly any policy or practice that offered inducements to mechanical employees to refrain from performing proper air brake tests and inspections. In addition, Conrail was required to conduct a system-wide review of the adequacy and effectiveness of its procedures for compliance with initial terminal train brake test regulations.

Disqualification Order No. 92-2. On August 14, 1992, FRA issued an order of disqualification to a former manager of the

Seagraves, Whiteface and Lubbock Railroad Company, finding that he had willfully violated the Track Safety Standards, Safety Appliance Standards, and Power Brake Regulations, thereby demonstrating his unfitness for safety-sensitive duty. Under the terms of the order, the respondent was disqualified from the performance of safety-sensitive functions for several months, beginning on the date of issuance of the notice of proposed disqualification, with reentry allowed thereafter only under the conditions set forth in the order.

Emergency Order No. 15. FRA continues to hold in effect an emergency order requiring the trains of the Florida East Coast Railway Company to sound their train whistles whenever they approach a public highway-rail grade crossing. The administrative review of the order, requested by 21 parties from Florida, is also continuing.

Emergency Order No. 16 (E.O. 16). On April 2, 1992, FRA issued its 16th emergency order, requiring owners of "dual-diameter" tank cars to inspect and repair them on a "fast track" basis. The problem to be corrected revealed itself in a January 18, 1992, accident in which a dual-diameter tank car loaded with liquefied petroleum gas split at its seams from what were later discovered to be old cracks in the welds. When similar cracks were discovered in other dual-diameter cars, FRA ordered owners to establish an inspection and repair plan and to report the results of their inspections. On May 15, 1992, the second notice in E.O. 16 was issued, modifying the inspection requirements for owners who had successfully inspected significant portions of their fleets and establishing ultrasound as an alternative to radiography as an inspection technique. On August 27, 1992, the third notice was issued, modifying the inspection requirements for small fleets and continuing the requirement to report cracks found in critical areas of dual-diameter tank cars.

Emergency Order No. 17. Acting on reports of failure to the draft sill area on at least 10 stub sill tank cars, FRA issued Emergency Order No. 17 on September 3, 1992, requiring a phased program of inspection and repair for essentially all of the Nation's nearly 160,000 tank cars of this type. The mandatory program requires regular reporting of the inspections and will last a maximum of 7 years. Cars with at least 400,000 miles of service and cars related to those with known defects are on an accelerated program, one that will have these "high priority" cars inspected and repaired within 24 months.

Oil Pollution Act of 1990. This legislation required the DOT to issue regulations designed to enhance the ability of transporters of oil and hazardous wastes to respond to emergencies. During 1992, FRA worked with other modes within the DOT to hammer out issues surrounding the delegation of authority under the Act and

to begin resolution of the issues involved in implementing the statutory mandate.

Sanitary Food Transportation Act of 1990. This legislation required the DOT to issue regulations designed to foster the safe transportation of food and food products. During 1992, FRA worked primarily with the Research and Special Programs Administration (RSPA) and the Federal Highway Administration on delegation of authority issues and reviewed an NPRM that would require railroads to investigate instances of food contamination during rail transportation.

Section III

WAIVER PETITIONS

FRA reviews all railroad petitions and decides whether to grant permanent or temporary waivers and exemptions from safety rules. During 1992, FRA received 160 new petitions and took 145¹ actions to waive specific requirements of FRA safety regulations issued under section 202(c) of FRSA or other provisions of the railroad safety laws. Table I lists each category, gives its corresponding citation in the regulations, and notes the decisions granted.

WAIVER PETITIONS and BLOCK SIGNAL APPLICATIONS

TABLE I

Category	Received 1992	Approved 1992 ²
Block Signal Applications (49 CFR Part 235)	70	81
Signal and Train Control Waiver Petitions (49 CFR Part 236)	8	4
Track Safety Standards (49 CFR Part 213)	16	9
Railroad Operating Rules (49 CFR Parts 217, 218, 220 & 228)	11	0
Motive Power & Equipment Rules (49 CFR Parts 215, 221, 229, 231 & 232)	21	14
Safety Glazing Standards (49 CFR Part 223)	<u>34</u>	<u>37</u>
	160	145

¹ For statistical purposes, FRA has included some waiver requests that involve regulations issued under other statutory provisions. For example, FRA included the Locomotive, Safety Appliance, and Signal and Train Control Standards.

² Some of the waivers approved involve petitions received prior to 1992.

PUBLIC HEARINGS

BS-AP-No. 3118: Soo Line Railroad Company submitted an application seeking approval of the proposed discontinuance and removal of the automatic block signal system on the two main tracks between West Davenport, milepost 194.0, and High Bridge, Iowa, milepost 219.2, a distance of approximately 25.2 miles on the Southern Division, Davenport Subdivision. A field investigation was conducted. After review of the carrier's proposal, field report, and comments of a labor organization, the FRA held a public hearing in Davenport, Iowa, on March 11, 1992.

BS-AP-No. 3087: Washington Central Railroad Company, Inc., submitted an application seeking approval of the proposed signal changes consisting of the discontinuance and removal of the automatic block signal system consisting of 50 automatic signals between Kennewick, Washington, milepost 1.7, and Union Gap, Washington, milepost 84.4, and the removal of two slide fences and two associated signals, one at milepost 31.0, and the other at milepost 36.0. After review of the carrier's proposal, field report, and comments of a labor organization, the FRA held a public hearing in Yakima, Washington, on April 22, 1992.

BS-AP-No. 3148: Conrail submitted an application seeking approval of the proposed discontinuance and removal of the traffic control system and supplemental cab signal system on the single and double main tracks between "CP Conpit" Interlocking, milepost 0.0, near New Florence, Pennsylvania, and "CP Penn" Interlocking, milepost 77.9, near Pittsburgh, Pennsylvania, approximately 77.9 miles, on the Conemaugh Line, Pittsburgh Division, consisting of the removal of 14 remote-controlled interlockings, the conversion of all remaining switches to hand operation, the establishment of 7 block limit stations, the reclassification of the trackage as a secondary track, and the operation by Manual Block Signal System Rules. After review of the carrier's proposal, field report, and numerous letters of protest, the FRA held a public hearing in Pittsburgh, Pennsylvania, on May 28, 1992.

BS-AP-No. 3154: Twin Cities and Western Railroad Company submitted an application seeking approval of the proposed discontinuance and removal of the traffic control system between Glencoe, Minnesota, milepost 466.9, and Appleton, Minnesota, milepost 578.9, on the Glencoe Subdivision, a distance of approximately 112 miles. After review of the carrier's proposal and field report, the FRA held a public hearing in Fort Snelling, Minnesota, on June 11, 1992.

BS-AP-No. 3170: Wheeling and Lake Erie Railway Company submitted an application seeking approval of the proposed discontinuance and removal of the traffic control system on the single and double main tracks of the Bellevue Line between "CP Rex,"

milepost 184, near Rexford, Ohio, and Yeomans West, milepost 54.8, near Bellevue, Ohio, a distance of approximately 129 miles. After review of the carrier's proposal, field report, and numerous letters of protest, the FRA held a public hearing in Canton, Ohio, on September 10, 1992.

Section IV

EVALUATION OF COMPLIANCE

FRA's National Inspection Plan (NIP) was implemented in January 1992. NIP strategically allocates safety inspection activity to locations needing the most attention. The analytic NIP model provides a basis for determining a railroad's level of safety and, consequently, it allows for a more strategic application of resources, where necessary, to deter unsafe practices.

The model calculates planned inspection hours based on accident and injury data, results of previous inspections, and traffic volumes (especially hazardous materials and passenger traffic). NIP focuses on the volume of activity at each inspection site for each of the five inspection disciplines nationwide. FRA has a growing body of accident/incident information on inspection points and results of prior inspections. With its Quality Improvement Program (QIP)/work measurement system, FRA can assess where and how the inspectors are conducting their work, and how long each specific type of activity is taking. Complaint information remained another important source of information regarding emerging issues. Accident/incident information, QIP data, and complaints helped to guide the deployment of the inspection force. In summary, the model assists FRA managers to direct inspectors to railroad operations that should receive the most attention. Inspection time is allotted to specific railroads based on the safety risk each poses.

This overall program change places less importance on system assessments and more importance on task force or special assessments.¹ The latter efforts are less resource-intensive than the system assessments that FRA performed in the past and are targeted to specific enforcement issues. This shift in assessment focus is in keeping with NIP objectives of a national strategic placement of inspections based on an inspection point's risk when compared against all other inspection points.

An increased emphasis was placed on producing quality accident investigations by directing inspectors to gather all relevant facts that accurately determine the probable cause as well as any

¹ A system-wide assessment of a rail carrier would include the entire geographical boundaries over which the carrier operates. Thus, a system-wide assessment of the Union Pacific would include 16 states of operation and include five FRA regions. A task force or special assessment is a smaller version of a system-wide assessment and focuses on a particular location and on one or two specific issues (i.e., Topeka, Kansas, on the Union Pacific, would only involve one region and possibly one or more of FRA's five disciplines).

contributing factors. FRA used inspector findings to evaluate what corrective actions on the part of the carrier should be implemented as a means of reducing or eliminating similar future accidents.

The following table compares inspection data for 1990, 1991, and 1992.

INSPECTION DATA

	<u>1990</u>	<u>1991</u>	<u>1992</u>
Track:			
Number of inspections	18,363	17,665	17,016
Miles inspected	355,328	356,074	348,649
Records inspected	172,898	154,673	180,369
Defects recorded	133,402	122,741	104,223
Violation reports filed	304	293	168
Violations settled	1,880	1,230	1,266
Settlement amount	\$710,785	\$844,332	\$1,692,735
Signal:			
Number of inspections	5,858	6,006	6,435
Units inspected	64,122	75,481	82,601
Records inspected	57,497	86,034	86,717
Defects recorded	9,441	11,513	11,640
Violation reports filed	155	177	256
Violations settled	244	462	648
Settlement amount	\$128,424	\$413,518	\$578,756
Motive Power and Equipment:			
Number of inspections	21,400	20,685	20,408
Locomotives inspected	41,356	41,720	40,350
Cars inspected	1,061,866	994,814	989,194
Defects recorded	192,014	178,576	156,046
Violation reports filed	3,727	2,199	1,356
Violations settled	6,513	6,291	5,879
Settlement amount	\$3,983,442	\$5,404,277	\$9,922,572
Operating Practices:			
Number of inspections	12,096	11,694	15,111
Complaints received	386	420	299
Defects recorded	25,459	38,923	11,404
Violation reports filed	897	881	605
Violations settled	1,568	1,753	1,402
Settlement amount	\$525,144	\$729,545	\$1,612,770
Hazardous Materials:			
Number of inspections	10,323	9,146	10,374
Tank cars inspected	82,962	71,907	76,936
Defects recorded	21,447	13,404	13,886
Violation reports filed	759	528	546
Violations settled	2,000	1,931	1,579
Settlement amount	\$3,468,255	\$3,502,881	\$2,624,145

Section V

SUMMARY OF OUTSTANDING PROBLEMS

FRA targeted the following safety issues for special emphasis:

- o Highway-Rail Crossing and Trespasser Safety
- o Inspection/Analysis
- o Thermally Cracked Wheels on Commuter Railroads
- o Double-Stack Cars
- o Massachusetts Bay Transportation Authority Kawasaki Cars
- o RoadRailer Equipment

Highway-Rail Crossing Safety. Current programs sponsored by both the public and private sectors have resulted in a significant reduction of highway-rail crossing accidents and fatalities. The 575 fatalities at highway-rail crossings in 1992 tie the previous record low of 575 in 1983, and the 1,969 injuries in 1992 are the lowest on record. Despite this record low number of fatalities, highway-rail crossing fatalities still represent over 49 percent of all rail-related fatalities.

To ensure that this downward trend in fatalities and injuries continues, the DOT has developed a National Grade Crossing Safety Initiative which emphasizes the following areas: (1) elimination of unnecessary highway-rail crossings; (2) engineering improvements (including research regarding improved and innovative warning devices); (3) enforcement of traffic laws at crossings; (4) development of safety regulations and standards; and (5) public education about highway-rail crossing safety.

Trespasser Prevention. FRA recognizes, with growing concern, the alarming number of recent trespasser fatalities and injuries. (A trespasser is any person whose presence on railroad property is prohibited or unlawful.) Preliminary data for 1992 indicates that 533 people were killed and another 538 injured while trespassing on railroad property. The FRA accomplished the following activities in 1992:

- o Included the issue of trespasser prevention as a major element in a police training television series produced by various administrations of the DOT.
- o Attended meetings/conferences of police/enforcement personnel in order to both stress their role and to receive their insight in resolving the trespasser prevention problem.

- o Encouraged and promoted efforts by Operation Lifesaver, Inc. (OLI), to develop enforcement, educational, and engineering programs aimed at addressing trespassing issues.
- o Initiated development of a bulletin designed to increase the public awareness of the dangers on trespassing. The bulletin is scheduled to be published in 1993.
- o Published a pamphlet directed at law enforcement, including a section on trespasser prevention.
- o Conducted in March 1992 the first workshop on trespasser prevention. The purpose of the workshop was to provide a "working" forum to discuss definitions, problems, and solutions concerning trespassing. Attendees at the workshop included representatives from the railroad industry, OLI, and others.

Inspection/Analysis. The revised NIP, implemented in January 1992, is the centerpiece of the improvements in the inspection/analysis area. In past years, NIP was an aggregation of eight regional inspection plans that showed the number of inspections to be conducted in each region by discipline and relied heavily on the individual inspector's knowledge of his/her territory to set inspection priorities. NIP allows FRA to allocate scientifically its limited inspector resources by analyzing past inspection results in order to prioritize future inspections. Inspection time is allotted to specific railroads and inspection points based on the safety risk each poses. Specifically, the plan prioritizes all inspections based on accident and injury data, results of previous inspections, and traffic volume (especially hazardous materials and passenger traffic).

Although the revised NIP has been in use for only 1 year, its benefits are readily apparent. The plan has allowed FRA managers to be more informed when conducting planning, evaluation, regulatory, inspection, and enforcement activities. Using the NIP in conjunction with other management tools, FRA's safety program managers are better able to ensure that inspectors are distributed to where they are most needed. NIP is providing more precise methods of determining a railroad's level of safety; and, consequently, it is allowing for a more strategic application of sanctions, where necessary, to deter unsafe or illegal practices.

FRA will continue to study NIP to acquire more knowledge on better ways to measure safety risk. FRA wants to be certain the plan provides sound guidance to all Federal and state inspectors. Regional management is sharing in this responsibility by

providing feedback on their accomplishments toward the plan goals after they have analyzed the monthly reports provided by headquarters on their progress.

Thermally Cracked Wheels on Commuter Railroads. Since mid-1991, FRA has been investigating the incidents of thermally cracked wheels on the Long Island Rail Road, New Jersey Transit Rail Operations (NJTRO), Metro North Commuter Railroad, and Port Authority-Trans Hudson Corporation. Each railroad's operation was analyzed, and it was decided to concentrate efforts on NJTRO because this railroad operates at the highest speed (up to 100 mph) and with on-tread braking only.

Several thermally damaged wheels have been analyzed by sawcutting and peeling of the wheel tread surface to determine the extent of the damage. State-of-the-art technology has been employed to ascertain wheel tread temperatures on vehicles in revenue service. This was done with a thermal imaging video camera to survey various wheel locations in a train and with thermocouples imbedded below the tread surface on an individual wheel.

Due to a recent increase in the incidence of cracked wheels, NJTRO reduced its maximum speed from 100 to 80 mph. Railroad inspectors have been better trained to inspect wheels for thermal cracks. A test report was issued by the Transportation Test Center (TTC) at Pueblo, Colorado, which evaluates the test application of blended braking on NJTRO. These data are being assimilated into a computer simulation program to determine if the brake modification is effective in reducing wheel thermal input.

Double-Stack Cars. As double-stack, articulated, multiplatform, intermodal container (5-pack) cars have come into widespread use and have started to age, problems are occurring with these cars which can be placed in three broad categories: defective brakes, derailments due to articulation and side-bearing problems, and floor support structural failures. Double-stack cars have become high-utilization equipment, but the railroad industry, as a whole, has not yet implemented the training and procedures necessary to maintain them properly.

FRA Motive Power and Equipment Inspectors have been issued guidance on how to inspect double-stack cars and data collection forms to record the information necessary to get an accurate picture of the maintenance condition of double-stack cars. Over 500 double-stack cars have been inspected, and the preliminary analysis of the inspection data shows two out of every three cars inspected have one or more defective conditions that could affect safe operation of the car.

FRA's Office of Safety Enforcement wrote letters to the Association of American Railroads (AAR) and major owners/operators of double-stack equipment expressing the FRA's concerns and requesting their recommendations for a formal maintenance program on this equipment. FRA is working with industry to develop a formal maintenance program for double-stack equipment.

Massachusetts Bay Transportation Authority (MBTA) Kawasaki Cars. High-capacity commuter cars built by Kawasaki Rail, Inc., for the MBTA have a recent history of derailing on curves at low speed. The problem became serious enough for FRA to request that MBTA agree to operating restrictions for these cars. These operating restrictions are a short-term solution while a test program to determine long-term design solutions to the problem is conducted.

The operating restrictions are a procedural solution to a design problem which appears to be related to the stiffness of the trucks. The restrictions are intended only to be in place long enough for the team of MBTA/National Railroad Passenger Corporation (Amtrak)/Kawasaki to develop a permanent design solution to the problem and implement it on these cars. If testing shows the design solution to be effective in preventing these low speed derailments on curves, the operating restrictions will be lifted. Solutions found to the problem will be verified using the Vampire computer model.

RoadRailer Equipment. In 1987, Norfolk Southern Corporation was granted a conditional waiver to operate RoadRailers. At the present time, a combined total of approximately 2,200 Mark IV and Mark V RoadRailer units are being operated.

Amtrak, in conjunction with RoadRailer, has successfully tested the hauling of mail for the U.S. Postal Service in RoadRailers behind a passenger train. RoadRailer developed a special adaptor unit, called a CouplerMate, which safely connects the RoadRailer to the coupler of the passenger car. FRA authorized and monitored tests of this technology.

Southern Pacific Lines (SP) is testing the CouplerMate and RoadRailers hauled at the rear of a freight train. The impetus here is that a large trucking firm, Schneider National, has shown an interest in hauling RoadRailers as part of their overall operation. The test is being monitored carefully by the FRA.

The use of RoadRailer equipment in mixed trains with conventional freight equipment needs special train handling and train makeup attention. Tests and computer simulations have been done to determine the train handling and train makeup procedures necessary to operate safely RoadRailer equipment in mixed freight trains. These studies will continue in 1993.

Section VI

RESEARCH AND TECHNICAL ADVANCES

An effective safety research program is essential to fulfilling the objectives of the National Transportation Policy and the FRA Office of Safety's railroad transportation safety assurance and regulatory responsibilities. To this end, the FRA's Office of Research and Development (OR&D) conducts safety research, development, test, and evaluation (RDT&E) projects in support of the development and revision of safety guidelines, standards and regulations. In addition, OR&D promotes voluntary industry implementation and use of its safety research findings through the distribution of its technical reports to key industry representatives, the conduct of industry workshops, membership on industry and technical society committees, and invited presentations at conferences and seminars.

Research project planning and development is designed to be proactive and to anticipate and, where possible, prevent the development of avoidable safety hazards through close coordination with the Office of Safety and its analysis of recent industry trends. Most recently, the likelihood of the application of magnetic levitation (maglev) and high-speed rail transportation systems have dictated several new research needs.

There are also spontaneous or reactive research requirements that develop in direct response to a major accident investigation, or as a result of observation reports from field inspectors indicating unusual, unexplained development of potentially unsafe conditions for which a detailed technical explanation may be necessary or desirable.

Examples of the 1992 RDT&E activities by functional area follows.

COMPLETED RESEARCH

Track and Components

Heavy Axle Load Research. Testing continued at the Facility for Accelerated Service Testing (FAST) at the TTC to determine the behavior of track and components under sustained operation of 125-ton capacity cars. Experiments conducted as part of the FAST program monitored performance of rail, ballast, ties, and turnouts. Results to date indicate that successful operation of sustained heavy axle load service requires close attention to quality of track components and maintenance practices.

Track Buckling Research. Track buckles or "sun kinks" are sudden, severe track misalignments which result when the track does not have enough lateral strength to resist the expansion forces induced in the rail by high temperatures. These events

are most likely to occur in track with continuous welded rail (CWR) and have been the subject of continuing research aimed at developing performance-based track safety standards. A comprehensive parametric study of track buckling behavior was completed early in 1992. The study established safety limits for preventing track buckles in terms of rail installation temperatures, lateral track strength, and initial track misalignments which can focus the track buckling forces. The results provide the ability to predict track buckling behavior and to evaluate approaches to buckling safety assurance. The results were summarized in a 1992 draft report titled, "Parametric Analyses and Safety Concepts of CWR Track Buckling."

Rail Longitudinal Force Measurement. A major difficulty in controlling track buckling is that no simple technique exists for measuring the actual levels of longitudinal force in rail, despite intensive and longstanding efforts to accomplish such measurements. One concept which appears to successfully measure these forces was tested in 1992. This method determines the longitudinal force by measuring the force required to lift the rail. A "rail longitudinal force predictor" model was developed to relate uplift measurements to longitudinal rail forces.

Equipment to perform rail uplift tests was installed on the AAR's Track Loading Vehicle (TLV). Pilot tests at TTC were conducted to validate the rail uplift system design and to establish measurement accuracy and sensitivity limits. The TLV was used to map rail forces on revenue service, Burlington Northern track late in 1992. A draft technical report, "Rail Longitudinal Force Measurement Evaluation Studies Using the Track Loading Vehicle," was prepared, documenting the uplift technique, the results of the pilot tests, and the rail longitudinal force predictor model.

Longitudinal Force Remote Monitoring Device. Under the Small Business Innovation Research (SBIR) program, design and development work on the first stage of a remote sensing module for measuring rail longitudinal force was completed and a prototype field trial checkout was conducted at TTC. This module would be permanently installed on the rail at a time when rail force was known to be zero, and would automatically report longitudinal force values for that specific location thereafter. Field testing of the remote sensing modules began in late 1992.

Participation in the European Rail Research Institute's (ERRI) Committee on CWR. FRA is participating in the ERRI's committee on "Improved Knowledge of Forces in Continuous Welded Rail Track." The committee focuses on issues associated with welded-rail track such as track buckling. This participation provides a valuable opportunity for technical information exchange and research collaboration between the United States and the European rail community in track buckling and rail force measurement technology. The first meeting of the committee, held in November

1992, in Utrecht, The Netherlands, resulted in definition of overall research goals and establishment of four working groups.

Rail Integrity. This research addresses the occurrence, detection, and control of fatigue cracks in rail. Research continued to develop requirements for the frequency of rail inspections and for remedial action to be taken when rail defects are detected in service. The objective is to develop the technical foundation for performance-based standards in these areas. Specification of these requirements was completed in 1992.

Rail integrity research also included technical information exchange. Volume II of the 1990 Krakow Conference Proceedings, Final Report, was published in January 1992. FRA helped to organize and contributed papers for presentation at the international conference, "Rail Quality and Maintenance for Modern Railway Operation," held in Delft, The Netherlands, in June 1992. Additionally, full-scale wheel-rail contact experiments conducted by the Central Research Institute of the Polish State Railways have been completed, and joint research of rail residual stress prediction and measurement is continuing.

Gage Restraint Research. Research in this area during 1992 focused on the use of the Gage Restraint Measurement System (GRMS). GRMS is being developed under FRA sponsorship as part of the effort to prepare performance-based track safety standards. The system operates at up to 30 mph, continuously applies a test load, and measures the resulting track deflections. GRMS immediately detects and marks locations with inadequate gage restraint, while producing a digital record of track gage strength.

Efforts involved operating over significant mileages on seven Class I and short-line railroads to confirm realistic safety thresholds, to determine rates of change in track conditions, to refine system outputs to maximize utility to the railroads, and to demonstrate the potential safety and productivity benefits of this new technology. The GRMS concept of applying test loads to measure gage and to provide objective information to plan track maintenance activities was endorsed by the railroad industry in 1992. CSX Transportation requested that this method be tested as a safety standard for evaluating gage restraint over selected segments of CSX track. Data from 3 years of track degradation testing on CSX using GRMS were compiled and combined with the maintenance records of the track as reference information to determine recommended inspection intervals. Work began in 1992 on making available the current gage strength measurement technology to railroad equipment supply organizations that may want to develop a similar system, and one major railroad began construction of a similar test vehicle to apply the method on its property. Two railroads requested that the system be made

available for followup tests of virtually their entire trackage, since they intend to apply the information for maintenance planning.

Track-Train Interaction Derailment Studies. Studies are continuing of severe dynamic conditions which may result and lead to derailment when particular track conditions excite unusually severe motions in specific designs of rail cars. A paper was completed and presented describing the results of an analytical study of vehicle behavior when moving over tracks with excess crosslevel on tangent track and excess elevation in curves that allow wheel climb. The material in this paper provides the analytical basis for establishing the maximum superelevation permitted in curved track.

Equipment and Components

New and Untried Cars Safety Assessment. An efficient and more effective analytical technique was developed for use in evaluating the safe performance of new freight cars. The program demonstrated the viability of test and analysis techniques for an extended range of conditions not previously tested or not required by existing standards. The tests arrived at a determination of the safety envelope of any railroad vehicle. A report was published in June 1992.

Four-Axle Locomotive Evaluation Tests. In response to FRA's efforts to improve the design of locomotives to enhance the safety of cab occupants, the AAR established standards for crashworthiness, which includes anticlimb features, stronger collision posts, and thicker hoods on short-hood locomotives. These improvements add between 6,000 and 10,000 pounds to the locomotive, which increases the axle load beyond that which is normally considered to be the maximum desirable axle load. Tests which demonstrated that no deleterious effects were realized by the increased load were completed.

Rail Rollover. During operations at FAST at TCC near Pueblo, Colorado, excessive rail lateral deflections which can lead to derailments were observed. In one case, an unexplained derailment of heavy (125-ton) freight cars occurred. A test program to understand better the behavior of the equipment and the track was initiated. It was determined that gage widening attributed to truck warp was occurring. This was due to a combination of poor wheel/rail contact geometry, insufficient wheel tread taper, and inadequate rail lubrication. Several recommendations were made and a report is being published.

Development and Evaluation of Wheel Inspection Systems. The development and evaluation of nondestructive methods to assess the residual stress state and detect cracks and other defects in railroad wheels continued in 1992. Initial evaluations of a

prototype in-track wheel crack detection system and two pre-prototype wheel stress measurement concepts were completed at TCC.

A final report covering the development of the wheel residual stress measurement technology employing magnetoacoustics was completed. Two reports covering the initial evaluation of the prototype in-track wheel crack detection system and the two pre-prototype wheel stress measurement concepts were also completed.

Material Fatigue Properties. This joint government-industry program is to investigate the fatigue properties and fatigue life predictions of various proposed new freight car construction materials. The testing phase on aluminum alloy samples was concluded. A final report covering the aluminum fatigue testing results was drafted.

Freight Car Braking System Performance Evaluation. The investigation to examine the distribution of braking forces in freight cars equipped with body- and truck-mounted brake rigging was completed at TTC. A final report covering the results was drafted.

Roller Bearing Performance on Freight Cars. The evaluation of roller bearing failure mechanisms and wheel anomaly testing was completed at TTC on a series of test bearings. A final report covering the results of this evaluation and wheel anomaly testing was completed.

Operating Practices

Research and Locomotive Evaluator/Simulator (RALES) Upgrade. The control and visual systems of RALES were upgraded with state-of-the-art computer and video hardware. Operating software and available film for use with this new hardware were adapted. Capacity, capability, and flexibility of the facility were substantially enhanced. RALES is used by FRA for a variety of safety-related research activities, particularly those involving human factors. It is also used by the railroad industry and others for both training and research.

Advanced Train Control System (ATCS) Evaluation. The evaluation of a simulation of one configuration of in-cab display which may be used with the ATCS currently being developed by the railroad industry was completed. This project, which was conducted on RALES, used 30 experienced locomotive engineers to determine whether the display helped, hurt, or was neutral with respect to train handling by these engineers.

Enginemen Stress and Fatigue: Pilot Study. Pretest evaluation of methodologies considered for use in measuring performance degradation of locomotive engineers under known conditions of

fatigue as a precursor to a Phase II effort involving a statistically significant number of engineers as test subjects was completed. Phase II is scheduled to start in the spring of 1993. Both the Pilot Study and Phase II use RALES as the operating environment during testing.

Enginemen Stress and Fatigue: Workshop I. In October 1992, a workshop was sponsored by FRA to translate what is known from research on circadian rhythm, shift work, sleep deprivation, and related topics in other environments for application to the research to be done in the railroad operating environment. The workshop lasted 3 days and involved five experienced and well-known researchers in the aforementioned topics, a select group of FRA staff experienced in railroad operations, and key people who will shape the test protocols to be used in Enginemen Stress and Fatigue: Phase II. Results are still being studied. Additional workshops of a similar nature are anticipated at appropriate points in the Phase II research.

Hazardous Materials

Spent Nuclear Fuel Cask Fire Analysis. Currently, the primary fire safety regulations governing the rail transportation of spent nuclear fuel are embodied in the Nuclear Regulatory Commission's certification process for shipping container design. Several realistic railroad accident scenarios are postulated in which a spent nuclear fuel cask, if it is in a train consist, is likely to be exposed to or engulfed in a large fire. While each of the postulated scenarios can occur, the overall probability or frequency in a given year that any one of the scenarios will occur is extremely small. The duration and temperatures of the fires postulated in the scenarios are realistic and are supported by accident and experimental data. The principal countermeasure that has the potential for significant reduction in risks over a number of accident scenarios is placing the casks in dedicated trains. The final report is being reviewed.

Tank Car Puncture Resistance. Tests were completed in 1990 to evaluate the puncture resistance of aluminum tank car heads and the effects of cold temperature on tank car head impacts. Fifth-scale and full-scale tests of the aluminum tank car heads have been conducted. Results indicate that head shields substantially improve the puncture threshold of aluminum tank car heads. The aluminum tank car puncture test final analysis report was completed in 1992. Similar tests were conducted on fifth-scale, full-scale tank cars for DOT Class 105 tank cars used in chlorine service. The final analysis report for the chlorine tank car puncture tests was also published in 1992.

Emergency Response Procedures. Work was completed in 1992 on procedures for use by emergency responders to tank car accidents. A handbook was prepared and will be published to aid responders

in procedures for the safe handling of hazardous materials at a derailment site. As a result of this work, it was suggested that a companion book describing critical flaw size and damage assessment be developed. Such a handbook is currently being used by the AAR at the Hazardous Materials Training Facility; however, it is necessary to validate scientifically the damage assessment guidelines currently being used by emergency responders.

Safety of High-Speed Maglev Transportation Systems

Transrapid Maglev. A major study and analysis was conducted of the German safety standards developed for the Transrapid maglev system. This was accomplished in close collaboration with TÜV Rheinland, a safety assurance organization engaged by the German Federal Ministry of Research and Technology to develop the standard through a working group of experts.

The document titled, "High-Speed Maglev Trains: German Safety Requirements RW-MSB," was examined with a view as to its suitability for application in the U.S. environment. This in-depth review also included a companion document known as the Maglev Construction and Operating Regulation. A multidisciplinary team, employing FRA engineers and Volpe National Transportation Systems Center (VNTSC) scientists and engineers, examined these documents and prepared their assessment and recommendations in a report on "German High-Speed Maglev Train Safety Requirements--Potential for Application in the United States."

Transrapid Maglev Rule of Particular Applicability. Since the franchise award to Maglev Transit, Inc., for the construction and operation of a maglev demonstration project in Orlando, Florida, employing German Transrapid technology, there has been a concentrated effort to coalesce all of the safety-relevant research findings of an FRA/VNTSC study group into a draft rule of particular applicability for the Orlando project. This draft was completed by the technical staff and is being reviewed by safety enforcement and legal staffs prior to finalization.

Electromagnetic Fields (EMF). In a more specific area of concern, extremely low frequency (ELF) EMF and their potential for health effects has led FRA to conduct EMF measurements of high-speed transportation systems and to expose animals and cell tissue to these fields in laboratory simulations. The initial measurement program concerned itself with the Transrapid maglev system and a measurement team was dispatched to the German Experimental Test Facility at Emsland, Germany. Results of the measurements are contained in a two-volume report titled, "Magnetic Field Testing of TR07 Maglev Vehicle and System." Subsequent comparison measurements have been made of the Northeast Corridor and Jersey coast line, the French TGV,

Washington Metrorail, and Boston "T" System; and reports are in preparation.

Transrapid Test Facility. In the fall of 1992, the FRA/VNTSC Safety Task Force observed test operations over a 2-month period at the Transrapid Emsland Germany Test Facility. A 46-page project memorandum presents the findings that indicate all safety measures have not as yet been fully implemented due to developmental problems. None of the deficiencies noted are considered insoluble issues but will merit continued following.

Safety of High-Speed Guided Ground Transportation (HSGGT)

High-Speed Rail Tilt-Train Technology. With the advent of tilt-train technology, improvement of on-rail trip times between city pairs using existing infrastructure has become possible. A survey of the state of the art was conducted and a report published. The report indicates that tilting in and of itself is not directly safety-relevant, but rather a passenger ride quality enhancement, and that other attributes found on some tilt trains, such as passive, radial steering trucks, may contribute to the safety of higher speed operations over existing rights-of-way.

Shared Rights-of-Way. One of the most important issues in the debate over the viability of HSGGT systems is the premise that they can be deployed along existing rights-of-way, at least part of the time, and particularly near or in urban areas. To what extent these rights-of-way can be used is a function of many factors, some technical, some economic, some operational, and some safety-oriented. The safety issues were examined in the study report, "Shared Right-of-Way Safety Issues." As a result of this study, an additional investigation concerning protection against incursion of one mode upon another adjacent mode was initiated.

Collision Avoidance and Accident Survivability. Because of the possibility of application of foreign HSGGT systems in the United States, as in the Orlando maglev demonstration project and the Texas Triangle TGV Project, both of lightweight design and built to International Union of Railways standards, it became apparent that a review of U.S. crashworthiness standards was necessary. The safety of these foreign systems is predicated on a total system approach. With this in mind, research to develop a system performance specification for collision avoidance and accident survivability was undertaken. This work is now reported in a four-volume report covering collision threat, collision avoidance, accident survivability, and a performance specification.

ONGOING RESEARCH

Track and Components

Heavy Axle Load Research. Testing will continue at FAST at TTC to determine the behavior of track and components under sustained operation of 125-ton capacity cars. Experiments which will receive special emphasis in 1993 will be turnouts and crossing diamonds, which have been identified as being particularly susceptible to impact damage under heavy axle load service. Planning activities will be undertaken to test new designs of freight car trucks, which show promise of reducing operating forces and track damage which result from the operation of heavier cars.

Track Buckling Research. Emphasis in 1993 will be on support to the development of a performance-based track safety standard to address safety limits and maintenance practices for managing CWR. Testing to determine the specific effects of maintenance and rail anchoring practices will be conducted at TTC. A new ultrasonic technique to measure longitudinal force in rail has been proposed by a railroad industry supplier and a prototype has been constructed. FRA will cooperate with the industry to assess the validity of this technique and to consider its use in ongoing research programs if it proves successful. Field testing of remote force monitoring modules will be undertaken with two participating railroads and at TTC.

Rail Integrity. Efforts will address the alternative remedial actions which may be appropriate when rail defects are detected in track, and will develop the technical foundation for rail performance improvements which might be accomplished by changes to rail manufacturing practices, rail maintenance procedures, and/or nondestructive inspection methods. A particular focus of these efforts will be to understand the generation, behavior, and control of residual stresses introduced into the rail by manufacturing processes and revenue service effects. These stresses are known to contribute to the susceptibility of rail to fracture in service.

Gage Restraint Research. Demonstrations of the current prototype GRMS technology and information transfer to allow the railroad industry to implement the concept of applied-force testing of track to determine gage restraint capacity will continue in 1993. The FRA-owned prototype GRMS will be used to support implementation of this technology under waiver as an alternative performance-based track safety standard.

Track-Train Interaction Derailment Studies. Studies of track and vehicle characteristics which may interact to produce dynamic derailments will continue. New designs of rail vehicles for both passenger and freight service will be considered.

Operation of Grade Crossing Protection Circuits. This effort, begun in 1992, addresses "loss of shunt" in grade crossing warning circuits. This phenomenon can cause grade crossing flashers and gates to fail to operate, or to stop operating during passage of a train. Seven grade crossings have been selected and instrumented to monitor and record crossing warning circuit operation, and to identify rail vehicles which are susceptible to cause loss of shunt. Detailed investigation will be conducted to ascertain the conditions under which loss of shunt can occur. Similar warning circuits will be installed at TTC under closely controlled conditions to mimic the revenue service behavior and to allow for testing of proposed mitigation techniques.

Equipment and Components

Locomotive Crashworthiness. Locomotive cab safety has been an area of concern for industry, labor, and government since the passage of FRSA, which gave FRA broad powers to regulate in all matters affecting railroad safety. Fatalities caused by locomotive-to-locomotive collisions have been of particular concern. As a result of inquiries and surveys, the AAR adopted locomotive crashworthiness requirements for new road-type locomotives built after August 1, 1990. The requirements include anticlimbers, stronger collision posts, and thicker hoods on short-hood locomotives. The effectiveness of these new protection features have yet to be proven. An analytical program has continued in 1992 to evaluate the effectiveness of these new features.

In addition, in response to RSERA, a comprehensive data base is being established for all locomotive accidents. This data base will lead to the development of a model for analysis of the effectiveness of locomotive crashworthiness. It is expected that this analysis will assist in a determination of whether or not additional rulemaking is necessary.

High Productivity Integral Train (HPIT). HPIT was initiated in 1984 as a concept project to develop and operate safely an improved train capable of increased productivity and efficiency. One such proposal is the "Iron Highway" submitted by New York Air Brake Company. Initial tests were conducted on the design of the innovative suspension system. Tests are now being conducted to evaluate fully the safety, reliability, and performance of the entire system concept.

Passenger Vehicle Safety. To support the FRA's Office of Safety, a rail passenger vehicle safety research effort was initiated to improve the safety of commuter and Amtrak rail vehicles that have been introduced in the service in the last few years. Many of those vehicles were designed by foreign suppliers for operating

in other countries. This task will collect the engineering design and dynamics performance data and evaluate their effects on vehicle safety. A research program plan will be developed to address the identified safety issues.

Development and Evaluation of Wheel Inspection Systems. The development and evaluation of nondestructive methods to assess the residual stress state and detect cracks and other defects in railroad wheels is continuing. Recommended modifications resulting from the initial evaluations on the wheel detection prototype systems have been incorporated and follow-on field tests are being scheduled to begin during 1993.

Investigation of Wheel Cracking on Commuter Equipment. A task force was established in September 1991 to investigate the cracking of railroad wheels operating in commuter train service in the New York area. The efforts to date include preliminary engineering analyses, wheel saw cutting and peeling experiments, development of finite element models to determine the wheel stress and thermal environment, full scale braking tests to measure the thermal wheel loads, and associated metallurgical evaluations of cracked wheel specimens. A series of technical reports covering the findings of this investigation are planned. The first report is expected to be released in 1993.

Operating Practices

Selection of Locomotive Engineer Trainees. A battery of tests was developed and validated to screen candidates for training as locomotive engineers. A draft final report for this work was delivered to FRA near the end of 1992. The final report is expected to be published during 1993.

Grade Crossing Safety: Operation Lifesaver. Financial assistance was provided for the National Operation Lifesaver Program for the development, production, distribution, and presentation of materials and programs intended to increase public awareness of hazards at highway-rail grade crossings, and near all railroad operations.

Freight Car Reflectorization. Work continued during 1992 to evaluate the usefulness of retroreflective materials on the sides of freight cars to make them more visible to motorists at night at highway-rail grade crossings.

Locomotive Conspicuity. Work was initiated in 1992 to evaluate the value of a variety of lighting, paint, and reflective material schemes applied to locomotives to make them more visible to motorists at highway-rail grade crossings. This work is to be completed in 1993.

Impairment Testing (SBIR Phase II). Work continued on the development and validation of a device to determine the fitness for duty of railroad operating personnel when they report for duty. The device would determine fitness, or lack of fitness, for duty (impairment), regardless of cause, following a quick, non-invasive test when reporting for work. This project is expected to be completed in mid-1994. It is being sponsored by FRA under the SBIR program.

Dispatcher/Dispatch Center Evaluation. The study design phase of this activity was initiated in 1992. Study designs are being developed to evaluate workload, stress, and fatigue; selection for training; and training. Work on at least one of these topics is expected to start in 1993.

Enginemen Driving Records Versus Train Handling. Efforts to correlate motor vehicle driving records of locomotive engineers with their train handling records were begun in 1991 and continued through 1992. This work is being done to determine what parts of an individual's driving record, if any, should be considered in the locomotive engineer certification process. Initial results will become available in 1993.

Advanced Alertor (SBIR Phase I). Two feasibility studies were initiated under the SBIR program to develop a retrofit for currently available locomotive in-cab alertors that would preclude engineers from unconsciously resetting the alertor (like a snooze alarm) while dozing or otherwise not vigilant. If successful development looks likely, a Phase II project will be started in 1993.

Hazardous Materials

Spent Nuclear Fuel Cask Fire Analysis. This project will determine, among other things, the fire boundary conditions that would be used in a model analysis of a spent nuclear fuel cask. Previous fire data were analyzed and an evaluation of thin-walled and thick-walled, thermally massive object was attempted. This project was initiated to determine the feasibility of rail transportation of spent nuclear fuel considering the effects of a typical rail accident fire on this cask. Design temperatures for cask for radioactive materials are slightly different from thermal conditions prescribed for insulated tank cars. A final report is being prepared.

Residual Stress/Fatigue Crack Growth. The objective of this project is to identify stresses in tank cars that can lead to crack initiation and to determine the time it takes for a crack, once initiated, to propagate to failure. Over-the-road tests have been conducted to develop data for use on the simuloader test equipment for a tank car with an actual or fabricated crack(s). The test car was exposed to 300,000 miles of simulated

track movements to determine the rate of crack growth. Information collected was used in the preparation of working papers for dual diameter and stub sill equipped tank car issues. A final report is being prepared.

New Tank Car Steels. This project will conduct metallurgical evaluation of the new steels proposed by the railroad industry for use in tank car construction. Research is also being conducted on existing tank car steels to develop a data base of desired material properties. The new steels are high-strength, microalloyed steels, some of which are made using inclusion-shaped control practice. A final report will be prepared at the conclusion of the project.

Tank Car Structural Integrity. The analysis of critical flaw size for tank car steels continues. This project is a long-term project due to the need to study a variety of damaged tank car steels. Detailed metallurgical investigations of deformed, dented, or otherwise stressed steels from tank cars involved in derailments will be conducted. This work includes determining the materials' metallurgical properties as a function of its loading rate and temperature. A final report will be prepared at the conclusion of the project.

Nondestructive Evaluation (NDE) for Insulated Tank Cars. Due to measures beyond the control of the contractor, this Phase II SBIR program is continuing into 1993. This program will determine if a detection device can be developed and applied to insulated, jacketed tank cars to identify internal shell cracks and flaws that may cause the tank cars to fail. Detection techniques exist for uninsulated tank cars; however, their use on insulated tank cars is limited. Existing NDE techniques rely on the use of induced stresses for detection of cracks.

Manufacturing/Repair/Retest Facility Inspection. In response to the National Transportation Safety Board's recommendations R85-89 and R85-122 and the 1989 General Accounting Office report, the FRA's Office of Safety has requested that an enforcement manual be developed for use in training FRA personnel in performing adequate and meaningful inspections of tank car manufacturing, fabricating, or repair facilities. The manual would ensure that rules and regulations of DOT and AAR are followed. The manual will provide easy retrieval and interpretation of the information on tank cars. This information will provide for continuing data on manufacturing and repair of a particular tank car or series of tank cars. The manual could be tailored for instruction of FRA and other regulatory official personnel, personnel of manufacturing or repair facilities, as well as emergency response personnel.

Vent and Burn Method of Emergency Response Procedure. This project initiated in 1992 is to study and investigate factors to

be considered in the selection of type, size, and shape of explosive charges to be used in the vent and burn method to enhance safety related to field removal of tank car contents in accidents.

Spent Nuclear Fuel Cask Analysis (Route and Mode Study). This project, initiated in 1992 in conformance with the requirements of section 116 of Hazardous Materials Transportation Uniform Safety Act (HMTUSA) of 1990, is to determine which factors, if any, should be taken into consideration by shippers and carriers in order to select routes and modes which, in combination, would enhance overall public safety related to the transportation of high-level radioactive waste and nuclear fuel. This program is currently being managed by RSPA with funding from FRA.

Spent Nuclear Fuel Cask Analysis (Dedicated Train Study). A project, in conformance with the requirements of section 116 of HMTUSA, to compare the safety of using trains operated exclusively for the transportation of high-level radioactive waste and spent nuclear fuel (dedicated trains) with the safety of using other methods of rail transportation for the same purpose was initiated in 1992.

Tank Car/Lading Compatibility. Research continued in 1992 to determine and evaluate the proper packaging criteria for transportation of hazardous materials based on risk analyses. This project is concentrated on loadings that are flammable liquids, flammable gases, or poisonous by inhalation. This project included a review of the bulk packages prescribed in Docket HM-181.

Hazardous Materials Central Reporting System. This project, to evaluate the feasibility of establishing a centralized reporting system for shipments of hazardous materials, will provide technical information to support regulatory changes promulgated under Docket HM-206. A report to Congress is also planned under this project. RSPA is responsible for managing this program with funding from FRA.

Tank Car Design Study. This project, in conformance with the requirements of section 21 of HMTUSA, is to study the tank car design process, including specification development, design approval, repair approval, repair accountability, and the tank car design criteria, including whether head shields should be installed on all tank cars carrying hazardous materials. A contract was awarded in 1992 for this study.

Safety of High-speed Maglev Transportation Systems

Guideway Beam Deflection. Based upon experience at the Transrapid Test Facility in Germany, there is concern over the

effect of thermally induced beam deflection that may occur in the steel guideway span beams (nominally 25m long) to be used in the Florida maglev demonstration project. It is possible that an unloaded positive camber in the beam may become exaggerated by the sun's rays on the top of the beam. To determine this effect, a collaborative experiment is planned wherein the developer will provide a single specimen beam in its normal installed configuration while the FRA instruments and records the varying deflection modes of the beam under the diurnal temperature ranges expected to be experienced at Orlando, especially during the summer months. An excessive camber in a guideway beam may overtax the vehicle's gap control mechanism and create undesirable stresses.

Environmental and Occupational Health Effects of Maglev EMF.

Using EMF measurements obtained from HSGGT and transit systems, the Environmental Protection Agency, for FRA, is comparing the measurements to known effects and risks to humans from exposure to magnetic, electric, and EMF at comparable levels of exposure. The object is to obtain a recommended safe profile description based upon the current state of knowledge with respect to EMF health effects.

Safety of HSGGT

Anti-Intrusion System Study. As a result of an earlier study of shared right-of-way safety issues, it was determined that adjacent facilities pose certain hazards to HSGGT systems that require remediation. HSGGT vehicles are vulnerable to collision in the event of intrusion of a vehicle--either rail or vehicular. The objective of the current study is to evaluate the feasibility of anti-intrusion systems and develop prototypical designs.

Emergency Preparedness Guidelines. The object of this effort is to develop a general set of guidelines to which HSGGT operating authorities may turn in evaluating, modifying, or supplementing emergency response plans, operating and maintenance plans, and related training, and consider in-vehicle and guideway design.

Human Factors and Automation in HSGGT Systems. Initially, a review of HSGGT systems in Japan, Europe, and the United States for methods of operation as they relate to operators and automation technology will be conducted. Operator functions will be characterized and operator information processing requirements will be documented. Research gaps will be identified. Future work will be focused on the development of guidelines and/or the filling of research gaps as they apply to proposed new systems.

Tests of High-Speed Train Sets in the Northeast Corridor. As part of the process of Amtrak evaluating high-speed rail equipment for use on the Northeast Corridor, instrumented tests of dynamic performance have been conducted on a leased Swedish

X2000 train set and are planned for a German InterCity Express (ICE) train set. Research staff have provided technical support to establish the forces generated on the track, while operating under various degrees of unbalance in curves, in order to establish appropriate safety limits for subsequent demonstration service.

Collision Avoidance and Accident Survivability. As followup work on the earlier effort which resulted in the development of a performance specification for collision avoidance and accident survivability, it was determined that two case studies should be conducted to examine and test the proposed specification's application in an existing mixed traffic Amtrak high-speed corridor and in a planned dedicated high-speed corridor as proposed in Texas.

Highway-Railroad At-Grade Crossing Safety. This research will examine safety issues related to potential high-speed train operation on existing track. It will include a definition of the magnitude of the problem, such as the number of public and private crossings, a risk analysis for various warning device treatments, jurisdictional/institutional issues as they relate to public grade crossings, and the development of recommended applications and/or further research. In particular, the five corridors outlined in the Intermodal Surface Transportation Efficiency Act of 1991 will be of special interest along with the Northeast Corridor from New York to Boston and the Empire Corridor (New York-Albany).

High-Speed Passenger Trains in Freight Railroad Corridors. In addition to the foregoing project, the object of this study is an examination of the operational safety factors that must be considered in assessing the upgrade potential for high-speed passenger service in an existing rail corridor with freight traffic. It is to outline potential signaling and control problems and the availability of systems to ameliorate them. Also to be reviewed are factors affecting train stopping distances, headways, track capacity, and operational efficiency. An analysis of the measure of safety provided under different levels of upgrade and a methodology for estimating the relative tradeoff costs will also be developed.

Electrical Safety Requirements Definition. The objective of this research is to establish the need for, and to develop a set of, comprehensive safety guidelines that are particularly applicable to HSGGT systems using electrically-powered guideways (whether steel-wheel-on-steel-rail, maglev, or other technological implementation). The ultimate intent is to provide for the protection of the traveling public, other members of the public who may be affected by proximity to the railway, all types of railroad employees, and also rescue personnel who may enter upon railroad facilities in the event of emergency. This protection

is to be accomplished by equipment manufacturers and railway operators under guidelines that aim for proper operation of the HSGGT system via designs with fail-safe, fault-tolerant, or redundant features. These guidelines may be defined in terms of recommended practices by professional organizations, currently established industry standards (United States and/or foreign), or specific regulatory language (newly drafted) suitable for future codification.

Advanced Braking Concepts. As higher speed train operations have evolved, the requirement for greater braking (energy dissipation) capacity has lead to the application of several unique technologies and combinations thereof. This effort is composed of three basic tasks. The first is the description in as much detail as practical the nature of the various braking strategies used for vehicle braking in high-speed operations. This work would include frictional brakes (wheel tread and disc), dynamic brakes, regenerative or rheostatic brakes, eddy current brakes, and magnetic "track" or "rail" brakes. The second component of this effort requires a system safety analysis of each type of braking system. Finally, the last task will be to prepare recommended minimum safety requirements for each application of a braking system or probable combination. In all, it is to assist in the potential formulation of rules or guidelines related to HSGGT braking systems.

Automation in Train Control Systems. This project addresses the key safety issues that arise out of the use of computers for both signaling and automated control systems used in various HSGGT systems proposed for application in the United States. Both hardware and software issues will be examined. Traditionally, up to the decade of the seventies, railroad interlocking control, which is control of track switch positioning, route request, and authority for trains to proceed into a track section, was done by a very special type of electromechanical relay called "vital relay." The vital relay has well-known failure modes that are taken into account by the designer of fail-safe railroad control systems. In the decade of the seventies, the microprocessor chip was introduced in the industry. The microprocessor's failure modes are not as predictable as those of the vital relay, and design of fail-safe controls using this component is not as straightforward as it is with the vital relay. The inspection and testing frequency of signal and control equipment may need to be specifically defined for microprocessor-based systems. One particular issue of concern is how much testing is required when changes are made to a vital microprocessor control system. The project seeks to establish a methodology for safety validations of computer-controlled systems in guided ground transportation.

Obstacle Detection. HSGGT systems are inherently limited in their emergency stopping distance; thus, the earliest possible detection of an obstacle in the vehicle's path is imperative to

safe operation. Trespassers, workmen, service vehicles, and fallen rock or debris placed by vandals all pose a potential threat to safe passage. Several existing technologies could be applied to the problem; however, either cost or performance limitations preclude their practical use. This SBIR project is seeking an innovative solution to the problem.

Texas TGV Rule of Particular Applicability (RPA). Since the award of a franchise to the Texas TGV Corporation for the construction and operation of high-speed rail service in the Texas Triangle (Fort Worth/Dallas-Fort Worth Airport/Dallas/Houston/San Antonio) employing TGV (Atlantique) technology, a concentrated support effort was devoted to the development of a draft RPA. The RPA is likely to cover system safety, emergency preparedness, testing, vehicle, command-control-communications, environmental, propulsion/levitation (for maglev), track/guideway, training, and other aspects that would be the counterparts of current rules in the Code of Federal Regulations applicable to existing systems.

Section VII

JUDICIAL ACTIONS

The following briefly describes judicial actions taken under FRSA and other safety statutes, including actions completed or pending during CY 1992.

Completed

Reader Railroad v. Skinner (W.D. Ark.): In September 1991, plaintiffs Historic Reader Foundation, Inc., Reader Industries, Inc., and Reader Railroad brought this case to review FRA's exercise of safety jurisdiction over the Reader, a 3-mile intrastate tourist railroad in southern Arkansas. Plaintiffs argued that FRA had no jurisdiction over the railroad because it was not part of the national system of railroads, did not transport passengers for hire from one point to another, and did not engage in interstate commerce.

FRA inspectors had issued a special notice for repairs on one of Reader's antiquated steam locomotives, effectively removing the locomotive from service until necessary safety repairs were completed. In response, plaintiffs filed their complaint and request for injunctive relief. An evidentiary hearing on the plaintiff's request for a preliminary injunction was held before the Federal District Court in El Dorado, Arkansas, on September 25, 1991. At the conclusion of the hearing, the court requested that both parties submit briefs on the issues raised at the hearing. When plaintiffs failed to submit such brief, FRA filed a motion for summary judgment on November 22, 1991, arguing that the FRSA gives FRA jurisdiction over all railroads except urban rapid transit operations not connected to the general railroad system of transportation. In addition, FRA argued, the commerce clause of the U.S. Constitution empowers Congress to regulate local railroads that affect interstate commerce.

On January 16, 1992, the court granted FRA's motion for summary judgment. Noting that operation of the Reader Railroad affects interstate commerce and that the Federal Government has a legitimate interest in protecting railroad passengers, the court held that the commerce clause empowers FRA to exercise jurisdiction over intrastate railroads.

United Transportation Union v. Skinner (N.D. Cal. and 9th Cir.) and *Brotherhood of Locomotive Engineers v. Skinner* (D. Ore. and 9th Cir.): The United Transportation Union (UTU) and the Brotherhood of Locomotive Engineers (BLE) filed these identical suits against the DOT and FRA in January 1990. The unions challenged an FRA

interpretation of the Hours of Service Act concerning the status of train crews who have completed their maximum 12 hours of continuous service but must remain with their train while awaiting deadhead transportation. FRA's interpretation stated that crews were considered "on duty" following their 12 hours of service if they were required by the railroad to continue to perform duties while they awaited transportation to their point of final release. However, if no duties were assigned, the crews were considered in "limbo time," neither on duty nor off duty for hours of service purposes. The unions sought declaratory judgments ordering FRA to consider time spent awaiting deadhead transportation as time on duty whether or not the crew was assigned other duties during that period.

On September 27, 1990, the court dismissed the California case for failure to state a claim under Federal Rule of Civil Procedure 12(b)(6). The UTU filed a notice of appeal on November 26, 1990, and oral argument was held on February 11, 1992. In the BLE's identical suit, the district court in Oregon ruled in favor of the BLE, holding that time spent waiting for deadhead transportation under circumstances where a crew remains responsible for the train it has been operating is time on duty. FRA filed an appeal and oral argument was held on March 12, 1992.

On September 22, 1992, the United States Court of Appeals for the Ninth Circuit upheld the decision of the district court in Oregon. In the California case, the Court of Appeals reversed the district court's dismissal of the entire case and remanded the case to that court for further proceedings consistent with the appellate court's opinion on the interpretive issue. Rather than maintain a bifurcated application of the Hours of Service Act, where time awaiting deadhead transportation would be considered time on duty in the Ninth Circuit but not elsewhere, FRA decided to apply the appellate court's interpretation nationwide. The Ninth Circuit's interpretation was to be enforced in all other areas of the country beginning January 1, 1993.

Nebraska State Legislative Board v. Skinner (D. Neb.): On November 18, 1991, the Nebraska State Legislative Board of the UTU filed a complaint virtually identical to those filed in *United Transportation Union v. Skinner* and *Brotherhood of Locomotive Engineers v. Skinner*. Although service of process was accomplished on DOT and FRA, the complaint has never been served on the Attorney General of the United States, as required by the Federal Rules of Civil Procedure. On August 6, 1992, FRA filed a motion to dismiss for failure to perfect service, as well as for failure to state a claim under Federal Rule of Civil Procedure 12(b)(6).

Pending

Brotherhood of Locomotive Engineers v. Southern Pacific Transportation Co. (E.D. Mo.): The BLE sued the SP, DOT, and FRA asserting that SP has been misapplying FRA's new engineer qualifications regulations by (1) revoking certifications for overspeed violations involving speeds less than 10 miles per hour over the authorized speed, and (2) failing to credit time during which a certificate is suspended pending a revocation hearing toward any period of revocation ultimately determined. FRA contends that BLE, not SP, is misreading the FRA rule and that the actions complained of do not violate FRA's rule. The court denied plaintiff's preliminary injunction motion on July 31, 1992. FRA has planned to file a motion to dismiss or, in the alternative, for summary judgment.

FRA Docket No. EQAL-92-04: A locomotive engineer whose operating license had been revoked by Norfolk Southern Railway received an adverse decision by FRA's Locomotive Engineer Review Board on September 17, 1992. He then asserted his right to have an administrative hearing concerning that decision by filing a petition for review on October 3, 1992. The main issue in the case is whether or not the locomotive engineer failed to adhere to a railroad rule or practice that involves a procedure for the safe use of train brakes. In response to the locomotive engineer's request, an administrative law judge was assigned to the case, and a hearing was scheduled for March 17-19, 1993.

Section VIII

INFORMATION DISSEMINATION

During 1992, FRA published the following:

Rail-Highway Crossing Accident/Incident and Inventory
Bulletin No. 14 Calendar Year 1991.

Accident/Incident Bulletin No. 160 Calendar Year 1991.

Appendix C lists the technical reports on railroad safety research studies published by FRA during 1992.

Section IX

STATE PARTICIPATION PROGRAM

Under the State Participation Program, authorized by section 206 of FRSA, states can participate with FRA in the enforcement of Federal rail safety regulations. Participating states in this grants-in-aid program can obtain Federal reimbursement, if appropriated by Congress, of up to 50 percent of allowable state costs.

During 1992, the 29 states in the program employed 127 state inspectors. Fifty-seven state inspectors participated in the track discipline, 39 in motive and equipment, 14 in operating practices, 3 in signal and train control, and 14 in hazardous materials.

FRA continued to provide 100 percent of the funding for training state safety inspectors. State inspectors are trained and certified on the same basis as FRA inspectors. No state was denied participation by FRA.

Table 2 lists the participating states and their onboard inspectors in the program at the end of 1992.

Federal safety regulations (49 CFR Part 212) were expanded by FRA on June 24, 1992, to include state hazardous materials inspection authority. This action permits state safety inspectors to inspect railroad hazardous materials operations for compliance with Federal safety regulations. Nine states have responded with 14 hazardous materials inspectors.

TABLE 2

STATE PARTICIPATION PROGRAM
(CY 1992)

Number of State Safety Inspectors as of December 31, 1992

<u>State</u>	<u>Track</u>	<u>Motive Power & Equipment</u>	<u>Operating Practices</u>	<u>Signal & Train Control</u>	<u>Hazmat</u>
Alabama	2	2			
Arizona	1 ²	2	1		1
California	4 ²	6 ¹	4		2
Connecticut	1				
Florida	3	2	2		
Illinois	4				3 ³
Iowa	3				
Kansas	1				
Maine	2				
Maryland	1	1	1		
Minnesota	2				
Missouri	2				1 ¹
Montana	1				
Nebraska	1	1			
Nevada	1	1			
New Hampshire	1				
New York	3	3			
North Carolina	2	1			
Ohio	3	4			1 ¹
Oklahoma	1				
Oregon	2	2			1 ¹
Pennsylvania	3	3	1		
South Carolina	1	1			
Tennessee	2	2	1	1	
Texas	4	3	2	1	3 ³
Utah	1	1			
Virginia	2				
Washington	1	1 ¹			1 ¹
West Virginia	2	3	2	1 ¹	1
Total	57	39	14	3	14

¹ One trainee

² Two trainees

³ Three trainees

TABLE A-1

SUMMARY OF ALL CASUALTIES BY TYPE OF ACCIDENT/INCIDENT AND TYPE OF PERSON

PAGE 1

Type Accident/Person	X Of Total		Total Cases		...Killed...		..Injured..		..Illness..	
	1991	1992	1991	1992	1991	1992	1991	1992	1991	1992
TRAIN ACCIDENTS - RAIL EQUIPMENT ACCIDENT/INCIDENT CASUALTIES										
EMPLOYEE ON DUTY.....	.96	.59	236	133	9	4	220	127	7	2
EMPLOYEE NOT ON DUTY..	.04	---	11	---	---	---	7	---	4	---
PASSENGER ON TRAIN...	.16	.13	40	30	8	---	32	30	---	---
NONTRESPASSER.....	.20	.03	50	6	---	1	50	5	---	---
TRESPASSER.....	.03	.02	7	4	2	1	5	3	---	---
CONTRACTOR EMPLOYEE..	.00	---	1	---	---	---	1	---	---	---
TOTAL.....	1.40	.77	345	173	19	6	315	165	11	2
TRAIN INCIDENT CASUALTIES										
EMPLOYEE ON DUTY.....	11.31	9.57	2,789	2,144	13	19	2,695	2,062	81	63
EMPLOYEE NOT ON DUTY..	.02	.08	6	17	1	---	5	17	---	---
PASSENGER ON TRAIN...	.38	.48	94	107	---	3	94	104	---	---
NONTRESPASSER.....	.16	.20	39	45	13	6	26	39	---	---
TRESPASSER.....	3.95	4.40	973	985	509	512	464	473	---	---
CONTRACTOR EMPLOYEE..	.09	.10	21	22	3	8	18	14	---	---
TOTAL.....	15.90	14.83	3,922	3,320	539	548	3,302	2,709	81	63
NONTRAIN INCIDENT CASUALTIES										
EMPLOYEE ON DUTY.....	66.86	68.02	16,488	15,231	12	10	15,906	14,427	570	794
EMPLOYEE NOT ON DUTY..	1.40	1.30	346	290	---	1	343	286	3	3
PASSENGER ON TRAIN...	.95	.82	234	183	---	---	234	183	---	---
NONTRESPASSER.....	1.42	1.57	350	351	3	5	347	346	---	---
TRESPASSER.....	.32	.37	78	82	13	20	65	62	---	---
CONTRACTOR EMPLOYEE..	.80	.95	197	212	---	2	195	210	2	---
TOTAL.....	71.74	73.01	17,693	16,349	28	38	17,090	15,514	575	797
RAIL-HIGHWAY GRADE CROSSING ACCIDENT/INCIDENT CASUALTIES (EXCLUDED FROM ABOVE CATEGORIES)										
EMPLOYEE ON DUTY.....	.60	.71	148	158	1	2	142	146	5	10
EMPLOYEE NOT ON DUTY..	---	.00	---	1	---	---	---	1	---	---
PASSENGER ON TRAIN...	.09	.37	22	82	---	---	22	82	---	---
NONTRESPASSER.....	8.74	8.76	2,155	1,962	468	461	1,687	1,501	---	---
TRESPASSER.....	1.52	1.54	374	344	139	113	235	231	---	---
CONTRACTOR EMPLOYEE..	.01	.01	3	3	---	1	3	2	---	---
TOTAL.....	10.96	11.39	2,702	2,550	608	577	2,089	1,963	5	10
GRAND TOTALS BY TYPE OF PERSON										
EMPLOYEE ON DUTY.....	79.72	78.89	19,661	17,666	35	35	18,963	16,762	663	869
EMPLOYEE NOT ON DUTY..	1.47	1.38	363	308	1	1	355	304	7	3
PASSENGER ON TRAIN...	1.58	1.80	390	402	8	3	382	399	---	---
NONTRESPASSER.....	10.52	10.56	2,594	2,364	484	473	2,110	1,891	---	---
TRESPASSER.....	5.81	6.32	1,432	1,415	663	646	769	769	---	---
CONTRACTOR EMPLOYEE..	.90	1.06	222	237	3	11	217	226	2	---
TOTAL.....	100.00	100.00	24,662	22,392	1,194	1,169	22,796	20,351	672	872

NOTE: Rail-highway crossing casualties include those occurring at both public and private crossings

TABLE A-2

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(EST) COMPARISON OF JANUARY

1991 - DECEMBER 1992 RAIL EQUIPMENT ACCIDENTS BY CAUSE

CAUSES	NBR OF ACCS 1991	NBR OF ACCS 1992	\$DAMAGE 1991	\$DAMAGE 1992	KILLED 1991	KILLED 1992	INJURED 1991	INJURED 1992	HAZMAT RELEASE 1991	HAZMAT RELEASE 1992
TRACK, ROADBED AND STRUCTURES										
ADDED DEFECTS.....	43	51	4,491,105	5,326,877	0	0	4	7	1	0
ACK GEOMETRY.....	390	335	23,866,673	18,454,802	0	0	11	23	4	1
IL, JOINT BAR AND RAIL ANCHORING...	238	189	22,190,769	17,290,126	0	0	3	4	8	4
OGS, SWITCHES AND TRACK APPLIANCES.	255	226	7,713,718	6,629,676	0	0	3	4	2	1
HER WAY AND STRUCTURE.....	26	26	1,166,779	595,943	0	0	3	0	0	0
GNAL AND COMMUNICATION FALURES.....	16	19	527,119	690,146	0	0	3	0	0	0
TRACK TOTALS.....	968	846	59,956,163	48,987,570	0	0	27	38	15	6
MECHANICAL AND EQUIPMENT FAILURES										
AKES.....	48	41	3,345,930	1,982,695	0	0	5	11	2	0
AILER OR CONTAINER ON FLATCAR.....	2	1	23,500	19,360	0	0	0	0	0	0
DY.....	28	27	1,313,603	1,472,354	0	0	0	2	0	2
UPLER AND DRAFT SYSTEM.....	64	40	4,581,300	2,005,438	0	0	1	0	1	1
UCK COMPONENTS.....	72	55	8,906,895	5,272,805	0	0	0	0	5	1
LES AND JOURNAL BEARINGS.....	63	75	13,521,175	5,901,554	0	1	9	3	5	0
EELS.....	75	74	11,518,700	6,528,611	0	0	1	0	2	1
COMOTIVES.....	24	17	3,944,401	885,296	0	0	2	0	0	0
ORS.....	6	3	266,556	29,200	0	0	0	0	0	0
IERAL MECHANICAL ELECTRICAL FAILURE	33	16	714,008	432,393	0	0	0	0	0	0
EQUIPMENT TOTALS.....	415	349	48,136,068	24,529,706	0	1	18	16	15	5
TRAIN OPERATION - HUMAN FACTORS										
AKES, USE OF.....	137	161	7,220,652	6,924,586	0	2	10	11	2	4
PLOYEE PHYSICAL CONDITION.....	1	1	3,549,387	25,900	0	0	1	0	0	0
AGGING, FIXED, HAND & RADIO SIGNALS	39	34	4,636,585	3,579,856	2	1	26	17	1	1
NERAL SWITCHING RULES.....	204	245	5,330,762	5,828,142	0	1	23	14	2	2
IN TRACK AUTHORITY.....	55	44	15,462,506	1,546,176	3	0	30	11	1	0
AIN HANDLING/TRAIN MAKE-UP.....	178	136	15,767,360	5,034,437	0	0	7	1	4	3
EED.....	66	50	6,302,221	3,566,372	0	0	29	7	0	1
ITCHES, USE OF.....	140	147	7,870,630	5,729,192	1	1	9	15	0	0
B SIGNALS.....	0	0	0	0	0	0	0	0	0	0
SCCELLANEOUS.....	67	33	4,673,747	1,089,685	0	0	15	5	0	0
HUMAN FACTOR TOTALS.....	887	851	70,813,850	33,324,346	6	5	150	81	10	11
MISCELLANEOUS										
VIRONMENTAL CONDITIONS.....	23	20	3,436,834	3,475,143	3	0	12	1	0	0
ADING PROCEDURES.....	50	42	3,356,347	3,182,348	1	0	1	1	1	2
GHWAY-RAIL GRADE CROSSING ACCIDENTS	156	167	13,275,120	8,028,238	30	28	134	211	1	1
USUAL OPERATIONAL SITUATIONS.....	162	104	7,725,575	4,107,152	0	0	65	9	4	1
HER MISCELLANEOUS.....	153	132	16,237,038	8,106,446	9	0	53	27	1	1
MISCELLANEOUS TOTALS.....	544	465	44,030,914	26,899,327	43	28	265	249	7	5
TOTAL ALL CAUSES.....	2,814	2,511	222,936,995	133,740,949	49	34	460	384	47	27
TOTAL 1991 RECORDS PROCESSED=>	3,479									
TOTAL 1992 RECORDS PROCESSED=>							3,103			

APPENDIX B

The Federal regulations and orders that have been issued under FRSA and which were in effect during 1992 are:

Railroad Safety Enforcement Procedures
(49 CFR Part 209)

Rule of Practice
(49 CFR Part 211)

Track Safety Standards
(49 CFR Part 213)

Railroad Workplace Safety
(49 CFR Part 214)

Railroad Freight Car Safety Standards
(49 CFR Part 215)

Special Notice and Emergency Order Procedures
(49 CFR Part 216)

Railroad Operating Rules
(49 CFR Part 217)

Railroad Operating Practices
(49 CFR Part 218)

Control of Alcohol and Drug Use
(49 CFR Part 219)

Radio Standards and Procedures
(49 CFR Part 220)

Rear End Marking Device--Passenger, Commuter, and Freight Trains
(49 CFR Part 221)

Safety Glazing Standards--Locomotives, Passenger Cars, and
Cabooses (49 CFR Part 223)

Railroad Accidents/Incidents: Reports Classification and
Investigations (49 CFR Part 225)

Hours of Service of Railroad Employees
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(49 CFR Part 229)

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(49 CFR Part 233)

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(49 CFR Part 234)

Instructions Governing Applications for Approval of a
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APPENDIX C

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5. Residual Stress Measurements of Weldments of Retrofitted Tank Cars; W. R. Larson, B. R. Rajkumar; FRA/ORD-92/05;
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