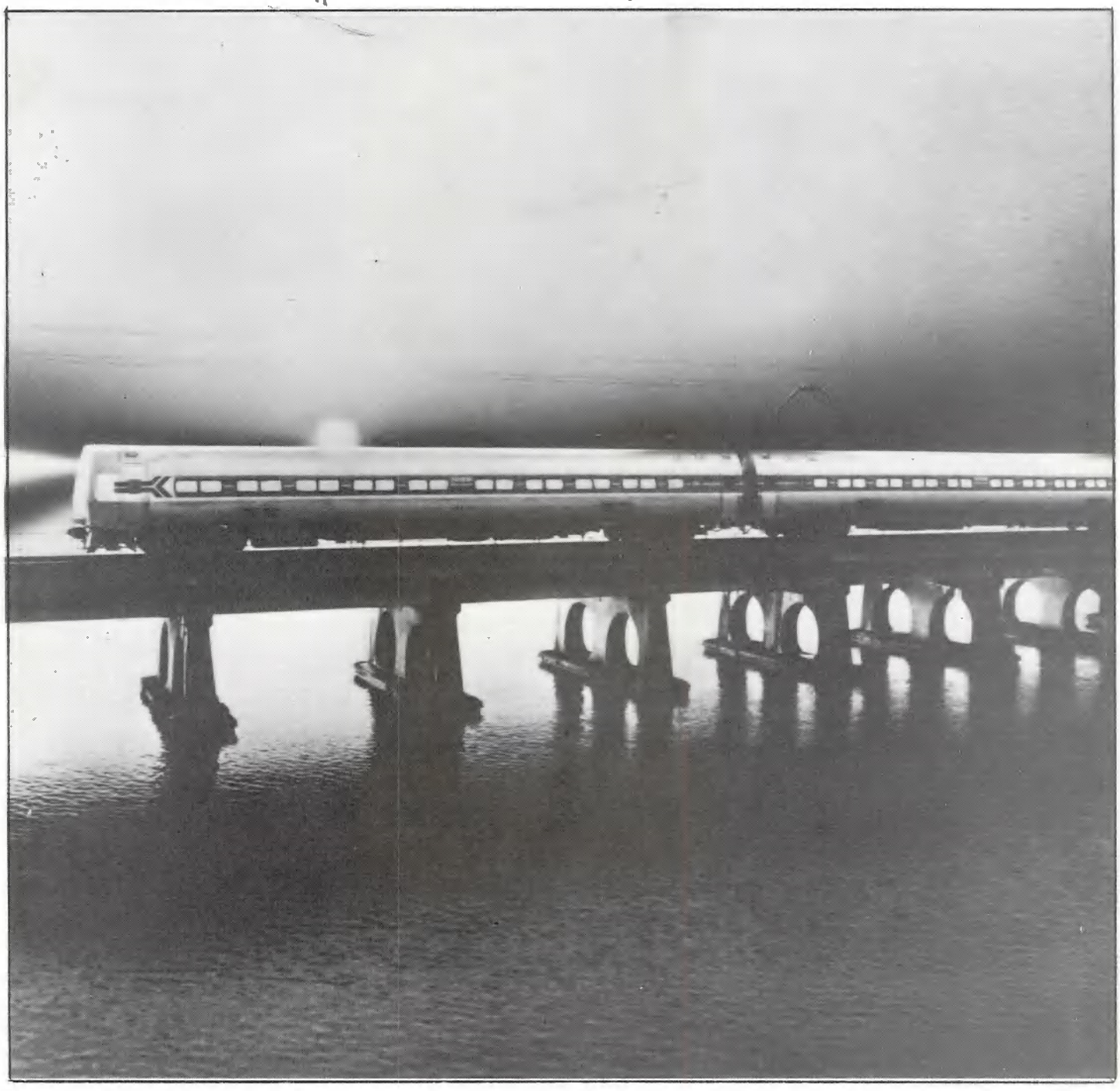
U.S. Department
of Transportation

**Federal Railroad
Administration**

Railroad Passenger Equipment Safety

A Report to Congress

Office of Safety January 1984



THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

January 14, 1984

The Honorable George Bush
President of the Senate
Washington, D.C. 20510

Dear Mr. President:

It is my pleasure to submit to the Congress this report as required by section 202 of the Federal Railroad Safety Act of 1970, as amended in 1983. The report presents the results of the Department of Transportation's comprehensive examination of railroad passenger safety, including consideration of equipment, track, operating practices, and emergency procedures. This examination considered only those providers of rail passenger service subject to the federal rail safety laws.

Railroad passenger service in the United States has compiled an excellent safety record, which is attributable to the industry's operational and safety practices as well as the effect of the Department's extensive safety regulations. During the five-year period 1978-1982, when 1.5 billion passengers were transported, railroad operations resulted in only 10 fatalities and 1,006 injuries.

Seeking to continue this record, the Federal Railroad Administration is undertaking several initiatives to enhance rail passenger safety: extension of FRA's track safety standards to all track used exclusively for commuter service; issuance of guidelines on the flammability and smoke emission characteristics of materials used in construction of rail passenger equipment; a special safety inquiry to assess the potential impact of technological changes in passenger equipment components; and a joint FRA-industry effort to ensure that adequate emergency procedures are in use by all railroad passenger service providers.

We are confident that these initiatives will make positive contributions to railroad passenger safety.

Sincerely,

Elizabeth Hanford Dole

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Enclosure

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WASHINGTON, D.C. 20590

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Speaker of the House of Representatives
Washington, D.C. 20515

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Report to Congress

on Railroad Passenger Equipment

Executive Summary

This Report presents the results of the Federal Railroad Administration's comprehensive examination of railroad passenger safety in response to section 702 of the Rail Safety and Service Improvement Act of 1982.

Rail passenger service in the United States has compiled a superior safety record that can be attributed to the rail industry's operational and safety practices as well as the effect of FRA's extensive safety regulations. To enhance that record, FRA is undertaking several rail passenger safety initiatives:

- Commuter Track. Consistent with a Congressional mandate, FRA is issuing a final rule extending its Track Safety Standards to include all track used exclusively for rail commuter service.
- Power Brake. To ensure continued inspection and testing of passenger car brakes, FRA is amending its Power Brake Standards, which refer to industry rules that have been cancelled.
- Flammability. FRA is issuing guidelines consistent with those developed by the Urban Mass Transportation Administration on the flammability and smoke emission characteristics of materials used in the construction of rail passenger equipment.
- Special Safety Inquiry. FRA will convene a Special Safety Inquiry to assess the potential impact of technological changes in passenger equipment components, such as wheels, axles, bearings, and brakes.

- Emergency Procedures. FRA will sponsor an industry-wide review of emergency procedures by passenger service providers to ensure that adequate measures for emergency preparedness are in use throughout the systems within its jurisdiction.

FRA is confident that its comprehensive review of rail passenger safety and the resulting initiatives described in this Report will contribute to maintaining the rail industry's excellent passenger safety record.

I

BACKGROUND

Section 702(a) of the Rail Safety and Service Improvement Act of 1982, enacted on January 14, 1983, amended section 202(h)(1) of the Federal Railroad Safety Act of 1970 (45 U.S.C. § 431(h)(1)) (Safety Act) to provide, in pertinent part:

> (A) The Secretary [of Transportation] shall, within one year after the date of enactment of the Federal Railroad Safety Authorization Act of 1982, issue such initial rules, regulations, orders, and standards as may be necessary to insure that the construction, maintenance, and operation of railroad passenger equipment maximize safety to rail passengers. . . .
>
> (B) The Secretary shall submit to the Congress a report within one year after the date of enactment of the Federal Railroad Safety Authorization Act of 1982 with respect to rules, regulations, orders, and standards issued under subparagraph (A) of this paragraph which describes any rules, regulations, orders, and standards issued or to be issued under this subsection, explains the reasons for their issuance, and compares them to comparable Federal regulations and procedures which apply to other modes of transportation, especially those administered and enforced by the Federal Aviation Administration.

In response, the Federal Railroad Administration (FRA) has undertaken a comprehensive examination of all safety issues associated with this country's rail passenger system and has developed initiatives to further enhance rail safety.

In the course of its study, FRA has reviewed all applicable regulations, guidelines, and research on passenger equipment and operations. It has considered relevant recommendations of the National Transportation Safety Board. In addition, FRA consulted with other transportation regulatory

agencies, including the Federal Aviation Administration, the Federal Highway Administration, the National Highway Traffic Safety Administration, the Urban Mass Transportation Administration and the United States Coast Guard, and with the Association of American Railroads.

FRA examined the operations and maintenance practices of the 20 railroads or commuter authorities that operate railroad passenger equipment used in commuter or intercity service. Finally, FRA studied rail passenger accident and casualty data for the five-year period 1978-1982. FRA's review was based on a conceptual framework comprised of three broad categories: accident prevention, accident mitigation, and emergency preparedness.

II

PASSENGER EQUIPMENT AND OPERATIONS

Twenty rail passenger operators, including commuter authorities, provide (directly or indirectly) regularly scheduled rail passenger revenue service throughout the year. Appendix A lists those operators and authorities, provides information on the passenger operations of each member of that group, and illustrates the locations at which such passenger service is provided.

The 20 operators and authorities (passenger service providers) provide passenger service over 138 distinct routes totalling 28,500 route miles. In 1982, this group operated more than 1.5 million trains, comprised of from one to 18 cars, and carried 344 million passengers. The operators and authorities employ more than 9,200 train operating employees and almost 13,000 equipment maintenance and service personnel.

A wide variety of equipment of differing age and design features is dedicated to providing rail passenger service. More than 750 diesel-electric and electric locomotives are used to haul 3,770 passenger-carrying coaches and control cab cars. In addition, approximately 3,000 self-propelled, passenger-carrying units, which include diesel-electric, electric, and turbo powered equipment, are in service.

Rail passenger service providers fall into three categories: long distance, commuter, and excursion/other. Long distance rail passenger operators are the National

Railroad Passenger Corporation (Amtrak) and the Alaska Railroad. Amtrak receives federal capital and operating subsidies, and the Alaska Railroad is owned and operated by the federal government. Amtrak operates 63 routes over 23,000 route miles and employs 2,000 operating and 5,900 equipment maintenance workers. Amtrak carried 19 million passengers in 1982, which represents 5.5 percent of the total number of rail passengers carried that year. Amtrak's four billion passenger miles in 1982 represents 38 percent of the rail-passenger miles generated by intercity and commuter service. An average passenger-trip on Amtrak trains was 210 miles in 1982, compared with less than 30 miles for the average commuter-trip. The Alaska Railroad, which operates four routes over 478 route miles, carried 179,154 passengers in 1982.

Railroad commuter operators and authorities, which provide short-haul commuter service in metropolitan areas, carried 324 million passengers in 1982, which produced 6.4 billion passenger miles. Typically, scheduled service is provided throughout the work day over a limited number of routes, but is more frequent during the morning and evening rush hours. Ten of the operators in this category are private freight railroads providing service under contracts with public agencies. The four largest passenger operators in this group carried 56 million passengers during 1982 in metropolitan Chicago (Chicago and Northwestern, Illinois Central Gulf, and Burlington Northern) and Boston (Boston and Maine). The six smaller

operators carried approximately eight million passengers during 1982 in and around the cities of San Francisco (Southern Pacific), Chicago (Chicago South Shore and South Bend and Norfolk and Western), Detroit (Grand Trunk Western, discontinued October 17, 1983), Pittsburgh (Pittsburgh and Lake Erie and Baltimore and Ohio), and Washington, D.C./Maryland (Baltimore and Ohio).

Commuter authorities or publicly owned railroads provided rail passenger service for about 260 million passengers in 1982. The largest operator is the Long Island Rail Road, which carried 83 million passengers in 1982, or 26 percent of all commuter passengers carried in the United States that year. The next five largest passenger carrying authorities are Port Authority Trans-Hudson, Metro North Commuter Railroad, New Jersey Transit Rail Operations, Inc., Southeastern Pennsylvania Transportation Authority (SEPTA), and the Northeast Illinois Regional Commuter Rail Corporation (NIRC). The first three transported about 134 million passengers during 1982 in the New York City metropolitan area. In the same year, SEPTA and NIRC carried approximately 20 and 13 million passengers, respectively, in and around the cities of Philadelphia and Chicago. Two smaller authorities, the Staten Island Rapid Transit-Operating Authority and the San Diego Metropolitan Transit Development Board provided service to a total of ten million passengers in 1982 in the metropolitan areas of New York and San Diego.

Passenger operations providing service exclusively for excursion, educational, recreational, or private transportation purposes using historical or antiquated equipment were not considered in FRA's safety review. Such operations typically involve low-speed trains carrying very limited numbers of passengers on a seasonal basis. FRA has not found and is not aware of any safety concerns arising from such operations that warrant discussion in this Report. In addition, FRA has not examined rail rapid transit operations, which generally fall outside FRA's safety jurisdiction.

III

RAIL PASSENGER SAFETY

Rail passenger service in the United States has compiled a remarkable safety record, which is reflected in the passenger casualty statistics derived from reports filed with FRA by all railroads (including the commuter authorities) under its accident reporting rules. In its analysis, FRA has used rail passenger accident data for the five most recent calendar years for which complete and reliable information is available (1978-1982). During that period, when the rail passenger industry carried 1.5 billion passengers, 36 passenger fatalities and 3,642 passenger injuries were associated with rail passenger service. Of the 36 fatalities, 26 were not associated with train operations.

RAIL PASSENGER CASUALTIES - 1978-1982

CAUSE	FATALITIES	INJURIES
Operational Accidents		
Track	1	87
Operating Practices	4	606
Equipment	0	49
Grade Crossing	0	41
Other (e.g., Vandalism, Fire, Objects Fouling Track)	5	1,006
Non-Operational Accidents		
Getting On or Off Trains, Stumbling, Slipping, or Falling	22	1,667
Assaults	4	186
Total	36	3,642

During this period, passenger trains were also involved in accidents that resulted in 90 deaths and 573 injuries to non-rail passengers: 73 of those killed and 37 of those injured were occupants of motor vehicles involved in rail-highway grade crossing accidents; fifteen of those killed and 527 of those injured were railroad employees; and two trespassers were killed and nine injured.

As these data show, extraordinarily few passenger casualties occurred during the five-year period. Of the 1.5 billion passengers transported during those years, a single passenger had a one in 400,000 chance of becoming a passenger casualty and a one in 40 million chance of becoming a passenger fatality.

The safety record for rail passenger service is also noteworthy in comparison to other forms of transportation. Passenger casualty statistics on file with FRA and analogous reports graphically demonstrate the sound safety record of rail passenger service. Indeed, for the period 1976 through 1980, the passenger fatality rate for travel by rail is comparable to other public carrier modes. All public carriers have achieved excellent safety records; however, several accidents with fatalities can greatly affect the year-to-year rankings. The following table presents comparable data for a five-year period.

Passenger Fatalities Per 100 Million Passenger Miles 1976-1980 [1]

Air Carrier (Scheduled Domestic)	.04
Railroad Passenger Trains	.06
All Buses	.15
Class I Intercity Buses [2]	.04
Passenger Auto and Taxi	1.32

FRA attributes this excellent record to the longstanding quality of the rail industry's operational and safety practices as well as FRA's safety regulations. A summary of FRA's rail safety regulations governing the three major elements of railroad operations--equipment, track, and operating practices--is presented in Appendix B. Most of these regulations are applicable to passenger operations. FRA regulates, for example, the condition of the track over which passenger trains operate; the maintenance and inspection of locomotives and self-propelled cars used in passenger service; the installation, inspection, and maintenance of signal systems protecting and governing passenger trains' movements; and the instruction and testing of railroad employees on the operating rules under which passenger service is provided.

1/ Source: National Transportation Statistics, Transportation Systems Center, Department of Transportation, November 1982, p. 60. Comparative statistics for years after 1980 cannot be shown because total passenger mile figures for buses, automobiles, and taxis are no longer gathered.

2/ Class I bus carriers provide approximately 60 percent of total intercity bus passenger miles. Source: 1981 Report of the American Bus Association.

IV

ACCIDENT PREVENTION

The prevention of train accidents--whether passenger or freight--is the primary purpose of FRA's rail safety program. In addition to oversight of track, rolling equipment, and train service personnel, safe rail operations require a recognition of the many threats to safety from outside the system, including encroachments at grade crossings and vandalism. Safety is also a concern from the moment a rail passenger arrives at the train station until he or she boards a train.

Track

During the five-year period 1978-1982, one rail passenger was killed and 87 were injured in passenger train accidents caused by track conditions. (This fatality and 24 of the injuries occurred in a single accident involving track washed out by a flood.) In addition, 155 railroad employees were injured in such accidents.

Adequate maintenance of railroad track structures is crucial to the safe operation of passenger trains. In recognition of this critical relationship, the Track Safety Standards were the first rules FRA adopted after Congress provided the necessary regulatory authority in the Federal Railroad Safety Act of 1970. With one exception, these standards have applied to all track over which regularly scheduled rail passenger service is operated. Consistent with a Congressional mandate, FRA is now extending coverage of these regulations to those passenger tracks not previously included:

approximately 350 miles of track used exclusively for commuter or other short-haul passenger service in metropolitan areas.

All passenger tracks must meet standards that specifically address the discrete safety needs of passenger service. FRA's track regulations establish particularized speed limits for passenger trains based on specific track maintenance requirements. Train speeds can range up to 110 mph, with speeds of 80 mph or more requiring special signal system controls. The regulations also impose rail flaw detection inspection requirements for track over which passenger trains operate that are more stringent than the standards applicable to track used exclusively for freight operations. The specific regulations include detailed, minimum requirements for the condition of and geometry parameters for various track components, such as the ballast, crossties, rail fastenings, and the rail itself. FRA regulations require periodic inspection of all track structures by qualified railroad personnel, including trackage used for passenger service. FRA monitors this activity using an automated track inspection vehicle and qualified federal and state inspectors, and that monitoring effort has increased from inspection of 162,400 miles of track in 1978 to 275,500 miles of track in 1982.

In 1982 Congress amended the Federal Railroad Safety Act of 1970 to require that FRA issue regulations to apply appropriate safety principles to track used for commuter service. Because FRA determined that track used exclusively for commuter service poses no

unique safety hazards that are not addressed by the existing regulations, FRA has concluded that extension of its existing standards to commuter track is appropriate. This change will result in the application of the existing track standards to 350 miles of track in the vicinity of eight major cities. Approximately 150 miles of this track are located in station areas, coach yards, and repair shop areas, and the rest on main lines.

Equipment

No passengers were killed and 49 passengers were injured in passenger train accidents caused by defective equipment during the five-year period studied. In addition, 48 railroad employees were injured.

Proper maintenance and inspection of rail passenger equipment is a second critical element of safety. As a result of its review of passenger equipment regulations and industry standards as an element of passenger safety, FRA is taking two actions: (1) amending its power brake rules to ensure continued inspection and testing of passenger car power brake systems, and (2) convening a Special Safety Inquiry in 1984 to explore the impact of technological changes in the passenger service industry in order to assess the need for uniform standards for safety-critical components of passenger cars.

Locomotives used in passenger service have either electric, diesel-electric, or turbine-driven propulsion systems. Hauled vehicles are those passenger-carrying cars, such as coaches,

sleepers, and food service cars, that require separate locomotive power. Self-propelled vehicles resemble traditional passenger coaches, but are equipped with their own propulsion systems that permit them to move as a single unit or in multiple units.

Self-propelled passenger vehicles are subject to FRA's Locomotive Safety Standards. These rules establish minimum requirements for the significant mechanical and structural components of locomotives. The rules address the condition of wheels and axles in terms of stress or fatigue cracking and wear. Similarly, the rules set standards for the brake, suspension, coupling, and electrical systems as well as the crashworthiness of the car body. In addition, specific inspection and testing procedures are required. Locomotives and self-propelled vehicles are also subject to FRA's Safety Appliance Standards, which specify design features for exterior steps, ladders, and handholds.

Coaches, sleepers, baggage, and food service cars are subject to FRA's Power Brake Standards and Safety Appliance Standards. The Power Brake rules establish minimum operational and periodic inspection requirements and minimum periodic testing requirements for the brake systems on these cars. In addition, approximately 300 of these vehicles are equipped with a control compartment and

control machinery that permit these cars to remotely control attached locomotives. These are known as "cab control cars." The control devices must be inspected and tested as though they were located on a locomotive.

The extremely low incidence of casualties resulting from equipment defects is noteworthy. However, the foundation for this record has been the standards set by the industry during the period when private railroads operated extensive passenger services and interchanged cars among the various railroads. With the emergence of public funding as the basis for continuation of intercity and rail commuter services, the private sector's involvement has changed from owner-operator to contract-operator.

Since railroad passenger cars were, until recently, primarily owned by individual railroads, their operation over the lines of other railroads necessitated standard agreements for the purpose of interchange. These agreements generally reflected consensus opinions regarding design, inspection, testing, and maintenance. While these agreements did not have the force of regulation, they established the guidelines the industry followed. Effective January 1, 1984, the AAR cancelled the interchange rules and republished them as recommended industry practices.

Accordingly, FRA is amending its Power Brake Standards to ensure continued inspection and testing of the brake systems on passenger cars. FRA has determined this action to be necessary because of the Association of American Railroad's recent decision to delete from

its interchange rules the provisions concerning passenger cars, including brake systems. Certain FRA brake inspection and testing requirements were keyed to the AAR's rules. Without this amendment, FRA's requirements would not have effective referents.

FRA intends to closely monitor the effect of the change. In a Special Safety Inquiry to be convened in 1984, FRA will explore with the passenger service providers the technical and operational changes occurring in the industry that may have an adverse effect on its excellent safety record and the need to establish a uniform set of minimum criteria for the condition of various safety-critical components such as wheels, axles, and bearings.

Operating Practices

The human element is the most critical factor in safe railroad operation. Failure to follow safe operating practices is the major cause of passenger train accidents; such failures resulted in four passenger fatalities and 606 injuries during the 1978-1982 period. In addition, these accidents resulted in the deaths of ten employees, the injury of 208 employees, and the death of one trespasser during the five-year period.

More than 9,200 employees work in passenger train operations. These workers, who include engineers and conductors, are augmented by 13,000 others who perform maintenance and operational functions. To assure that these workers perform their interrelated tasks safely and efficiently, each passenger service operator has adopted a wide range of procedures and rules generally referred to as operating practices.

Since 1976, FRA has required that these operating practices, which include a railroad's operating rules, timetables, special instructions, and general orders, be filed with the agency. In the event FRA's review of these operating practices indicates a deficiency, FRA works with the individual operator to correct the problem. All 20 operators and authorities providing regularly scheduled passenger service have filed their operating practice rules with FRA.

FRA requires that carrier operating personnel be trained and periodically tested on applicable operating practices. Each operator trains all of its operating personnel, including line supervisors, train and engine crews, and dispatchers. This training consists of both introductory programs for new employees and a minimum of 20 hours of refresher training annually. In addition, each operator conducts periodic testing programs to monitor employee compliance with operating rules during the routine performance of their tasks.

FRA rules require that passenger operations at speeds higher than 60 mph be augmented with automatic block signal systems or a manual block signal systems that meets FRA's standards. More sophisticated signal systems are required when passenger trains are

operated at the highest speeds, such as in the Northeast Corridor. Virtually all passenger service operators conducts operations within signalized territory.

In the human factors area, a specific problem now being addressed by FRA and the industry is the use of alcohol and drugs by railroad employees involved in railroad operations. FRA issued a public notice in July 1983 describing the problem and the options available to FRA. Public hearings have been completed and comments reviewed, and FRA is presently considering options for addressing the problem. FRA has not identified any aspect of alcohol and drug use that is unique to either passenger or freight operations; therefore, FRA believes that any related rail safety problems are best addressed in the context of the current rulemaking.

Grade Crossings

Even where passenger operators provide safe track, equipment, and operating practices, an accident-free environment is not guaranteed. Highways and railroads cross at more than 350,000 public and private grade crossings throughout the country. Further, the opportunities for vandalism on railroad property and other encroachments on the railroad right-of-way are limitless. The most serious safety issue involves motor vehicle rail/highway accidents at grade crossings.

During the period January 1978 through December 1982, 222 grade crossing accidents involving passenger trains resulted in 69 fatalities and 143 injuries. Sixty-six of these fatalities and 45

of the injured were occupants of motor vehicles or trespassers. These accidents also resulted in three deaths and 57 injuries among railroad employees. Only 41 injuries and no deaths occurred among rail passengers.

FRA has had a continuing interest in improving safety at grade crossings for all rail operators. FRA maintains a comprehensive computerized data base regarding every rail-highway crossing in the United States. Begun in 1975 as a cooperative industry, state, and federal initiative, this inventory makes available detailed information about the location, site characteristics, and operating data for every crossing. This inventory is kept current through the voluntary submission of information by states and railroads.

FRA developed and continues to fund a Departmental computer-based model that allows railroads and the states access to the inventory, accident history, accident predictions, warning device cost and effectiveness data, and budget limitations in developing a list of suggested rail-highway crossing improvement projects based on cost-to-benefit ratios.

Because of the difficulty of quickly stopping any train, the focus for accident prevention programs in the Department has been on improving the safety of motor vehicle movements over crossings. FHWA, under section 203 of the 1973 Highway Safety Act, as amended, has been dedicating a portion of the Highway Trust Fund for rail-highway crossing safety improvements. The Department believes that the "203" program has been a major factor in the reduction of

accidents and casualties in the last decade. Approximately 15,000 public rail-highway crossings have been equipped with automated train-activated devices using "203" funding, bringing the total number of crossings equipped with some sort of automated warning device to 54,000.

Complementing the "203" program has been Operation Lifesaver, a program of public education, law enforcement, and engineering. The National Safety Council, with sponsorship from the AAR and Amtrak, functions as a national coordinator for the program, which is active in more than 30 States.

The effectiveness of these various rail-highway crossing programs is shown by the signficant decrease in such accidents: accidents, fatalities, and injuries decreased by 43, 44, and 41 percent, respectively, between 1978 and 1982. Over the same period, the potential exposure (vehicle miles x train miles) was down only 18 percent.

FRA is now developing two additional rail-highway crossing initiatives to further improve grade crossing safety. First, FRA will become directly involved in Operation Lifesaver activities. Second, FRA will seek to promote low cost safety improvements at those crossings that, because of less frequent rail and highway traffic, will not economically justify automated warning devices.

Vandalism and Miscellaneous Incidents

During the period 1978 through 1982, a series of random, isolated events caused five fatalities and 1,006 injuries to rail passengers. These kinds of events also caused two employee fatalities, 59 employee injuries, one trespasser fatality, and one trespasser injury. These events included sporadic acts of vandalism (such as misaligning switches, leaving objects fouling the track structure, and throwing objects at trains), on-train fires, and loads that shifted on freight cars.

Because of the sporadic nature of these events and their lack of commonality, it is not practical to devise effective preventive measures. An exception is vandalism involving rocks or other objects thrown at train windows. Since 1980, FRA has required the installation of improved glazing in all new locomotives, self-propelled passenger cars, hauled passenger cars, and cabooses and retrofitting of existing equipment. These glazing materials will resist the impact of small objects moving at high velocity and large objects moving at lower velocity. The size of the existing fleet and service requirements have resulted in some delay to the total retrofitting of the fleet. However, the work should play a significant role in the prevention of future casualties.

Non-Operational Accidents

A major cause of the relatively few passenger casualties is stumbling, slipping, or falling, generally in close proximity to a train that passengers were boarding or exiting. These casualty figures--22 fatalities and 1,667 injuries--represent over 60 percent of all the passenger fatalities and over 45 percent of all the injuries suffered by rail passengers during the 1978-1982 period. Only limited factual information is available to FRA concerning these incidents.

Non-operational accidents also constitute a major cause of casualties for rail rapid transit operators. In order to obtain a better analysis of this issue, the Port Authority Trans-Hudson Corporation (PATH), which provides a rapid transit service but is subject to FRA's safety jurisdiction because of its traditional railroad ancestry, is conducting a study of the issue under Urban Mass Transportation Administration funding. This study is scheduled for completion in February 1984 and includes investigation into the design of handrails and the surface friction differentials of various floor surfaces. Given the difficulty inherent in managing these risks through federal regulation, FRA will carefully consider the conclusions reached in the UMTA/PATH report.

Finally, a total of four fatalities and 186 injuries were caused by physical assaults. Recognizing that more than 1.5 billion passengers were transported during the five years of the study period and that passenger service operators employ a large force of security personnel to discourage criminal behavior, FRA does not perceive any legitimate federal role in addressing this problem.

V

ACCIDENT MITIGATION

Despite the low incidence of rail passenger service accidents, passenger operations will never be absolutely failsafe. Accordingly, FRA has examined measures to minimize casualties when accidents do occur.

In an accident situation, passengers face potential injury from four major sources: crushing due to deformation of the car body or penetration by an outside object or structure; ejection from the car; fire and its byproducts (smoke and toxic gases); and impacts with interior objects such as seats, posts, and racks.

Car Body Structure

FRA's regulations governing locomotives and self-propelled passenger vehicles and the AAR's design standards for passenger cars collectively cover all passenger vehicles for minimum car body structure strength. Since 1939, the AAR has issued extensive recommended specifications on structural strength of all types of passenger equipment. In addition, FRA has promulgated regulations that apply to all MU (multiple unit) rail vehicles built new after April 1, 1956, that are used to transport passengers in the United States. FRA's requirements are designed to prevent an MU passenger car from being crushed by adjoining cars if the train suddenly stops. Passenger equipment manufacturers have used the FRA and AAR standards, with few exceptions, in the design and construction of all types of railroad passenger equipment.

As discussed earlier, FRA regulations require passenger cars built or rebuilt after June 30, 1980, to have improved glazing materials in all windows to protect passengers from being struck by external projectiles during normal operations. In addition to serving that function, these materials also protect passengers from being thrown through windows if an accident occurs because they are highly resistant to breakage.

Finally, the typical rail car's substantial weight and the fact that the mass of the train prevents immediate cessation of movement mitigate the impact forces experienced by passengers in an accident.

Flammability and Smoke Emission

The occurrence of injury-threatening fires on rail passenger equipment is rare. Rail passenger operators carried 1.5 billion passengers during the years 1978 through 1982. Yet only three fires involving on-track passenger equipment resulted in passenger casualties in that five-year period. The most serious of these involved a fire that occurred aboard an Amtrak sleeping car near Gibson, California on June 23, 1982. That incident illustrates that every passenger car fire, despite its rarity, is a potential problem. Two passengers were killed in the accident and more than 50 others required treatment for smoke inhalation.

UMTA has sponsored considerable research on the flammability and smoke emission characteristics of various materials commonly used in the construction of rail transit passenger equipment. In 1974, UMTA issued its draft voluntary guidelines to rail transit authorities on the testing of and standards for flammability and smoke emission properties of materials used in such equipment. On November 26, 1982, UMTA sought public comments on revised voluntary guidelines, which address such equipment features as seat cushions, frames, shrouds and upholstery, wall panels, ceilings, partitions, windscreens, air conditioning ducts, windows, light diffusers, flooring and floor coverings, insulation (thermal, acoustic, and vibration), component box covers, and exterior shell. The Department of Transportation's Transportation Systems Center performs material testing and maintains a list of materials and products that meet the UMTA guidelines. These materials are also tested at the FAA's test center in Atlantic City, New Jersey. All of the flammability and smoke emission test data are available from the Department to interested parties.

Over half of the passenger service providers that have procured equipment in the last five years, including Amtrak, have required manufacturers and builders to meet the UMTA voluntary guidelines or similar standards developed by the American Society for Testing of Materials. FRA anticipates expanded use of the UMTA guidelines as procurement specifications by the passenger service operators and authorities.

Consistent with the satisfactory safety record in this area achieved by the passenger service providers and their expanding use of the UMTA guidelines, FRA proposes to follow the UMTA guidelines on flammability and smoke emission testing and performance criteria in publishing its guidelines.

FRA's involvement in this critical area will not cease with issuance of its guidelines. FRA will work actively with passenger service providers to ensure immediate use of those guidelines in the procurement of all new and rebuilt equipment. The degree of voluntary adherence to these guidelines will strongly influence future FRA determinations on appropriate actions to be taken in this important area. In addition, FRA will continue to work with other modal agencies (UMTA, FAA, NHTSA, and USCG) to identify emerging safety concerns that may have relevance to the rail environment.

Toxicity

Unlike flammability and smoke emission, there are no generally accepted performance criteria among experts on the toxicity of materials commonly used in the construction of passenger equipment. Recognizing that the toxicity issue is multi-modal, the Department will sponsor a symposium in August of 1984 to coordinate activities and disseminate available data. The symposium will be coordinated by the Transportation Research Board and will include participants from UMTA, NHTSA, USCG, FRA, FAA, the research community, and equipment suppliers and manufacturers.

Following this symposium, FRA and UMTA will consider guidelines on toxicity for materials used in rail transit and passenger vehicles. In the meantime, the use of fire and smoke emission guidelines will significantly decrease the potential toxicity problem. If the interior materials of a passenger car are difficult to ignite or are self-extinguishing, toxic releases are less likely.

Interior Design

Rail passengers have substantial protection against serious injury in a rail accident because of the average car's weight, rugged construction, and interior volume. Moreover, as noted earlier, the sheer mass of a train precludes immediate stoppage of movement, lessening a passenger's risk of impact with a car's interior features. The accident statistics for 1978-1982 do not indicate a safety problem attributable to any deficiency in interior design. FRA believes, however, that this complex subject merits additional study; it will consult with all interested parties, including Amtrak and passenger equipment manufacturers that have already made considerable efforts in the area. Among the subjects to be addressed are design and securement of seats, luggage retention, and interior contouring.

Emergency Systems

Emergency systems (lighting, communications, exits) and the placement of emergency tools in passenger equipment can

further lessen the risk of injury in an accident. FRA requires that all passenger cars constructed or rebuilt after June 30, 1980, have at least four emergency opening windows that can be manually operated and that all passenger cars built or rebuilt prior to July 1, 1980, meet the same requirement by July 1, 1984. Passenger service providers subject to these requirements are in compliance with the regulation.

With few exceptions, emergency systems and tools have been installed in the equipment operated by the passenger service providers. For example, over 90 percent of the passenger carrying equipment has fire extinguishers, emergency communications systems, and emergency tools, and over 97 percent has emergency lighting systems. Accident statistics show the effectiveness of these efforts. However, FRA will work actively with the passenger service providers, serving as a clearinghouse for, and advocate of, any initiatives that would improve safety.

VI

EMERGENCY PROCEDURES

FRA is aware that proper training of personnel and effective emergency response plans can play a critical role in avoiding serious injury or death when an accident occurs.

FRA has determined that several of the major passenger service operators and authorities do not have complete emergency evacuation procedures in place, and some others do not have formal emergency plan training programs for their employees. Although FRA's casualty data do not reflect any passenger casualties directly attributable to inadequate emergency planning, FRA intends to assume a leadership role in ensuring that all rail passenger providers have effective emergency procedures in place.

During the past several years, FRA has successfully employed cooperative safety initiatives in a variety of areas with many railroads. These efforts have been successful because of the participation of senior management and reliance on carrier cooperation to achieve the shared goal of improved safety. FRA is confident that similar results can be achieved in this area. Accordingly, FRA will work actively with each passenger service operator and authority to ensure that adequate emergency planning, training, and response plans are developed and implemented. Primary attention will be given to those passenger service providers discussed above that have incomplete programs in this critical area.

In working with the passenger service operators and authorities on emergency preparedness, FRA will stress the need to address the following subjects:

1. Emergency Plans - overall plans to deal with all aspects of an emergency.

2. Emergency Plan Training - periodic training and requalification of passenger service and operating personnel in the various emergency plans.

3. Emergency Simulations - practice responses to potential emergencies through simulated events.

4. Evacuation Procedures - evacuation planning in response to various types of emergencies, taking into account design differences in the equipment used.

5. First Aid Training - ensure that service and onboard personnel are capable of performing emergency first aid care (cardiopulmonary resuscitation, minor cuts, bruises, and burns, smoke inhalation) pending arrival of medical experts.

6. Notification for Emergency Response - plan for the participation of, and communication with, outside emergency response personnel if an emergency occurs, including notification, coordination of efforts, response time, and level of effort available from fire and police departments and medical resources.

7. Public Awareness Efforts - to educate passengers on emergency procedures and equipment through such measures as posting of informational materials in trains and stations, regular safety information announcements over public address systems, safety demonstrations by operators, and media (print, radio, and video) presentations.

In working with the passenger service operators and authorities, FRA will draw on its considerable experience and expertise and on extensive study and efforts recently made by Amtrak.

Following the Gibson, California, Amtrak accident, which resulted in two fire and smoke related fatalities, Amtrak initiated an extensive training program for its onboard service and operating personnel on emergency evacuation procedures and the use of emergency equipment. That program was described in FRA's February 1983 report to Congress on emergency procedures training of onboard passenger train personnel.

Amtrak has two programs on evacuation procedures and emergency equipment handling. Each new Amtrak employee attends a 15-day training program that includes sessions on first aid, use of emergency equipment, and evacuation procedures. The course of instruction includes information on various types of fires and firefighting methods, locations of fire extinguishers in cars, and a demonstration on, and practice in, the use of a

fire extinguisher. Also, employees are instructed on their responsibilities during an emergency, steps to be followed, and use of emergency exits, lighting systems, and public address equipment.

The second program is given solely to onboard personnel and focuses exclusively on emergency procedures and use of emergency equipment. It includes lectures and films on both subjects and practice sessions on duties such as emergency window removal, use of fire extinguishers, and handling of various emergency situations. All employees who take the course must pass a written examination or repeat the course until they can pass that test.

VII

CONCLUSION

Rail passenger service in the United States has compiled an outstanding safety record. This excellent performance is attributable both to FRA's safety regulations governing rail passenger operations and to the longstanding quality of the rail industry's operational and safety practices.

Gradual technological, operational, and institutional changes in rail passenger service during recent years have changed the make-up of the industry and brought technical advances in rail passenger equipment. In view of these changes, FRA is taking regulatory action in two areas and undertaking safety initiatives in other areas covered by this Report.

In the regulatory area, FRA is issuing two final rules, one to extend FRA's track regulations to all track used solely for commuter service and the other to ensure continued inspection and testing of passenger car brakes.

FRA is publishing guidelines on flammability and smoke emission characteristics of materials used in passenger car equipment in conjunction with the issuance of this Report.

Because the potential safety impact of various changes in the passenger service industry are not readily discernible at this time, FRA will convene a Special Safety Inquiry so that FRA and all passenger service providers can explore the need, if any, for standards governing the condition of safety-critical components.

In addition to these actions, FRA will work directly with senior management of the passenger service operators and authorities in 1984 to ensure the development and implementation of complete emergency preparedness procedures throughout the industry.

FRA is confident that these actions, together with the continuing efforts of the passenger service operators and authorities, will maintain the excellent safety record achieved by rail passenger service.

LONG DISTANCE RAIL PASSENGER OPERATORS AND COMMUTER OPERATORS/AUTHORITIES

Long Distance Rail Passenger Operators

Alaska Railroad
National Railroad Passenger Corporation (Amtrak)

Commuter Operators and Authorities

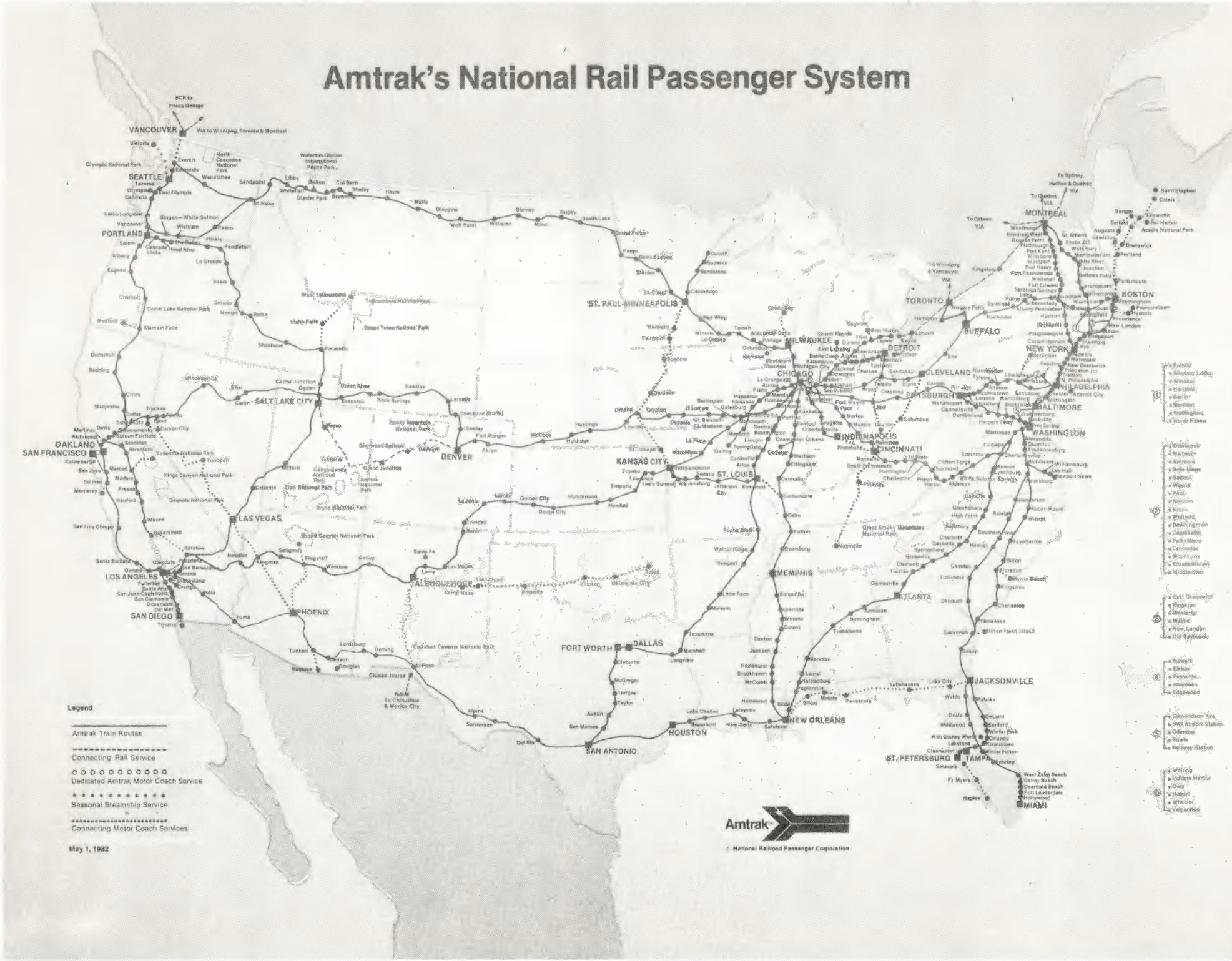
--Private Railroads Providing Contract Service--

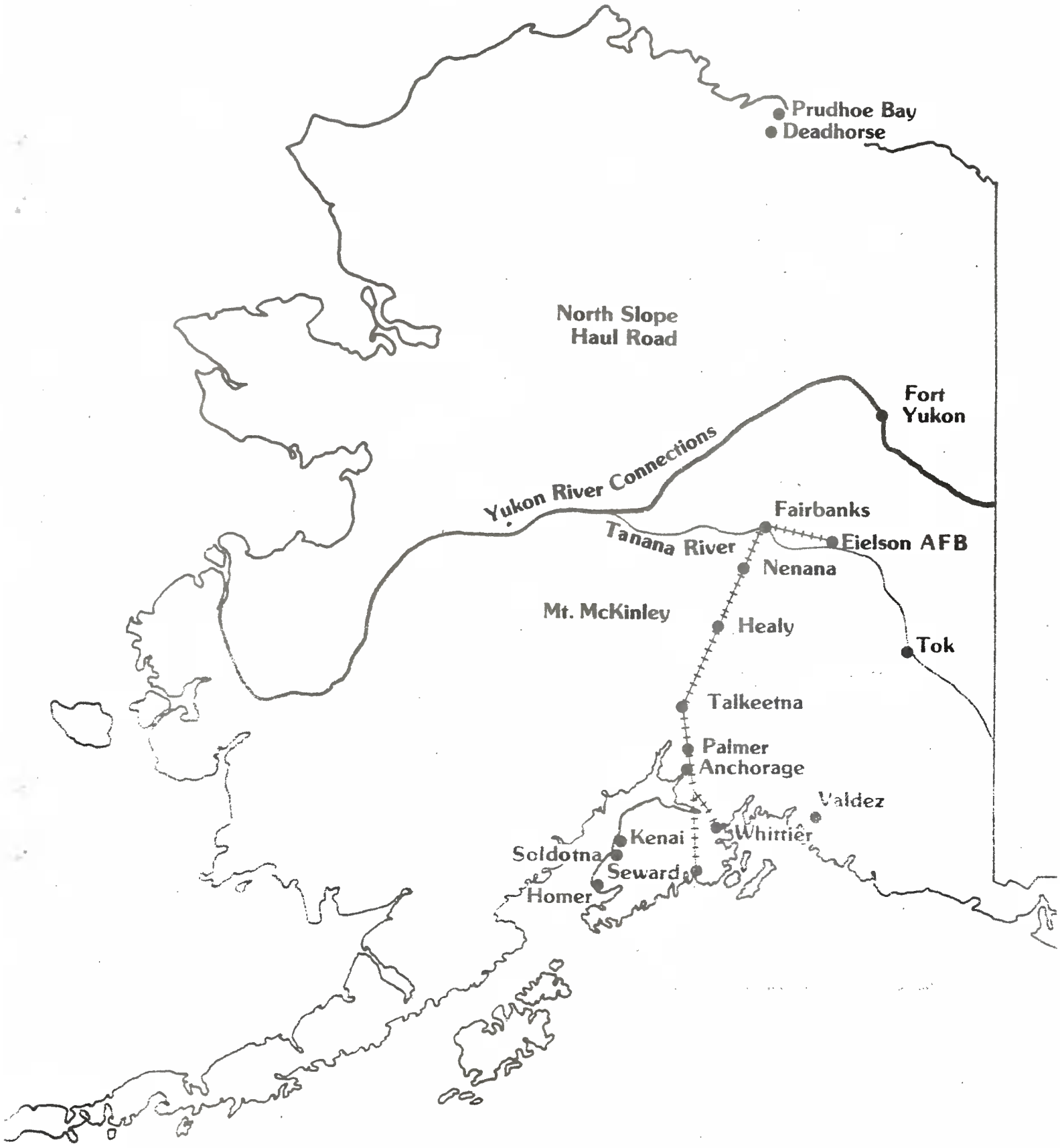
Boston and Maine Corporation
Burlington Northern Railroad Company
Baltimore and Ohio Railroad Company
Chicago and North Western Transportation Company
Chicago South Shore and South Bend Railroad
Grand Trunk Western Railroad Company
Illinois Central Gulf Railroad
National Railroad Passenger Corporation (Amtrak)
Norfolk and Western Railway Company
Southern Pacific Transportation Company

--Public Railroads and Authorities--

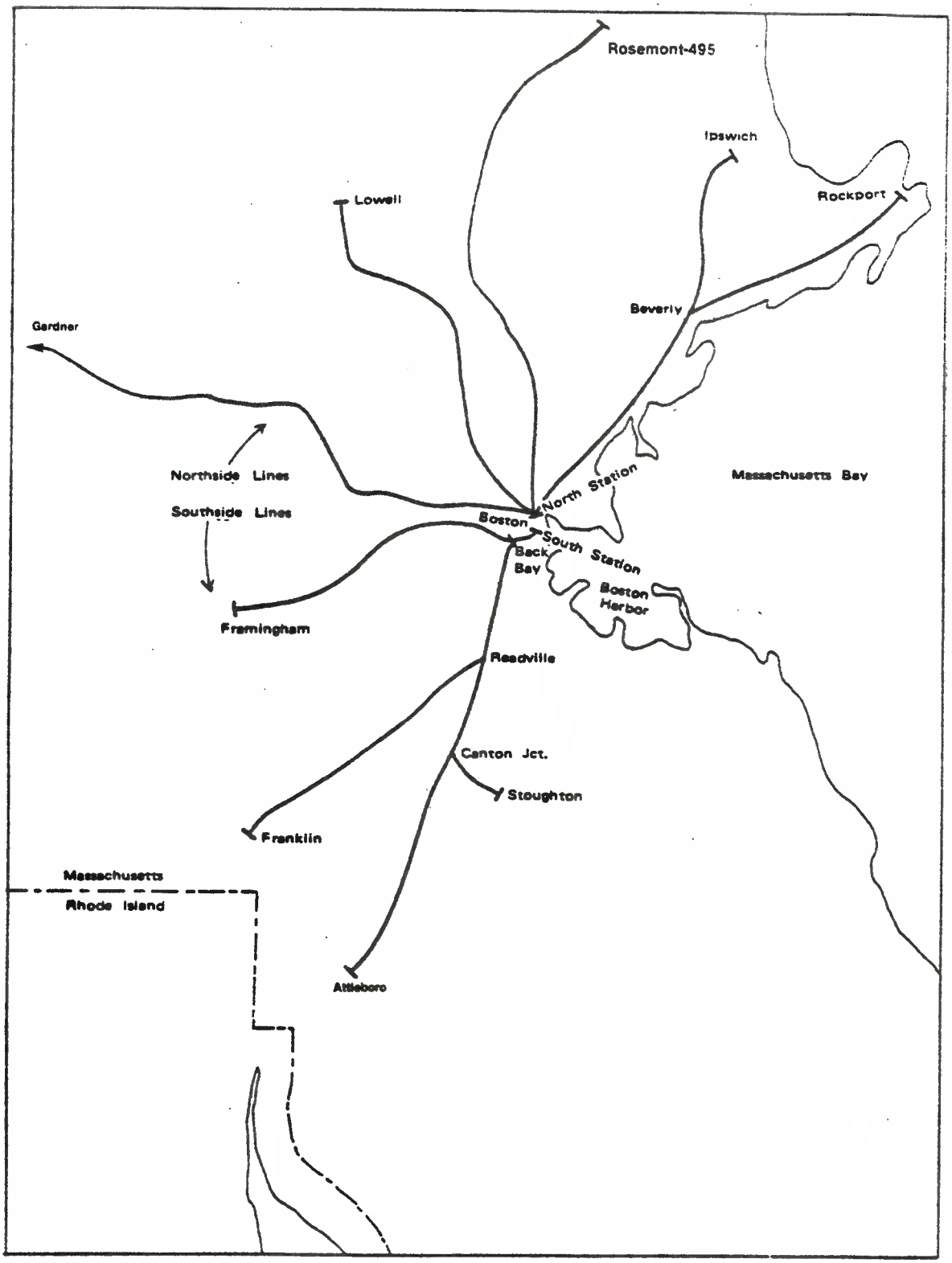
Long Island Rail Road Company
Metro North Commuter Railroad
New Jersey Transit Rail Operations, Inc.
Northeast Illinois Regional Commuter Rail Corporation
Pittsburgh and Lake Erie Railroad
Port Authority Trans-Hudson
San Diego Metropolitan Transit Development Board
Southeastern Pennsylvania Transportation Authority
Staten Island Rapid Transit Operating Authority

Amtrak's National Rail Passenger System

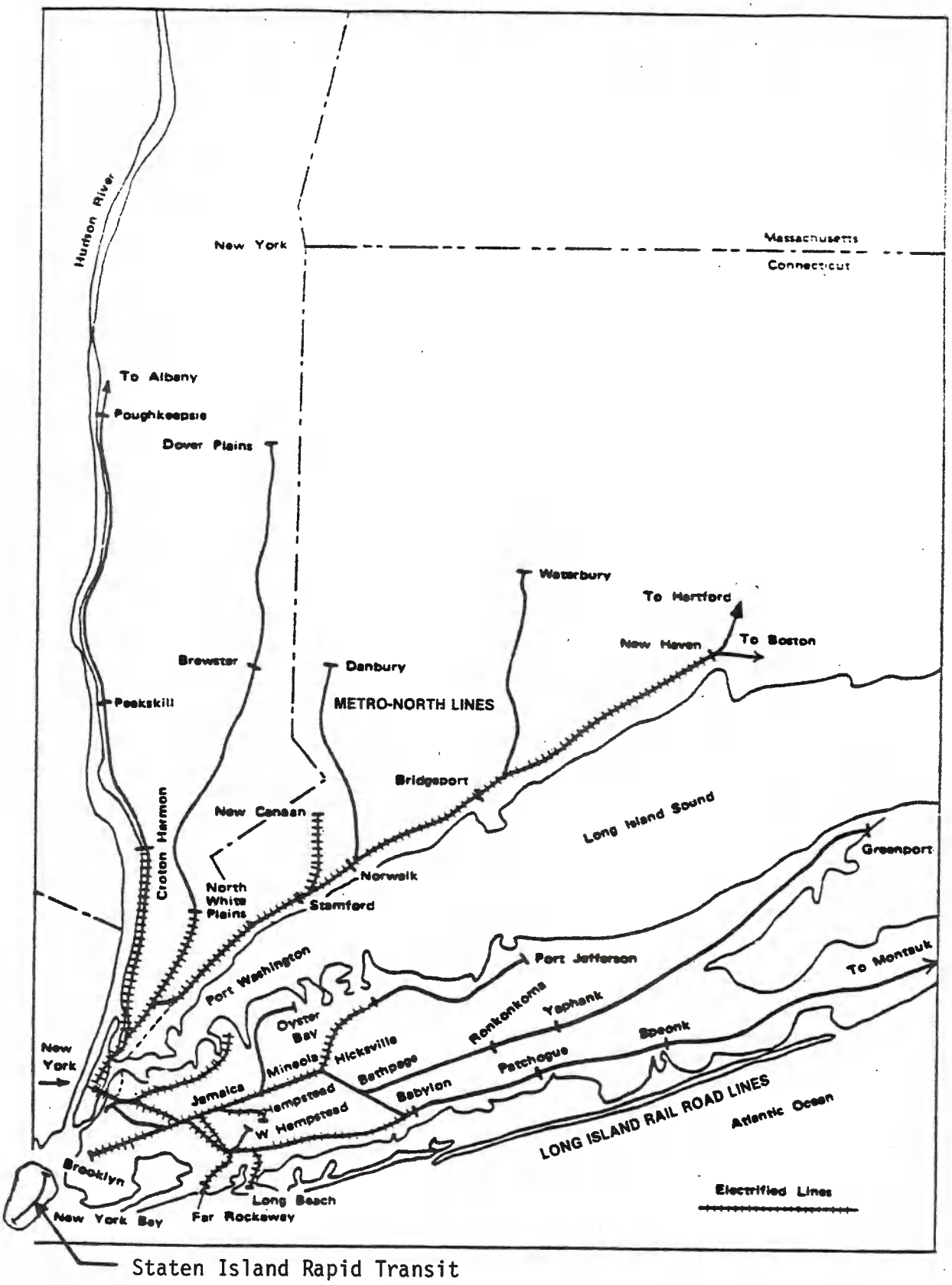



Alaska Railroad
Prudhoe Bay
Deadhorse
North Slope
Haul Road
Fort
Yukon
Yukon River Connections
Fairbanks
Tanana River
Eielson AFB
Nenana
Mt. McKinley
Healy
Tok
Talkeetna
Palmer
Anchorage
Valdez
Whittier
Kenai
Soldotna
Seward
Homer

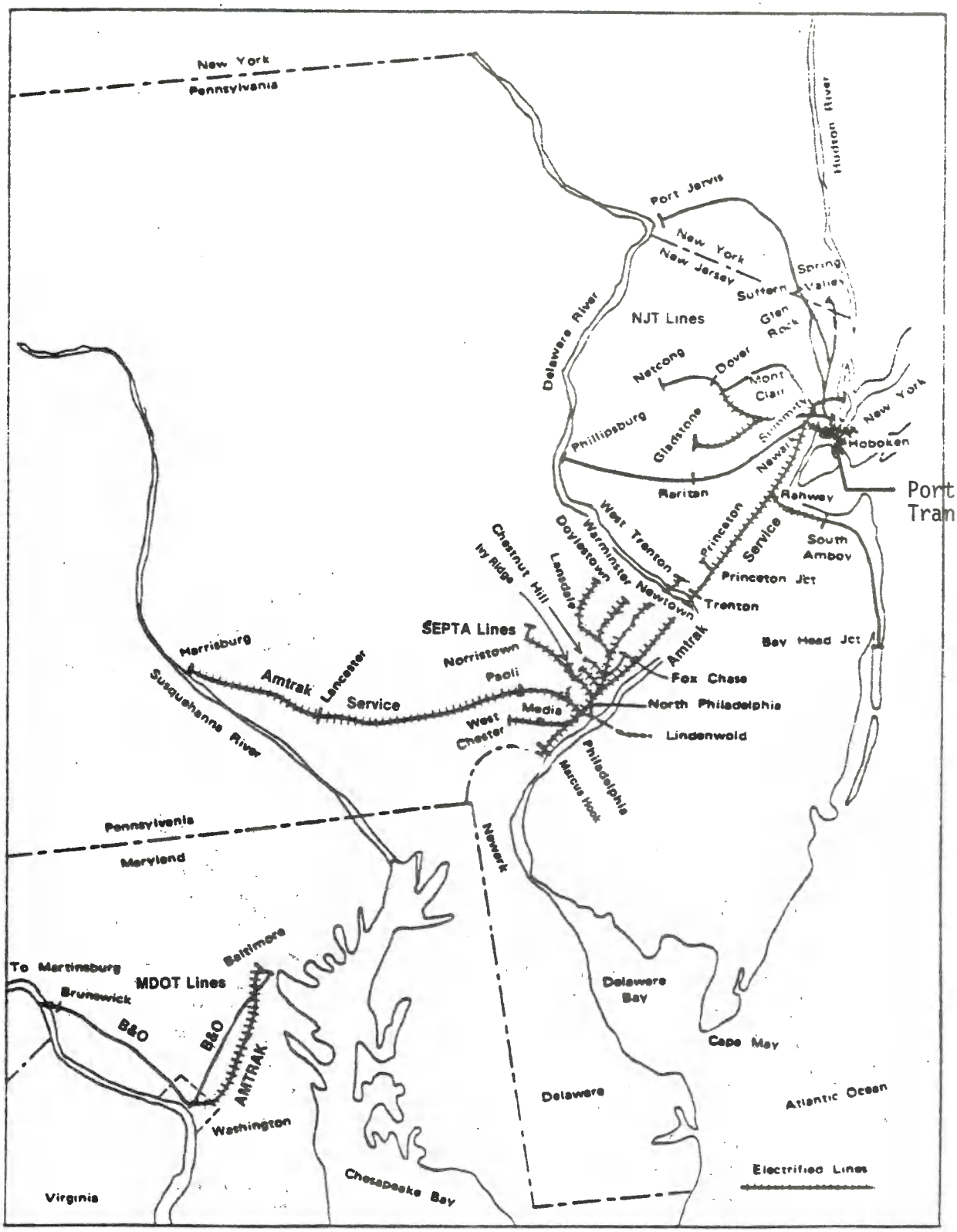
BOSTON COMMUTER RAIL LINES



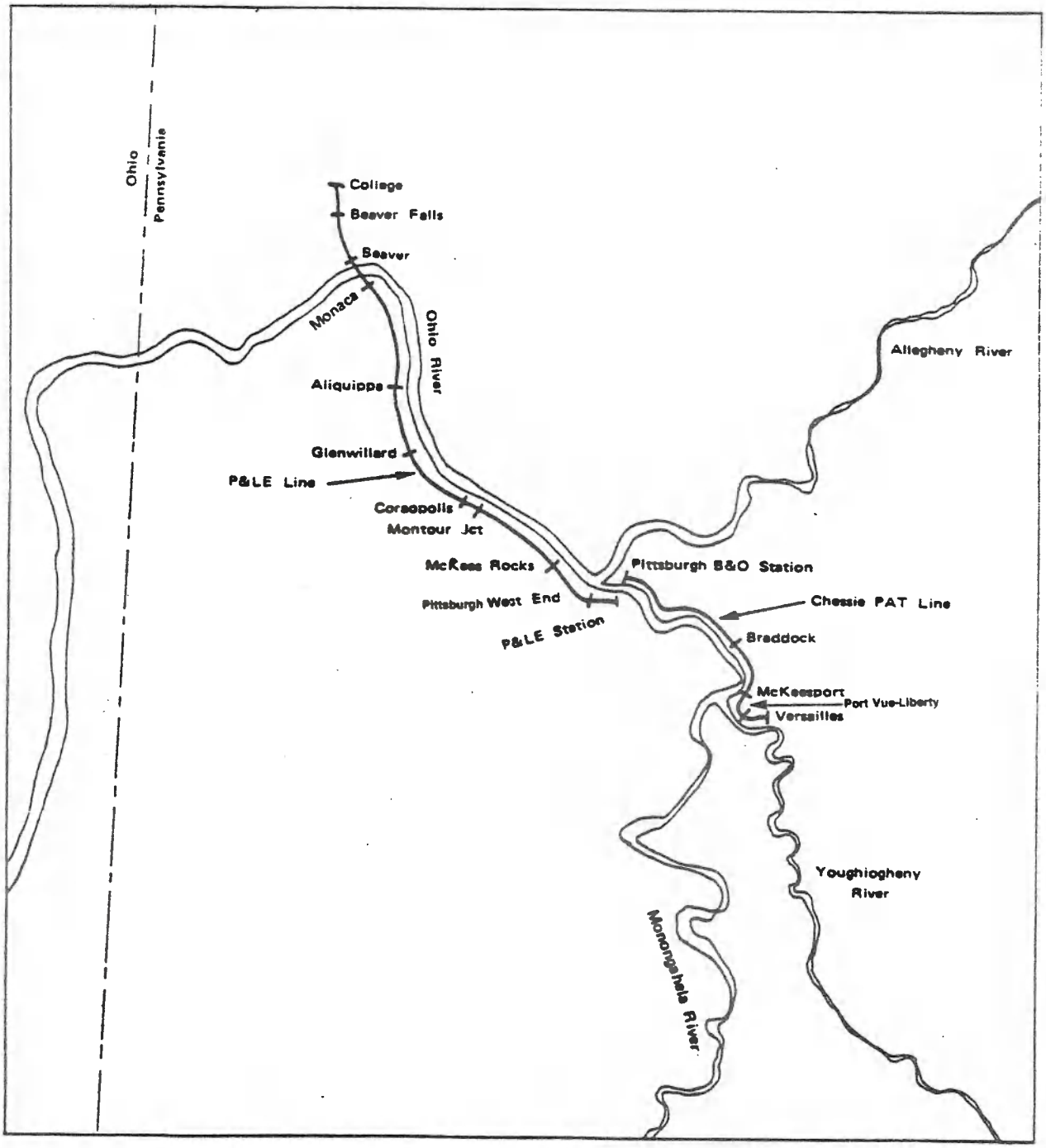
NEW YORK/CONNECTICUT COMMUTER RAIL LINES



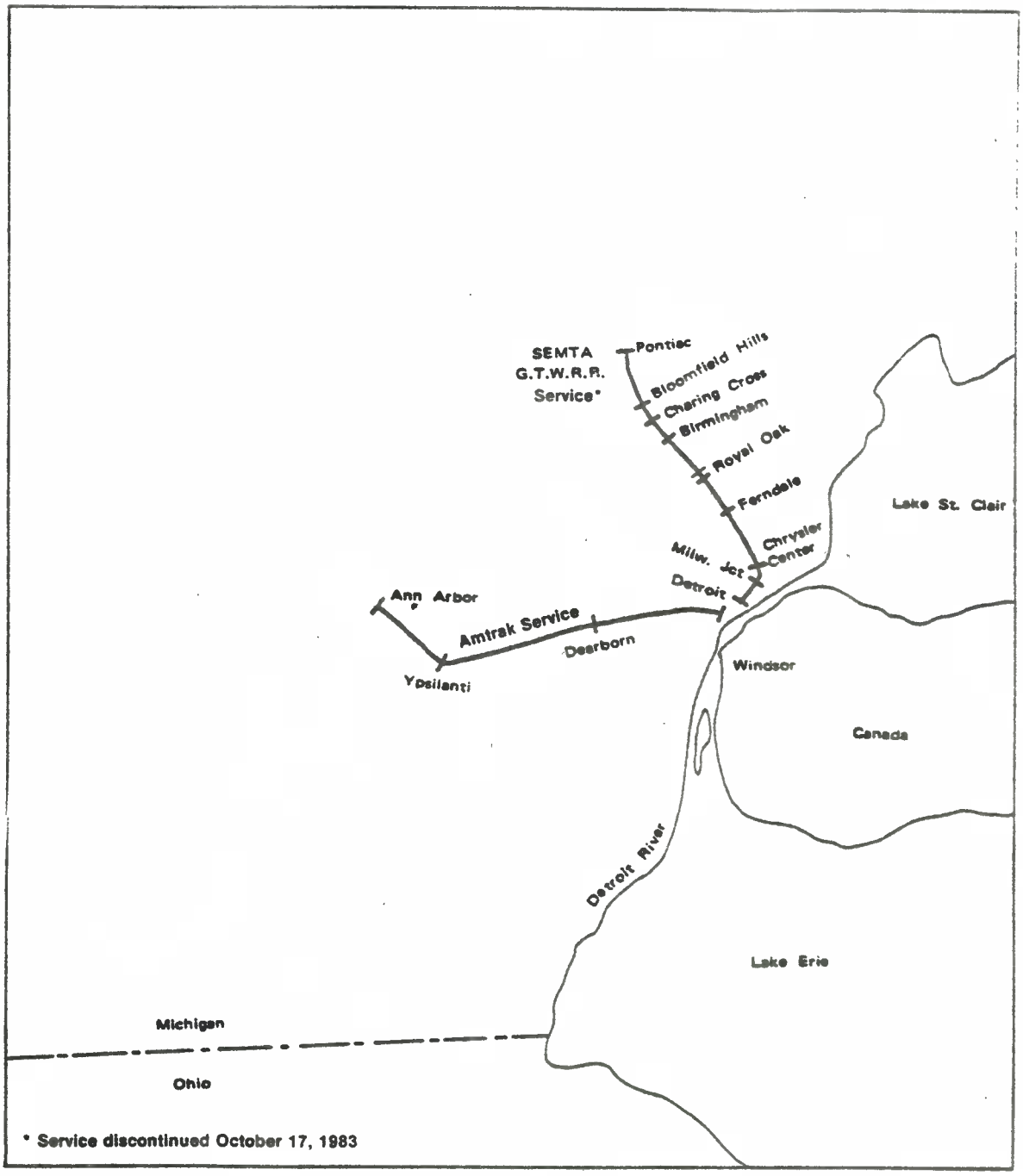
NEW JERSEY, PHILADELPHIA, WASHINGTON, D.C./MARYLAND
COMMUTER RAIL LINES



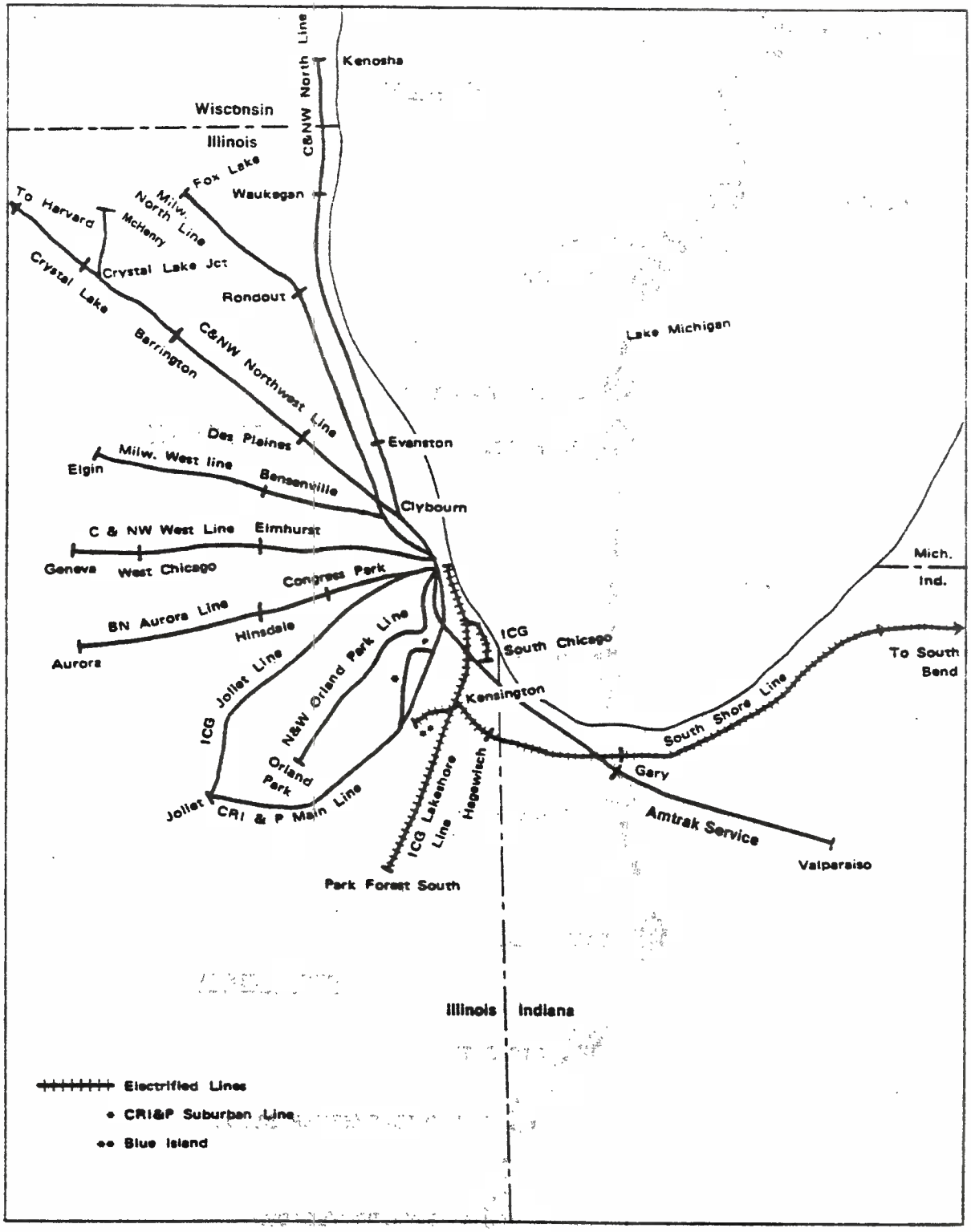
PITTSBURGH COMMUTER RAIL LINES



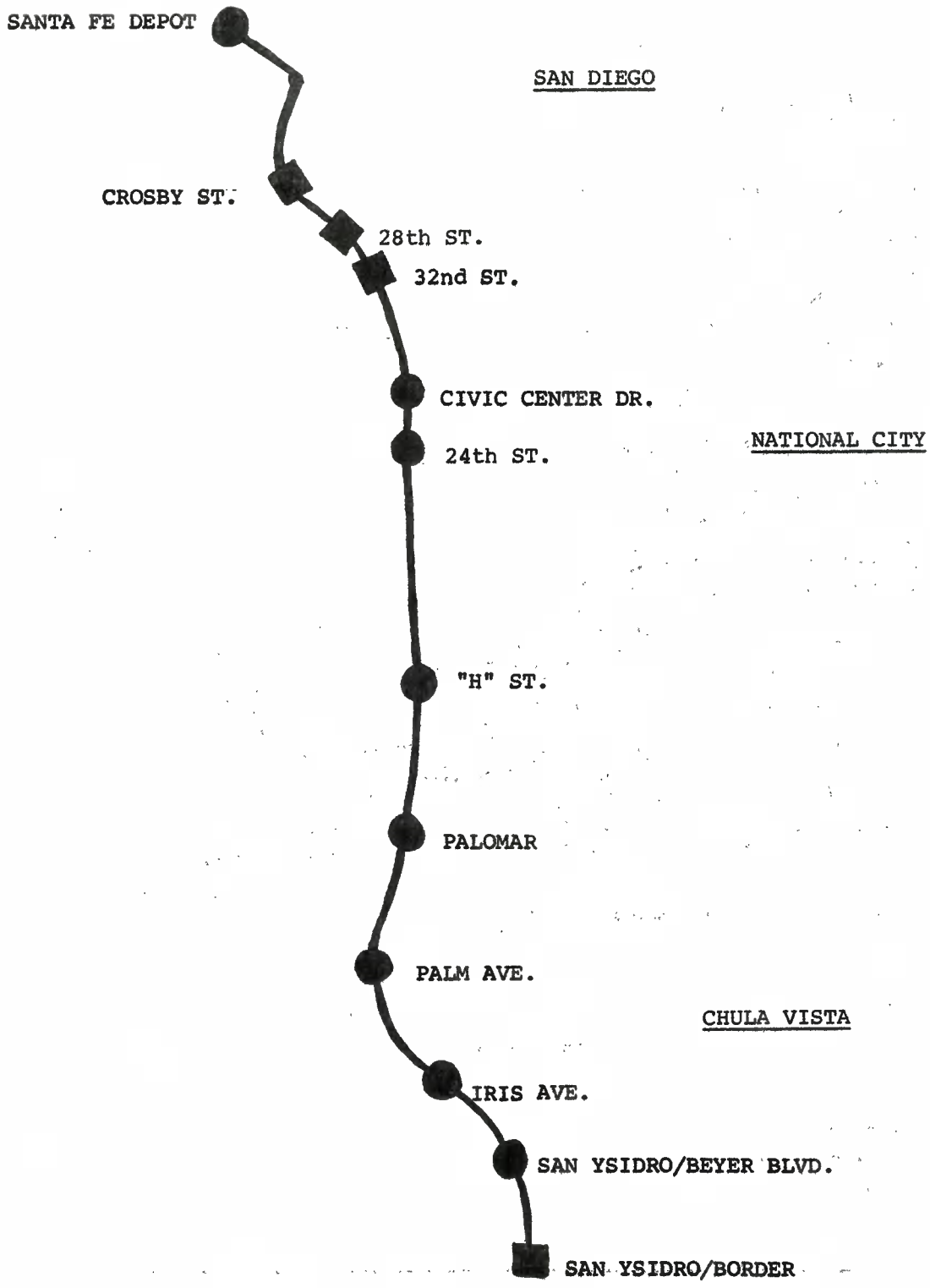
DETROIT COMMUTER RAIL LINES



CHICAGO COMMUTER RAIL LINES



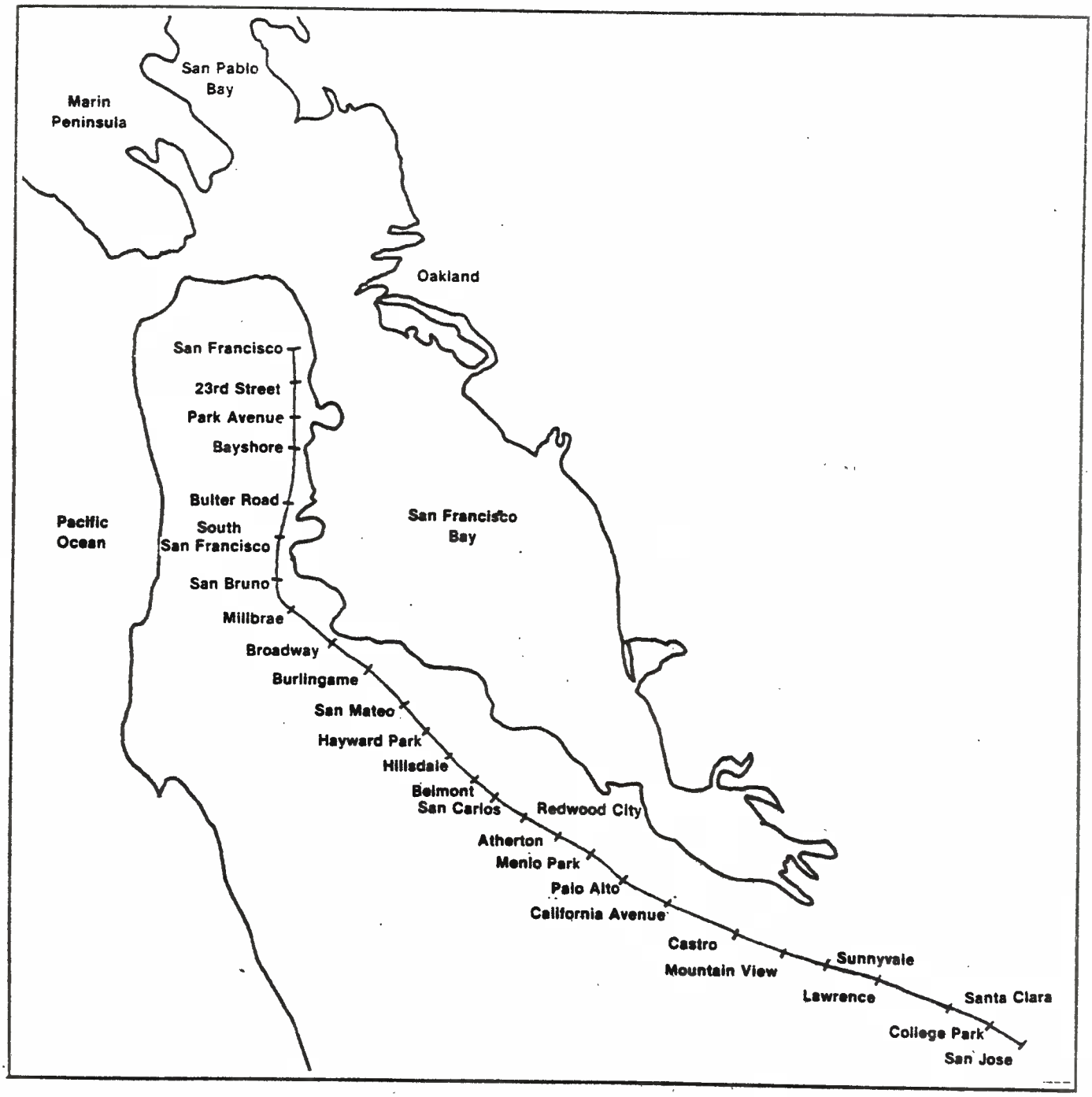
SAN DIEGO TROLLEY



TROLLEY STATION

TROLLEY STATION WITH PARKING

SAN FRANCISCO COMMUTER RAIL LINE



SUMMARY OF FRA SAFETY REGULATIONS

FRA has issued twelve separate substantive safety regulations that address the three major elements of the railroad system: the rolling equipment, the track over which it operates, and the rules for conducting such operations. All of these are contained in Title 49 of the Code of Federal Regulations.

I. ROLLING EQUIPMENT

FRA has five distinct rules concerning rolling equipment: Locomotive Safety Standards, Freight Car Safety Standards, Power Brake Rules, Safety Appliance Standards, and Safety Glazing Standards.

Locomotive Safety Standards (49 CFR Part 229)

This part prescribes minimum federal safety standards for all locomotives except those propelled by steam. It also applies to self-propelled passenger cars, and, to a limited degree, to hauled passenger cars equipped with locomotive control compartments. These standards contain requirements for daily and periodic inspections and tests; for various parameters of component deterioration; for movement of noncomplying locomotives; and for remedial action.

Freight Car Safety Standards (49 CFR Part 215)

This part prescribes minimum federal safety standards for railroad freight cars. It applies to all freight cars operating on standard gage track of a railroad, except maintenance-of-way equipment, equipment in dedicated service and equipment operated solely on industrial track. Specifically, these standards contain requirements for the inspection of all freight cars; for various parameters of component deterioration; and for remedial action.

Power Brake Rules (49 CFR Part 232)

This part supplements statutory requirements concerning the brake systems for all locomotives and railroad cars. These rules contain requirements for predeparture inspection and testing of train brakes as well as the periodic inspection and testing of the brake equipment on individual cars.

Safety Appliance Standards (49 CFR Part 231)

This part supplements statutory requirements concerning the handholds, steps, and ladder systems for all locomotives and railroad cars. These standards contain requirements for the location, clearances, securement, and strength of all devices used by personnel for mounting such equipment.

Safety Glazing Standards (49 CFR Part 223)

This part prescribes minimum Federal safety standards for the impact resistance of all glazing materials used in the windows of locomotives and railroad cars. It also contains

emergency egress requirements for passenger cars. In addition, the rule requires the installation of glazing materials that will resist both bullet and large object impacts.

II. TRACK SAFETY STANDARDS (49 CFR Part 213)

This part prescribes minimum federal safety standards for all railroad track in the general railroad system of transportation. These standards establish minimum requirements for the condition of various components of the track, the relevant geometry parameters for these components, the maximum allowable operating speeds for trains over a segment of track that meets all of the requirements for its particular classification, inspection procedures, and mandatory remedial actions.

III. OPERATING PRACTICES

FRA has six distinct rules concerning the methods and procedures for operating trains: Railroad Operating Rules, Use of Radio Communications, Employee Hours of Service, Use of Marker Devices, and Railroad Signal Systems.

Railroad Operating Rules (49 CFR Parts 217/218)

These parts prescribe minimum criteria for the substantive provisions of several specific railroad operating rules, the filing with FRA of all operating rules by railroads, and the periodic instruction and compliance testing of employees on these rules.

Radio Standards (49 CFR Part 220)

This part prescribes minimum requirements governing the use of radio communication in connection with railroad operations. It requires railroads to designate and publish information relating to base and wayside stations and radio channels and to instruct each employee on these procedures. The rule also provides guidelines for proper radio communication procedure, including procedures for transmission of train orders.

Employees Hours of Service (49 CFR Part 228)

This part supplements statutory requirements concerning maximum hours that railroad employees may work. These standards define the employee service constituting time on duty and the records to be maintained by railroads and submitted to FRA. It also contains procedures governing FRA approval of the location of certain railroad facilities used to lodge employees.

Rear Marker Devices (49 CFR Part 221)

This part prescribes requirements for rear end devices for the trailing end of passenger, commuter, and freight trains operated on a main track that is part of the general railroad system of transportation. The rule contains requirements for effective illumination or candela of the device; for light beam characteristics of the device; the use and location of the device; and procedures for approval of rear end marking devices.

Signal Rules (49 CFR Part 236)

This part prescibes minimum federal safety standards for the installation of signal systems. These standards contain requirements for design, inspection, testing, and for manadatory remedial action.

In addition to the substantive rules discussed above, FRA has issued several procedural regulations, which include Accident/Incident Reporting Requirements (49 CFR Part 225), State Safety Participation Regulations (49 CFR Part 212), and Railroad Noise Emission Compliance Rules (49 CFR Part 210).