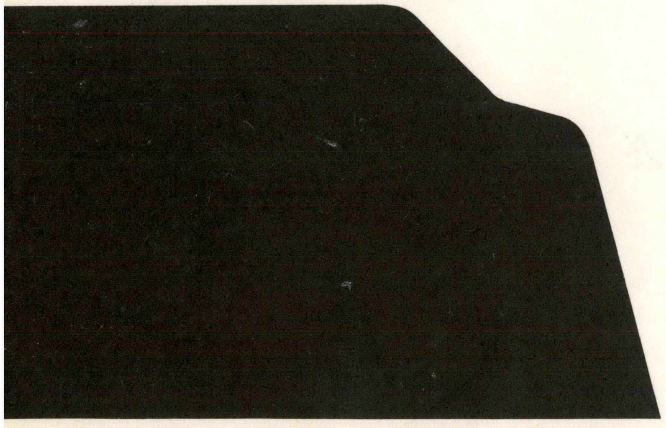
A Preliminary Report by the Secretary of Transportation

A Prospectus for Change in the Freight Railroad Industry

October 1978



A PROSPECTUS FOR CHANGE IN THE FREIGHT RAILROAD INDUSTRY

A Preliminary Report by the Secretary of Transportation

Submitted in accordance with sections 504 and 901 of the Railroad Revitalization and Regulatory Reform Act of 1976 (P.L. 94-210)

U.S. Department of Transportation

October 1978

THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

October 10, 1978

Honorable Walter Mondale
President of the Senate
Washington, D.C. 20510

Honorable Thomas P. O'Neill
Speaker of the House of Representatives
Washington, D.C. 20515

Dear Mr. President:

Dear Mr. Speaker:

I am transmitting to Congress the preliminary report on the railroad industry as directed by sections 504 and 901 of the Railroad Revitalization and Regulatory Reform Act of 1976 (the 4R Act). The report entitled, "A Prospectus for Change in the Freight Railroad Industry," paints a rather gloomy picture of the present state of the railroad industry. This situation has developed because traditional rail markets have shifted, and the railroads have not fully held their own against the new competitive technologies of air, highway, and inland waterway transport. Also, the Government's policies on regulation and financial assistance have not been equal for all modes of transportation. Many Government policies were developed when the railroads were the dominant mode—a circumstance that is no longer the case.

This report deals with changes that will be necessary if the railroads are to regain vitality and to continue to play a major role in the Nation's transportation system. I believe the future holds much promise for the railroads. This traditional transportation technology has been given renewed importance because of the long-term problem of energy availability and the economy's need for efficient transportation to dampen inflationary pressures; these are the essential strengths of the industry on which constructive policies can be built.

The Department of Transportation is not in the business of simply preserving railroads and terminals as historic relics or national transportation landmarks. Our role is to identify America's transportation needs and the best ways these needs can be served. Viewing these requirements, I do not think we should be permanently discouraged by the difficult economic situation that this report portrays.

The diagnosis in this report says parts of the system are sick, but the system as a whole is far from dead. The report includes several specific remedies regarding Federal regulation and financial assistance policies that can help move the railroad industry toward financial health, so it can play its proper role in the efficient transportation system demanded by our Nation's economy.

I have often referred to the Nation's transportation system as the "invisible service." Its overall performance has been so good that we only pay attention to it when it doesn't work or when it is stopped by a strike, a natural disaster, or a financial crisis. This is especially true of railroads. The steady decline of the railroads began just after World War I but went virtually unnoticed by the public and untended by the Federal Government as the other modes increased their capacity, and the rail system slowly cannibalized itself until the collapse of the Penn Central forced public attention to the problem.

We must now take the time and seize the opportunity to take the necessary public actions to ensure that our railroad system remains in the private sector and provides good public service. It is a tribute to the basic strength of our economic system that the United States is the only country in the world whose freight railroad system is still mainly in private hands. Elsewhere in the world, it is heavily subsidized as a necessary public service.

I wish to underscore the significance of this report and the public policy debate that will ensue. There have been numerous studies of the problems posed by declining rail service, the financial condition of the railroads, and the effects of regulation on the industry. Some of these studies have been conducted by private groups, some by Government agencies; most, however, have been limited to specific problems or geographic areas. This report takes a broader view. It is a comprehensive nationwide study of railroad problems, finances, and policies and is designed to provide the framework for making judgments about this system as part of the Nation's total transportation policy.

During the decade of the Department of Transportation's existence, the rail industry and its competitors have undergone many changes. The Government now has a much different relationship to the railroad industry than it did 10 years ago. The Department of Transportation has far greater responsibilities and is confronted with substantially different economic circumstances with regard to all means of transportation. The public's attitudes on environmental protection, energy policy, user charges and taxation, regulatory flexibility, and intermodal transportation planning have changed.

Now the railroad industry faces a time of reckoning with those changes. There is no escaping transition, for the underlying social and economic forces cannot be denied. The question is not whether, but how changes will take place.

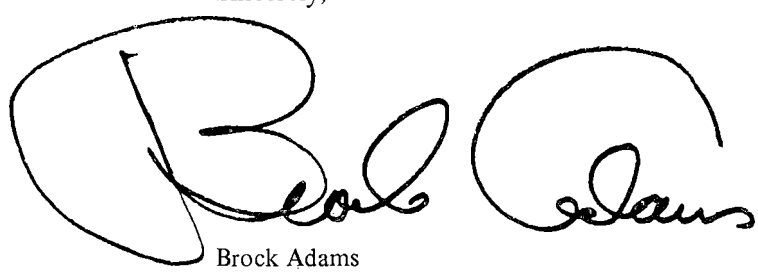
This report represents the administration's commitment to help in seeking solutions. It cannot offer a Federal guarantee of prosperity or survival for all railroads. The report recommends the continuation of a program of Federal financial assistance, but it also makes clear that financial assistance alone will not cure all the problems of the railroad industry. Changes in Federal financial policy toward the other modes and in the system of economic regulation, as well as other changes in labor and management attitudes will be necessary, and the appropriate role for any Federal financial aid is to facilitate these changes.

Ultimately, the future of the railroad industry rests with the men and women who manage and operate it. Their day-to-day decisions and actions will decide the future of the railroad industry in the private sector. Those who work in railroading must take pride in an industry that helped to build this country and which, through their sustained effort, will continue to make vital contributions to our economic welfare.

Pursuant to an agreement with the Chairmen of the House and Senate commerce committees, we have combined the reports required by sections 504 and 901 and now submit them jointly to the Congress and the public. Following a suitable period to allow interested parties time to reflect upon this preliminary report, we will hold nationwide hearings in which the public may provide comments on the analyses and alternatives presented in the report. We hope to have the advice of railroad management and labor, other elements of the transport industry, the shipping and financial communities, Government officials at the Federal, State, and local levels, and informed members of the general public. These views will assist us in the development of a final report and recommendations to the Congress, to be provided in February 1979.

We welcome the comments and suggestions of the Congress and of those many citizens who share our concern for the future of one of America's most basic and most essential industries, railroading.

Sincerely,



Brock Adams

Enclosure

PREFACE

The roots of the railroad problem lie deep in the economic history of this Nation. Congress was compelled to establish or adjust the legislative environment for railroads in 1850, 1867, 1887, 1893, 1903, 1913, 1920, 1926, 1933, 1940, 1958, 1970, 1973, and 1976. Each of these Acts (after 1867) was in response to a major economic crisis, a perceived need to control rail rates, or some manifest failing within the industry. Early Government programs took a wide variety of forms: 19th century land grants, regulation by the Interstate Commerce Commission (ICC), emergency national operation by the Government during World War I, and Reconstruction Finance Corporation loans during the Great Depression.

Three recent enactments have again involved the Federal Government in the affairs of the industry.

- Creation of the National Railroad Passenger Corporation (Amtrak) in 1970. The intent of the Rail Passenger Service Act was to relieve freight railroads of the burden of operating financially unsuccessful passenger trains, preserve warranted services, and operate a more limited, restructured service on a for-profit basis. The first two goals were achieved, but, despite cutbacks in service, the operating deficit borne by the Federal Government has been increasing each year and is now over $500 million.
- A system for reorganizing the bankrupt northeastern railroad companies in 1973, to avoid a halt in service. The Regional Rail Reorganization (3R) Act established the United States Railway Association to plan a restructured system and set procedures for transfer of properties to a new company, the Consolidated Rail Corporation (Conrail). Labor protection payments and a new light-density line (branchline) subsidy program were also established to facilitate the reorganization. Financial aid was provided in the form of grants for interim operation of the bankrupts and loans for rehabilitation of rail properties in the Northeast and Midwest.
- The Railroad Revitalization and Regulatory Reform (4R) Act followed in 1976. The 4R Act provided funding authorization of $2.1 billion for Conrail, as well as the following.

— $1.75 billion in Federal funds was authorized to improve the Northeast Corridor operations.

— $600 million was authorized to begin a program of financial assistance for railroads, in which the Government purchased shares of a special class of new redeemable preferred stock at subsidized rates. This program benefits mainly marginal railroads because a certification is required that other private financing is not available.

— $1 billion was authorized for Government guarantees of loans to railroads; loans available on the strength of the guarantee at rates substantially below the market rate of interest.

— Increased regulatory flexibility was provided, and the ICC was instructed to begin giving more consideration in its rulings to the financial health of railroad companies.

— A shortened timetable for railroad mergers was authorized, and the Secretary of Transportation was given authority to facilitate consolidation and coordination projects.

— $360 million was authorized to provide for a 4-year, nationwide program of subsidy to those

branchlines that had been approved for abandonment by the ICC. In addition, the deadline for use of the $180 million provided by the 3R Act to assist the Northeast and Midwest regions in working on the branchline problem was extended for 2 years.

Events of the past 2 years demonstrate that there has not been any improvement in the underlying circumstances that led to the passage of the recent Acts. There has been continued deterioration in the weak parts of the rail freight industry. The Milwaukee Road has joined the Boston and Maine and the Rock Island in bankruptcy; the Delaware and Hudson Railroad has avoided bankruptcy only through additional Federal financial assistance; and Conrail, less than 2 years after its inception, has said that it needs an additional $1.3 billion in Federal capital funding if it is to achieve long-term financial self-sufficiency.

While it is too early to evaluate the final effectiveness of the new policies set in motion by recent legislation, the financial condition of Conrail, the slow pace of regulatory change under new rate flexibility features, and the controversy that has arisen over funding provisions of the 4R Act indicate that more changes may be required. The foundation of Federal policy toward freight railroads needs to be reexamined, and changes need to be made. The Department of Transportation (DOT) will continue to try to implement successfully the reforms of the 3R and 4R Acts, but we will also propose further legislative changes.

Congress, in recognition of the need for continuing study of potential additional measures to solve the problems of the industry, has directed the Secretary of Transportation (in the 4R Act) to conduct a series of policy-oriented studies. These studies fall into four key areas: (1) a catalogue and description of the system of lines of the intercity railroads in the United States (section 503); (2) a determination of whether Federal policies towards other transportation modes have unfairly disadvantaged the railroads (section 902); (3) an assessment for the period 1976–1985 of the capital needs of the railroad industry and whether those needs are likely to be met by private sources of capital, and—in the event they are not—an estimate of the amount and form of financial assistance the Federal Government should provide to the rail industry (section 504); and (4) an investigation of a number of other specifically identified problems of the U.S. rail system, with consideration of possible solutions to those problems (section 901). The full text of sections 504 and 901 of the 4R Act is reproduced in the next section of the report, along with that of section 401, which details the Secretary's independent authority with respect to rail system restructuring.

The first two studies were completed and submitted to the Congress in January 1977. The remaining two sections (504 and 901) are the subject of this report. The precise mandate in sections 504 and 901 includes a number of specific directions that the DOT found it could not accomplish in any satisfactory fashion. This applies particularly to the provisions in section 504 (b)(A), as amended, and to subsections (1) through (5) of section 901. The DOT's determination was based on the absence of the data needed for an effective analysis and the desire to avoid misleading the Congress or the public with inadequate estimates of the costs or benefits theoretically attributable to any single element in the solution to the railroad problem. Those benefits are best expressed in broader terms, and are more likely to be realized if pursued as a coordinated policy, as this report seeks to do.

Accordingly, there is no attempt in this report to take the estimate of the rail industry's capital shortfall and to relate how much that shortfall could be reduced by each of the following suggested means: restructuring physical plant, modifying intermodal investment and user charge policies, or modernizing the economic regulatory laws affecting railroads. Rather, this report is intended to address from a Federal perspective the major policy instruments that need to be fashioned to provide an environment for rail transportation in which its full potential can be realized.

This rail study provides an examination of the nature and extent of the problems facing the railroad industry. It directs much attention toward answering the question: Is there a likely shortfall in the railroad industry's ability to finance capital expenditures from private sources? The report provides an analysis by the DOT of the condition of current railroad facilities and future trends for investment in the industry.

The report explores the desirability of restructuring the rail system to improve its efficiency and thus reduce the need for large-scale public assistance. It includes discussions of governmental policies toward the rights-of-way of other modes of transportation and the benefits and costs of public ownership of railroad fixed facilities. The report also examines problems involved in existing economic regulation and the reforms initiated by the 4R Act. It identifies other possible reforms that would lessen the negative impact of regulation on rail performance. Such changes would help to ease the financial difficulties of the industry and thus help meet its capital requirements. The concluding chapter sets forth DOT's preliminary recommendations on the methods for providing additional Federal financial assistance to the railroad industry.

Finally, Congress has indicated an interest in the potential for high-speed and electrified services to revitalize the rail system, and appendixes B and C evaluate the potential of this strategy.

Not every area of current or potential significance to the future of the rail system is included in the report. Rail safety, environmental questions, and

the potential benefits of new technology are referenced but not thoroughly evaluated. Nor does the report pretend to be the last word on the major areas it does address. Research and careful thought often raise more questions than they answer. Our hope is that this report will provide a basis of fact for debating the critical issues facing rail transportation, so that we can proceed with a more effective policy toward the most troubled part of the national transportation system—America's railroads.

MANDATE

The following are extracted from the Railroad Revitalization and Regulatory Reform Act of 1976, PL 94-210 (as amended by the Rail Transportation Improvement Act of 1976).

Section 504 (45 U.S.C. 824). (a) *Deferred Maintenance Statement.*—Within 180 days after the date of enactment of this Act, each railroad designated by the Commission as a class I railroad (other than a railroad subject to reorganization pursuant to the Regional Rail Reorganization Act of 1973) shall prepare and submit to the Secretary a full and complete statement (1) of such railroad's deferred maintenance and delayed capital expenditures, as of December 31, 1975, and (2) of the projected amounts of appropriate maintenance to be performed and capital expenditures to be made for such railroad's facilities, during each of the years from 1976 through 1985. Each railroad shall submit such additional information as may be required from it by the Secretary, in connection with his duties under section 503 of this title or under this section, prior to July 1, 1977, including the projected sources of and uses for the funds required by such railroad for such projected program.

(b) *Preliminary Financing Recommendations.*—Within 540 days after the date of enactment of this act, the Secretary, after giving due consideration to (1) the final designations under section 503(e) of this title, (2) the information furnished under subsection (a) of this section, and (3) any other relevant information, shall develop, publish and transmit—

(A) to the Congress, preliminary recommendations as to the amount and type of carrier equity and other financing to be effected through the Fund, or through any other funding mechanism, recommended by the Secretary, based upon his view of the rail industry's facilities rehabilitation and improvement needs, the projected gross national product, the potential demand for rail service and the types of service capable of meeting that potential demand, the potential revenues and costs (including capital costs associated with these revenues), the demand for rail services for which the railroads could compete on an economic basis, the probable sources of funding for the capital costs of providing these services, and which of those costs must be provided by public financing, as projected through December 31, 1985; and

(B) to the Congress and to the Secretary of the Treasury, preliminary recommendations as to the means by which the Federal share, if any, of such equity and other financing should be provided.

In preparing such recommendations, the Secretary shall specifically consider and evaluate the public benefits and costs which

would result from public ownership of railroad rights-of-way.

(c) *Evaluation.*—Within 90 days after the date of publication of the Secretary's preliminary recommendations under subsection (b) of this section, the Secretary of the Treasury shall publish and transmit to the Secretary and to the Congress his evaluation thereof and any recommendations with respect to the matters referred to in subsection (b)(3)(B) of this section.

(d) *Final Recommendations.*—Within 90 days after the date of receipt of the evaluation, transmitted under subsection (c) of this section, the Secretary shall, after giving due consideration to such recommendations, prepare and transmit to the Congress his final recommendations with respect to the matters referred to in subsection (b) of this section.

Section 901 (90 STAT. 147; 49 U.S.C. 1654 note). The Secretary shall conduct a comprehensive study of the American railway system. Such study shall commence not later than 45 days after the date of enactment of this Act. Such study shall include—

(1) a showing of the potential cost savings and of possible improvements in service quality which could result from restructuring the railroads in the United States;

(2) an identification of the potential economies and improvements in performance which could result from the improvement of local and terminal operations;

(3) estimates as to potential savings in the cost of rehabilitating the United States railway system if rehabilitation is limited to those portions of such systems which are essential to interstate commerce or national defense;

(4) an assessment of the extent to which common or public ownership of fixed facilities could improve the national rail transportation system;

(5) an assessment of the potential effects of alternative rail corporate structures upon the national rail transportation system;

(6) a listing, in order of descending priority, of the rail properties which should be improved to the extent necessary to permit high-speed rail passenger or freight service over such properties, in terms of the costs and benefits of such improvements and the reasons therefor; and

(7) an estimate of the potential benefits of railroad electrification for high density rail lines in the United States, and an evaluation of the costs and benefits of electrifying rail lines in the United States with a high density of traffic, including—

(A) the capital costs of such electrification and the oil fuel economies which would be derived therefrom, the ability of existing power facilities to supply the additional power required, and the amount of coal or other fossil fuels required to generate the power necessary for railroad electrification; and

(B) the advantages to the environment of electrification of railroads in terms of reduced fuel consumption and air pollution, and the disadvantages to the environment from increased use of fuels such as coal; and

(8) a survey and analysis of the railroad industry in the United States to determine its financial condition and the physical condition of its facilities, rolling stock, and equipment.

Within 720 days after the date of enactment of this Act, the Secretary shall submit a report to the Congress setting forth the results of the study conducted pursuant to this section.

Section 401. The Department of Transportation Act (49 U.S.C. 1651 et seq.) is amended by inserting after section 4 thereof the following new section 5:

Rail Services

Section 5. (a) The Secretary may develop and make available to interested persons feasible plans, proposals, and recommendations for mergers, consolidation, reorganization, and other unification or coordination projects for rail services (including, but not limited to, arrangements for joint use of tracks or other facilities and any acquisition or sale of assets) which the Secretary

believes would result in a rail system which is more efficient, consistent with the public interest.

(b) In order to achieve a more efficient, economical, and viable rail system in the private sector, the Secretary may upon the request of any railroad and in accordance with subsections (a) through (e) of this section, assist in planning, negotiating, and effecting a unification or coordination of operations and facilities with respect to two or more railroads.

(c) The Secretary may conduct such studies as are deemed advisable to determine the potential cost savings and possible improvements in the quality of rail services which are likely to result from unification or coordination with respect to two or more railroads, through the elimination of duplicative or overlapping operations and facilities; the reduction of switching operations; utilization of the shortest, or the most efficient, and economical routes; the exchange of trackage rights; the combining of trackage and of terminal or other facilities; the upgrading of tracks and other facilities used by two or more railroads; reduction of administrative and other expenses; and any other measures likely to reduce costs and improve rail service. For purposes of studies conducted under this section and the study described in section 901 of the Railroad Revitalization and Regulatory Reform Act of 1976, each railroad shall provide such information as may be requested by the Secretary in connection with the performance of functions under this section and such section 901. In furtherance of any of the functions or responsibilities of the Secretary under this section or such section 901, any officer or employee duly designated by the Secretary may obtain, from any railroad, information regarding the nature, kind, quality, origin, destination, consignor, consignee, and routing of property, without the consent of the consignor or consignee involved, notwithstanding the provisions of section 15(13) of the Interstate Commerce Act (49 U.S.C. 15(13)) and may, to the extent necessary or appropriate, exercise, with respect to any railroad, any of the powers described in section 203(c) of the Regional Rail Reorganization Act of 1973 (45 U.S.C. 713(c)), as provided therein, except that subpoenas shall be issued under the signature of the Secretary.

(d) When requested by one or more railroads, the Secretary may also hold conferences with respect to any proposed unification or coordination project. The Secretary may invite officers and directors of all affected railroads; representatives of employees of such railroads who may be affected; the Interstate Commerce Commission; appropriate State and local government officials, shippers, and consumer representatives; and representatives of the Federal Trade Commission and of the Attorney General to one or more such conferences with respect to such a proposal. The Secretary may mediate any dispute which may arise in connection with any proposed unification or coordination project. Persons attending or represented at any such conference shall not be liable under the antitrust laws of the United States with respect to any discussion at such conference and as to any agreements reached at such conference, which are entered into with the approval of the Secretary in order to achieve or determine a plan of action to implement any such unification or coordination project.

(e) Whenever any railroad submits a proposal for a merger or other action the approval of which is subject to the jurisdiction of the Interstate Commerce Commission under section 5(2) of the Interstate Commerce Act (49 U.S.C. 5(2)), the Secretary may, if he has not already done so, conduct a study of such proposal in order to determine whether or not, in his judgment, such proposal is in accordance with the standards set forth in section 5(2)(c) of such Act (49 U.S.C. 5(2)(c)). Whenever such proposal is the subject of an application and a proceeding before such Commission, the Secretary is authorized to appear before the Commission in any proceeding held with respect to such application.

CONTENTS

SUMMARY AND CONCLUSIONS

Railroads are one of the great industrial achievements of modern civilization. It is impossible to imagine the building of our Nation's commercial and military strength without the railroads. Railroading has a proud tradition, and the industry remains an indispensable part of our economy.

Within the next few years, fundamental decisions will be made that will determine the course of the railroad industry for years to come. These decisions must be made wisely, for tremendous economic consequences are at stake. The railroad industry is one of high fixed costs and long-lived investments; if those investments are made incorrectly, they will affect the industry's efficiency long into the future. The rail industry has always been significantly affected by public policy, and changes made in public policy in the next few years will affect the destiny not only of the railroads, but also other modes of transportation. Because of the public's interest in rail service, taxpaper resources are very much a part of policies toward the industry.

Decisions on the future of railroading must be made quickly as well as wisely. The costs of delay in setting a proper course are substantial, and we must get the earliest possible start on what, in any event, will be a long journey toward vitality for the industry.

This report seeks to establish a framework for public and congressional discussion of these highly significant issues.

THE IMPORTANCE OF RAILROADS

In 1977, U.S. railroads accomplished the following.

- Hauled 1.4 billion tons of freight an average distance of 568 miles
- Received more than $20 billion in operating revenues
- Employed more than 500,000 people at an average salary of $18,000
- Spent $2.29 billion for new plant and equipment

The railroad industry is a common carrier mode, which means that it provides service to all customers, under published rates and terms. Railroads are able to provide services to many shippers at far lower costs than other modes, depending on the type of service, commodity characteristics, and distances. Railroads contribute daily to the fight against inflation because if they did not exist, the cost of consumer goods would be much higher.

Railroads are the principal mode of transport for many bulk materials and agricultural products. They handle over 70 percent of coal ton-miles and 60 percent of grain ton-miles. They are also the primary mode for such manufactured products as: pulp and paper products (77 percent); automotive products

(73 percent); food stuffs (66 percent); chemicals (60 percent); and primary metals (60 percent).

Without rail service, these industries would suffer major dislocations and would be faced with the need for vast new investments in transport and warehouse facilities, as well as with higher operating costs. These extra costs to the economy would exceed many times the investment needed to keep railroads functioning efficiently.

The rail mode is the most energy efficient form of transport for many goods, especially long-distance movements of bulk goods. On long hauls, trains consume only about one-third as much energy as trucks to haul a given amount of freight. Because of the circuity and directional flow of waterways, railroads often have an energy advantage over barges as well.

Railroads are essential to achievement of the Nation's energy goals, which include greatly increased reliance on coal. Railroads employ large numbers of workers and provide important and continuing economic stimulus to local communities across the land. Railroads are essential to exports, especially for commodities such as coal and grain. Rail movement of domestic materials for the energy, automotive, and steel industries reduces the amount of petroleum and heavy industrial goods that otherwise would have to be imported. Because of the high visibility of individual accidents, most people do not know the injury rate per unit of rail freight service is one-sixth that of trucks.

THE CURRENT SITUATION

Railroading has fallen on difficult times. Return on invested capital is among the lowest of major industries. The condition of railroad plant and equipment is deteriorating, and estimated deferred maintenance over the past decade has accumulated to some $5.4 billion.[1] Preliminary figures indicate that in 1977 the industry's profits fell to $347 million, the lowest figure since 1932.

Depending upon the cost of providing rail service in selected markets, declining traffic levels will have a major effect on rail profitability. Large parts of the industry have experienced a cycle in which loss of traffic causes reductions of revenues and then profits, which reduces the capacity to provide service, which, in turn, causes more losses of traffic, and so on. In 1947, the railroads accounted for two-thirds of total intercity freight ton-miles; today, they account for only a little more than one-third. If measured by tonnage hauled rather than by ton-miles, railroads have recently lost their preeminence among freight modes to trucking; trucks now make up 38 percent of intercity tonnage, versus 29 percent for railroads, with pipelines and barges carrying approximately 18 percent and 15 percent, respectively.

Rail passenger service has suffered even sharper declines. The profits went out of most rail passenger services just after World War II, and today the National Railroad Passenger Corporation (Amtrak), which operates nearly all intercity rail passenger service, receives subsidies of more than $0.5 billion annually. Revenue passenger-miles declined 80 percent between 1947 and 1973 and now represent less than 1 percent of all intercity travel. The automobile represents about 87 percent, with aircraft, buses, and trains dividing the rest.

After adjusting for inflation, railroad ordinary income today is one-quarter its 1947 level. In 1977, all Class I railroads earned only a 1.26-percent rate of return on an average net investment in rail plant of $28 billion. Net ordinary income (defined as net railway-operating income plus income from outside sources, less fixed rentals, interest, and other deductions) was only $284 million in 1977, and return on net worth was 1.8 percent.

Cash flow from internal operations and funds that can be raised from private capital markets vary from company to company, but overall are insufficient to renew the existing plant and equipment and provide capacity for anticipated levels of traffic. In 1977, cash flow for all Class I railroads was $1.7 billion less than capital expenditures, forcing the industry to seek capital from external sources. Cash flow affects the industry's net working capital position; at the end of 1976, it was minus $40 million.

Requirements for funds by Class I railroads, exclusive of Consolidated Rail Corporation (Conrail) and the Long Island Railroad (LIRR), over the decade 1976 to 1985, will exceed funds available from internal sources or private financial markets by $13 to $16 billion. Seven railroads, which provide 20 percent of all rail freight service, account for approximately half this amount. Ten companies have filed for protection in bankruptcy since 1967. Other companies have been able to hold their own in traffic and profitability, and some have prospered reasonably well, except in periods of abnormal weather or other dislocations. Nevertheless, the national rail system cannot be healthy while it suffers from the weakness of certain companies in the Northeast and Midwest. The general assessment must be that the railroad industry is in poor financial condition.

In response to inadequate financial performance, many railroads have deferred maintenance and delayed capital expenditures for roadway and equipment. For the period 1966 through 1976, normalized maintenance of the rail system, exclusive of Conrail and LIRR, would have amounted to $23.9 billion. (Normalized maintenance is defined as the level of railroad maintenance-of-way expenditures necessary to ensure that, on the average, one-half the useful life remains in the components of the railroad

[1] All dollar amounts in the Summary and Conclusions are in current year dollars unless otherwise noted.

track system.) Actual maintenance-of-way expenditures for the same 10-year period were only $18.5 billion, leaving a gap of $5.4 billion. A portion of this shortfall represents economies purposely made through changes in operating patterns, service policies, or anticipated line abandonments. Indeed, more than 20,000 miles of rail line (approximately 10 percent of total mileage) are being considered by railroads for potential abandonment.

As a result of deferred maintenance, by June 30, 1976, 47,200 miles of track, 15 percent of the total, were under slow orders requiring the operation of trains at reduced speeds. Slow orders impair the efficiency of railroad operations by often requiring an additional train crew to be brought on duty when a regular run cannot be completed in a 12-hour time period.

The railroad industry will not be able to correct its deferred maintenance and its delayed capital investments for new plant and equipment without additional outside funds. Financial weakness may jeopardize the ability of some companies to make the large investments that are needed to handle increased coal traffic, even though those projects may have a high internal rate of return and are in the national interest.

Continuation of the trends of the postwar period would result within the next 10 years in an industry facing enormous capital shortages, competing only for bulk shipments of low-value goods, lacking the resources needed for safe operation, and to a very considerable degree, operating under the financial control or ownership of public agencies.

CAUSES OF THE INDUSTRY'S PROBLEMS

The industry's difficulties in earning an adequate return on existing investment stem from various factors, not all of which are within the industry's control. They include the following.

- Traditional rail markets have changed as heavy industry has given way to a service-oriented, high-technology economy and as shifts have occurred in the location of industry.
- Federal regulation has constrained management's ability to adjust rates, merge corporate entities, provide new services, and abandon obsolete facilities and services.
- Labor unions and management have been unable to agree on methods for full implementation of innovations designed to improve productivity despite sizable increases in wages and benefits.
- Government has provided right-of-way facilities for highways, waterways, and airways that—in cases where adequate user charges are absent—have subsidized the rail industry's principal competitors.
- Railroads have been slow in adapting to new technology, while rival modes have been more successful in making use of new developments.

This report concludes there is not any single cause for the decline of the rail industry but rather a number of important factors, which, when taken together, constitute an institutional framework that inhibits the industry from adjusting quickly or effectively to change.

The Department of Transportation (DOT) believes there is an urgent need for the industry to adjust, to adapt, to find new solutions to the causes of its decline. The railroads must make major advances in all or nearly all of the problem areas if they are to be vital as private enterprises. Such improvements will greatly reduce the long-run demands for additional Federal financial aid. As governmental actions have been very much a part of the environment of the transportation industry, there is an urgent need for consideration whether Government policies toward the transportation sector, including programs of financial assistance, are even-handed, fair, and adequate.

PROJECTED NEED FOR OUTSIDE FUNDS

The analysis of sources and uses of funds for the railroad industry, excluding Conrail and the LIRR, indicates that the industry faces a potential capital shortfall of between $13.1 and $16.2 billion during the period from 1976 to 1985. This analysis assumes that current trends in inflation, business cycles, regulatory policies, operating efficiencies, levels of service, and availability of external capital will continue. No assumptions in arriving at this figure were made with respect to further regulatory reform or major changes in the present rail structure that could improve the outlook for the industry. Overall capital requirements of $42.5 billion, by category of expenditures, are set forth in table S-1.

TABLE S-1. CAPITAL REQUIREMENTS,

Category	Billion dollars
Capital expenditures for road property	6.8
Capital expenditures for equipment	21.5
Capital needed to repay debt coming due	10.7
Capital needed to improve working capital and other uses	3.5
Total	42.5

NOTE: For further detail refer to table 3-1, Projected Sources and Uses of Funds, 1976-85.

SOURCE: Federal Railroad Administration study.

Costs to overcome deferred maintenance and to raise the industry's ongoing maintenance-of-way expenditures to levels that would be called for by a normal maintenance program are not included as capital expenditures but are included in calculating the industry's necessary flow of funds from operations.[2]

During the 1978–1985 period, annual track and roadbed maintenance expenditures to gradually overcome existing deferred maintenance and to maintain facilities at appropriate levels in the future are estimated to range from $40.5 to $43.8 billion, omitting depreciation.

To assess the ability of the railroad industry to make capital expenditures, the Federal Railroad Administration (FRA) projected, on an annual basis, the level of funds the industry is likely to obtain over the forecast period. The projections indicate that the railroads will be able to generate internally or obtain externally between $26.3 and $29.5 billion over the 1976–1985 period. Forecasts of sources are shown in table S–2.

Even without expenditures for deferred maintenance, the industry faces a shortfall of $10.2 billion. In other words, beyond the need to overcome the lack of adequate spending on facilities in past years, if recent trends continue, the industry will generate insufficient funds to meet its needs over the next 10 years.

The analysis projects that the greatest gap between funds flow from operations and capital expenditures is likely to occur in the near future, that is, in the first half of the forecast decade. The timing of the need is such that even if actions are taken immediately to improve railroad earnings and correct underlying problems, further deterioration in facilities and service is likely to occur.

The analysis of the size and distribution of the projected capital shortfall leads to a number of conclusions.

First, although all railroads are affected by industry financial problems to some degree, the effects of the problems are more advanced in certain companies that tend to be grouped in the Northeast and Midwest. Approximately 50 percent of the shortfall will occur in those railroads that generate only 20 percent of the industry's revenues. This implies that the elements of the solution of the railroad problem—particularly the restructuring of fixed plant—will have to be mixed in different proportions to address different railroads and different regions.

Second, because of the factors discussed above, provision of external aid to cover the shortfall—even if interest free—would not return the railroad industry to profitability, since its poor financial performance results from the basic economic and institutional problems discussed in detail in this report. For the financially weaker railroads, finances and services would be improved to the extent that their rates of return would increase over the short run. This increase would still be less than that which would be necessary for these railroads to be self-sustaining in the long run. Traffic on these marginal railroads may be increased by Government assistance, but much of this traffic would be diverted from other railroads, thereby weakening other portions of the industry. Thus, Government financial assistance cannot substitute for more fundamental changes in the ability of railroads to increase revenues and control costs.

And, third, it is thus clear that the effectiveness of financial assistance hinges upon the degree to which the Government can secure needed changes in other policies affecting railroads as well as the extent to which railroad management and railroad labor can work together to improve the productivity of the railroads' assets and employees.

With these points in mind, the capital shortfall should not be viewed as the cause of the railroads' current difficulties. Rather, it is a symptom that the rail industry is in trouble and that the problem is sizable.

One cannot and should not, therefore, move directly from the estimated capital shortfall to a recommended congressional appropriation of funds. Numerous actions must be initiated if continued Government financial assistance is to be appropriate to help the railroads. Competing modes could pay, as railroads do, the full cost of constructing, operating, and maintaining their rights-of-way. Regulatory policies could be changed to put railroads on the same basis as other modes. Railroads themselves could undertake vigorous marketing efforts and

TABLE S-2. SOURCES OF FUNDS, 1976-1985

Category	Scenario 1 (billion $)	Scenario 2 (billion $)
Cash flow from operations after dividends	10.1	7.0
Proceeds from equipment financing	16.8	16.8
Proceeds from sale of debt	1.7	1.7
Other sources	.9	.9
Total	29.5	26.3

NOTE: The FRA projects that the industry should maintain a level of maintenance-of-way expenditures higher than normal for the next 10 years to correct for deferred maintenance. The total increase above normal ranges from 25 percent to 50 percent of existing deferred maintenance. Scenario 1 reflects the 25-percent estimate; Scenario 2, the 50 percent.
SOURCE: Federal Railroad Administration study.

[2]ICC accounting regulations require that costs of annual maintenance and the one-for-one replacement of rail, ties, and ballast be considered as operating expenses. Any portion of the expense that can be counted as upgrading is treated as a capital cost.

make internal management improvements. In concert with and to help facilitate changes such as these, Federal financial assistance can be appropriate and effective.

Consideration must also be given to the proper relationship of the Government to the private rail industry, the ability of private railroad companies to carry out large-scale investments, and the costs and benefits of specific projects eligible for Federal funding. Overall budget priorities will constrain the anticipations of those who advocate large-scale public assistance for rail rehabilitation.

If the railroad industry is to improve its financial health and remain in the private sector, changes must be made in the structure of the industry and in Government policy towards railroads and other modes, both in regulatory policy and financial assistance. The remainder of the report addresses those major issues.

RESTRUCTURING OF PHYSICAL FACILITIES

Most railroad facilities were constructed in an earlier, expansionary era, under vastly different market conditions, and with very little competition from other modes. There now are too many miles of track and other facilities of the wrong kind or in the wrong location to survive in the new competitive climate. The railroad industry must make substantial changes in its economic and physical structure. This is particularly true for financially weak railroads, which must analyze, in cooperation with appropriate public authorities, specific line segments to determine whether such segments are profitable (or can be made profitable). Unnecessary lines must be abandoned and traffic consolidated onto parallel or connecting lines, so that service can be maintained, but costs can be reduced.

Consolidation and coordination efforts include coordinated abandonments, joint use of facilities, trackage rights agreements, coordinated transfers, and purchase by other rail companies of line segments. These restructuring measures may preserve important services and have the potential to improve financial performance. Such devices avoid the disadvantages of mergers, while ensuring that the needed cost savings are actually realized. Restructuring should be aimed at preserving cost-effective services. This will result in stronger rail companies, to the benefit of the vast majority of shippers. Competitive changes in some markets will be balanced by the strengthening of competition in markets where coordination will permit upgraded facilities and service. Intermodal competition and Federal regulation will guard against abuses from reductions in rail competition.

Physical restructuring in the railroad industry must be a continuing process involving changes in line and yard capacities, line abandonments, and new construction. Consolidation and coordination projects have affected only a small percentage of the total rail fixed plant because of the difficulty of achieving cooperation between competing railroad companies. In the past, physical restructuring, typically, has occurred as a byproduct of corporate mergers. Several recent studies, however, have concluded that the rail mergers in the 1960's and 1970's have been disappointing with respect to achievement of anticipated cost savings from operations or physical restructuring. The FRA case studies of two recent consolidations found that these mergers did not significantly improve either profitability or market penetration.

End-to-end mergers have been suggested as helpful in restructuring the industry and improving rail service. Advocates of this type of merger argue that end-to-end consolidations would permit better origin-to-destination control of service than would parallel mergers, by eliminating reliance on interchange with cooperating railroads for through service. End-to-end mergers may improve service, but similar benefits could be achieved short of merger, with through trains and joint facilities. Because freight flows are highly dispersed, end-to-end systems still have to cooperate with other railroads to provide service for many important freight movements. Finally, part of the problem in achieving anticipated savings in recent mergers has been the difficulty of integrating and managing large organizations, and end-to-end mergers would face many of the same difficulties as parallel mergers in this regard.

Section 401 of the Railroad Revitalization and Regulatory Reform (4R) Act of 1976 authorizes the Secretary of Transportation to assist in planning, negotiating, and effecting a unification or coordination of facilities and operations of two or more railroads. As such, section 401 of the 4R Act provides a potentially powerful tool for exploring solutions to a number of rail industry problems. The Secretary may hold conferences with railroads and other interested parties, including shipper representatives, labor leaders, and public officials. The Secretary may also mediate any disputes that could arise from proposed unification or coordination efforts. These powers will be used in making specific restructuring proposals to the Interstate Commerce Commission (ICC). The ICC must give its approval to any abandonment, trackage right, line transfer, or merger proposal before implementation. Section 401 provides certain antitrust immunities to railroad executives and others participating in discussions at conferences held by the Secretary and to agreements reached at such conferences and approved by the Secretary. The Secretary of Transportation has

publicly declared his determination to use the new authority of section 401 to produce rail restructuring in the Midwest.

The administration has proposed changes in the Federal branchline assistance program that will be of value in the restructuring of the railroads' physical plant. The proposal would permit one-time investment in rehabilitation of those railroad lines that are important to States and local communities when railroad companies are unwilling or unable to upgrade the lines and when such investment has the potential for making the line profitable. Existing law permits Federal assistance only to those lines approved for abandonment by the ICC (or excluded from the United States Railway Association's *Final System Plan*)—often the least important lines in the rail system. Under the administration's new proposal, eligibility would be expanded to include those lines that are still operated by private companies, but which (possibly because of deteriorated condition) are subject to future abandonment. Such lines would not be eligible for operating subsidies but could receive funds for rehabilitation if they met established benefit/cost criteria and were included in a State's plan. Funds would also be available for the administrative costs of developing and measuring innovative management and marketing techniques designed to improve the economic viability of the lines.

Restructuring, in some instances, takes place when one (or more) company is involved in bankruptcy proceedings. The bankruptcy proceedings should resolve expeditiously the issue of a company's prospects for reorganization. If reorganization of a railroad company is not feasible without substantial changes to existing service patterns, then the court must be capable of moving swiftly to isolate a railroad's profitable services and to arrange for their continued operation while proceeding to dispose of other properties not necessary for the reorganization. The ICC and the DOT should participate in the review of the transportation aspects of a reorganization plan, recognizing that plenary power to approve such plans should be reserved to the courts, but with the assurance that the case will be promptly decided so that the entire restructuring can proceed. Otherwise, no progress can be made. Legislation is currently before Congress to change the bankruptcy laws to achieve these results.

In certain limited situations, non-Federal public ownership of specific rail lines or system segments will enable a larger degree of coordination and upgrading than other means of ownership. For example, if a bankrupt company possesses a line segment that government entities believe should be continued in service as part of a region's rail system, but which the railroad cannot afford to upgrade (or for which the company cannot provide repayment security for assistance sought pursuant to title V of the 4R Act), purchase of the line or facility by a State or local Government is an option. Such a line should be open to all companies serving that market in order to permit abandonment of duplicate facilities, where possible. This approach is preferable to total public ownership of rights-of-way and structures.

Certain sections of the U.S. railroad industry require substantial physical restructuring to ensure safe and profitable rail service in the private sector. Such restructuring will not occur without the cooperation of railroad companies, shippers, labor, and Government. Restructuring is as important as capital financing, regulatory change, and changes in Government policies toward other modes in solving the railroad problem. The DOT intends to encourage restructuring through the administration of its financial assistance program.

INTERMODAL POLICY

Railroads will continue to be adversely affected if Federal actions cause further diversions of traffic to other modes of transport. The railroads pay virtually all the costs of constructing and maintaining their own rights-of-way. Large trucks share with auto and other traffic the costs of constructing and maintaining the highway system. Inadequate enforcement by some State Governments of regulations on truck size, weight, and speed also permits truckers, not regularly subject to maintenance and hours of service checks, to reduce prices by carrying hidden loads for longer hours. Although the extent of such factors cannot be measured, these factors clearly lead to added damage to the highway system, higher accident rates, and unnecessary consumption of energy.

Barges pay no charges to use the federally constructed, operated, and maintained inland, coastal, and Great Lakes waterway rights-of-way and can haul bulk commodities at lower rates than railroads. Barge advantages will increase if the Nation enlarges the capacity of the inland waterway system and does not establish some fair system of user charges. If a network of coal slurry pipelines is developed as an alternative to unit coal trains, regulatory, tariff, and contractual arrangements must permit the railroads an equal opportunity to compete, or they will lose this business, too.

Federal freight transportation investments should be accompanied in all cases by user charges sufficient to recover an appropriate portion of the Government's costs. Public investment in, or approval of, new transportation capacity should pass strict tests of economic merit, including explicit consideration of all relevant public costs and benefits and intermodal impacts. Such analyses cannot be carried out effectively unless all modes are required to provide useful data on traffic and operations.

RECOMMENDATIONS FOR REGULATORY CHANGE

In the era when railroads enjoyed significant monopoly power, it was both reasonable and necessary for the Government to use economic regulation as an instrument of social policy. Value of service pricing, dependent on railroad monopoly power, permitted industrywide cross-subsidies of inefficient locations and commodity movements. But the emergence of ubiquitous motor carrier service, a pipeline network having greater mileage than railroads, and a strong water carrier industry have dramatically and permanently altered the economics of transportation. For the most part, railroads no longer enjoy monopoly power, and the 4R Act was a reflection of that change. The DOT recognizes the necessity of further regulatory reform to help solve the railroads' problems and ascribes highest priority to the achievement of those reforms.

One of the DOT'S particular concerns is the ICC's interpretation of the provision of the 4R Act by which the Congress clearly intended to permit rate flexibility to railroads, except in cases where a railroad possesses market dominance. The ICC, however, consistently has interpreted this provision in such a manner as to frustrate the congressional mandate for rate flexibility. The ICC's regulations tend to result in findings of market dominance because they neglect actual competition from other modes, if it can not be measured adequately, and they ignore potential competition completely. The ICC market dominance rules were challenged in the U.S. Court of Appeals for the District of Columbia but were, in the main, allowed to stand. New legislation will be needed to provide a market dominance criterion that recognizes the existence of actual and potential competition.

The implementation of other 4R Act provisions also must be reexamined. In connection with the seasonal, regional, and peak-period pricing provision, the notice periods for raising and lowering such rates must be shortened to assure their demand-sensitive character. Current policy prohibiting establishment of contract rates, which is being reviewed by the ICC, must be changed and contract rates must be freely allowed and encouraged. The rules governing establishment of distinct service prices must be amended to allow for segregation of more services, more flexible rules for submission of data, and expedited procedures for considering rate proposals for distinct services. Most important, the ICC must overrule the policy established by prior cases that requires underlying line-haul rates to be lowered by the cost of the distinct service if a distinct service is removed from an existing tariff and priced separately.

The ICC has only recently announced its procedures to meet the 4R Act's provisions regarding adequate railroad revenue levels. Yearly proceedings to establish individual and general railroad needs will be held and will require careful monitoring. Industrywide as well as specific rate increase requests will be measured against the findings in the annual needs' assessment. The ICC action on these requests will be an important instrument in the improvement of railroad finances.

In a recent decision, the ICC has rejected, pending the submission of additional evidence, a major rate bureau agreement. While the 4R Act had the goal of requiring more rates to be set competitively, the ICC must also recognize that railroads must be able to set joint rates and divisions simply and quickly. These goals are not incompatible.

With respect to the abandonment provision of the 4R Act, the ICC is working to revise its new rules pursuant to the judicial remand in a recent court challenge. The DOT hopes modifications will be made to reduce delays and improve cost computations. If they are not, further congressional action is appropriate. Since the problem of branchlines consists of the essential inability to cover full costs with existing revenues, Congress should consider granting broader freedom to railroad companies to set remunerative rates for such services as well as providing the mechanism for experimentation with labor-management cooperative action projects on light-density lines.

Pending further legislation on increased regulatory flexibility of branchline rates, the DOT recommends that the ICC initiate a new proceeding seeking recommendations on how to enhance company-shipper cooperation on branchline rate and service issues. This proceeding can be broadened to cover an overall examination of the public convenience and necessity standard for rail branchlines. Also, the ICC has recently begun an examination of the issues involved in port equalization. That examination should look toward affording railroad management more discretion in setting rate differentials for various ports if no market dominance is found.

Section 202 of the 4R Act—the 2-year, 7-percent, no-suspend zone—has already expired. As originally enacted, the provision offered the railroads less ratemaking flexibility than other provisions because it was tied to findings of market dominance. Another no-suspend provision should be enacted for an experimental period and with percentage restrictions. But, the provision must allow a true experiment in flexible ratemaking, without subjecting no-suspend proposals to market dominance findings. Rates proposed under this provision would still be subject to the antidiscrimination statutes, investigation, and ultimate findings of unlawfulness. A new no-suspend provision is crucial for effective railroad competition with other carriers.

Regulatory and policy imbalances in the treatment of different transportation modes must be

reconsidered. The ICC should use the powers granted by the 4R Act in section 207 to exempt certain commodities from regulation if other modes have such an exemption.

The DOT will study historical and current trends in the use of rail rates as an instrument of social policy. The study will examine the extent to which rail rates are deliberately depressed for the purpose of aiding particular industries or regions and will examine rail rates currently below variable cost. Congressional guidance will be sought, and appropriate ratemaking standards enunciated for those situations in which needs for rail revenue conflict with other important policy goals.

Traditional ICC considerations of rate structure and equity in pricing have led to circumstances where railroad plant and equipment utilization have been insufficient to cover minimum unit costs. The DOT will undertake a thorough examination of the impact of sections 2, 3, and 4 of the Interstate Commerce Act, with particular emphasis on modifications necessary to foster greater railroad efficiency and intermodal competition. Concurrent consideration will be given those aspects of sections 2 and 3 that the ICC appears to believe prevent contract rate and service arrangements among carriers and shippers when such arrangements are available to other modes.

The ICC, through administrative actions, has made major progress in reducing regulatory delay. As a further improvement, however, the ICC should consider retroactive collection of suspended rate increases from the effective tariff date, if the rate is later found to be just and reasonable. Allowing retroactive collection would reduce substantially the costs of regulatory lag and lessen shipper suspension requests designed only to postpone the effective date of a rate increase.

ALTERNATIVES FOR FEDERAL FINANCIAL ASSISTANCE

The financial collapse of much of the northeastern railroad system in the 1970's led to federally sponsored restructuring of that system and established a pattern of Government involvement in rail transportation. The 4R Act underscored this fundamental change by calling upon the Secretary of Transportation to recommend ways in which the Federal Government should provide future aid to the industry and the amounts, if any, of such assistance.

Faced with a potential need by the railroad industry for outside assistance amounting to many billions of dollars over the next decade, the Government must first determine how that need can be reduced through changes in Federal policies that affect the railroad industry as well as through changes undertaken by the industry itself. For example, substantial changes must be made in areas traditionally left to the railroad companies themselves or to the collective-bargaining process between management and labor. These areas include improvements in management productivity (perhaps through profit-oriented management structures and operational control systems), service quality, labor productivity, and technological innovation. This report has only scratched the surface, but these areas are important to the question: How much Federal assistance will be needed over the next decade?

Reaching the conclusion that considerable additional Federal assistance will be required to facilitate needed change, this report examines the forms such aid might take: loans, loan guarantees, the existing program of preference shares, and public ownership of rights-of-way. The DOT recommends that future financial assistance to railroads be provided through loan guarantees, repayable credits, and grants.

Loan Guarantees

Loan guarantees would be provided through a continuation of the present section 511 program. Such guarantees would be available for the stronger portions of the industry, at interest rates reflecting the Government's cost of capital, with liberal security terms and minimal interference with private corporate objectives.

Repayable Credits

Low-interest repayable credits would be provided to railroads facing financial difficulties to finance projects meeting the same economic and financial tests as projects financed under loan guarantees. Credits would also be provided for projects relating to specific areas of public interest, regardless of the financial condition of the applicant railroad. The credits could be structured as either debt or equity, depending on the financial structure of an applicant railroad. Limited advance disbursal of funds pending final security arrangements would be permissible.

Grants

Grants should be made available to encourage improvements in industry productivity. All three forms of financial assistance would be administered in such a way as to encourage restructuring of the railroad industry and its physical plant.

The DOT will recommend specific forms and amounts of Federal financial assistance after carefully considering public comment on this preliminary report. Public acceptance of the necessity for further abandonments, some losses of interrailroad competition, properly structured user charges on other modes, and less regulation of railroad rates and services, among other changes, will have a bearing on our recommendations. The DOT will prepare legislative recommendations on these and other rail issues, concurrent with the final report.

Each of the actions discussed in this report (such as restructuring, regulatory reform, and intermodal policy) will contribute to the improvement of the industry's financial performance. The relative impact of these actions on the capital shortfall, however, cannot be estimated. As discussed earlier, that number is a reflection of the problem that exists and is not the problem itself.

Yet, to the extent that changes in each of the policy areas serve to redress the underlying economic and institutional problems of the industry, their symptom—the shortfall—would be reduced proportionally. For example, the DOT estimates that proposed actions to reduce the regulatory burden and improve rail productivity could eliminate many of the weaknesses that led to a capital shortfall in the stronger railroads, located principally in the South and West. For the financially weak railroads in the Northeast and Midwest, however, restructuring of physical plant will assume greater importance. Even so, it is unlikely that the proposed changes in Federal policy will be sufficient to eliminate completely the problems that led to a capital shortfall, without some provision of Federal financial assistance to facilitate the implementation of these changes.

A LOOK AT THE FUTURE

Despite the continuing decline in rail market share and the industry's worsening financial condition, railroads remain a vital part of the Nation's economy. Many thousands of individual shippers and receivers rely on railroads for relatively low cost transportation. Railroads should continue to satisfy a substantial portion of the Nation's freight transportation requirements for the foreseeable future.

The rail industry will make major contributions to President Carter's goals of energy conservation and reduction of reliance on imported petroleum. The National Energy Plan projects that coal tonnage moving by rail will increase to 837 million tons in 1985, slightly more than double the 1975 level of 408 million tons. Coal is already the largest volume rail commodity, and doubling the tonnage will have tremendous implications for the industry.

In addition to coal, the railroads have shown continuing strength in handling high-volume commodities, such as automobiles and parts, chemicals, lumber, grain, woodpulp, and paper. Metal scrap and other recyclable materials hold some prospect for increasing volumes in the future. Also, piggyback and container traffic have grown dramatically. The enormous potential of this traffic is far from being completely realized, but, to fully develop this traffic, railroad companies must keep their plant in the condition needed for fast freight operations, and they must develop more reliable and efficient schedules and services. This traffic has the potential for sizeable profits to railroads and can make a major contribution to energy savings through reduced long-distance trucking.

Despite these potential improvements, the outlook for railroads remains clouded by the continuing loss of traffic to other modes. Trucks are carrying increasing amounts of bulk commodities as well as high-value goods. Factors that give an advantage to trucking over railroad transportation are greater regulatory freedom for trucking, increasing weight and speed, and shippers' increasing demand for reliable fast-freight service. These advantages could be affected by higher fuel costs, possible increases in highway user charges, and more consistent enforcement of highway speed and weight limits.

In many ways, the most important determinant of the future of railroading will be the attitudes toward the industry held by its supporters and critics. This report adopts the theme that fundamental, necessary changes will not occur without the enlightened cooperation of railroad companies, shippers, labor, and public officials. The public hearings undertaken in connection with this study will provide an opportunity for citizens to reflect and comment on the future of the rail industry, and the DOT looks forward to the receipt of their views.

1.
INDUSTRY STATUS

The railroad industry finds itself in the worst economic condition of any privately operated mode of transportation. Return on invested capital is among the lowest of major industries. In 1977, the industry's profits fell to $347 million, the lowest figure since 1932. Cash flow from internal operations and funds that can be raised from private capital markets are insufficient to renew existing plant and equipment and to provide capacity for anticipated levels of traffic.

Large parts of the industry have experienced a declining cycle, moving in sequence from loss of traffic to loss of revenues, then profits and the capacity to provide service, then more losses of traffic, and so on. In 1947, the railroads accounted for two-thirds of total intercity freight ton-miles; today, only a little more than one-third. If measured by tonnage hauled rather than ton-miles, railroads have recently lost their preeminence among freight modes to trucking; trucks now make up 38 percent of intercity tonnage versus 29 percent for railroads. Rail passenger service has suffered even sharper declines. Revenue passenger-miles declined 80 percent between 1947 and 1973, and now represent less than 1 percent of all intercity travel.

After adjusting for inflation, railroad ordinary income today is one-quarter its 1947 level. In 1977, all Class I railroads earned only a 1.26-percent rate of return on an average net investment in rail plant of $28 billion. Net ordinary income (defined as net railway operating income plus income from outside sources less fixed rentals, interest, and other deductions) was only $283.5 million in 1977, and return on net worth was only 1.8 percent.

Some 40 percent of rail freight services are provided by railroad companies that may be thought of as financially weak. Ten companies have filed for protection in bankruptcy since 1967. Other companies have been able to hold their own in traffic and profitability, and some have prospered reasonably well except in periods of abnormal weather or other dislocations. Nevertheless, the national rail system cannot be healthy while it suffers from the weaknesses of a number of important companies in the Northeast and Midwest.

Obviously related to the industry's poor financial condition, many railroads have deferred maintenance and delayed capital expenditures for roadway and equipment. For the period 1966 through 1976, normalized maintenance of the rail system, exclusive of the Consolidated Rail Corporation (Conrail) and the Long Island Railroad, would have amounted to $23.9 billion. For purposes of this study, normalized maintenance is

defined as the level of railroad maintenance-of-way expenditures necessary to ensure that, on the average, one-half the useful life remains in the components of the railroad track system. Actual maintenance-of-way expenditures for the same 10-year period were only $18.5 billion, leaving a gap of $5.4 billion. To be sure, a portion of this shortfall represents economies purposely made through changes in operating patterns, service policies, or anticipated line abandonments. Indeed, more than 20,000 miles of rail line (approximately 10 percent of total mileage) are being considered by railroads for potential abandonment.

As a result of deferred maintenance, by June 30, 1976, 47,203 miles of track, 15 percent of the total rail mileage, were under orders requiring the operation of trains at reduced speeds. Slow orders impair the efficiency of railroad operations, often requiring additional labor crews because of inability to perform normal work in a given time period.

INDUSTRY OWNERSHIP PATTERNS

The U.S. railroad industry is made of nearly 500 operating companies divided into two major categories by the Interstate Commerce Commission (ICC). The first consists of line-haul railroads that perform the basic service of hauling freight between origin and destination. The second consists of switching and terminal railroads that provide switching services, furnish terminal trackage and facilities, and operate railroad bridges and ferries. As of June 30, 1976, the ICC enumerated 332 line-haul railroads and 154 switching and terminal railroads, totaling 486.

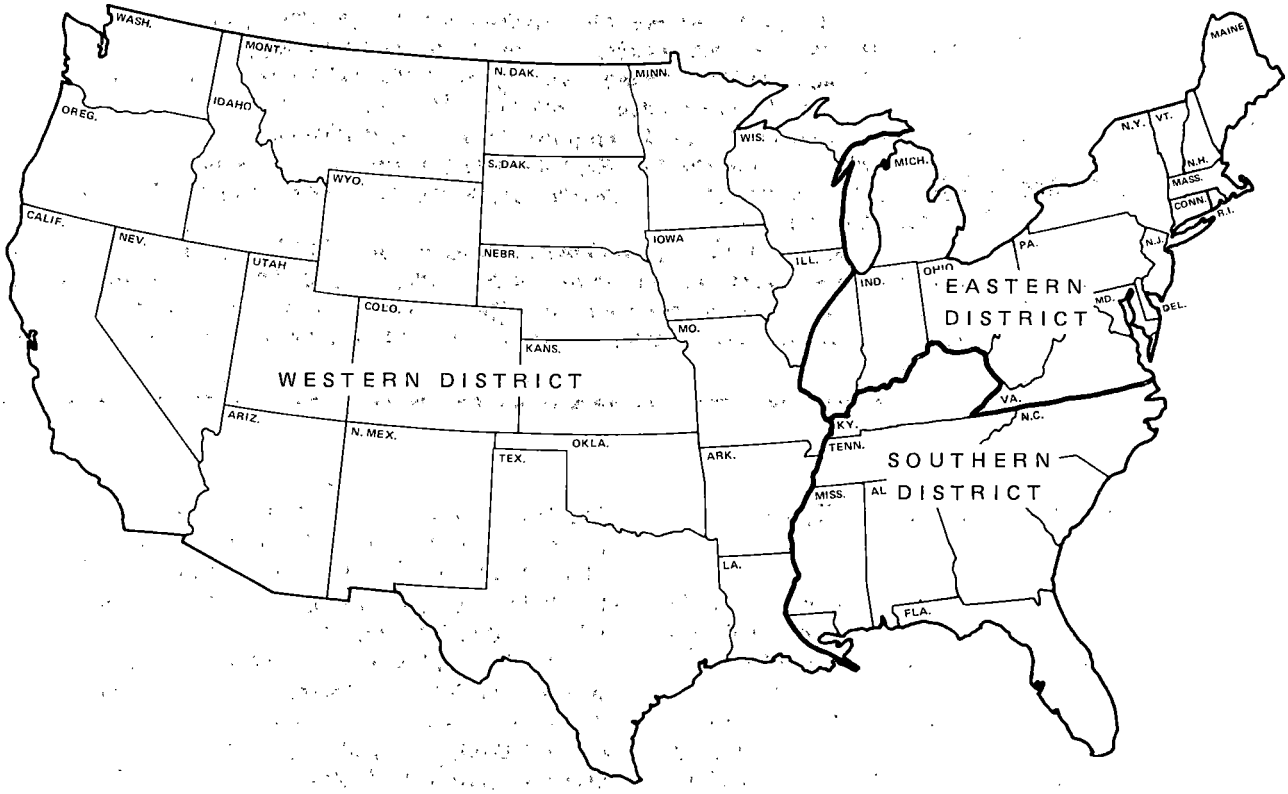
Line-haul railroads vary considerably in physical and operational size, and revenues range from under $50,000 to over $2 billion. In 1976, the ICC defined Class I railroads as those with annual revenues of $10 million or more. At the end of 1976, there were 56 Class I line-haul railroads (exclusive of the National Railroad Passenger Corporation (Amtrak) and Auto-Train, which only provide passenger service). These 56 railroads handled about 99 percent of the industry's traffic, owned 96 percent of the trackage, and employed 94 percent of the rail labor force.

For statistical purposes, the ICC has divided the United States into three rail districts—Eastern, Southern, and Western. Figure 1-1 shows the geographic boundaries of these districts and lists Class I railroads and their districts. As a result of these arrangements, the 56 Class I railroads can be arrayed into 30 affiliated groups, as shown in figure 1-2. One type of affiliation is the railroad holding company in which several railroads are owned by a parent corporation. Examples include the Southern Pacific, Family Lines, and the Chessie System. The Penn Central Transportation Co., also a holding company, has conveyed most of the Penn Central to Conrail but still retains ownership of the Detroit, Toledo and Ironton, and the Pittsburgh and Lake Erie. Another type of affiliation is common, or joint, ownership. Four Class I line-haul railroads are owned in common by two or more railroads; Illinois Terminal (a line-haul railroad despite its name) is owned by nine other railroads.

The development of the railroad industry, like many other mature industries, has been characterized by combination and concentration. There were 1,546 operating railroads in 1907, more than three times the number in 1976. This reduction is a result of numerous acquisitions and mergers, many of which have occurred during the past two decades. Concentration in the industry is greater than the number of firms indicates. As shown in table 1-1, 10 groups of affiliated railroads account for approximately 80 percent of total Class I operating revenues. Further consolidation and concentration can be expected. Several railroads have recently announced their intention to merge or that they are studying merger. Multiple railroad company competition, once characteristic of many eastern and midwestern markets, is now rarely found outside the Granger States and the Southwest. More detail on organizational and competitive factors in the railroad industry will appear in chapter 4.

RAILROAD MARKET SHARE

During the past decade, the railroad industry was surpassed in the hauling of intercity freight by the trucking industry. In 1976, intercity trucking revenues (regulated and unregulated) amounted to $56 billion, three times the revenues of $18.6 billion received by the railroad industry. In 1976, trucking employment topped 1 million persons—double the railroad industry figure. Trucks now handle 38 percent of intercity tonnage, with rail transporting 29.3 percent. Railroads are still dominant by the measure of ton-miles because of rail's predominant position in long-distance hauling of heavy bulk



Name	Initial	District
Alabama Great Southern R.R. Co.	AGS	S
Atchison, Topeka & Santa Fe Ry. Co.	ATSF	W
Baltimore & Ohio R.R. Co.	BO	E
Bangor & Aroostook R.R. Co.	BAR	E
Bessemer & Lake Erie R.R. Co.	BLE	E
Boston & Maine Corp.	BM	E
Burlington Northern Inc.	BN	W
Canadian Pacific Lines in Maine	CP	E
Central of Georgia Ry. Co.	CGA	S
Central Vermont Ry., Inc.	CV	E
Chesapeake & Ohio Ry. Co.	CO	E
Chicago & Illinois Midland	CIM	E
Chicago & North Western Tptn. Co.	CNW	W
Chicago, Milwaukee, St. Paul & Pacific R.R. Co.	MILW	W
Chicago, Rock Island & Pacific R.R. Co.	RI	W
Cincinnati, New Orleans & Texas Pacific Ry. Co.	CNTP	S
Clinchfield R.R. Co.	CCO	S
Colorado & Southern Ry. Co.	CS	W
Conrail	CR	E
Delaware & Hudson Ry. Co.	DH	E
Denver & Rio Grande Western R.R. Co.	DRGW	W
Detroit & Toledo Shore Line R.R. Co.	DTS	E
Detroit, Toledo & Ironton R.R. Co.	DTI	E
Duluth, Missabe & Iron Range Ry. Co.	DMIR	W
Duluth, Winnipeg & Pacific Ry. Co.	DWP	W
Elgin, Joliet & Eastern Ry. Co.	EJE	E
Florida East Coast Ry. Co.	FEC	S
Fort Worth & Denver Ry. Co.	FWD	W
Georgia R.R.	GA	S
Georgia Southern & Florida Ry. Co.	GSF	S
Grand Trunk Western R.R. Co.	GTW	E
Illinois Central Gulf R.R. Co.	ICG	S
Illinois Terminal R.R. Co.	ITC	E
Kansas City Southern Ry. Co.	KCS	W
Long Island R.R. Co.	LI	E
Louisiana & Arkansas	LA	W
Louisville & Nashville R.R. Co.	LN	S
Maine Central R.R. Co.	MEC	E
Missouri-Kansas-Texas R.R. Co.	MKT	W
Missouri Pacific R.R. Co.	MP	W
Norfolk & Western Ry. Co.	NW	E
Norfolk Southern Ry. Co.	NS	S
Northwestern Pacific R.R. Co.	NWP	W
Pittsburgh & Lake Erie R.R. Co.	PLE	E
Richmond, Fredericksburg & Potomac R.R. Co.	RFP	E
St. Louis-San Francisco Ry. Co.	SLSF	W
St. Louis Southwestern Ry. Co.	SSW	W
Seaboard Coast Line R.R. Co.	SCL	S
Soo Line R.R. Co.	SOO	W
Southern Pacific Transportation Co.	SP	W
Southern Ry.	SOU	S
Texas Mexican Ry. Co.	TM	W
Toledo, Peoria & Western R.R. Co.	TPW	W
Union Pacific R.R. Co.	UP	W
Western Maryland Ry. Co.	WM	E
Western Pacific R.R. Co.	WP	W

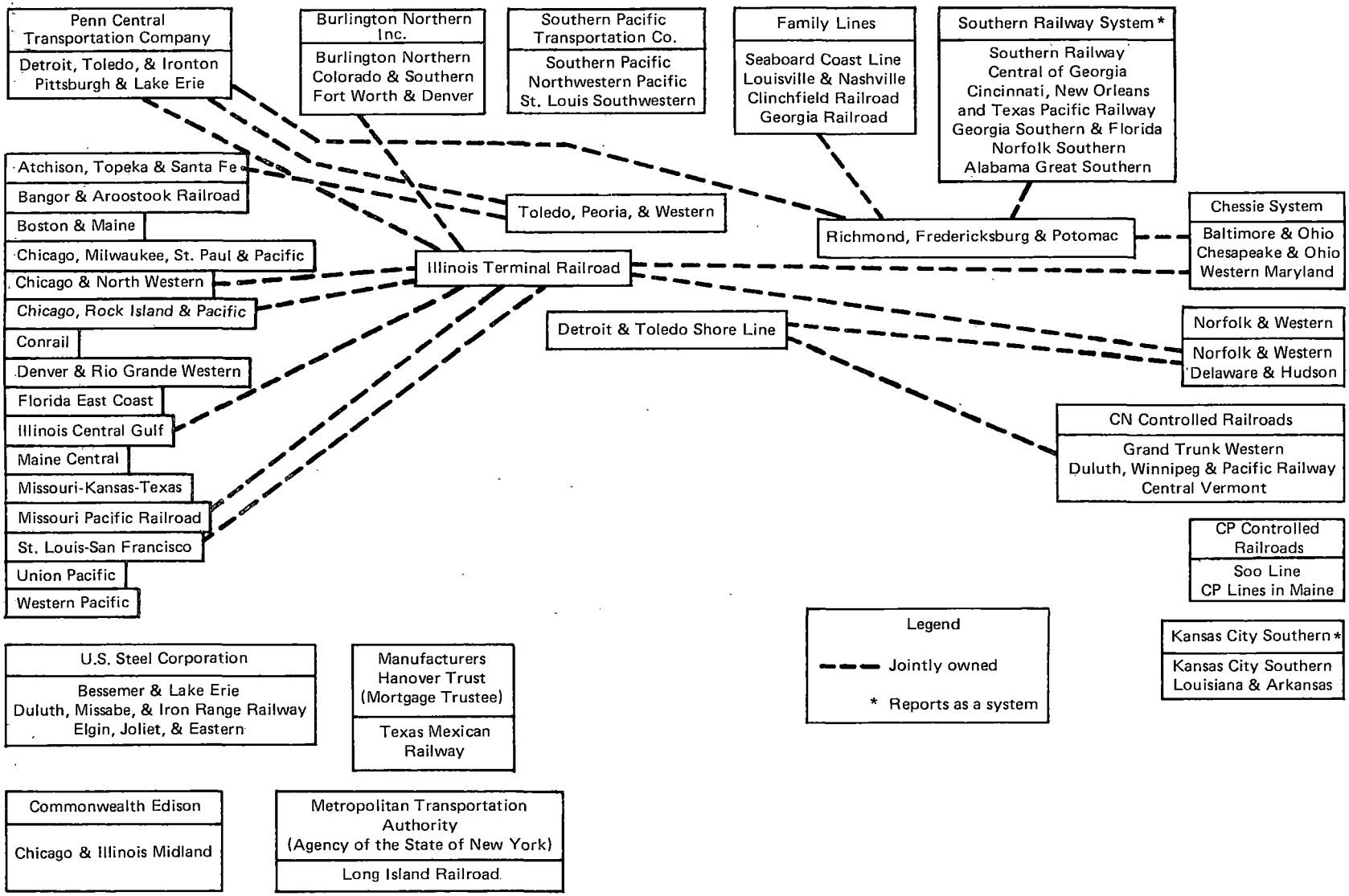
NOTE: In some cases, especially where the operated mileage of a railroad does not lie wholly in a single district, arbitrary assignment of the railroad is made on the basis of location of the major portion of the operation.

SOURCE: ICC, *Transport Statistics in the United States*, Part 1, 1976, p. 2.

FIGURE 1-1. U.S. RAILROAD DISTRICTS.

commodities such as coal, iron ore, and grain. The modal shares of intercity freight transportation are shown in figure 1-3.

Despite its shrinking market share, railroads continue to haul a wide variety of commodities, as shown in table 1-2. In 1976, more than half the rail carloadings involved bulk commodities, with coal representing one out of every five loaded railcars.



NOTE: Excluding Amtrak and Auto-Train. Includes 30 affiliated groups; 56 Class I line-haul railroads; and 50 reporting Class I railroads.

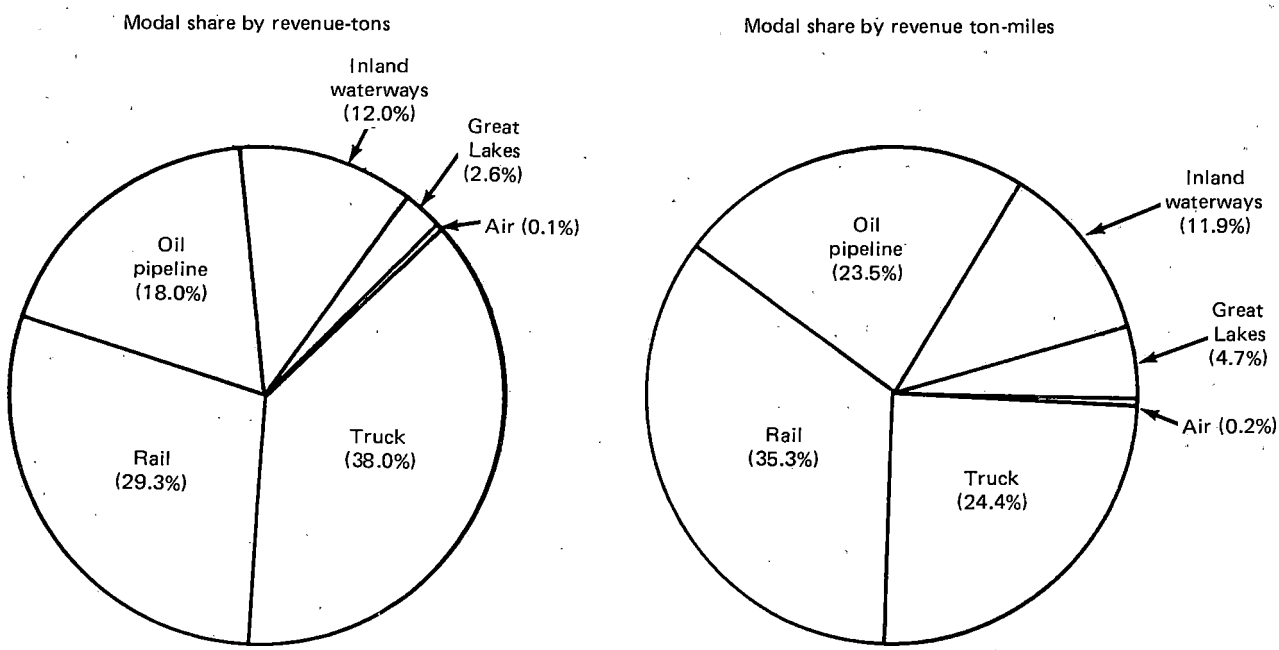
SOURCE: Railroad ownership and control is depicted as specified in *Moody's Transportation Manual*, 1976 Edition, Moody's Investor Services.

FIGURE 1-2. CLASS I LINE-HAUL RAILROADS.

TABLE 1-1. TOP TEN AFFILIATED RAILROAD GROUPS
(1976)

Group	No. of Class I Railroads	Operating revenues (million $)	Total Class I (%)	Freight revenues (million $)	% of total Class I	Revenue ton-miles (billion)	% of total Class I
Conrail	1	2,988.5	16.1	2,572.0	14.8	94.4	11.9
Burlington Northern	3	1,625.0	8.8	1,367.0	9.0	89.1	11.2
Southern Pacific	3	1,623.8	8.8	1,595.1	9.2	73.4	9.3
Family Lines	4	1,476.8	8.0	1,437.2	8.3	74.6	9.4
Chessie System	3	1,380.3	7.4	1,323.0	7.6	53.7	6.8
Norfolk and Western	2	1,200.6	6.5	1,153.3	6.6	52.1	6.6
Union Pacific	1	1,161.2	6.3	1,140.9	6.6	56.5	7.1
Atchison Topeka and Santa Fe	1	1,149.2	6.2	1,126.2	6.5	52.2	6.6
Southern Railway	6	1,028.0	5.5	1,002.2	5.8	45.7	5.8
Missouri Pacific	1	955.1	5.2	927.5	5.3	45.4	5.7
Total	25	14,588.5	78.8	13,844.4	79.7	637.1	80.4

SOURCE: Association of American Railroads, Economics and Finance Department.



SOURCE: For tons, *Transportation Facts and Trends*, 13th Edition, Transportation Association of America, July 1977, p. 10. For ton-miles, Transportation Facts and Trends, 13th Edition, Quarterly Supplement, TAA, Oct. 1977, p. 8.

FIGURE 1-3. MODAL SHARES OF FREIGHT MARKET.

Although metallic ores, principally iron ore, were next in importance, they accounted for only 1 out of 14 carloadings in 1976. Other important bulk commodities are chemicals, grain, primary forest products, flour, crushed stone, sand, gravel, and scrap materials. Manufactured goods transported by rail include motor vehicles, motor vehicle parts and accessories, paper products, household appliances, machinery, furniture, canned foods, tires, and textiles.

Modal market share varies greatly by commodity. The rail share of manufactured products, shown in table 1-3, ranges from a low of 2.7 percent for leather and leather products to a high of 76.6 percent

TABLE 1-2. REVENUE CARLOADINGS BY COMMODITY GROUP, 1976
(Class I railroads)

Commodity	Carloadings (thousand)	% of total	Cumulative % of total
Coal	4,699	19.9	19.9
Metallic ores	1,673	7.1	27.0
Chemicals and allied products	1,382	5.8	32.8
Grain	1,326	5.6	38.4
Motor vehicles and equipment	1,229	5.2	43.6
Primary forest products	1,134	4.8	48.4
Pulp, paper, and allied products	1,101	4.7	53.1
Food and kindred products	1,058	4.5	57.6
Crushed stone, gravel, and sand	1,035	4.4	62.0
Grain mill products	1,010	4.3	66.3
Metals and products	970	4.1	70.4
Stone, clay, and glass products	943	4.0	74.4
Waste and scrap materials	693	2.9	77.3
Nonmetallic minerals	689	2.9	80.2
Lumber and wood products	670	2.8	83.0
Other farm products	428	1.8	84.8
Forwarder and shipper association traffic	422	1.8	86.6
Petroleum products	371	1.6	88.2
Coke	364	1.5	89.7
LCL traffic	20	0.1	89.8
All other carloads	2,419	10.2	100.0
Total cars loaded	23,638	100.0	

SOURCE: Association of American Railroads, Car Service Division, reported 1977 *Yearbook of Railroad Facts*, p. 26.

for lumber and wood products, on a ton-mile basis.[1] With the exception of water-borne competition for grain, petroleum, and coal products, railroading's major competition is the trucking industry, which is composed of motor carriers for hire (common carriers, contract carriers, and exempt carriers) and private carriers (operated by the shipper or customer). In 1972, railroads captured more than half the ton-miles in the following commodity groups: transportation equipment, lumber and wood products, chemicals and allied products, primary metal products, and tobacco products. In comparison, the trucking industry transported more than half the ton-miles for textile mill products, apparel, and other finished textiles, furniture and fixtures, rubber and plastic products, leather products, fabricated metal products, instruments, photographic, and medical goods.

Underlying these differences in the commodity composition of each mode's traffic are the competitive advantages of each. Railroads compete most effectively for long-haul, large-volume, or heavy-weight shipments. Over 90 percent of the shipments moving more than 1,500 miles and weighing between 60,000 and 89,999 pounds were handled by rail in 1972; and the average length of haul during the same year for all U.S. railroads as a system was 511 miles, compared to 280 miles for Class I common carrier trucks. Figure 1-4 shows the rail market share by shipment distance and weight as a proportion of total manufacturing output. Most shipments on a tonnage basis are hauled relatively short distances. In 1972, 73.6 percent of shipments from manufacturers were under 500 miles. Similarly, most shipments are relatively small in size. In 1972, 59.5 percent of the shipments weighed less than 60,000 pounds, and 24.2 percent weighed less than 30,000 pounds. Railroads generally do not compete effectively for small or short-haul shipments.

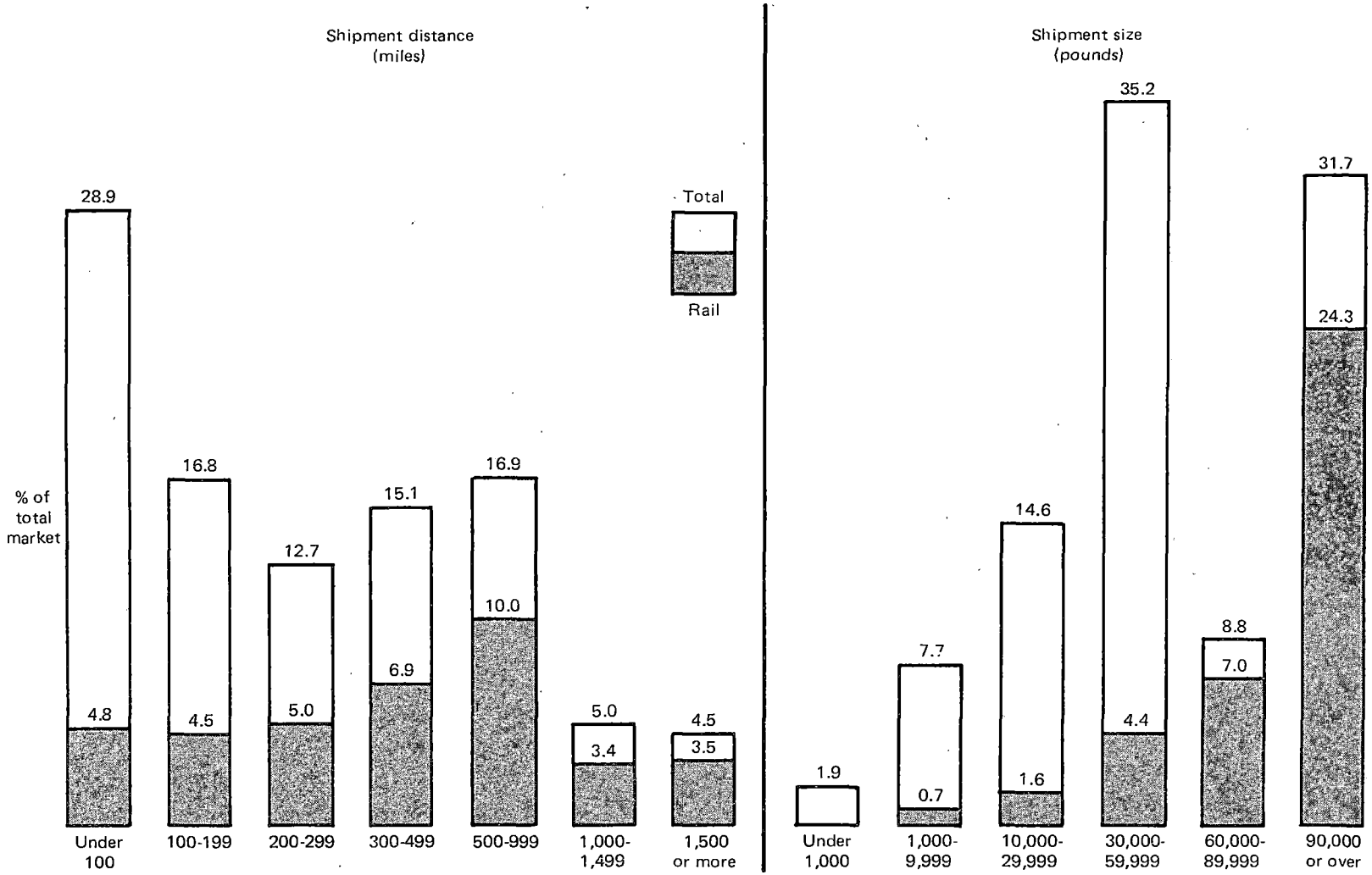
Although railroads are considered best suited for handling bulk commodities, their market share of coal, refined petroleum products, cement, crushed stone, sand and gravel, and grain has declined. For example, rail went from an 84-percent market share on a tonnage basis for bituminous coal in 1939 to a 66-percent share in 1976. This was a result of increased water carrier and motor carrier competition, plus an increase in mine-mouth power generation. During the last few years, however, rail's market

[1]Major bulk commodities such as coal and iron ore are excluded from the Census of Transportation since the census covers only nonlocal shipments from manufacturing plants with 10 or more employees. "Manufacturing plants" is defined broadly so that bulk commodities that have been processed in some fashion (i.e., are no longer in a raw or natural state) are included in the survey. This means that bulk commodities such as chemicals, refined petroleum products, and flour are included in the census.

TABLE 1-3. MODAL MARKET SHARES, 1972

Commodity	Tons of Shipments (%by mode)							
	% of total	Rail	Motor carrier	Private truck	Air	Water	Other	Unknown
Food and kindred products	27.0	37.4	25.0	33.9	—	3.5	—	0.4
Tobacco products	0.1	44.4	53.9	1.1	—	0.1	0.4	0.4
Textile mill products	1.0	8.5	63.5	27.3	0.2	—	0.6	0.2
Apparel and other finished textiles	0.4	10.0	68.5	15.2	1.9	—	4.5	0.2
Lumber and wood products	5.6	44.8	16.1	37.6	—	1.3	—	0.4
Furniture and fixtures	0.7	25.1	33.8	40.6	—	0.1	0.5	0.2
Pulp, paper, and allied products	5.9	52.1	27.7	17.9	—	2.2	0.1	0.2
Chemicals and allied products	11.6	42.0	33.5	11.3	—	12.7	0.6	0.2
Petroleum and coal products	23.2	11.5	16.1	8.3	—	63.8	0.2	0.4
Rubber and miscellaneous plastic products	1.2	23.4	60.4	15.1	0.7	0.1	0.4	0.3
Leather and leather products	0.1	2.4	61.1	31.8	0.3	—	3.9	0.7
Stone, clay, glass, and concrete products	11.3	21.3	48.2	23.1	—	6.7	0.1	0.9
Primary metal products	10.7	42.1	43.6	9.9	—	4.1	0.4	0.2
Fabricated metal products	2.7	25.1	49.3	24.0	0.2	1.0	0.5	0.3
Machinery, except electrical	1.5	20.6	61.6	15.5	0.7	0.2	1.3	0.4
Electrical machinery, equip. and supplies	1.0	30.3	53.1	13.8	1.4	0.2	1.3	0.3
Transportation equip.	4.1	54.2	37.3	8.0	0.2	0.2	0.3	0.2
Instruments, photo, and medical goods	0.1	22.6	60.0	12.5	2.3	0.2	2.4	0.3
Mines, manufacture	0.3	20.3	51.8	19.2	0.9	4.2	3.0	1.0
All other misc.	1.7	67.9	12.7	17.3	—	1.9	0.2	0.3
U.S. total	100.0	31.7	31.2	18.3	0.1	18.4	0.3	0.4
	Ton-miles of shipments (% by mode)							
Food and kindred products	14.8	55.9	26.5	13.6	—	3.7	—	0.4
Tobacco products	0.1	64.1	34.5	0.3	—	0.7	0.5	0.2
Textile mill products	1.1	16.2	61.4	21.4	0.2	—	0.7	0.3
Apparel and other finished textiles	0.5	14.4	66.2	9.3	4.9	0.1	5.2	0.2
Lumber and wood products	7.1	76.6	7.7	11.0	—	4.7	—	0.3
Furniture and fixtures	0.8	41.1	32.9	25.2	0.1	0.3	0.5	0.1
Pulp, paper, and allied products	6.3	73.9	19.0	5.5	—	1.4	0.1	0.3
Chemicals and allied products	11.9	51.5	23.1	4.9	0.1	20.1	0.3	0.3
Petroleum and coal products	29.6	9.0	3.5	1.7	—	85.9	—	0.2
Rubber and miscellaneous plastic products	1.4	33.5	55.5	9.4	1.0	0.3	0.3	0.2
Leather and leather products	0.1	2.7	75.7	14.8	0.9	0.2	5.1	1.0
Stone, clay, glass and concrete products	5.3	45.5	36.4	11.2	—	6.4	0.1	0.6
Primary metal products	8.1	54.1	34.0	6.2	—	5.5	0.2	0.2
Fabricated metal products	2.6	37.2	49.0	10.7	0.5	2.0	0.5	0.4
Machinery, except electrical	2.1	29.2	60.0	7.7	1.4	0.4	1.4	0.4
Electrical machinery, equip. and supplies	1.4	37.6	49.5	8.2	2.6	0.6	1.4	0.4
Transportation equip.	5.3	75.8	18.6	4.8	0.3	0.3	0.3	0.3
Instruments, photo, and medical goods	0.2	36.8	50.5	6.2	4.1	0.3	2.2	0.3
Mines, manufacture	0.5	35.2	46.6	11.8	2.2	1.2	2.6	0.7
All other misc.	0.8	76.5	10.7	8.7	—	3.5	0.2	0.6
U.S. Total	100.0	42.1	20.9	6.9	0.2	29.7	0.3	0.3

NOTE: Dash line indicates insignificant or nonexstant amount
SOURCE: Department of Commerce, Commodity Transportation Survey, *1972 Census of Transportation*, Area Report 8, United States.



NOTE: Excludes petroleum and coal products (TCC 29).

SOURCE: American Trucking Association, Department of Economics. Data were compiled from *1972 Census of Transportation,* Commodity Transportation Survey, Department of Commerce.

FIGURE 1-4. RAIL FREIGHT MARKET FOR INTERCITY MANUFACTURES, 1972.

share in coal has increased slightly and is likely to continue to increase as coal production grows.

The rail market share has improved for a limited number of manufactured products, principally motor vehicles. Until 1959, the rail market share of motor vehicles from factory to showroom decreased steadily, but this trend was successfully reversed by the introduction of auto rack cars during the early 1960's. These bilevel and trilevel cars allowed railroads to cut freight rates to a competitive level. As a result, railroads were able to increase their market share from 8 percent in 1959 to 55.2 percent in 1974. But, in 1976, the rail market share fell slightly to 51.5 percent; it is too early to say whether this constitutes a reversal in the growth trend.

Railroads have managed to maintain their market share for several products in the chemicals and allied products commodity group: chemicals, plastics, synthetic rubber, and fibers. Between 1963 and 1972, the market share for these products, measured in ton-miles, increased slightly from 61.8 percent to 63.2 percent. The chemicals and allied products group constitutes approximately 7 percent of railroad tonnage and 12 percent of rail revenues.

RAIL SERVICE QUALITY

Shippers expect differing levels of rail service, depending upon the commodity. In general, service expectations for bulk commodities are less than for manufactured goods. Bulk commodity shippers, therefore, are more satisfied with current rail service quality than are shippers of manufactured goods. Poor service is one of the primary reasons that railroads have lost traffic to competing modes. Countless shipper surveys and many detailed analyses of rail operations have documented that railroads generally provide inferior service compared to competing freight transportation modes.

The most recent comprehensive survey, "Industrial Shipper Survey (Plant Level)," conducted by the Department of Transportation (DOT) as part of the *1974 National Transportation Study,* involved 193 industrial manufacturers, each employing over 100 people, in 19 major metropolitan areas throughout the United States.[1] Selected results from this survey are presented in table 1-4.

Twenty-five percent of rail shippers interviewed described rail service as minimally acceptable, and nine percent found it unsatisfactory. Only 66 percent of rail users believed they were getting adequate or better service. By contrast, 97 percent of motor carrier users, 95 percent of water carrier users, and 95 percent of air carrier users considered their service to be adequate or better. The "Industrial Shipper Survey" sought to determine the reasons for shipper dissatisfaction. Responses indicated that for every major performance factor, rail provided the worst service. Shippers complained about the following factors when describing the less-than-adequate rail service.

- Late delivery—36 percent of the shippers
- Unavailability of specified equipment—35 percent of the shippers
- Late pickup—27 percent of the shippers
- Arrivals with loss or damage—17 percent of the shippers

For other modes, the highest percentage of shippers claiming less than adequate performance in any of the four categories was 9 percent (for lack of on-time delivery by motor carriers and air carriers). This is small compared to the 36 percent of shippers claiming minimally acceptable or unsatisfactory on-time performance for rail.

Many shippers surveyed pointed out that they had lower expectations for rail than for motor carrier service and, accordingly, allowed more leadtime for obtaining rail service. The survey found that only 65 percent of rail carload shipments arrived on time: 8 percent arrived 1 day late; and 27 percent arrived 2 or more days late. Rail TOFC/COFC (trailer on flat car/container on flat car), with 87 percent on-time deliveries, performed considerably better and almost on par with common carrier trucks. Private trucks had the best on-time performance record, 96 percent for truckload and 97 percent for less-than-truckload shipments. These findings confirm some of the reasons for shipper dissatisfaction with rail service and help explain the widespread and continued growth of private trucking.

This trend is likely to continue unless altered by one or more of the following factors: improvements in rail service; restricted fuel supply for motor carrier operations; substantial increases in motor carrier fuel prices; and major increases in highway user charges.

FINANCIAL CONDITION

In 1976, Class I railroads earned $468 million in net railway operating income on gross operating revenues of $18.6 billion.[2] This resulted in a 1.65-percent rate of return on an average net investment of $28.3 billion in rail plant. Net ordinary income (net railway operating income plus income from outside sources, less fixed rentals, interest, and other deductions) was even lower—$320 million.[2] Return

[2]After provision for deferred taxes and including equity in undistributed earnings of affiliated companies.

TABLE 1-4. FREIGHT TRANSPORTATION SERVICE QUALITY, 1974

Part A. Shipper evaluation of service

Mode	Excellent (%)	Quite good (%)	Adequate (%)	Minimally acceptable (%)	Unsatisfactory (%)	Total using mode
Motor	10.4	56.5	30.6	2.1	0.5	193
Rail	5.4	16.3	44.2	24.8	9.3	129
Air	16.9	51.5	26.9	4.6	0.0	130
Water	8.9	25.0	60.7	5.4	0.0	56

Part B. Shipper evaluation by performance factor

On-time Pickup:					
Motor	27	42	25	5	2
Rail	23	31	19	20	7
On-time Delivery:					
Motor	15	37	39	7	2
Rail	7	25	32	22	14
Air	29	42	20	7	2
Water	32	30	27	3	2
Arrival without loss, shortage or damage:					
Motor	31	44	18	5	2
Rail	20	39	23	11	6
Air	49	37	10	2	1
Water	51	29	15	5	0
Specified equipment availability:					
Motor	31	35	25	5	2
Rail	16	23	24	18	17

Part C. Aggregated city-pair data showing on-time delivery, by mode

	Shipment size	Observations	Average % on time	Average % 1 day late	Average % 2 or more days late
Motor, private	TL	50	96	3	1
	LTL	21	97	2	1
Motor, common	TL	186	89	7	4
	LTL	238	82	8	10
Rail, carload		122	65	8	27
Rail, TOFC/COFC		32	87	7	6
Air		19	93	6	1

SOURCE: Lana R. Batts, "Summary of Highlights of DOT's Industrial Shipper Survey (Plant Level)," prepared for the American Trucking Associations, Inc., Dec. 1975; pp. 3, 7, 8.

on net worth in 1976 was only 1 percent, based on ordinary income without regard to deferred taxes and before equity in undistributed earnings of affiliates.

The industry also experienced severe cash flow difficulties. In 1976, cash flow (ordinary income plus depreciation) was $1.3 billion less than capital expenditures, requiring the industry to seek capital

from external sources. This situation has adversely affected the industry's net working capital (current assets minus current liabilities exclusive of material inventories). Net working capital at the close of 1976 reached a deficit of $40 million.

The railroad industry fares poorly on fixed charge coverage and margin of safety. Fixed charge coverage is the ratio of fixed charges divided into net operating income after all expenses except fixed charges and income taxes, if any. The coverage ratio for Class I railroads in 1976 was 1.74:1.0, exclusive of outstanding leases. This ratio is far below what the financial community considers to be the minimum standard of 2.5 to 3.0:1.0.[2] The margin of safety (the percentage that revenue may drop and still cover fixed charges) for Class I railroads in 1976 was only 1.7 percent, as contrasted to an acceptable range of 10 percent to 15 percent.[3]

The railroad industry's marginal credit reflects its financial condition. According to one prominent railroad financial analyst, nearly two-thirds of the industry's debt obligations are below an A quality rating, a deficiency that in today's quality-oriented debt markets means that, at best, only one-third of railroad debt can be refinanced.[4]

The financial condition of individual railroads, as shown in figure 1-5, indicates rate of return on average net investment versus total operating revenues in 1976 for the 50 individual Class I reporting railroads. Although the industry as a whole is doing poorly, several railroads are faring reasonably well: The Norfolk and Western, Southern Railway, Missouri Pacific, Union Pacific, and Chesapeake and Ohio are major railroads enjoying a rate of return of 6 to 8 percent on average net investment. Nine smaller railroads also enjoy comparable, or even better, rates of return.

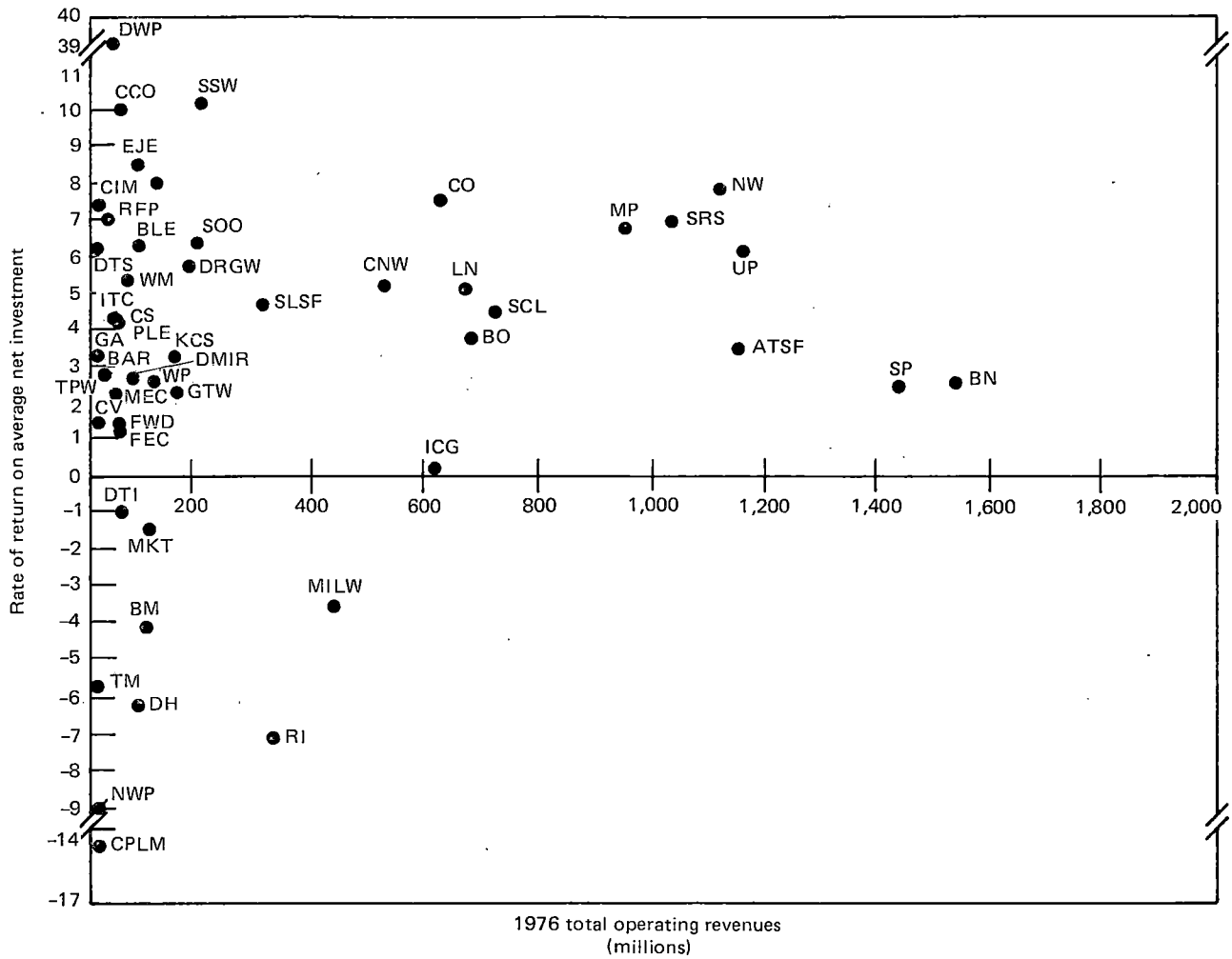
Most railroads, however, show a much less encouraging financial picture. For example, in 1976, 36 Class I railroads had a return on investment of less than 6 percent; and for many, it was considerably less. The chronic nature of the financial difficulties of a number of these companies has the financial community seriously concerned about their long-term viability. Eleven, or almost one-third, are in a deficit position. Three of these eleven are currently in reorganization: The Boston and Maine; the Chicago, Rock Island and Pacific; and most recently, the Chicago, Milwaukee, St. Paul and Pacific. Only 14 of the reporting railroads have a rate of return on average net investment in excess of 6 percent. Together, these railroads account for only 30 percent of industry revenues. Moreover, the comparative health of these railroads may be jeopardized by the poor condition of other railroad companies because all railroads function as a system, interchanging traffic and pooling equipment. More than one-third of rail shipments are transported by two railroads, and three- and four-carrier movements are not unusual. Failure of a major railroad company (as was threatened by the distressed condition of the Penn Central in the early 1970's) would have repercussions throughout the entire system.

The economic condition of the railroad industry stands in sharp contrast to the financial health of other regulated surface freight transportation modes (shown in table 1-5). Although direct and meaningful comparisons are difficult because of differences in the accounting treatment of the railroads' asset base and the extent of regulation among the industries, the financial performance of other regulated industries is, nonetheless, substantially better than that of the railroad industry. The First National City Bank corporate profitability tabulations, presented in table 1-6, confirm this finding for other major industries.

CONDITION OF RAIL PLANT AND EQUIPMENT

Despite steady shrinkage over the last several decades, the rail industry continues to support an extensive network of track and ancillary facilities. In 1976, the continental United States had a 198,000-mile rail network consisting of approximately 320,000 miles of track, including multiple main tracks, yard tracks, and sidings. There were 181 rail terminals consisting of yard facilities and connecting track used primarily for local service and interchange of freight cars. In addition to fixed plant, current railroad operations require an equipment fleet consisting of nearly 28,000 locomotives and 1.7 million freight cars.

To maintain these assets, in recent years, Class I railroads have devoted approximately 40 percent of total annual operating expenditures to maintenance of plant and equipment. These expenditures vary, depending upon financial conditions, but the industry traditionally defers maintenance and delays capital expenditures to protect profits during economic downturns. As rail revenues drop, cash flow is reduced, and railroads are forced to reduce expenses and cut back capital appropriations. Maintenance-of-way and maintenance-of-equipment expenditures in any given year are discretionary to a limited degree and can be deferred, in part, without significant effects. Prolonged deferrals and delays can be harmful, however, since they adversely affect operating expenses, safety, and the quality of rail service. As a result of poor financial performance in recent years, a number of railroads are deferring maintenance for roadway, equipment and, in some cases, both. The amount of deferral varies considerably by railroad company, with some reporting little or none. Estimates of deferral by individual railroads



Abbrv.	Railroad
ATSF	Atchison, Topeka & Santa Fe Railway
BAR	Bangor & Aroostook Railroad
BLE	Bessemer & Lake Erie Railroad
BM	Boston & Maine Corporation
BN	Burlington Northern Inc.
BO	Baltimore & Ohio Railroad
CCO	Clinchfield Railroad
CIM	Chicago & Illinois Midland Railway
CNW	Chicago & North Western Trans. Co.
CO	Chesapeake & Ohio Railway
CPLM	Canadian Pacific Lines in Maine
CS	Colorado & Southern Railway
CV	Central Vermont Railway
DH	Delaware & Hudson Railway
DMIR	Duluth, Missabe & Iron Range Railway
DRGW	Denver & Rio Grande Western Railroad
DTI	Detroit, Toledo & Ironton
DTS	Detroit & Toledo Shore Line Railroad
DWP	Duluth, Winnipeg & Pacific Railway
EJE	Elgin, Joliet & Eastern Railway
FEC	Florida East Coast Railway
FWD	Fort Worth & Denver Railway
GA	Georgia Railroad
GTW	Grand Trunk Western Railroad
ICG	Illinois Central Gulf Railroad
ITC	Illinois Terminal Railroad
KCS	Kansas City Southern Railway
LN	Louisville & Nashville Railroad
MEC	Maine Central Railroad
MILW	Chicago, Milwaukee, St. Paul & Pacific Railroad
MKT	Missouri-Kansas-Texas Railroad
MP	Missouri Pacific Railroad
NW	Norfolk & Western Railway
NWP	Northwestern Pacific Railroad
PLE	Pittsburgh & Lake Erie Railroad
RFP	Richmond, Fredericksburg & Potomac Railroad
RI	Chicago, Rock Island & Pacific Railroad
SCL	Seaboard Coast Line
SLSF	St. Louis-San Francisco Railway
SOO	Soo Line Railroad
SP	Southern Pacific Transportation Co.
SRS	Southern Railway System
SSW	St. Louis-Southwestern Railway
TM	Texas Mexican Railway
TPW	Toledo, Peoria & Western Railroad
UP	Union Pacific Railroad
WM	Western Maryland Railway
WP	Western Pacific

NOTE: Excludes Conrail and Long Island Railroad.

SOURCE: *Property Investment and Condensed Income Account,* Association of American Railroads, Economics and Finance Department, Nov. 4, 1977.

FIGURE 1-5. RATE OF RETURN ON AVERAGE NET INVESTMENT VERSUS TOTAL OPERATING REVENUES FOR CLASS I REPORTING RAILROADS, 1976.

TABLE 1-5. RATE OF RETURN ON REGULATED FREIGHT CARRIERS, 1975

Carrier	Return on net investment	Return on equity (net income basis)
Class I line-haul railroads[a]	0.08	-0.41
Class I intercity motor carriers of property	13.27	13.08
Class A and B water carriers by inland coastal waterways	15.79	20.18
Pipeline companies	7.66	21.19

[a]By reason of the railroad industry's use of replacement retirement betterment (RRB) accounting for its rights-of-way, the rate of return for railroads cannot be compared directly with rates of return for other industries. Adjustment of the rail rate to reflect this difference would not change the indicated conclusion.

SOURCE: Interstate Commerce Commission, "90th Annual Report, Fiscal Year Ending June 30, 1976," tables 10, 12, and 15.

TABLE 1-6. COMPARATIVE CORPORATE PROFITABILITY, 1976

Industry	Net income after taxes as % of net worth[a]
Class I railroads	1.8
Telephone and telegraph companies	11.6
Electric and gas utilities	11.8
Commercial banking	11.8
Air transportation	13.1
Common carrier trucking	14.8
Total manufacturing	15.0
Total, all industries	13.3

[a]Net worth in these tabulations is defined as "book net assets" or stockholders' equity, including preferred issues, as of the beginning of each year. Because many industries have a large proportion of capital in the form of funded debt, the return on networth should always be higher than the return on total invested capital.

SOURCE: Monthly Economic Letter, First National City Bank, Economics Department, New York, April 1977.

reflect not only differing conditions among the various Class I railroad companies, but also various views regarding what constitutes deferred maintenance. Regardless of the estimating procedures used, however, the level of deferred maintenance represents a measure of the condition of an asset or set of assets. Thus, the dollar value assigned to the total amount of deferred maintenance of a single railroad's assets is an important indicator of that firm's physical and financial condition.

In recognition of the relationship between deferred maintenance and long-term financial health, the ICC requested that estimates of the amount of deferred maintenance and delayed capital expenditures be submitted by each Class I railroad as part of a ratemaking determination involving a substantial rate increase sought by the industry. When the increase was granted in 1974 (Ex Parte No. 305), the ICC directed that a portion of the additional revenue be applied toward correcting deferred maintenance. Table 1-7 ranks Class I railroads according to the absolute dollar value of deferrals in maintenance and capital improvement still remaining on June 30, 1976, as reported to the ICC by the individual railroads. These figures indicate a reduction in total deferred maintenance and delayed capital improvements during the period mid-1974 through mid-1976 from $4.67 billion to $4.14 billion. Progress in reducing deferred maintenance has been slowed recently by inflation in material, supply, and labor costs.

Concerned over the seriousness of this problem, Congress directed the Secretary of Transportation to conduct a study of the projected amounts of maintenance and capital expenditures required between 1976 and 1985, including funds for deferred maintenance and necessary improvements to handle anticipated traffic. By reason of the wide variety of techniques used by the railroads to estimate deferred maintenance and needed capital expenditures, the Federal Railroad Administration (FRA) undertook independent studies to evaluate all facilities on a uniform basis, using a methodology based on standard industry engineering and maintenance practices. The results of the deferred maintenance study are presented in the following discussion.[5] (Projected capital expenditures are discussed in ch. 3.)

Under ideal conditions, a railroad would keep its fixed plant in a condition of normalized maintenance. A normalized maintenance program is defined as one that meets the average annual track material replacement requirement, at a level determined by dividing the total number of material units by the average material life. Over the long term, annual maintenance at the normalized level will result in a 50-percent remaining life of track materials.

In actual practice, a railroad's maintenance program will be established above or below the level of normalized maintenance. When business is good, greater amounts of funds are available for investment in track, and it is prudent to hedge against future years when funds may be insufficient for adequate maintenance. If a railroad's maintenance expenditures are below a normalized level, then the company may be deferring maintenance. The word "may" is important because the difference from the historical normalized maintenance level could represent not

TABLE 1-7. DEFERRED MAINTENANCE AND DELAYED CAPITAL, IMPROVEMENTS OF CLASS I RAILROADS, JUNE 30, 1976
(Thousand $)

Railroad	Deferred maintenance of way	Deferred maintenance of equipment	Delayed capital improvement of roadway	Delayed capital improvement of equipment	Total deferred maintenance capital improvements	Ratio of total to 1976 operating rev.
Chicago and North Western	556,729	28,897	305,858	98,329	989,813	1.87
Chicago and Rock Island and Pacific	213,736	20,828	87,748	77,854	400,166	1.17
Burlington Northern	22,222	3,083	212,735	151,900	389,940	.25
Missouri Pacific	38,070	12,479	51,150	169,979	271,678	.28
Illinois Central Gulf	69,683	7,865	144,184	41,861	263,593	.43
Atchison, Topeka and Santa Fe	0	0	84,000	161,000	245,000	.21
Southern Railway	17,130	0	106,690	40,600	164,420	.16
Seaboard Coast Line	63,772	12,222	45,598	32,264	153,856	.21
Norfolk and Western	51,776	7,937	63,606	2,725	126,044	.11
Missouri-Kansas-Texas	74,365	12,243	23,873	15,523	126,004	1.25
Chi., Milw., St. Paul and Pacific	51,405	4,033	14,300	54,400	124,138	.28
Southern Pacific	10,673	29,403	63,866	14,707	118,649	.08
Delaware and Hudson	23,821	11,289	6,790	50,764	92,664	1.19
Louisville and Nashville	20,089	7,299	47,676	0	75,064	.11
Kansas City Southern	65,981	5,846	1,714	10,571	47,850	.32
St. Louis, San Francisco	16,968	2,664	32,775	8,563	60,970	.19
Texas and Pacific	5,120	6,003	13,684	36,058	60,865	.41
Chesapeake and Ohio	0	0	0	44,938	44,938	.07
Maine Central	16,072	287	17,012	3,870	37,241	1.00
Clinchfield Railroad	10,105	1,460	1,235	19,679	32,479	.65
Toledo, Peoria and Western	11,506	400	13,267	7,240	32,413	1.58
Fort Worth and Denver	6,677	3,052	21,274	880	31,883	.75
Denver and Rio Grande Western	7,760	0	23,156	0	30,916	.18
Boston and Maine	14,379	5,060	5,872	3,471	28,782	.29
Chicago and Eastern Illinois[a]	2,082	1,405	4,771	16,363	24,621	.27
Colorado and Southern	758	7,298	11,809	3,750	23,615	.51
Union Pacific	731	120	16,204	6,099	23,154	.02
St. Louis, Southwestern	3,903	8,642	6,931	2,112	21,588	.11
Detroit, Toledo and Ironton	2,477	1,281	1,927	14,295	19,980	.37
Florida East Coast	7,195	1,344	5,791	398	14,728	.30
Pittsburgh and Lake Erie	7,539	0	390	4,221	12,150	.21
Duluth, Winnipeg and Pacific	1,950	640	8,721	156	11,467	.50
Detroit and Toledo Shore Line	4,283	1,275	1,152	638	7,348	.59
Western Pacific	4,100	187	0	1,630	5,917	.05
Northwestern Pacific	243	0	4,312	0	4,555	.33
Subtotal	1,343,165	200,410	1,458,928	1,134,117	4,136,620	.35
All other Class I	2,607	0	2,917	0	5,524	.00
Total	1,345,772	200,410	1,461,845	1,134,117	4,142,144	.22

[a]Merged with Missouri Pacific effective Oct. 15, 1976. Operating revenues for 1975 used instead of 1976.

NOTE: Conrail is not included in the above summary. It reported no deferred maintenance or delayed captial expenditures since this was accounted for in the net asset value of the properties conveyed by the bankrupt railroad estimates.

SOURCE: Interstate Commerce Commission, Bureau of Accounts, Ex Parte No. 305 Report for Second Quarter ending June 30, 1976, tables II and III.

deferred maintenance but conscious disinvestment (downgrading or abandonment), an expectation of lessened wear because of a decrease in operations, or simply an offset against a greater than normal level of maintenance in a previous year. Thus, true deferred maintenance is the negative deviation from historical normalized maintenance (less any amounts attributable to disinvestment, lessened rate of wear, or offsets against previous overmaintenance). When less than normal maintenance occurs, the average remaining life of track materials drops below 50 percent.

Due to the lack of complete information, FRA was unable to exclude all the elements of disinvestment and other offsetting factors in the deferral estimates. These figures do take into account,

however, the differing maintenance requirements experienced in the three rail regions: the Southern, Eastern, and Western Districts. No similar method for the evaluation of deferred maintenance of equipment exists, but a number of standard measures of equipment condition are discussed later in this chapter.

RAIL PLANT CONDITION

The graphs in figure 1-6 show the levels of tie and rail replaced from 1933 through 1975, exclusive of Conrail's predecessor companies. The tie graph depicts a massive installation of ties from 1933 to 1953. In the 1930's, this high maintenance level resulted from the replacement of untreated ties with creosote-treated ties, and in the 1940's, maintenance efforts were spurred by the defense requirements of World War II. In that 21-year period, 86 percent of the ties were replaced, although the normalized requirement was only 63-percent replacement.[3] During the peak of maintenance activity in World War II, ties were replaced at a rate 50 percent higher than the normalized rate.[4]

As a consequence of these above-normal replacements, tie requirements in the late 1950's and early 1960's were greatly reduced. From 1956 to 1965, only 19.5 percent of the ties were replaced (33 percent below normal), and from 1966 to 1975, 22.9 percent were replaced (23 percent below normal). As shown in figure 1-7, cross ties and rail are by far the largest cost components of track materials required to return track to a normalized maintenance condition.

Although the trend of tie replacement rates has been increasing steadily during the past 16 years, railroads have not replaced ties at a normalized rate since 1953. The large numbers of ties installed in the 1930's and 1940's are wearing out, and 50 percent of all ties must be replaced during the next 10 years to continue at current levels of track use and operating speeds. Therefore, even maintenance at the normal level during this period will be insufficient to replace all obsolete materials.

The installation of new rail follows a similar pattern, with an even more pronounced peak in the World War II years. From 1940 to 1953, rail was replaced at rates considerably above normal requirements; but, since 1953, rail replacement rates have been at less than normal levels. Since 1961, the rail replacement rate has steadily increased, but because the rail installed during the 1940's will soon be worn out, rail replacement must exceed normal requirements during the next 10 years.

There are considerable regional variations in these historical trends in ties and rail replacement rates. Tie installations in the South actually have exceeded normalized requirements since 1970. Rail replacement rates are also higher in the South than in the East or West but remain below normalized levels. Because of the higher replacement rates by Southern District railroads over the past 7 years, the problem is less severe there than in other parts of the country or in previous years. Figure 1-8 shows the regional differences for all deferred rights-of-way maintenance. These figures reflect the decreasing track-miles in the East, the increasing gross tons per track-mile in the South and West, and the large amount of excess track-miles in the Midwest.

As a consequence of maintaining rights-of-way at less than normalized levels, 47,203 miles of track, or 15 percent of U.S. track mileage, were under slow orders in 1976 (trains operating at reduced speeds), resulting in impaired efficiency of rail operations. The impact of slow-ordered track on service quality depends on the current level of traffic and the potential traffic volume on the line. Class I railroads with more than 250 miles of track under slow orders are shown in table 1-8. Three railroads (Conrail, Chicago and North Western, and the Rock Island) account for nearly half the industry's slow-order track.

Light-Density Lines

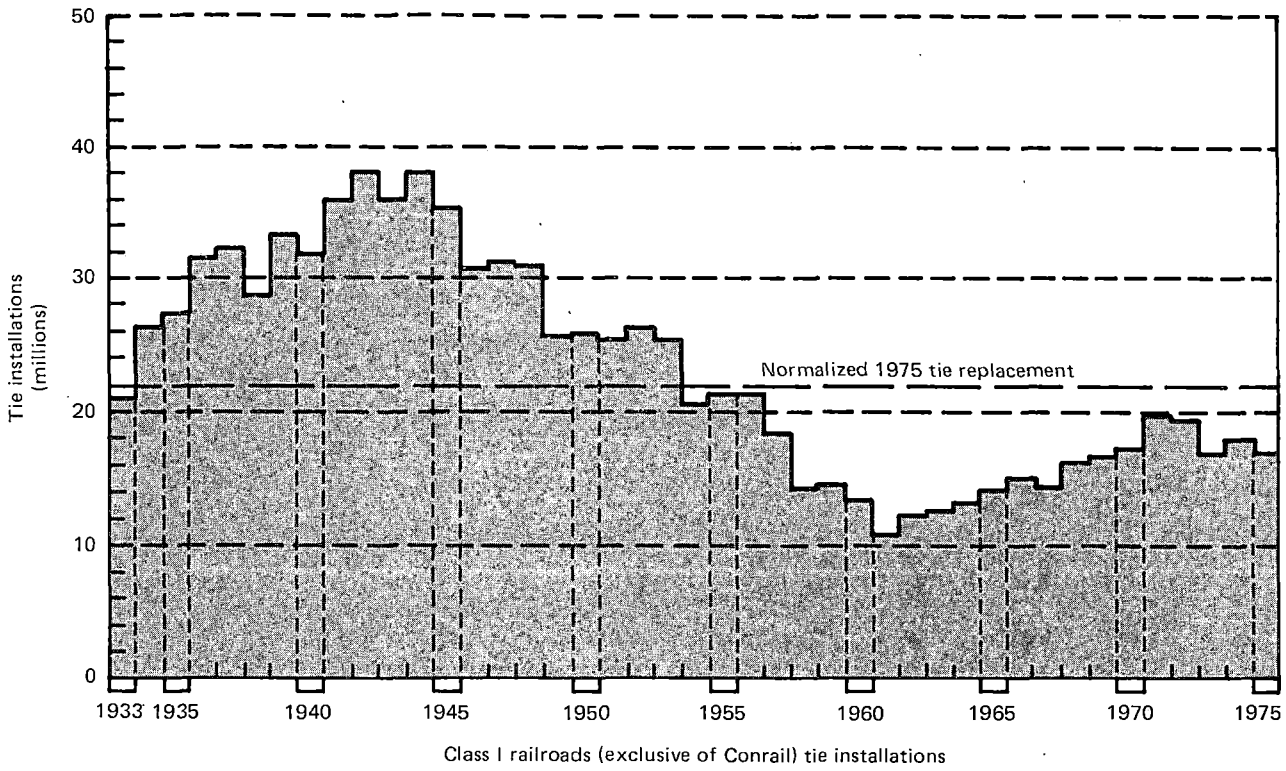
With some notable exceptions, a high correlation exists between maintenance levels and current economic performance of line segments. As table 1-9 shows, high-density mainlines, which carry the vast share of rail traffic, are generally in good condition.[5] Although three-quarters of total tonnage (ton-miles per mile of road) are transported over these lines, they represent only 3 percent of total deferred maintenance. Light-density lines, on the other hand, carry less than 5 percent of the tonnage, but possess 34 percent of total deferred maintenance. Most deferred maintenance is found in yards and terminals because railroads try to invest their scarce resources where utilization rates and return on investment are highest.

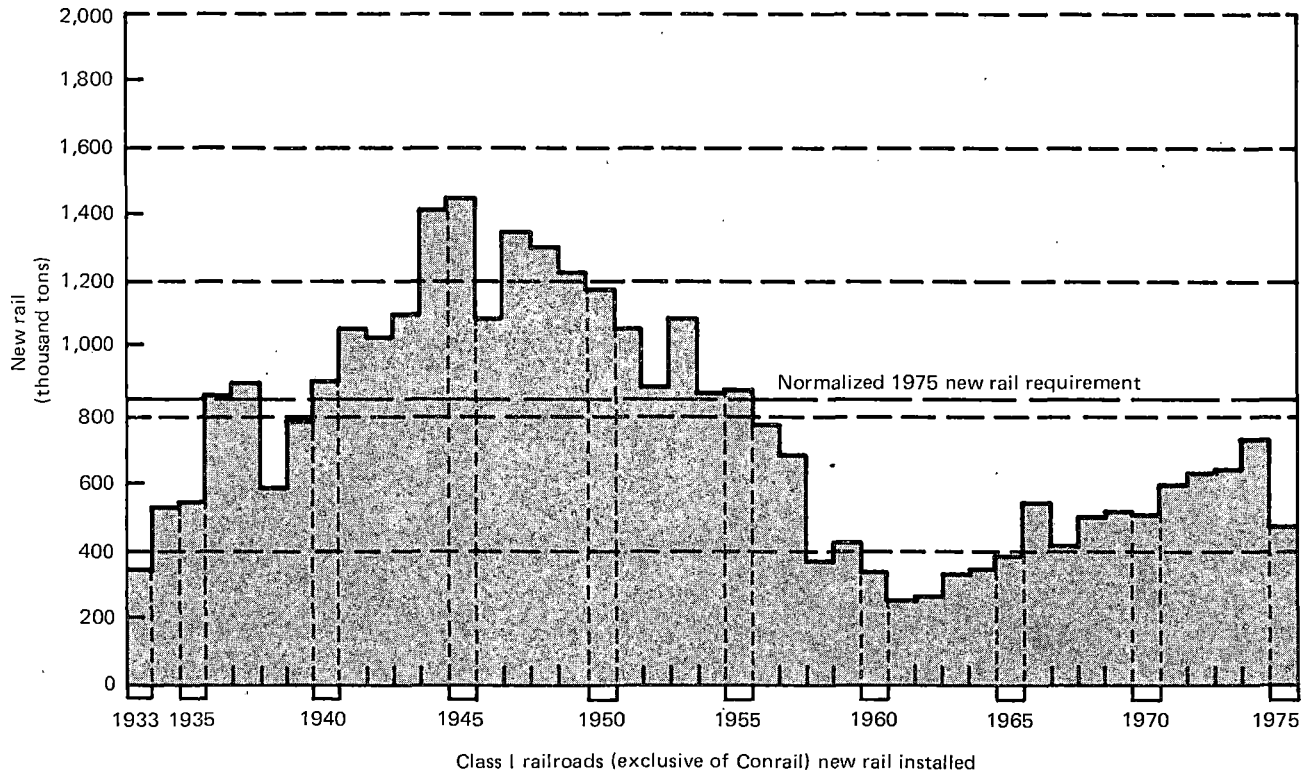
A graph of typical annual track maintenance costs over time (fig. 1-9) indicates the eventual cost implications of downgraded lines if they are kept in service. The graph shows the decline in speed as the track deteriorates; after about 25 years, the track has been downgraded from FRA Class 4 to Class 1, with a maximum speed of 10 mph. At this point, essential material replacement causes line maintenance costs to rise substantially.

[3]Throughout the deferred maintenance study, the number of ties (or tons of rail) in place on Dec. 31, 1975, was used as a base for comparative purposes.[5]

[4]During the war, railroads had a strong monetary incentive to overmaintain, since these expenditures reduced their income tax and wartime excess profit liability.

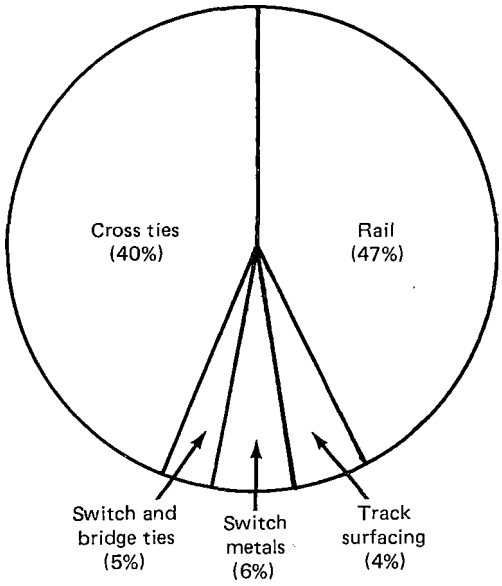
[5]High-density lines are defined as those lines with an annual traffic density greater than 20 million gross ton-miles. Light-density lines are lines with an annual traffic density of less than 5 million gross ton-miles.





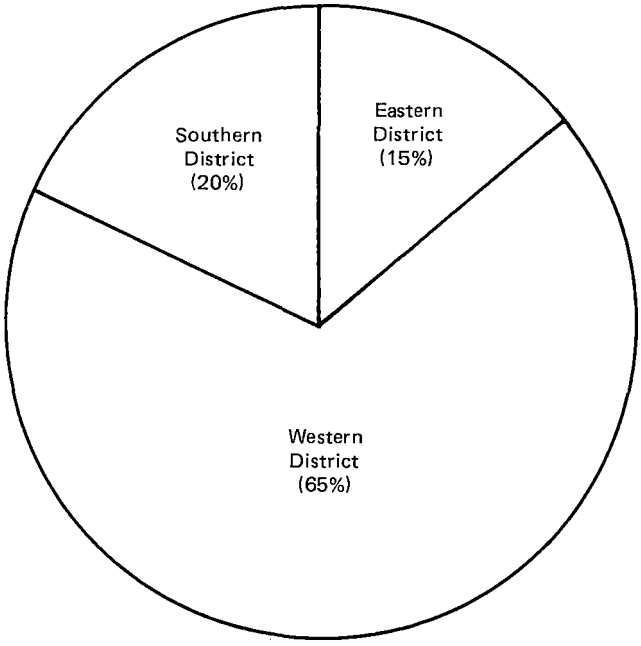
SOURCE: Thomas K. Dyer, Inc., for the Federal Railroad Administration, *United States Class I Railroad Fixed Plant Requirements*, Lexington, Mass., 1977, p. 3.

FIGURE 1-6. FIXED PLANT MAINTENANCE LEVELS, 1933-1975.



SOURCE: Thomas K. Dyer, Inc., for Federal Railroad Administration, *United States Class I Railroads Fixed Plant Requirements,* Lexington, Mass., 1977, p. 28.

FIGURE 1-7. PERCENT OF EXPENDITURES OF DEFERRED MAINTENANCE ON TRACK BY MAJOR TRACK COMPONENT, 1975.



SOURCE: Thomas K. Dyer, Inc., for Federal Railroad Administration, *United States Class I Railroads Fixed Plant Requirements,* Lexington, Mass., 1977, p. 29.

FIGURE 1-8. DEFERRED MAINTENANCE OF WAY, BY REGION, 1975.

TABLE 1-8. CLASS I RAILROADS WITH OVER 250 MILES OF TRACK UNDER SLOW ORDERS, JUNE 30, 1976

Railroad	Track under slow orders		Total track-miles
	Miles	Percent	
Missouri-Kansas-Texas	1,905	59.1	3,226
Chicago, Rock Island and Pacific	5,635	52.5	10,727
Chicago and North Western	6,899	48.0	14,371
St. Louis Southwestern	622	30.4	2,181
Chicago, Milwaukee, St. Paul and Pacific	3,910	26.3	14,888
Southern Pacific	4,316	23.7	18,228
Conrail	9,807	22.8	43,107
Kansas City Southern	388	22.5	2,617
Soo Line	984	16.7	5,897
Delaware and Hudson	386	14.1	2,736
Illinois Central Gulf	1,849	12.7	14,532
Southern Railway	2,020	11.7	17,282
Louisville and Nashville	1,024	9.6	10,616
Atchison, Topeka and Santa Fe	1,486	7.2	20,502
Burlington Northern	2,302	6.9	33,423
Norfolk and Western	609	4.1	14,858
All other	2,821	2.8	99,548
Total	47,203	14.4	328,739

SOURCE: Interstate Commerce Commission, Bureau of Accounts, Ex Parte No. 305, Report for the Second Quarter ending June 30, 1976.

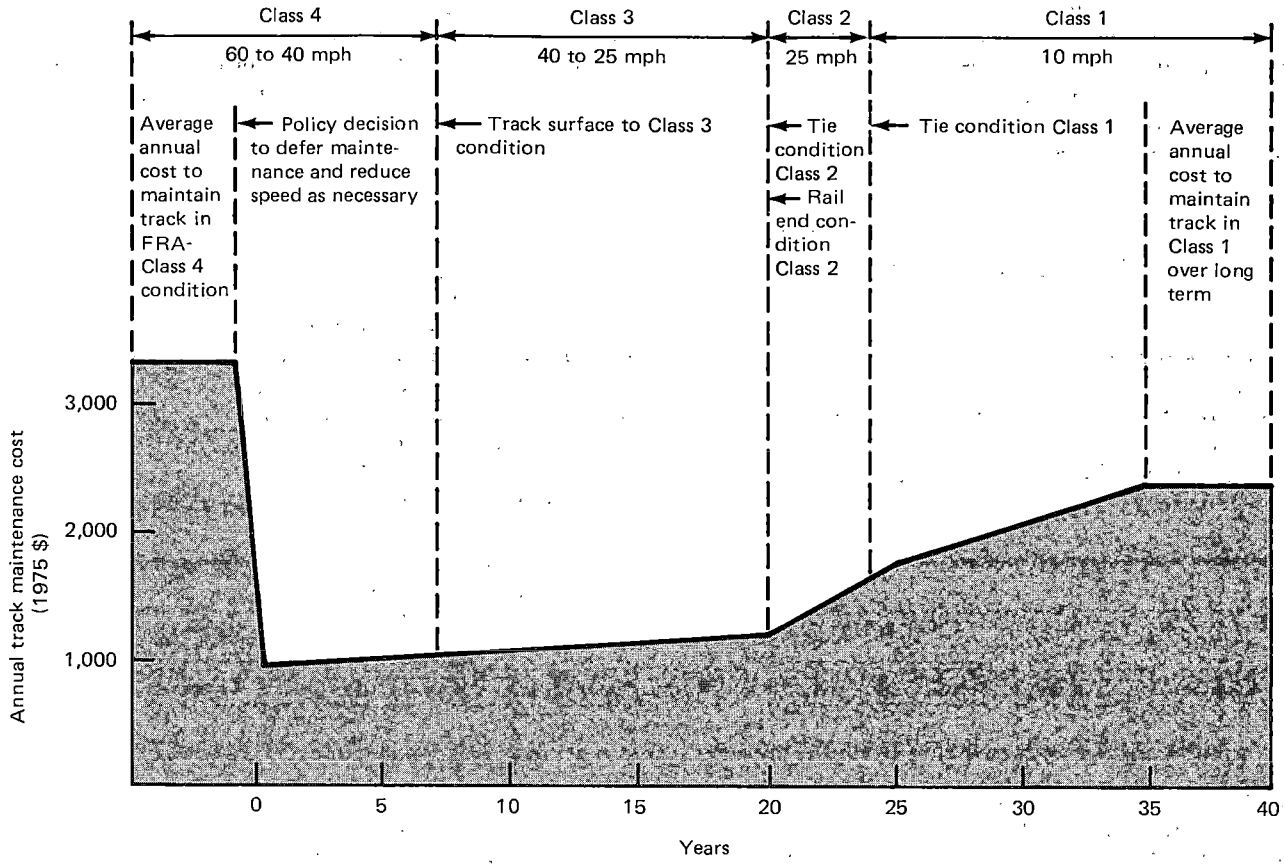
TABLE 1-9. DEFERRED MAINTENANCE BY LINE DENSITY OF TRACK

Category	Total deferred track maintenance (%)
Yards and switching track	50
Running track[a] (million gross-tons):	
0-1	20
1-5	14
5-10	10
10-20	3
20-30	2
30+	1
Total	100

[a]Running track refers to all track on rail rights-of-way, including second main, but does not include yard or switching track.

SOURCE: Derived from data compiled for the Federal Railroad Administration, by Thomas K. Dyer Inc., Class I Railroads, Fixed Plant Equipment Requirements, Lexington, Mass., Oct. 1977.

In general, light-density lines are approaching or are now in the 20- to 25-year point in material replacement deferral, and rapidly increasing costs can be anticipated over the next 10 years if such lines continue to operate, even at slow speed.



SOURCE: Thomas K. Dyer, Inc., for Federal Railroad Administration, *United States Class I Railroads Fixed Plant Requirements*, Lexington, Mass., 1977, p. 67.

FIGURE 1-9. LIGHT-DENSITY BRANCHLINE MAINTENANCE EXPENDITURES. (Constant 1975 $)

Yards and Terminals

Railroad companies have experienced sharp increases in costs attributable to yards and terminals. Many service reliability problems occur in yards and terminals, and the major portion of deferred maintenance is located in these facilities. A recent study of railroad facilities estimates that there are 4,169 yards; of these, 1,229 are used for classification (switching) of road-haul freight.[6] The remaining 2,940 are primarily used as industrial yards. Classification facilities, generally categorized as either hump or flat switchyards, handle approximately 840,000 cars per day. Hump yards classify a large number of cars more efficiently. At present, 116 of these facilities handle nearly the same number of cars as are processed in the low-volume, flat switchyards. In terms of date of original construction, 50 percent of the flat switchyards are over 60 years old; while 50 percent of the hump yards are less than 20 years old. In 1964, the first computer-controlled hump yard was built; by 1976, 23 were in operation.

Yards make up an increasing proportion of total track mileage. Excluding Conrail and its predecessors, mainline and branchline (i.e., running track) miles have decreased from 201,833 in 1940 to 182,237 in 1975. During the same period, yard track-miles have increased from 79,279 to 80,171. The ratio of yard to running track-miles has grown from 39 to 44 percent in the past 35 years.[5] For a typical railroad, yard track maintenance costs range from 24 cents per thousand gross ton-miles (high-tonnage road) to 38 cents per thousand gross ton-miles (low-tonnage road).[5] When traffic declines, the unit cost of maintaining these facilities usually increases. A recent study of railroad yard technology requirements for the years 1975 to 2000 takes into account future changes in rail transportation demand, operating procedures, railroad route rationalization alterna-

tives, modal shifts, equipment utilization programs, capital availability, technology improvement, and the age of present facilities.[3] The study concludes that 35 to 50 percent of the facilities will have to be downgraded or abandoned, and about 15 percent will have to be upgraded through expansion, reconfiguration, or totally new construction.

RAILROAD EQUIPMENT CONDITION

Railroad equipment in service at the end of 1976 is shown in table 1-10. The freight car fleet of some 1.7 million cars is composed of a variety of the car types required to handle the broad range of commodities carried by rail. Class I railroads directly own 78.4 percent of the U.S. car fleet. Car companies (some of which are owned by railroads) and shippers own a fleet consisting primarily of tank cars, covered hoppers, and flatcars, representing 19.6 percent of the total industry fleet. The locomotive fleet of nearly 27,600 units consists almost entirely of diesel electric locomotives, with electric units accounting for less than 1 percent of the total.

In 1976, Class I line-haul railroads spent $3.2 billion on equipment maintenance, a sum equal to 21.5 percent of total operating expenses. The level of maintenance expenditures has a direct bearing on the condition of the equipment fleet but provides only a partial indication of overall equipment condition. The bad-order ratio (unserviceable freight equipment as a percent of total freight equipment on line) is the standard industry measure of equipment condition.

Freight Cars

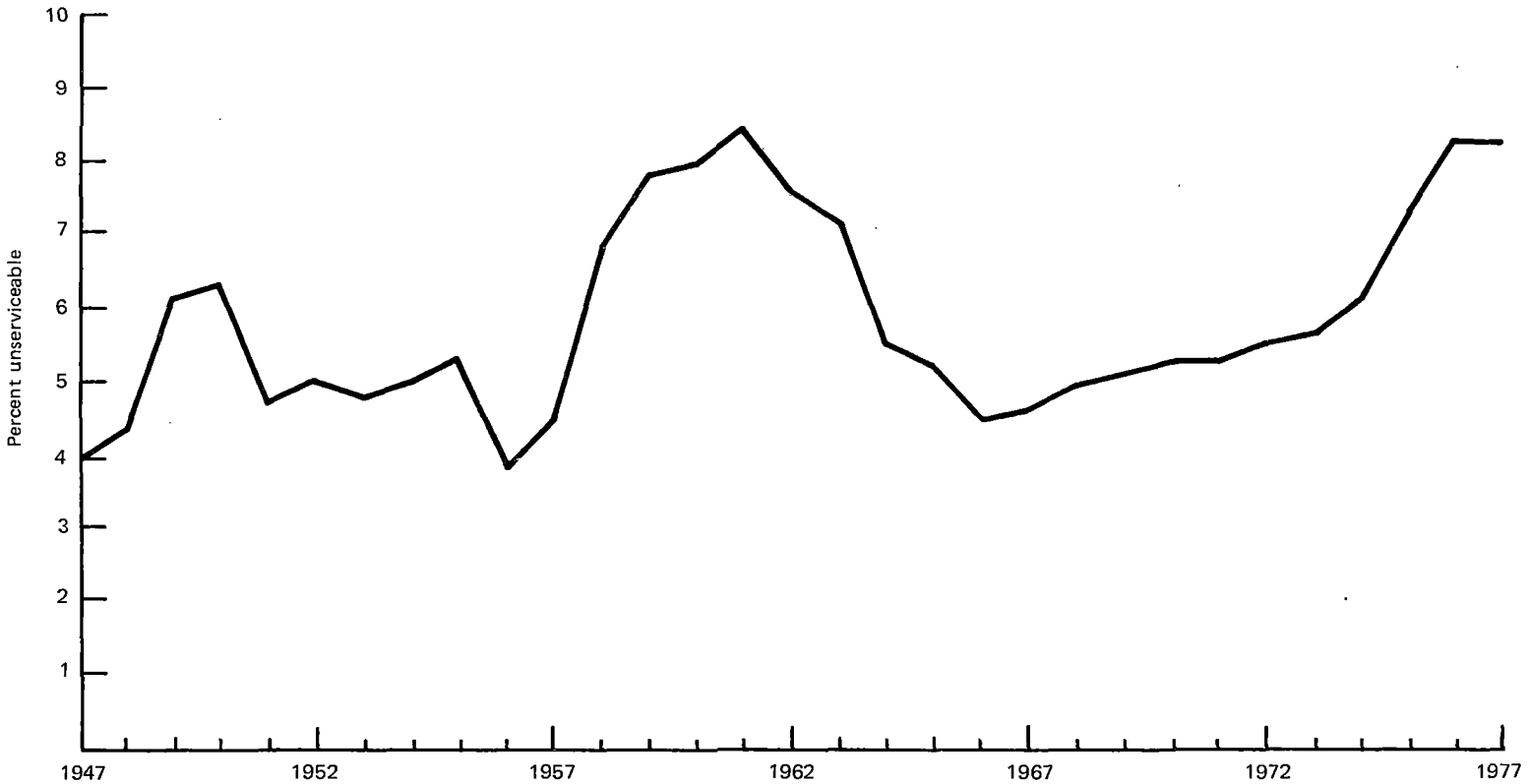
During the past three decades, the freight car bad-order ratio has fluctuated within the range of 3.8 percent to 8.4 percent, as shown in figure 1-10. This fluctuation reflects, in large part, railroad management's practice of deferring equipment maintenance during economically difficult times and catching up when conditions improve. An increase in the bad-order ratio, under such circumstances, might not have a detrimental effect on freight car availability or freight car utilization.

This is not the case, however, when an increase in the bad-order ratio occurs simultaneously with traffic growth. The steady increase in the bad-order ratio from 4.4 percent in 1966 to 8 percent in 1976 occurred despite an increasing traffic base, as measured in ton-miles, during the same period. Thus, the generally poor financial condition of the industry has led, or forced, railroads to defer equipment maintenance when traffic levels require an increasing number of cars. Table 1-11, a summary of Class I railroads with bad-order ratios greater than 9 percent

TABLE 1-10. RAILROAD EQUIPMENT IN SERVICE, DECEMBER 31, 1976

Type[a]	Total	% of car fleet	Class I railroads	Other railroads	Car companies and shippers
Boxcars:					
Plain	302,899	17.8	281,663	10,812	10,424
Equipped	171,054	10.1	167,426	2,722	906
Hopper cars	365,526	21.5	343,186	9,859	12,481
Covered hoppers	230,069	13.5	158,850	1,074	70,145
Gondola cars	185,776	10.9	172,789	4,641	8,346
Tank cars	168,018	9.9	2,905	17	165,096
Flatcars	141,781	8.3	98,386	908	42,487
Refrigerator cars	98,017	5.8	74,936	2,956	20,125
Stock cars	3,637	0.2	3,559	-	78
Other freight cars	32,250	1.9	28,005	1,463	2,782
Total	1,699,027	100.0	1,331,705	34,452	332,870
Locomotive units:					
Diesel electric	27,380				
Electric	217				
Steam	12				
Total	27,609				

[a]In addition, approximately 13,800 cabooses are used in conjunction with freight service.
[b]Class I railroads include 374 locomotive units owned or leased by Amtrak and 15 locomotive units owned or leased by Auto-Train.
SOURCE: Association of American Railroads, Economics and Finance Department.



SOURCE: Association of American Railroads, Car Service Division.

FIGURE 1-10. BAD-ORDER FREIGHT CARS AS A PERCENT OF TOTAL FREIGHT CARS ON LINE CLASS I RAILROADS.

TABLE 1-11. CLASS I LINE-HAUL RAILROADS WITH FREIGHT CAR BAD-ORDER RATIOS GREATER THAN NINE PERCENT, JUNE 30, 1976

Railroad	Bad-order ratio	1976 rate of return (%)
Fort Worth and Denver	24.4	1.2
Detroit and Toledo Shore Line	19.4	6.3
Western Maryland	16.0	5.3
Missouri-Kansas-Texas	15.5	-1.6
Colorado and Southern	15.1	4.3
Baltimore and Ohio	14.5	3.7
Boston and Maine	13.5	-4.2
Louisville and Nashville	13.2	5.0
Chicago and North Western	13.0	5.1
Illinois Central Gulf	12.8	0.3
Soo Line	12.2	6.2
Delaware and Hudson	11.3	-6.2
Conrail	11.1	-16.3
Chicago, Rock Island and Pacific	11.0	-7.2
Canadian Pacific Lines in Maine	10.8	-14.7
Clinchfield Railroad	9.1	10.0
Detroit, Toledo and Ironton	9.1	-1.1

SOURCE: Interstate Commerce Commission, Bureau of Accounts, Ex Parte No. 305 Report for Second Quarter ending June 30, 1976, table V.

in 1976, supports this contention. When deferrals occur at the same time as traffic is increasing, rail service quality deteriorates, often leading to further erosion of traffic and profits for the companies with high bad-order ratios as well as for the connecting companies.

Two important factors not revealed by these statistics are the practice of equipment disinvestment and the availability of equipment. A trend toward more specialized and sophisticated car types has made a number of car types virtually obsolete. When such cars are bad ordered, they are not repaired because of a lack of shipper demand, and so the cars remain on the bad-order list for extended periods. Specialized cars also may require more maintenance than general service equipment.

Another important factor is equipment availability. Only 65 percent of the shippers interviewed in the "Industrial Shipper Survey (Plant Level)" stated that rail equipment availability was adequate or better than adequate, as compared to 93 percent for motor carrier equipment availability.[1] Although the poor availability of rail equipment is aggravated by the failure of railroads to rebuild or upgrade old equipment and to purchase new equipment, it is principally due to poor utilization of equipment.

Distribution of empty cars is governed by car service rules that have been followed by the industry throughout most of the 20th century. Since a Supreme Court decision in 1971, primary responsibility for issuing and enforcing orders implementing these rules has rested with ICC. Prior to 1971, however, the Association of American Railroads (AAR) was solely responsible for enforcing these rules and the AAR continues to play a significant role. Under the present dual system, the industry generally follows AAR directives unless the ICC issues orders pertaining to the same rule. In such instances, ICC orders supersede those of AAR. Although the ICC has clear authority over car service rules, responding to directives from two agencies has led, on occasion, to unnecessary confusion regarding car distribution.

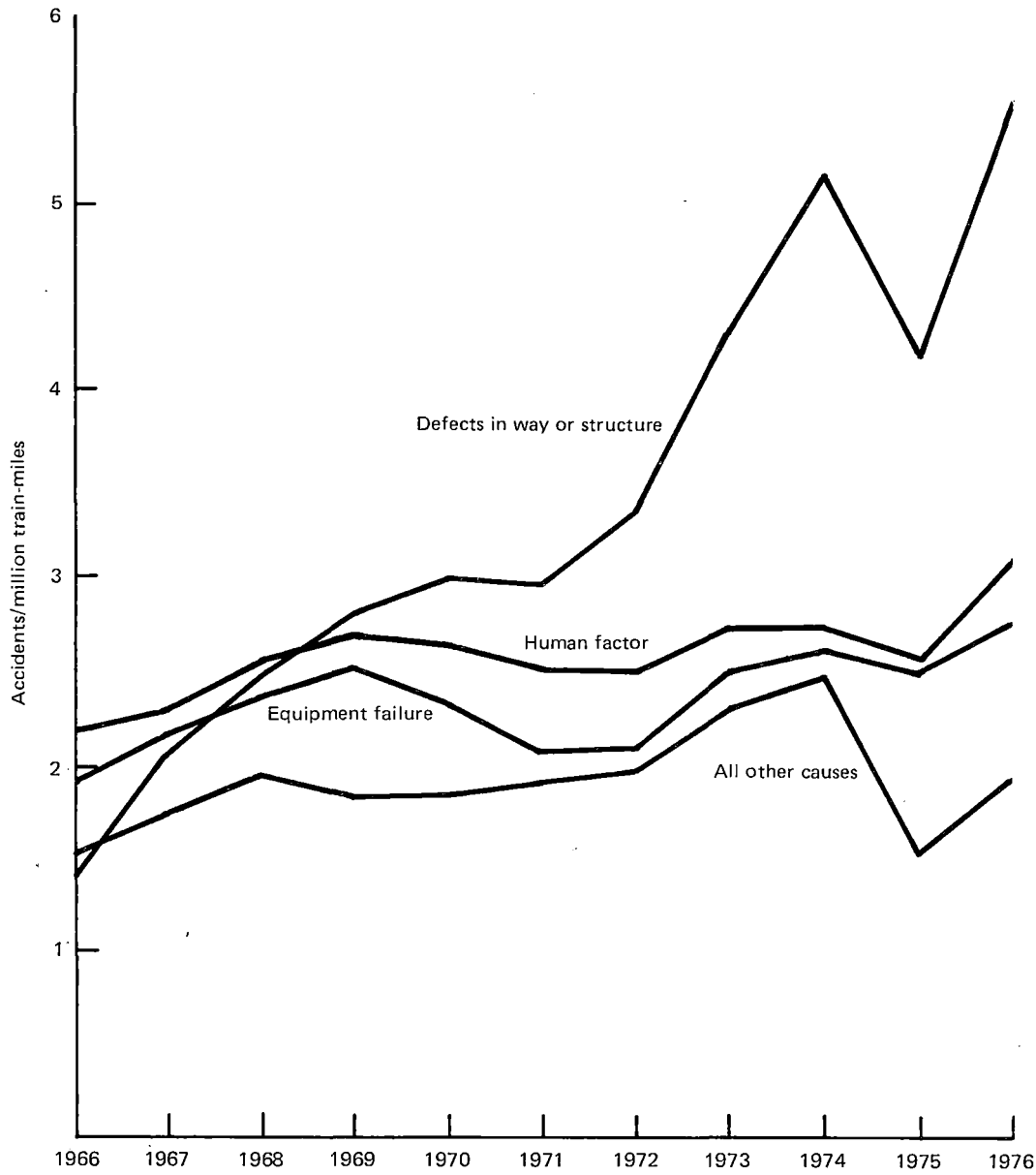
There is no evidence that the overall increase in the freight car bad-order ratio has affected the overall train accident rate substantially. Figure 1-11 shows that during the past decade the train accident rate due to equipment failures approximately equalled the train accident rate due to human factors and that both have generally remained constant over time, while the accident rate due to track failures has increased substantially.

The age distribution of the freight car fleet in 1976 is shown in figure 1-12; the average age of freight cars by car type in 1976 is shown in table 1-12. The average age of the fleet is 13.9 years, or less than half the average car life of approximately 30 years.

Freight Locomotives

The bad-order ratio for locomotives was reduced considerably over the period 1947 to 1977, as shown in figure 1-13. High bad-order ratios for both line-haul freight service (road) locomotives and yard-switching locomotives occurred during the late 1940's and early 1950's, due, in part, to the factors involved in the changeover from steam to diesel locomotives. Most of the benefits of the changeover from steam to diesel had been achieved by 1957, when the bad-order ratio for road locomotives fell to 8.6 percent, and yard switchers fell to 5.1 percent. During the 1960's and early 1970's, locomotive bad-order ratios generally declined, reaching a low of 4.8 percent for road locomotives in 1974. Two major factors contributing to these trends were the growing experience in diesel electric maintenance procedures and the increasing degree of standardization of locomotive units and subcomponents.

Since 1974, the bad-order ratios for both locomotive types have increased sharply. Table 1-13 shows those railroads with road or yard locomotive bad-order ratios in excess of 9 percent at the close of 1976. High bad-order ratios for both cars and locomotives are more likely to occur on railroads that have low or negative earnings (see tables 1-11



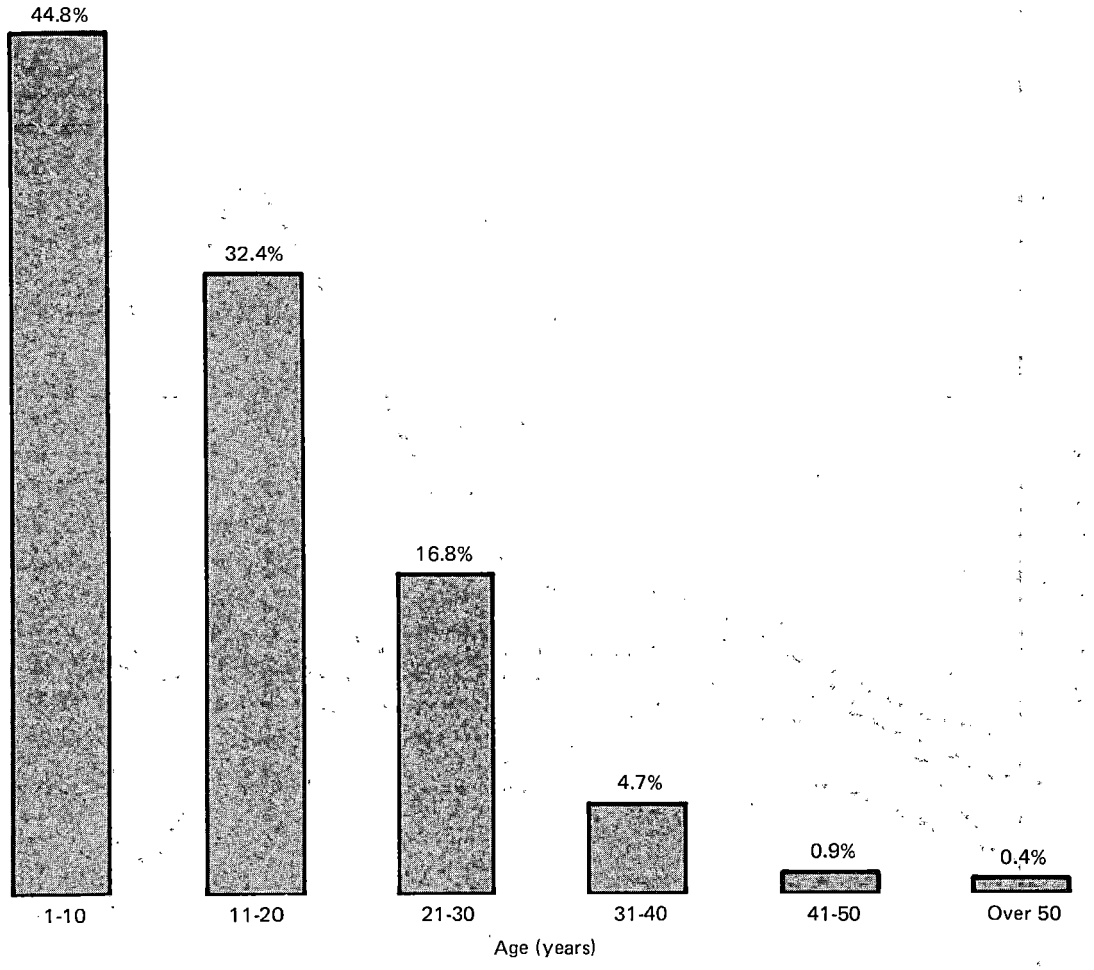
NOTE: In 1975 and 1976, the train accident-reporting threshold was $1,750, from 1966 to 1974, it was $750.

SOURCE: Federal Railroad Administration, *Accident/Incident Bulletin No. 144,* Table 4, Calendar Year 1975, Office of Safety (1976 figures furnished directly by Office of Safety).

FIGURE 1-11. TRAIN ACCIDENTS BY CONTRIBUTING CAUSE, CLASS I AND CLASS II RAILROADS, 1966-1976.

and 1-13), although (as displayed in figs. 1-10 and 1-13) some companies with reasonably healthy earnings also appear in tables 1-11 and 1-13.

In 1975, railroads reduced purchases of new and rebuilt locomotives. But, in 1977, locomotive purchases increased 27 percent over the depressed 1976 level. If the 1977 level were sustained over an extended period, the entire locomotive fleet would be replaced in 29 years. This period is longer than the average locomotive life of 15 to 20 years for line haul and implies that locomotive installation must increase in the future if present traffic levels are to be sustained. Figure 1-14 shows that nearly one-quarter of the U.S. locomotive fleet are 22 years of age or



SOURCE: Association of American Railroads, Car Service Division.

FIGURE 1-12. AGE DISTRIBUTION OF FREIGHT CAR FLEET, 1976.

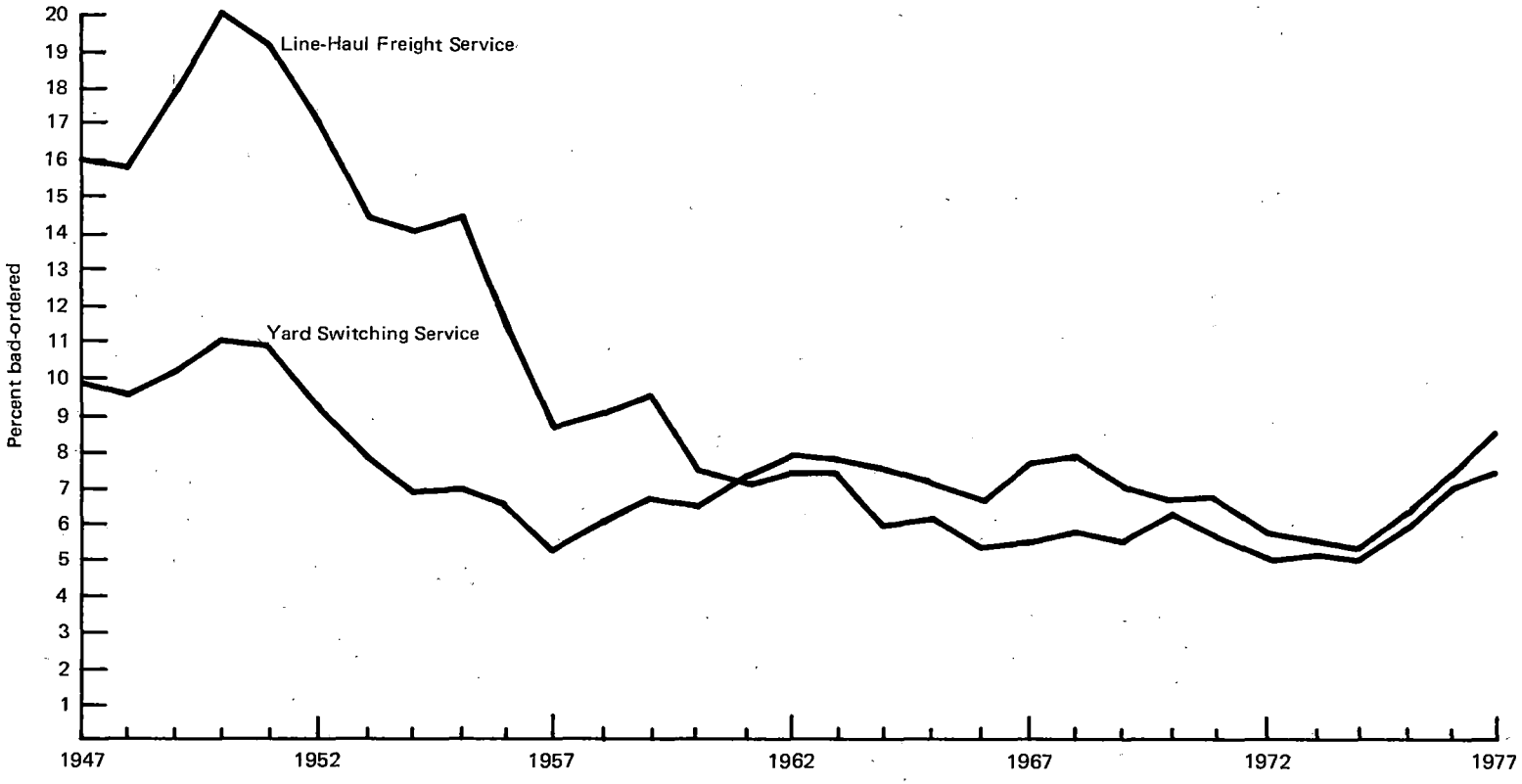
TABLE 1-12. AVERAGE AGE OF FREIGHT CARS BY CAR TYPE, 1976

Type	Amount	Average age (years)
Boxcars:		
Plain	302,899	16.0
Equipped	171,054	11.5
Hopper cars	365,526	14.2
Covered hoppers	230,069	11.5
Gondola cars	185,776	16.4
Tankcars	168,018	15.0
Flatcars	141,781	12.6
Refrigerator cars	98,017	11.9
Stock cars	3,637	32.6
Other freight cars	32,250	19.3
Total	1,699,027	13.9

SOURCE: Association of American Railroads, Car Service Division.

older, while approximately the same number are 6 years of age or less.

Railroads have allocated a steadily increasing proportion of capital for equipment since the 1920's. Factors contributing to this trend have been the relatively high rate of return on investment of equipment, the transition from steam to diesel locomotives, the trend towards larger and more expensive freight cars, and corresponding reductions in maintenance expenditures. Additionally, equipment financing has been generally available to the industry because of the security (or collateral) the equipment provides to the creditor; in the event of default, the equipment can be repossessed and resold if necessary. The advent of the investment tax credit also has made equipment debt attractive to the railroad companies and has encouraged companies to purchase new equipment when maintenance of existing cars might otherwise be more prudent.



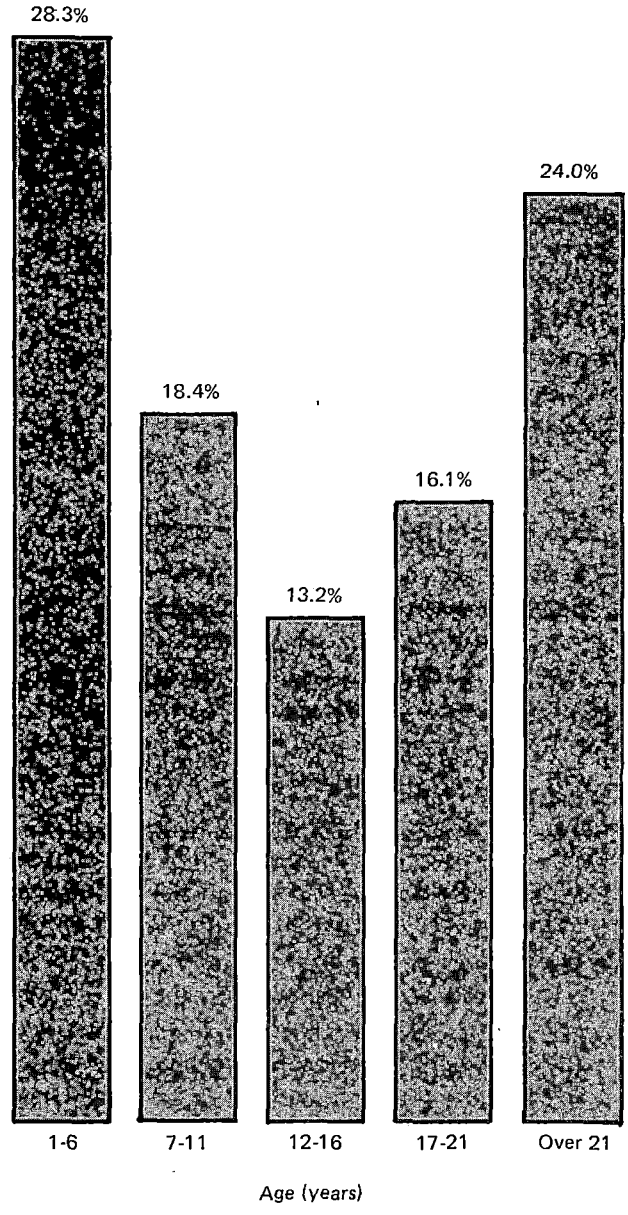
SOURCE: Association of American Railroads, Economics and Finance Department.

FIGURE 1-13. BAD-ORDER LOCOMOTIVES AS A PERCENT OF TOTAL LOCOMOTIVES ON LINE.
(Class I Line-Haul Railroads, 1947-1977)

TABLE 1-13. CLASS I LINE-HAUL RAILROADS WITH LOCOMOTIVE BAD-ORDER RATIOS GREATER THAN NINE PERCENT, DECEMBER 31, 1976

Railroad	Locomotives		1976 rate of return (%)
	Road (%)	Yard (%)	
Delaware and Hudson	19.2	28.2	-6.2
Elgin, Joliet and Eastern	15.6	8.6	7.9
Duluth, Missabe, and Iron Range	14.3	13.9	2.6
Grand Trunk Western	14.1	15.4	2.2
Chicago, Rock Island and Pacific	14.1	14.1	-7.2
Union Pacific	13.9	5.7	6.0
Pittsburgh and Lake Erie	13.6	10.3	4.2
St. Louis, San Francisco	13.4	7.6	4.6
Florida East Coast	12.8	0.0	1.1
Conrail	12.4	12.9	-16.3
Clinchfield Railroad	11.0	8.3	10.0
Kansas City Southern	9.6	15.6	3.2
Illinois Central Gulf	9.4	9.7	0.3
Maine Central	8.0	35.3	2.2
Chicago and Illinois Midland	7.7	12.5	7.4
Louisville and Nashville	6.2	9.1	5.0

SOURCE: Interstate Commerce Commission, Bureau of Accounts, OSC Reports for Fourth Quarter of 1976.



SOURCE: Interstate Commerce Commission.

FIGURE 1-14. AGE DISTRIBUTION OF LOCOMOTIVE FLEET, 1976.

RAIL SAFETY

Safety is one aspect of the railroad's situation that has recently received a good deal of national attention, largely due to a series of accidents involving hazardous materials. Although a case can be made that the deterioration of rail safety performance is a symptom of more fundamental railroad problems in such areas as operating discipline and maintenance of plant and equipment, any decrease in the safety of rail operations is certainly a major cause for concern.[6] Thus, it is important to examine closely the sharp rise in train accidents experienced since 1966.

As shown in figure 1-11, the number of accidents per million train-miles caused by defects in rail rights-of-way or fixed structures has nearly quadrupled from 1.52 in 1966 to 5.50 in 1976. During this period, train accident rates attributed to equipment failures, human factors, and miscellaneous causes have increased by a factor of less than one-half. The interpretation of figure 1-11 is affected by reporting criteria because the train accident-reporting threshold was held constant at $750 from 1966 through 1974, and inflation has resulted in more accident reports in each successive year, thereby overstating the real increase in the train accident rate during the early 1970's. Furthermore, the figures for 1975 and 1976 reflect the increase in the train accident-reporting threshold to $1,750, which temporarily depressed the number of accidents reported in 1975 as compared to previous years. Nevertheless, the large increase in the train accident rate that can

[6]In 1977, 946 persons were killed in rail-highway grade-crossing accidents. This figure represents more than 62% of all fatalities involving rail transport. Accidents to trespassers accounted for approximately 30% of total fatalities, and employee accidents, which have been decreasing in recent years, represent approximately 7% of the total fatalities in 1977.

In recent years, progress has been made in the grade-crossing problem through the efforts of the States, the railroads, and the DOT, but increased automotive traffic has kept absolute casualty figures at significant levels. The continuation of high levels of grade-crossing deaths and injuries is likely to create demands for increased expenditures by both railroad companies and public agencies to reduce the problem.

be attributed to defects in way or structure, compared with other causes, provides clear evidence of the harmful effects of an undermaintained and deteriorating rail plant.

Increased axle loadings also appear to be related to track-caused accidents because of the intensified wear and tear on the roadbed, without an attendant increase in roadbed maintenance. Additional research now in progress will determine the specific connections between increased axle loadings and track-caused accidents.

HAZARDOUS MATERIALS

A recent series of accidents involving hazardous materials has drawn widespread attention to the problem of train derailments. In 1977, approximately 500 derailments involved 1,400 tank cars; approximately 150 of these cars released hazardous materials. These derailments resulted in four fatalities, 500 injuries (150 were serious), and 14 evacuations, involving a total of 19,000 persons. The absence of certain safety features on the tank cars and the poor physical condition of the cars were important contributing factors in many of these accidents.

The problem of transporting hazardous materials is an issue concerning all modes. In 1977, more than 14,000 truck (for-hire and private carrier) accidents involved hazardous substances. These accidents resulted in 30 fatalities and 1,008 serious injuries.

Enforcement

Prior to the passage of the Hazardous Materials Transportation Act (HMTA) of 1974, violations of hazardous materials regulations were enforceable only by instituting a criminal case in the Federal courts, and the fines were nominal. On January 3, 1977, under HMTA, the Materials Transportation Bureau issued comprehensive hazardous materials regulations, making violations of these regulations subject to civil as well as criminal penalty sanctions. Procedures for carrying out these sanctions were published by the FRA on October 28, 1977. During the first 4 months of 1978, notices alleging 26 violations against rail shippers and 103 violations against railroad companies were issued.

Concern over recent accidents and train derailments involving hazardous materials has prompted DOT to launch a concerted effort to increase safety inspections. In many cases, the safety recommendations made by FRA inspectors are heeded by the railroad companies on a voluntary basis. But, despite this generally cooperative spirit, FRA believes that use of out-of-service orders, penalties, and other legal tools are necessary for the public safety. Thus, FRA will implement safety enforcement toward all railroads regardless of their financial condition.

1977 PERFORMANCE

The result of the trends described previously is a steady decline in financial and operating performance of a number of railroad companies and an overall decline in rail employment. The continuing decline in critical performance measures has since been confirmed by 1977 statistics recently released by the AAR.

These statistics show, for example, a decline in net railway operating income to $347 million—the lowest figure since 1932. Rate of return on net investment has dropped below the depressed 1976 level to a bare 1.26 percent. Equipment rentals during the period increased slightly, as did tax accruals including deferred taxes. Fourth-quarter statistics show even lower earnings than for the year as a whole, despite significant increases in coal movements in the Eastern and Southern Districts.

Increases in nonrailroad income offset these declines and resulted in very slight gains in ordinary income in the Southern and Western Districts. Operating revenues also increased by $1.5 billion to $20.1 billion, 8.5 percent above the 1976 level. Operating expenses, however, climbed to almost $16.4 billion, an increase of 9.9 percent over 1976. The industry reported 23,297,000 revenue carloadings, which represents a modest 0.67 percent decline from the 1976 level. Both revenue ton-miles and revenue per ton-mile, however, increased approximately 4 percent during 1977.

REFERENCES

[1] Lana R. Bates, "Summary of Highlights of DOT's Industrial Shipper Survey (Plant Level)," prepared for the American Trucking Associations, Inc., Dec. 1975.

[2] Financial statistics for this section are provided by the Association of American Railroads and, in part, are drawn from the following publications.

— *1978 Yearbook of Railroad Facts,* Association of American Railroads, Economics and Finance Department.
— *1977 Yearbook of Railroad Facts,* Association of American Railroads, Economics and Finance Department.
— *Railroad Revenues, Expenses and Income,* Association of American Railroads, Economics and Finance Department, Apr. 11, 1977.
— *Property Investment and Condensed Income Account,* Association of American Railroads, Economics and Finance Department, July 5, 1977.

[3] John W. Ingraham and John R. Whitman, "A Capital Markets Approach to the Financial Needs of the Railroad Industry," *Railroad Research Study Background Papers* of the Transportation Research Board, Richard B. Cross Co., July 1975, p. 144.

[4] Isabel H. Benham, "Why Rails Lack Investor Confidence—And What Can be Done About It," *Railway Age,* vol. 178, No. 8, Apr. 25, 1977, p. 65.

[5] Thomas K. Dyer, Inc., *United States Class I Railroads Fixed Plant Requirements,* prepared for the Federal Railroad Administration, Oct. 1977, Lexington, Mass, pp. 63, 64.

[6] S. J. Petracek, A. E. Moon, R. L. Kiang, and M. W. Siddiqee, *Railroad Classification Yard Technology: A Survey and Assessment,* prepared by the Stanford Research Institute for the Federal Railroad Administration, Jan. 1977, p. 27.

2.
CAUSES OF THE RAILROAD PROBLEM

The railroad problem results from a variety of factors, not all of which are within the industry's control. If the railroads are to regain their vitality as private enterprises, it is imperative to seek improvements with respect to each of the different causes of the problem. There is no single solution that will cure all the ills of the industry; there are multiple causes, and there must be a corresponding variety of solutions.

Among the most important factors contributing to the relative decline and poor financial health of the industry are the following.

- *Basic changes have occurred in traditional rail markets, as heavy industry gave way to a service-oriented, high-technology economy and as shifts have occurred in the location of industry.*
- *Regulatory constraints have impinged upon management's ability to adjust rates, merge corporate entities, abandon facilities and services, and improve productivity.*
- *Government provision of highways, waterways, airways, and other facilities, which—in areas where user charges are inadequate—has subsidized the rail industry's principal competitors.*
- *The railroad industry has been slow in adapting to new technology; rival modes have been more successful in making use of new developments.*
- *Labor unions and management have not been able to agree on methods for full implementation of changes that would increase productivity, despite substantial increases in wages and benefits.*

There is an urgent and unavoidable necessity for the industry to adjust, to adapt, to find new solutions to its many problems. Since governmental actions have been very much a part of the environment of railroading, there is an equally urgent demand for constructive changes in Government policy to be part of the solution.

THE CHANGING FREIGHT TRANSPORTATION MARKET

Basic changes in the American industrial economy since the period of railroad building and wartime reconstruction have had great significance for the industry. These shifts include changes in demographic patterns, the transportation component of manufacturing, and the manufacturing component of the economy as a whole. In short, the type of transport service railroads provide today adds relatively less value to the economy than it did in the earlier years of railroading. Not only have these basic changes affected the aggregate market demand for rail service, but also the slowness or inability of the railroads to adapt to shifting markets has been operationally costly.

DEMOGRAPHIC CHANGE

Railroad tracks and terminals were laid out to serve the transportation markets existing at the time of their construction. The major portion of construction occurred between 1870 and 1920, and the substantial changes in geographic population distribution and economic activity over the last half century have hurt many railroads. The major changes include the following.

- A shift in population from the Northeast and North-Central regions to the West and the South
- An even more pronounced shift in manufacturing activities from the Northeast and North-Central regions to the West and the South
- A shift in population within regions from rural to urban areas
- A shift within urban regions of population and manufacturing activity from the central cities to the suburbs

The movement of population and manufacturing activity to the West and South has generally benefited the railroads in these regions. But railroads in the Northeast have suffered as freight traffic dispersed, and portions of that region's extensively developed rail plant became obsolete. From 1929 to 1976, Eastern District (see fig. 1-1) freight shipments declined by one-third. By contrast, Southern District tonnage more than doubled, and Western District tonnage increased by one-quarter during the same period.

The rural to urban shift has hurt most railroads by transforming what was formerly a balanced two-way movement of commodities between urban and rural areas into a one-way movement. In 1930, farm population was 24.9 percent of the total population. Railroads hauled consumer goods from the cities to rural areas in boxcars, which were then reloaded with bulk farm commodities for shipment to the cities. Excellent utilization of rail equipment was achieved, and the two-way traffic flow was profitable. But, by 1976, the farm population was only 3.9 percent of the total population, and although railroads haul large amounts of bulk farm commodities today, these are one-way moves with little return flow of manufactured goods.

Suburbanization has been detrimental to the railroad industry. Railroads were built to serve the center city, and as long as business remained concentrated in the city, there was ready access to rail facilities. Highway development and construction programs carried out at all levels of Government have encouraged consumers, factories, warehouses, and retail stores to locate in the suburbs, placing the railroads at a competitive disadvantage with the much more flexible trucking industry. Even when suburban rail facilities are available, many businesses (such as factories, warehouses, and shopping centers) place greater importance on easy highway access by employees and customers than on rail access for freight service.

Urban railroad congestion is another legacy of the 19th century. As cities expanded outward and highway traffic increased, conflicts between community development objectives and rail operations increased. Concern for motorist and pedestrian safety at some 80,000 urban rail-highway grade crossings, for example, requires the railroads to operate at substantially reduced speeds in urban areas. The railroad companies also must bear the expense of maintaining the vast majority of these grade crossings.

DEMAND FOR IMPROVED SERVICE

Another dimension of the changing freight transportation market has been the increasingly higher service standards for shipments of manufactures. Since the railroad industry has not been able to provide the same level of service quality as its competitors, it has lost traffic to other transportation modes. Demands for higher quality service are attributable to a number of factors, especially a more affluent populace. As purchasing power has improved, more expensive products, requiring higher quality freight service, have become more important. Some of the reasons for the trend to higher quality freight service are the following.

- The increasing value per unit of weight or volume of manufactured goods decreases the relative impor-

tance of freight costs in total delivered product cost. Thus, quality of service becomes a more significant factor in the shipper's modal choice.

- The increasing value of manufactured goods provides an incentive for speedier, more reliable deliveries as a way of controlling logistical costs. This has been given an added boost in recent years by soaring interest rates, which have increased inventory carrying costs.
- More highly fabricated and expensive goods tend to be fragile, perishable, or otherwise damage-prone and, therefore, require more delicate handling.
- There is a growing sophistication on the part of corporate managements in evaluating freight transportation requirements. Not only do manufacturers evaluate total logistical costs, but they also try to satisfy customer requirements. Manufacturers increasingly compete on the basis of service as well as product price and quality.

CHANGES IN COMMODITY MIX

Changes in the market have also affected the railroads' share of bulk transport. Rail's advantage in hauling bulk commodities has been partially offset by a lower-than-expected growth rate in demand for certain commodities. The outstanding example is coal, rail's largest volume commodity. As shown in figure 2-1, between 1929 and the early 1970's, coal provided a decreasing portion of U.S. energy requirements. Although total energy consumption rose during the last half century, the overall rail transportation market for coal has been virtually stagnant in absolute terms. Reliance on coal is now anticipated to increase substantially and should be reflected in expanded requirements for rail transportation.

Rail freight transportation has also been affected by such developments as the substitution and the recycling of materials. Heavier materials, more likely to be transported by rail, are being replaced by lighter materials. For example, less steel is used in automobiles, as more parts are made of plastic and other lightweight materials. Material recycling is increasing for environmental as well as economic reasons, as raw materials become scarcer and more expensive to process. The need to transport raw materials is reduced, and scrap material transportation, which tends to be intraregional, does not fully compensate for the reduction. Scrap iron and steel, aluminum, copper, paper, and rubber are examples of materials that are being recycled in increasing amounts.

CHANGES IN TECHNOLOGY

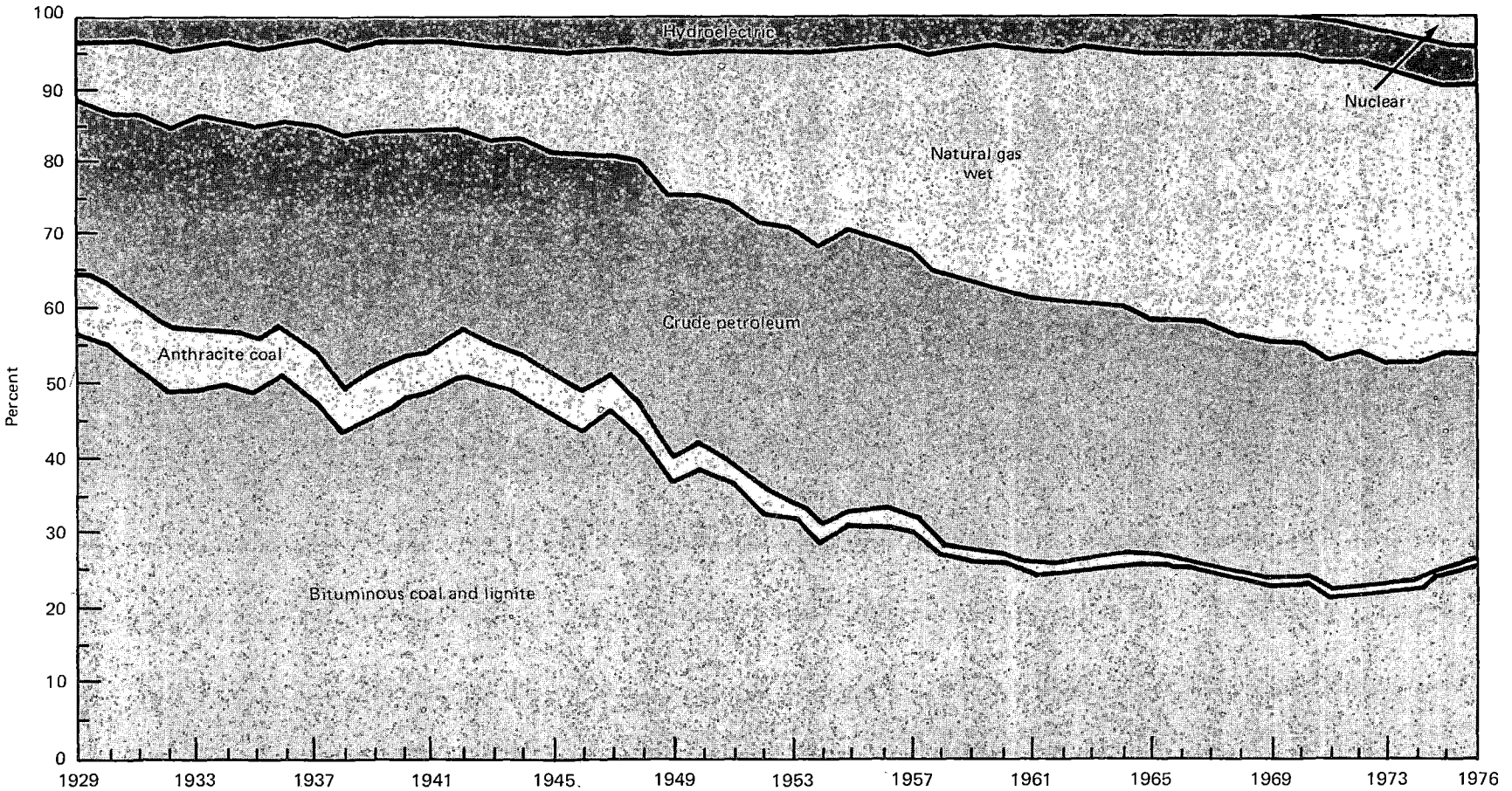
In addition to demographic changes, developments in technology have affected the nature of the freight market. For example, technological improvements in the efficiency of long-distance electricity transmission have resulted in an increase in mine-mouth, power-generating plants. When coal is converted into electricity at the mine, the amount of coal transported by rail declines. During the last 10 years, coal tonnage consumption by mine-mouth generating plants has more than tripled; in 1976, for every 9 tons of transported coal, 1 ton was consumed at the mine.

LOSS OF PASSENGER MARKET

Since the turn of the century, the industry has evolved from providing general services for passengers and freight to a predominantly freight service mode. The invention of the automobile in the latter part of the 19th century had no immediate impact, because automobiles were very expensive and in short supply. With the development of mass production techniques, however, automobile ownership soared, and by 1929, automobiles accounted for 78 percent of intercity passenger-miles.

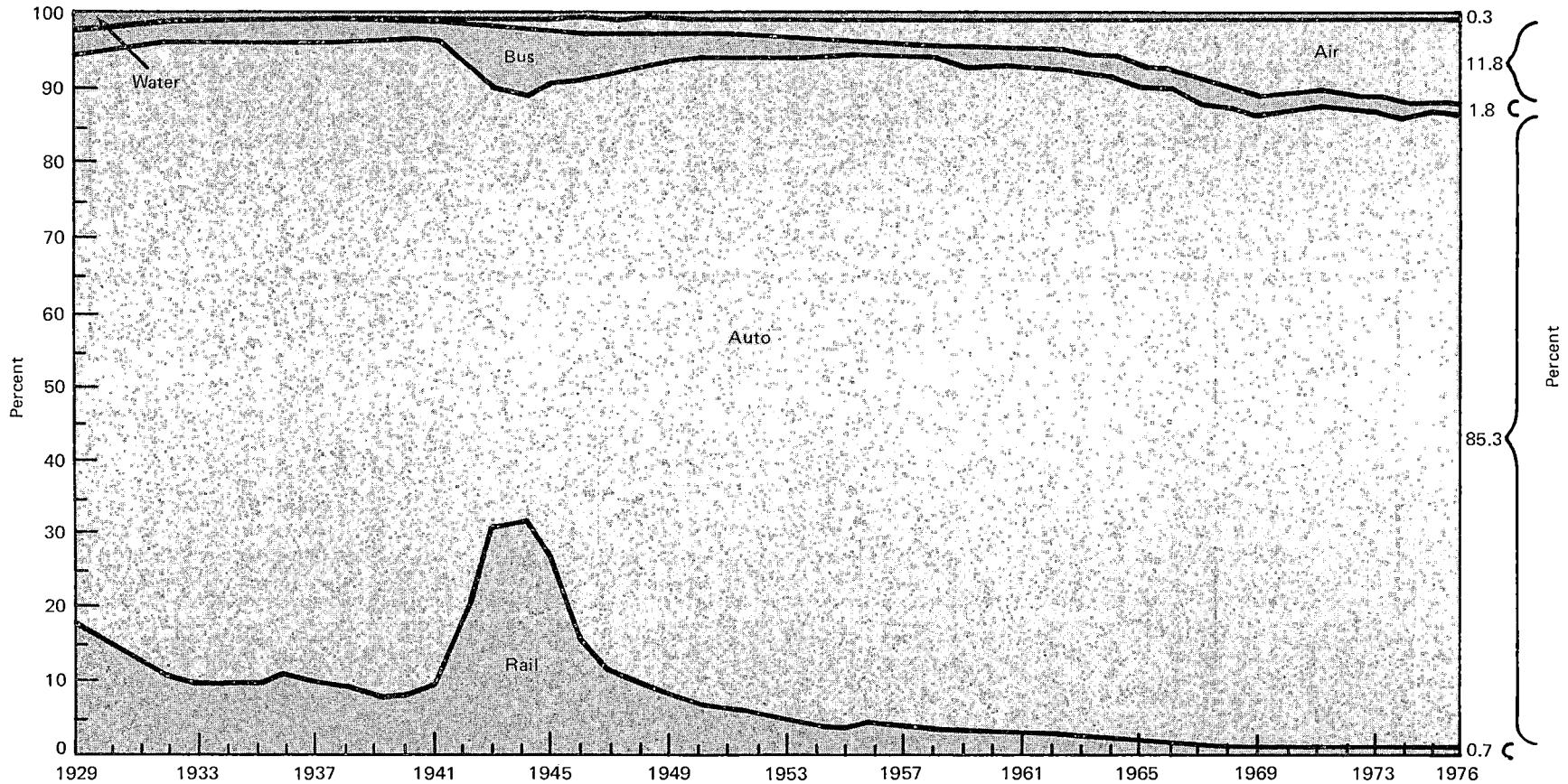
Competition in the public passenger transportation market intensified with the formation of bus companies, although not until the early 1960's did bus intercity passenger-miles actually exceed those of rail. In the last two decades, air transportation has made the most substantial inroads into rail's long-distance passenger traffic. Since 1945, air passenger traffic has grown at an average rate of 12 percent per year as a result of increased air speeds and reduced air fares. By 1976, railroads retained only 0.7 percent of the intercity passenger market. Figure 2-2 illustrates the declining railroad role in intercity passenger transportation from 1929 to 1976. (An exception to the historical trend occurred during World War II, when rail's share of total passenger-miles climbed to 31 percent as a result of special wartime conditions.)

Loss of passenger traffic was detrimental to the rail industry in a variety of ways. From their inception until the early 1920's, railroad companies made substantial profits on passenger services, but as passenger traffic declined, passenger services began to lose money and overall profitability dropped. The dramatic decrease in passenger travel following the end of World War II caused cutbacks in passenger services, resulting in lower utilization of the rail plant and raising the proportion of facility-related costs that had to be recovered through freight operations. Even with the reduced level of passenger services, however, substantial operating losses continued. The industry was relieved of most of the financial burden of operating passenger services at a loss when the National Railroad Passenger Corporation (Amtrak) assumed responsibility for the preponderance of intercity rail passenger services on May 1, 1971.



SOURCE: National Coal Association, *Coal Facts 1974-1975,* and *Coal Data 1976,* Washington, D.C.

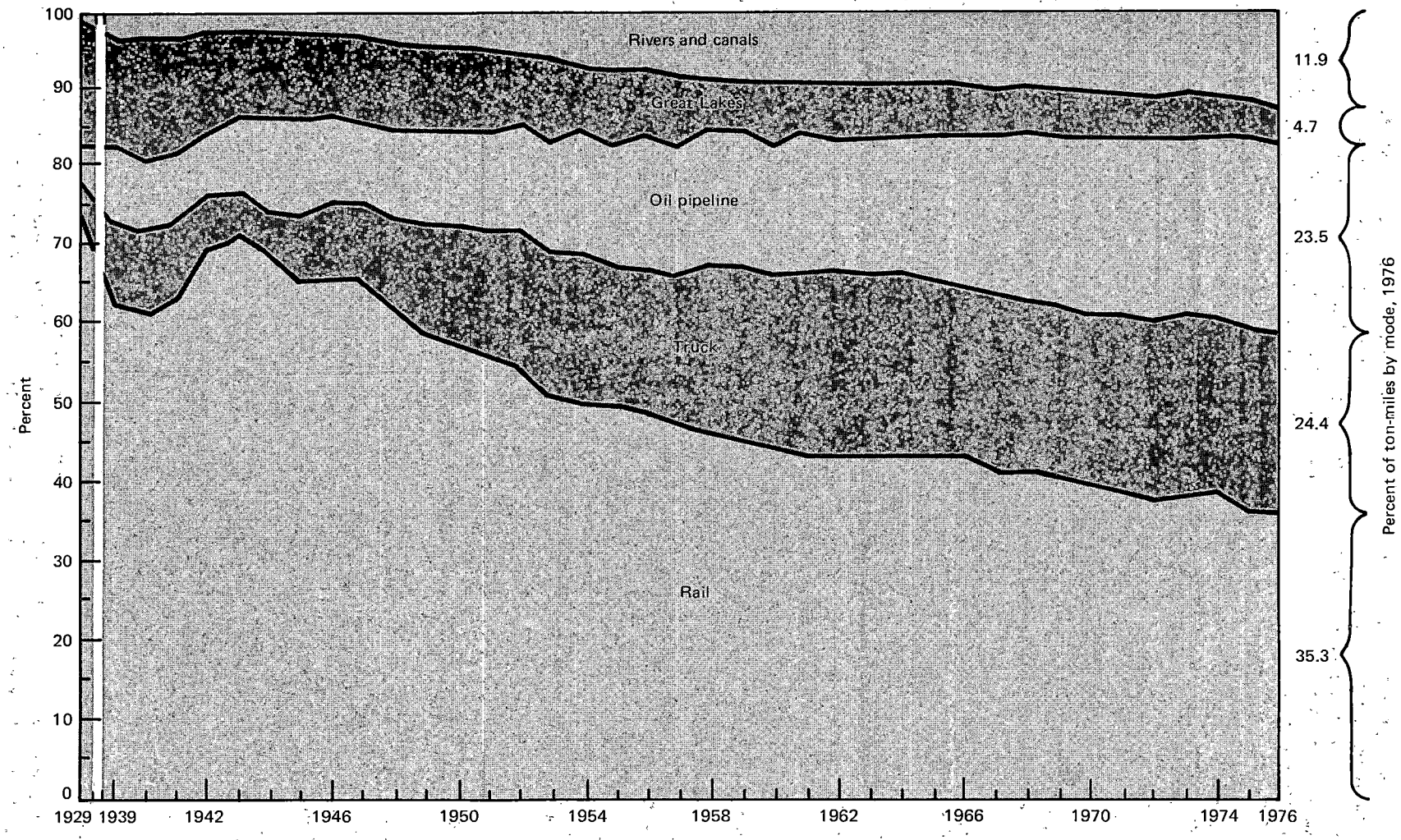
FIGURE 2-1. U.S. ENERGY PRODUCTION, 1929-1976.
(Percent of Btu)



NOTES: Rail percentage includes commutation; air percentage includes private aircraft.

SOURCES: James C. Nelson, *Railroad Transportation and Public Policy* (Washington, D.C.: The Brookings Institution, 1959, pp. 443-444. Transportation Association of America, *Transportation Facts and Trends*, thirteenth edition, July 1977, p. 18.

FIGURE 2-2. INTERCITY PASSENGER-MILES BY MODE, 1929-1976.
(Percent)



NOTES: Including mail and express and for hire and private carriers. To date total air ton-miles are insignificant.

SOURCES: Association of American Railroads, *Yearbook of Railroad Facts,* 1977 edition, p. 36. Transportation Association of America, *Transportation Facts and Trends;* 1977 edition, p. 8; Quarterly Supplement, October 1977 for revisions and updates.

FIGURE 2-3. TON-MILES OF INTERCITY FREIGHT BY MODE, 1929-1976.
(Percent)

The displacement of rail passenger travel by automobile travel also indirectly facilitated the rise of rail's primary competitor—the trucking industry. The fast-growing use of automobiles provided both the impetus for highway-building programs and a broader base against which the cost of the programs could be spread.

Associated with the decline in rail passenger traffic is the loss in mail traffic and express traffic since these were carried mostly on passenger trains. As recently as 1960, mail and express revenues amounted to 4.6 percent of Class I railroad-operating revenue. By 1975, however, mail and express traffic had dropped to such a low level that they were no longer listed separately in the Association of American Railroads (AAR) industry income statements.

INCREASING COMPETITION FOR FREIGHT TRAFFIC

Over the last half century, the railroad industry has been faced with increasing competition from other modes—the rise of the trucking industry, the resurgence of inland water carriers, and the growth of oil pipelines. Figure 2-3 depicts the dramatic shift in modal market shares of freight during the period 1929 to 1976. In 1929, railroads were the dominant freight transportation mode by a wide margin and claimed a 72.9-percent freight market share, as measured in ton-miles. The closest competitor was Great Lakes shipping with 16 percent. By 1976, rail's market share was cut to less than one-half its former size, while market share for trucking grew sevenfold; inland waterway operations, eightfold; and oil pipelines, fivefold. Only Great Lakes shipping suffered a similar drop in market share, falling to one-third its former level. In absolute terms, while railroad ton-miles have less than doubled from 1929 to 1976, truck ton-miles have multiplied by a factor of 26, and inland waterway ton-miles, by a factor of 28.

The rapid growth of trucking and inland waterway carriage has been facilitated by public construction and maintenance of rights-of-way. Publicly provided highways and inland waterways require no direct capital investment by truckers and water carriers, thus lowering the fixed expenses and corporate investment base of these modes. Publicly provided rights-of-way have the additional advantages of exemption from property taxation. In 1975, ad valorem taxes on rights-of-way amounted to $167.4 million for Class I railroads.

THE TRUCKING INDUSTRY

As shown in figure 2-4, total U.S. highway mileage has steadily increased since 1904, and surfaced highway mileage has grown even faster. A major innovation in highway design, the limited access highway, has led to important improvements in the operating efficiency of the trucking industry. The Pennsylvania Turnpike, the first limited access highway that could be used by trucks, was opened in 1940. The Federal Government took steps as early as 1944 toward construction of a national system of limited access highways, and in 1956, funding was authorized and construction began on the National System of Interstate and Defense Highways (the interstate highway system), the largest public works project in history. By mid-1977, 90.7 percent of the planned 42,500-mile interstate highway system was opened to traffic (fig. 2-5). The Federal Highway Administration (FHWA) estimates that by 1990 the total construction cost of the interstate system will reach $104.3 billion in 1976 dollars.

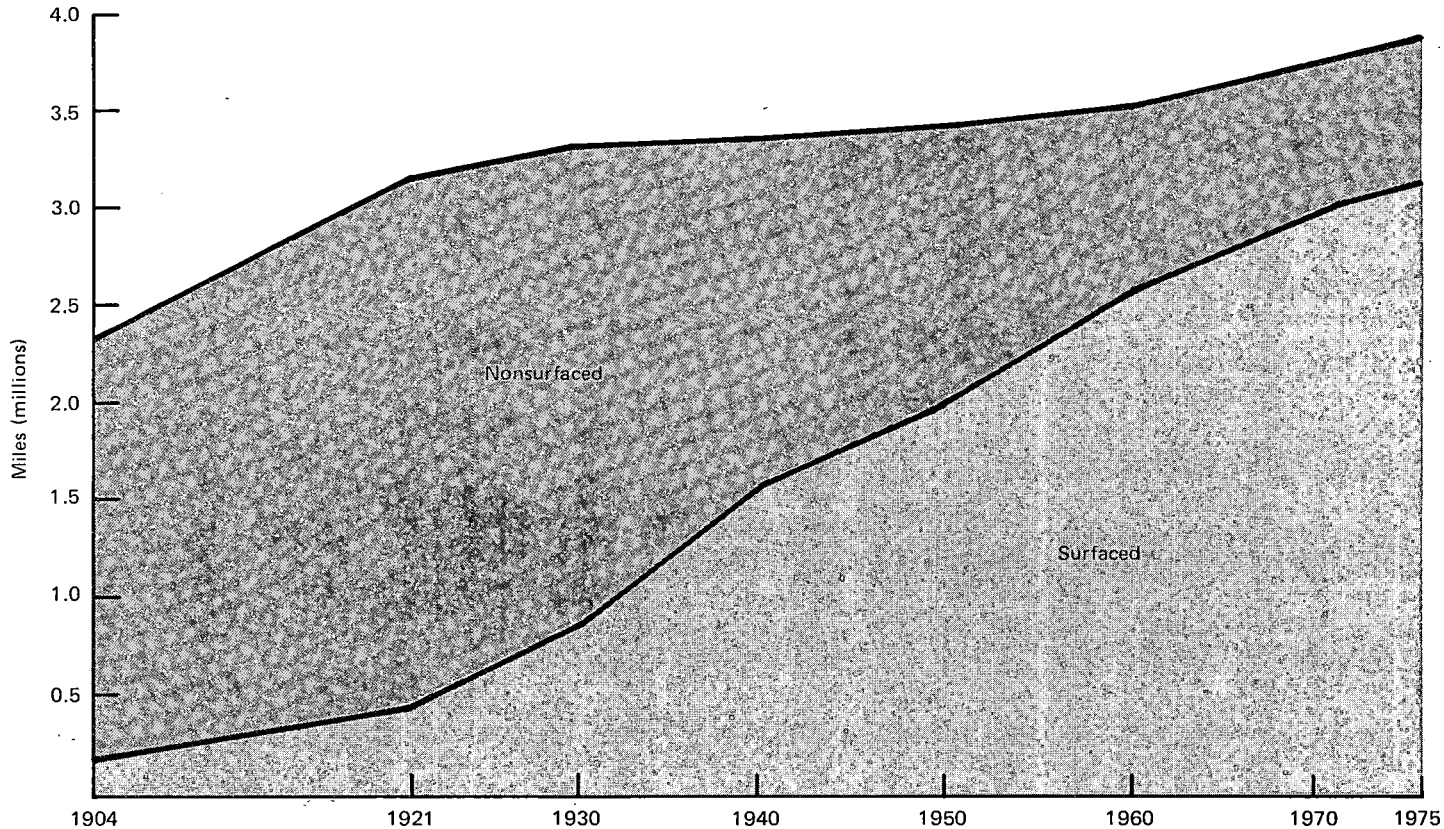
Limited access highway improvements enable higher truck speeds. According to the FHWA, the average truck speed increased from 43 mph in 1950 to 56.6 mph in 1973, thereby increasing the effective daily operating range of trucks by a proportional amount and boosting overall motor carrier operating efficiency. Since 1973, average truck speed has decreased slightly, in response to the 55-mph speed limit.

The highway system was designed and constructed more recently than the rail network and serves present day markets more directly. Furthermore, highway vehicles can operate over higher gradients than rail vehicles. Consequently, circuity of the rail network is 18 percent greater than the highway network.[1]

Through a combination of license fees, excise taxes, and fuel taxes, the trucking industry contributes to building and maintaining the highways. But, it is highly debatable whether long-distance, multiple-axle heavy vehicles (those trucks most competitive with rail service) pay their fair share towards total highway construction and maintenance expenses. This is discussed in more detail in chapter 5.

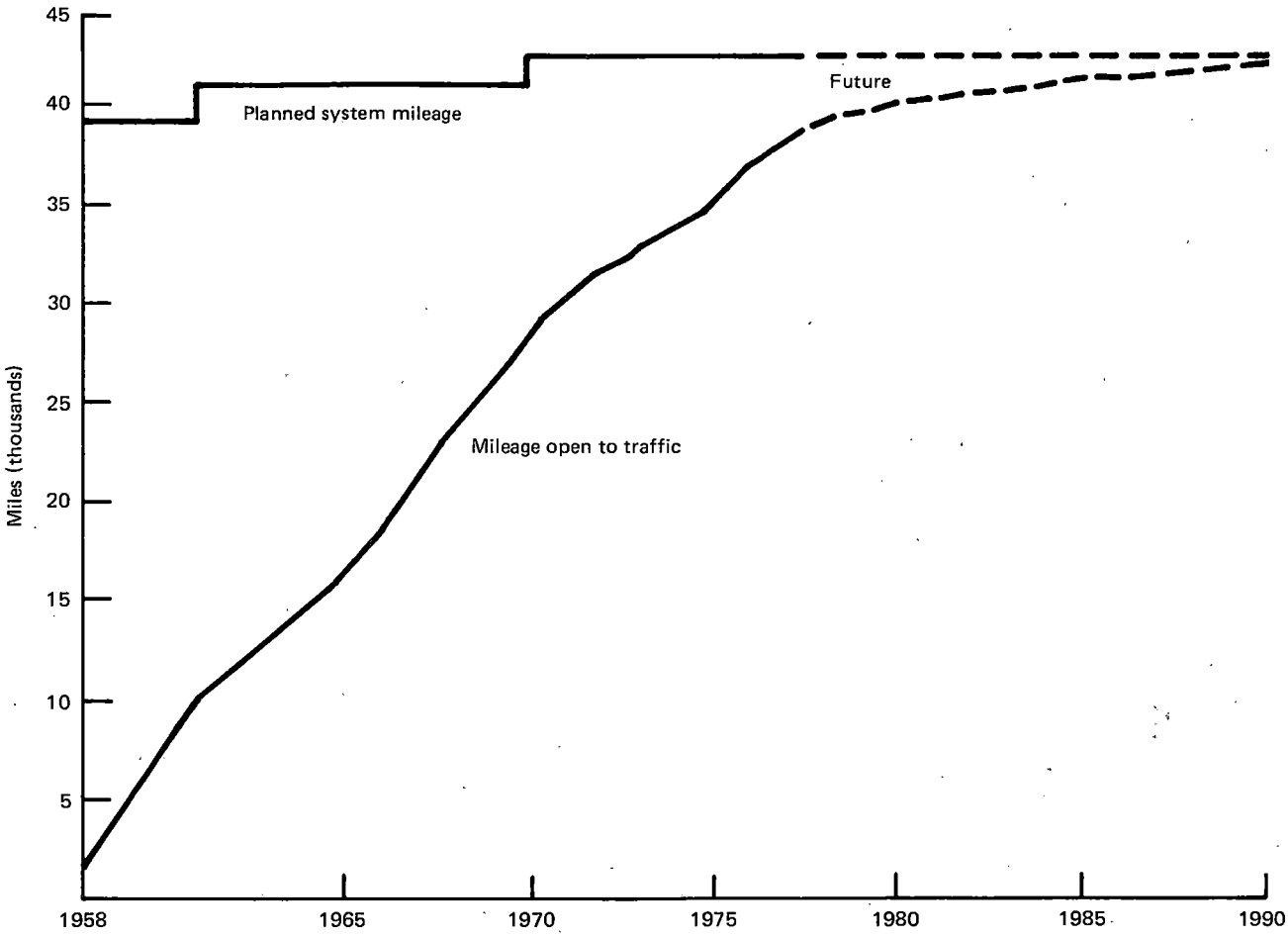
From the time trucks were introduced in significant numbers, in the early 1900's, continuing technological improvements greatly increased the trucking industry's ability to compete with the railroads. Trucks have become larger, more powerful, faster, and more reliable. In addition, a wide range of sizes and specialized truck designs were developed to fit the varying requirements of shippers. Such rapid innovation is fostered by the large number of competing truck and trailer manufacturers. As truck innovations are introduced, they are rapidly assimilated into the nationwide truck fleet because the average life of a truck is only 5 years, due to the high rate of utilization.

The rapid growth of the trucking industry is also encouraged by the following factors.



SOURCE: Motor Vehicle Manufacturers Association, *Motor Vehicle Facts and Figures '77.*

FIGURE 2-4. U.S. SURFACED AND NONSURFACED HIGHWAY MILEAGE, 1904-1975.



SOURCE: Federal Highway Administration.

FIGURE 2-5. U.S. INTERSTATE HIGHWAY SYSTEM.

- Relaxation of Size and Weight Restrictions. The trucking industry can take advantage of improvements in equipment and highways. The industry has worked hard for State laws allowing operation of twin trailers and triples. In January 1975, Congress passed legislation permitting higher axle and gross weight limits on the interstate system. The legislation allowed States to raise the gross vehicle weight limit on interstate highways from 73,280 to 80,000 pounds. By August 1977, 40 States had enacted laws raising weight limits up to, or near, the Federal maximum limit. Size and weight limits may be waived by special permit, and some States have been criticized because they are too liberal in granting these.
- Enforcement. Not all truckers adhere to truck size, weight, and speed limits. An FHWA Truck Weight Study in 1972, covering all 50 States, determined that 20 percent of tractor-semi-trailers were overloaded, and 29 percent of five-axle, tractor-semi-trailers (those most directly rail competitive) were overloaded. Despite the recent imposition of a nationwide 55-mph speed limit, a recent survey (1977) of tractor-trailer drivers on the interstate highway system revealed that over half the drivers interviewed averaged 60 mph or more, and 7 percent said they averaged over 70 mph.
- Nonunion Labor. It is estimated that only 25 to 30 percent of rail competitive, intercity truckdrivers belong to a union. By contrast, the railroad industry is almost completely unionized. Nonunion labor generally is paid less and receives fewer fringe benefits.
- Owner-Operator Trucking. Due to economic incentives, some owner-operators log more than 200,000 miles per year. The high productivity of these individuals results in relatively low costs, which, in

turn, often results in lower charges. Because of the competitiveness of this business, owner-operators frequently underprice their services. Consequently, owner turnover is high, despite the potential profit available to an entrepreneur.

- Private Trucking. As the size of a corporation increases and full-service truck leasing expands, many corporations find cost and service advantages in private trucking.
- Skilled Management. Large portions of the trucking industry have developed excellent managerial skills. In this highly competitive environment, trucking companies are compelled either to manage effectively or to go bankrupt. Management combines detailed and accurate profitability analyses of traffic with selling and operating tactics, so that profit decisions can be made quickly and effectively at the terminal level.

INLAND WATERWAY CARRIERS

Inland waterway carriers, unlike truckers, do not pay any user charges for operating on the inland waterways. In the 95th Congress, both the House and the Senate have passed bills that, if enacted, would impose at least some level of user charges. The total U.S. inland waterway system consists of approximately 25,000 miles of navigable channels, canals, reservoirs, and lakes. Virtually all the natural watercourses making up the inland waterway system have needed improvements in the form of widening, deepening, minimizing bends, and/or construction of locks and dams operated and maintained by the U.S. Army Corps of Engineers. From 1791 through fiscal 1975, the Federal Government has spent $14.7 billion (not including waterway land grants) on the construction, improvement, and operation of domestic waterways. The greater share of these expenditures, $10.7 billion, has been made since World War II.[2] The Federal Government has helped the inland waterway carriers by expanding the size of the inland waterway system, by permitting year-round operation on more river segments, by eliminating bottlenecks, and by allowing larger barge tows and tug equipment to be used, thereby improving operating efficiency.

Towboats have converted to diesel from steam power, thus increasing efficiency. Average towboat horsepower on the Mississippi and Gulf intracoastal waterways has grown by approximately 50 percent since 1967. As a result of improvements to the inland waterways plus technological improvements in equipment (such as the Kort nozzle), a typical tow today carries 300 percent more cargo than the typical tow of 20 years ago, with a 40- to 60-percent smaller crew. Over the last 40 years, the productivity of a tow, measured in ton-miles per day, has increased from 150,000 to 3 million ton-miles. The net result is a fortyfold increase in productivity per employee.

PIPELINES

Pipelines are also a source of increased modal competition, but their effect on railroads has been confined primarily to crude oil and petroleum products. By 1938, railroads handled only 2.2 percent of total crude petroleum tonnage carried in domestic transportation, while pipelines handled 71 percent. The use of pipelines for transporting refined petroleum products is a more recent occurrence. Pipelines carried only 6.4 percent of refined petroleum products tonnage in 1938, but, by 1974, this figure had increased to 33.5 percent.

The single most important factor favoring the use of pipelines over rail is lower unit costs for high-volume applications. Unit costs are lower for the following reasons.

- Pipelines are ideally suited to unidirectional movement of commodities. Pipelines only move the commodity, while railroads must move equipment as well. Once the commodity is unloaded, the rail equipment usually has to be returned empty, imposing a heavy economic penalty.
- Pipeline technology readily lends itself to automation. In 1976, pipelines accounted for two-thirds as many ton-miles as rail, with one-thirtieth the number of employees. Total pipeline employment in 1976 was only 17,000.
- Once a pipeline is constructed, costs are largely fixed, since annual interest and depreciation expenses account for a significant proportion of total expenses. Pipeline costs are, therefore, highly resistant to inflation, making pipelines an attractive long-term investment even though they may not be economical in the short term.

In recent years, the development of slurry pipelines has posed a new competitive threat for the railroad industry. Using a fluid-conveying medium to move solid material, slurry pipelines greatly expand the range of commodities open to pipeline carriage. In the past, slurry pipelines have been proposed or built to transport coal, iron ore, limestone, phosphate, and other bulk commodities. The railroad industry is chiefly concerned about slurry pipelines that could divert coal traffic. Thus far, two coal slurry pipelines have been built in the United States. The first line, built in 1957 by the Consolidated Coal Co., went from Cadiz, Ohio, to a point on Lake Erie. The pipeline, 108 miles long, with a capacity of 1.25 million tons per year, was

deactivated in 1963 due to the introduction of unit coal trains and sharply reduced rail rates. The other slurry pipeline, the Black Mesa Line (opened in 1970), is 273 miles long and currently transports approximately 5 million tons per year, or less than 1 percent of total domestic coal production. At least five new coal slurry pipelines, which could transport more than 75 million tons of coal per year, are currently proposed.

The future for slurry pipelines is uncertain. Railroads have blocked construction by refusing to allow pipelines to cross rail rights-of-way. Slurry pipeline builders are attempting to obtain the right of eminent domain, and several States have already granted eminent domain for slurry pipelines. The 95th Congress, however, voted down legislation to allow eminent domain on a national level. Another concern that may limit the use of slurry pipelines is water availability. Today, every ton of coal transported in a slurry pipeline requires about 1 ton of water.

GOVERNMENT REGULATION OF THE RAILROADS

Although Government regulation has benefited the industry in certain respects, the adverse effects of economic regulation have contributed to the decline of the railroad industry. As common carriers, railroads are required to provide transportation service upon demand to the general public and are subject to very broad Federal and State regulation. The present regulatory environment has evolved over many decades and is extraordinarily complex, but, in general, railroads are subject to the following basic types of regulation.

- Rate Regulation. Railroads are not allowed to set rates unilaterally. Rate increases or decreases are subject to review and possible suspension by the Interstate Commerce Commission (ICC) and State regulatory agencies.
- Entry and Exit Regulation. The overall contraction of the industry has made entry regulation largely meaningless while increasing the importance of exit regulation. The latter covers railroad line abandonments, service discontinuances, mergers, and bankruptcies.
- Car Service Regulation. Certain operating practices of the railroads can be directed by regulatory agencies to insure that the common carrier obligation is satisfied. This affects freight car availability and return of empty cars.
- Labor Regulation. Labor regulation covers negotiations, strikes, retirement, and unemployment.
- Safety Regulation. The Federal Railroad Administration (FRA) and the Occupational Safety and Health Administration prescribe various safety regulations to which railroads must comply. The FRA sets track and car standards and locomotive and car inspection requirements.
- Environmental Regulation. The Environmental Protection Agency (EPA) regulates railroads with respect to water, air, and noise pollution.
- Other Regulation. When involved in federally assisted projects, railroads are subject to laws pertaining to equal opportunity and affirmative action in employment, including contracting with minority businesses.

The railroad industry has long been fully regulated, while competitors are either partially or largely unregulated. When the railroad industry was first regulated in 1887, it had a virtual monopoly on intercity freight and passenger transportation. This monopoly disintegrated as other transportation modes evolved and pressure to regulate the other modes developed. This took years to accomplish, however, and resulted in only partial regulation. Federal regulation of trucking did not occur until 1935, and inland water carrier regulation did not occur until 1940. When regulation has been applied to other modes, it generally has been less comprehensive. The Transportation Association of America's estimate of Federal regulation of intercity freight in 1975 (based on a percent of total ton-miles per mode) is shown in table 2-1.

The recent trend is towards lessening those regulatory restrictions that apply to competing modes. In 1973, the Barge-Mixing Rule was eliminated, thereby making all bulk inland waterway carriers exempt from regulation. Previously, tows mixing more than three bulk commodities were regulated.

Generally, economic regulation is believed to have affected the rail industry adversely in that it has: inhibited the industry's ability to adjust rapidly to changes in market forces; downgraded managerial

TABLE 2-1. FEDERAL REGULATION BY MODE, 1975

Mode	Federal regulation[a] (%)
Rail	100.0
Oil pipeline	84.4
Truck	44.0
Inland waterways	15.5
Great Lakes shipping	0.3

[a]The basis of Federal regulation is total ton-miles per mode.
SOURCE: Transportation Association of America.

effectiveness by insulating the assets and operations of railroads from market forces; required large expenditures for clerical and legal staff; and served to inhibit innovation. Management has had to devote an inordinate amount of time and resources to coping with the numerous regulatory requirements. In the long run, regulation favors legal skills over marketing and entrepreneurial skills.

RATE REGULATION

Probably the most significant restriction on railroads is rate regulation. The ICC rarely sets rates, but it rules on the lawfulness of rate changes proposed by railroads and establishes minimum and maximum rate levels. The number of proposed rate changes rejected is very small, usually about 1 to 2 percent of initial applications.[3] Few applications are rejected, however, because a railroad will not propose a rate unless there is a reasonable chance of gaining ICC approval. Rate regulation is treated extensively in chapter 6, but the major effects of rate regulation on the railroads are summarized below.

Cost of Timelag

The regulatory process moves very slowly, and delays in implementing general rate increases mean lost revenues. The AAR estimates that between 1967 and 1975 regulatory timelag cost the industry $2.2 billion in lost revenues, an amount equal to nearly 25 percent of the actual increases granted during this period.[4]

Cross-Subdidization to Achieve Public Goals

In approving rates, the ICC, under sections 2, 3, and 4 of the Interstate Commerce Act and the Hoch-Smith Resolution of 1925, must take into consideration various public goals such as port equalization, assistance to agriculture, and aid to depressed industries. Freight rates are either held down or reduced to achieve these purposes, with rate increases on other commodities supposedly making up the loss. Unregulated and private carriers do not have to absorb the cost of realizing these goals; thus, to the extent that cross-subsidy does exist, private carriers are more cost competitive than regulated carriers.

The subsidization of depressed industries poses a particular problem for railroads during recessions, when traffic levels are low. The following examples of ICC-imposed rate holddowns (Ex Parte No. 310 General Rate Increase) during the 1975 recession illustrate the problem.

- Asphalt building and roofing materials, Fiberglas insulating materials, plastic and asbestos, and cement pipe—"In view of the depressed conditions of the housing industry . . ."
- Lumber and other forest products—"Industries . . . have been seriously hurt as a result of the depressed housing market."
- Recyclables—"Prices for wastepaper have dropped as much as 80 to 90 percent in the last few months . . . no increase is warranted."

Umbrella Ratemaking

For decades, the ICC rendered rail rate decisions that protected the trucking and water carrier industries. This originated from two key phrases in the Declaration of National Transportation Policy included in the Transportation Act of 1940, to the effect that the Act should be administered to: "preserve the inherent advantages of each" mode, and that "destructive competitive practices" were to be prevented. In enforcing these provisions, the ICC deemed many railroad rate proposals too low since traffic would be drawn away from water or motor carriers. Thus, when other modes made competitive inroads into high-value rail traffic, railroads were not allowed to adjust their rates below fully distributed costs. The Transportation Act of 1958 attempted to correct the inequity by specifying: "Rates of a carrier shall not be held up to a particular level to protect the traffic of any other mode of transportation."

The mandate to eliminate umbrella ratemaking was not really enjoined, however, until the 1963 Supreme Court decision, *ICC* v. *New York, New Haven and Hartford Railroad Co.* This case ruled that "something more than even hard competition must be shown before a particular rate can be deemed unfair or destructive." In 1965, however, the ICC, in the Ingot Molds case, restrictively interpreted the 1963 Supreme Court decision. The Railroad Revitalization and Regulatory Reform (4R) Act, with its emphasis on "going concern value," however, has added a new dimension to costing for railroad ratemaking purposes. The effect of this provision in intermodal rate level disputes is still unclear.

Stifling of Innovation

The foremost example of the adverse effects of rate regulation on innovation in rail transport is the "Big John" grain rate case of the Southern Railway.[5] From 1962 to 1965, the ICC impeded the installation of 100-ton grain hopper cars that the Southern intended to use for hauling grain at substantially lower rates. A Supreme Court order was required before the Southern could introduce full use of the Big John hopper car.

Another example of rate regulation impeding innovation is the delayed introduction of the unit train. The economic benefits of unit trains were

acknowledged in the industry in the 1920's, but not until the 1960's were unit trains put into service.[6] The railroads feared that if trainload rates were offered in one area to meet competition, the ICC would require them to make similar rate reductions in other areas. Conceivably, the result would have been a net revenue loss. Therefore, railroad companies had no incentive to introduce unit trains. Only in the early 1960's, when demand appeared to change, did the railroads find that they could increase their profits by adopting unit train operations, regardless of restrictive regulations.

Rate regulation is only one factor stifling innovation. Although railroads may own other transportation modes, they are restricted in this ownership, while water carriers, pipelines, and motor carriers are not (except that none may acquire airlines). Approval by the ICC of truckline ownership by railroads is necessary. Many observers believe this policy slowed the development of piggyback service in the United States as compared to the earlier large-scale introduction of piggyback service in Canada, where no such restrictions existed.

Complexity of Rail Tariffs

As a result of rate regulation, the determination of the rail rate of any given commodity moving between any two specified points is very complex. Rates are not maintained on a current basis; instead, old rates must be adjusted in accordance with various regulatory rate rulings that have occurred since the earlier rates were established. The calculation of freight rates is costly, not only in terms of clerical time but also in terms of clerical mistakes that can and do occur. Complex rail tariffs also deter shippers who would like a rate quotation on short notice. In contrast to railroads, truckers and inland waterway operators can quote rates almost immediately.

ENTRY AND EXIT REGULATION

Since the Transportation Act of 1920, railroads have been required to petition the ICC before constructing or abandoning a section of line. The Act was passed only 4 years after railroad line mileage peaked, and mileage has since steadily declined.

Abandonment

Railroad line and facility abandonment is one of the industry's most common methods of adjusting its plant to its changing transportation role, but ICC actions have slowed abandonments and, in some instances, prevented them. As with rate regulation, regulatory timelag for line abandonments is costly, since the railroad must continue to provide service at a loss until abandonment approval is granted by the ICC. Prior to passage of the 4R Act, it was not unusual for abandonment proceedings to last 2 or 3 years, with a few lingering 4 years or longer. Today, under the expedited provisions of the 4R Act, the ICC will issue a decision on most cases within 15 months, and all uncontested abandonment applications are granted within 2 months. Chapter 6 contains a detailed discussion of the provisions of the 4R Act dealing with abandonments.

Another factor inhibiting railroads from filing abandonment applications, even if approval is likely, is the substantial legal and administrative cost involved, which can exceed $50,000 per application. An analysis of all line abandonment applications filed between 1960 and 1969 revealed that only 2.2 percent were actually denied.[7] Nonetheless, there is evidence that some railroads choose to continue operating small branchlines at a loss, rather than pursue the costly and time-consuming abandonment process.

Delay in Merger Approval

The merger of the Chicago, Rock Island and Pacific with the Union Pacific was pending before the ICC from 1964 until final approval in 1974. During this time, the condition of the Rock Island deteriorated, and the Union Pacific lost interest in consummating the merger. Less than 6 months after ICC merger approval, the Rock Island filed for bankruptcy. In 14 cases involving a merger, acquisition, or control of two or more Class I railroads between 1955 and 1970, the ICC took an average of 2-1/2 years from the date of application to final approval.

In general, the larger the combined size of the merging properties, the longer the time period required to gain ICC approval. For example, the comparatively small merger of the Minneapolis and St. Louis into the Chicago and North Western was approved by the ICC after only 5 months. By contrast, the merger creating the Burlington Northern required 6 years 9 months to gain ICC approval.[2] Important mergers often are held up in litigation for 1 year or more after ICC approval.[7] Amendments enacted in title IV of the 4R Act—and described in chapter 6—have established a requirement that the ICC must decide merger cases within 31 months of the filing date of the application.

Bankruptcy Statutes

Section 77 of the Bankruptcy Act has the effect of preserving inefficient railroads rather than allowing the rationalization of the railroad industry

through liquidation of the assets of failed companies and permitting the viable parts of their systems to be acquired and operated by profitable companies. Such a prospect was generally viewed by both Federal and State Governments as potentially too catastrophic to the economy to be allowed when the Act was passed during the Great Depression, although in a few cases, liquidation has occurred. The use of section 77 reorganizations to prolong the life of an individual railroad on the justification of helping the economy in the regions served, nevertheless, has hurt the railroad industry's efforts to improve profitability.

CAR SERVICE REGULATION

Car service regulations by the ICC focus on the adequacy of car supply and car distribution during times of shortage. As common carriers, the railroads are called upon to meet various levels of demand for transportation, almost as if an unlimited reserve car capacity existed. Historically, the highly seasonal movements of grain and grain products create the worst problems of car supply. While the ICC expects railroads to have an adequate reserve to meet peak harvest flows, their competitors—trucks and barges—are not under this requirement and can lower rates during the off-peak to maximize equipment utilization while charging what the market will bear at harvest.

SAFETY REGULATION

Significant disagreement exists as to whether, on the whole, static railroad safety laws and regulations have hindered improvements in efficiency and the introduction of new technology. Among the more burdensome requirements imposed on the industry by laws passed as safety measures were the "full crew" laws enacted by many States, which decreased labor productivity while producing few direct safety benefits.

In general, Federal safety laws and regulations merely require minimum maintenance and inspection practices that are essential to assure adequate levels of service and safety. Many of the individual requirements were derived from recommended industry maintenance standards, which may or may not have applicability as safety standards. Federal regulations are highly detailed, however, addressing such issues as component dimensions and frequency of tests and inspections. The FRA is currently engaged in an effort to review and modernize its regulations. Where feasible from the point of view of enforcing safety compliance, the substitution of performance standards for maintenance and inspection requirements may relieve the industry of strictures that have the effect of raising operating costs or impeding innovation.

ENVIRONMENTAL REGULATION

Federal, State, and local agencies regulate a variety of environmental problems, including noise, air, and water pollution. Environmental regulation controls the following aspects of railroad operations: permissible diesel smoke; noise from locomotives and rolling stock; disposal of human and other waste (such as oils); treatment of wastewater; cleanup of spills; methods of disposal of cross ties; and selection of herbicides for maintenance of rights-of-way. The Federal agencies involved in air, water, noise, pesticide, and waste treatment include the EPA, the FRA, the Food and Drug Administration, and the Department of Agriculture.

In general, the railroad industry prefers Federal environmental laws, which preempt State and local statutes and regulations, to the difficulties of complying with a variety of State and local laws. A preliminary estimate by the AAR indicates that the annual costs to railroads of environmental controls may now be in the range of $100 million.

OTHER REGULATION

Railroads, when acting as contractors of the Federal Government or when involved in a federally assisted construction contract, are subject to Executive Order 11246, administered by the Department of Labor, which requires equal opportunity and affirmative action in employment. Railroads that receive Federal financial assistance are also subject to: the FRA's regulations regarding equal opportunity and affirmative action with respect to employment and to participation of minority businesses when assistance is provided under the 4R Act; and, except in the case of loan guarantees, title VI of the Civil Rights Act of 1964, Department of Justice regulations, and implementing regulations of the various Federal agencies that prohibit discrimination on the basis of race, color, or national origin with respect to any program or activity receiving such Federal assistance.

TAX POLICY

The ICC's method of calculating the depreciation of rail equipment to determine rate bases is used

by the Internal Revenue Service (IRS) in establishing taxing policies for rail companies. Historically, this has meant a low annual depreciation allowance, discouraging railroads from making longer term investments.

Until 1962, the IRS determined the depreciable life of rail equipment by calculating the average life of freight cars retired during the taxable year and the preceding 2 to 4 years. This led to an extremely long depreciation life of 25 to 50 years and a very low annual depreciation allowance, particularly since the scrap value of the car had to be subtracted from the purchase price in determining the depreciable amount. As a result, railroads found it preferable to completely rehabilitate a freight car in cycles of 12 to 15 years rather than scrapping the freight car after it had worn out and replacing it with a new one. Rehabilitation could be treated as an expense item in the year it occurred, whereas the investment in a new car had to be depreciated over many years.

In 1962, the IRS adopted guideline class lives for depreciable assets that reduced the depreciable life of a freight car to 14 years. This was further reduced to 11 years by the Revenue Act of 1971. These reductions as well as the investment tax credit have helped to encourage new equipment investment. Marginally profitable or unprofitable railroads, however, are unable to take advantage of the investment tax credit or accelerated depreciation other than indirectly through leasing. The overall inadequacy of depreciation allowances on railroad property in general, resulting from depreciation lives of 30 years or more, remains an issue, since even the 11-year accelerated depreciation of equipment has been criticized as inadequate. This problem is exacerbated by the high rate of inflation in recent years, which makes it increasingly difficult to renew rail assets.

INDUSTRY STRUCTURE

Railroads have not been able to adapt their physical facilities swiftly to changes in the demand for transportation. This problem stems from the nature of railroad technology, regulatory constraints, political opposition, labor protection requirements, inadequate cost information for managers, and traffic (or profit) forecasting errors by railroad management. The subject of rail restructuring is treated at length in chapter 4, but several factors are significant to consideration of industry problem.

EXCESS PLANT AND CIRCUITOUS ROUTING

The problem of excess capacity affects both rail lines and rail yard and terminal facilities. Multiple rail routes serving the same markets decrease traffic line density and increase operating expenses. Although the number of parallel rail routes has decreased because of mergers, acquisitions, line abandonments, and joint trackage agreements, many parallel mainlines still exist. For example, there presently are five mainline routes between Chicago and Minneapolis, eight between Chicago and Kansas City, and five between Dallas-Ft. Worth and Houston. Multiple rail terminal facilities in major cities lead to inefficient terminal operations. Chicago, the most extreme case, is served by 22 railroads and 105 rail yards.

Circuitous routing of rail traffic over routes that are much longer than the principal direct routes between the origin and destination of shipments serves to increase expenses and decrease profitability. The shipper has the right to specify the particular route for a shipment, even though the route may be extremely circuitous. Originating railroads also encourage circuitous routings to increase their rate divisions, to the detriment of other railroads. Since the freight rate is based on the shortest distance rail route, no additional compensation is received by the railroad industry even though the expense may be greater. The average circuity of traffic routings over shortest distance routings for all rail traffic is estimated to be 9.3 percent,[8] exclusive of the 18-percent circuity factor of the rail network as compared with the highway network, mentioned earlier.

FOCUS ON INTRA-INDUSTRY COMPETITION

Both the regulatory environment and the structure of the industry tend to promote competition among railroad companies, rather than intermodal competition. Collective ratemaking practices are heavily influenced by the desire of railroad companies to preserve their existing market share. This means that the railroad companies tend to focus their efforts on pricing to protect what they have, and their sales efforts are directed accordingly. The recent general rate increases do not represent any change in this attitude.

MULTIPLE CARRIER SHIPMENTS

Aside from its effects on competition, the fractured structure of the railroad industry presents other problems. Each railroad serves a restricted geographical area, but since railroads are interconnected to provide service throughout the continental United States, more than 30 percent of rail carloads,

involving an estimated 60 to 70 percent of total freight revenues, are handled by two or more railroad companies.[9] The breakdown for 1976 is shown in table 2-2.

Use of multiple railroad handlings for a significant portion of rail traffic (on a revenue basis) has a number of negative effects. Since no single company can control a shipment from beginning to end, service reliability is unsatisfactory. Time delays result from poorly coordinated operations in handling interchange traffic, especially when three or more railroad companies are involved.

The revenue received for a shipment is divided among the various railroad companies in accordance with previously negotiated agreements. Disputes about the fairness of previous agreements can arise, however, and resolution of these disputes through the regulatory process can take years. The outcome of such disputes, although not affecting total industry revenues, can seriously hurt individual companies.

Problems of financially weak railroads affect the stronger companies. The Penn Central crisis and the more recent operating problems of the Consolidated Rail Corporation (Conrail) have demonstrated that difficulties on one railroad have an effect throughout the entire industry.

CORPORATE FINANCIAL MANAGEMENT

Poor financial condition in the railroad industry is characterized by low return on investment, an income that is inadequate to finance replacement of wornout equipment and facilities, deferral of maintenance, and delay of capital improvements. These conditions clearly affect railroads that earn approximately 40 percent of the industry's revenues. A contributing factor to this problem has been corporate financial management practices in the rail industry, including investment analysis and costing methods.

TABLE 2-2. CARLOAD ALLOCATION AMONG SINGLE AND MULTIPLE CARRIERS

No. of railroad companies	Carloads (%)
1	58
2	34
3	7
4+	1

SOURCE: Association of American Railroads.

INVESTMENT ANALYSIS

Only within the last 10 years have the railroad companies begun to identify and evaluate their investment needs with financial plans that look 5, 10, or more years into the future. Not until the 1960's did many railroads begin to establish annual investment budgets, evaluating each investment option in terms of the rate of return on investment.

Determination of the rate of return necessitates predicting conditions far into the future to determine the value of a potential capital investment, a task made more difficult because of the long average asset life in the railroad industry. Management's ability to adopt equipment innovations rapidly has been affected by the high cost and the long average life of equipment (15 to 30 years). It took more than 20 years for the diesel electric locomotive, one of the most outstanding railroad technological innovations, to completely replace the steam locomotive.

COSTING ANALYSIS

Railroad companies are also handicapped by an inadequate understanding of railroad costs and, consequently, the sources of their profit or loss. The computer has facilitated costing, but railroad costing and profitability analysis systems are only beginning to be refined to the point of providing useful information. Reliable costing is inhibited by a number of factors, including the following.

- The complexity of freight transportation services covering a wide variety of commodities transported among many different combinations of origins and destinations in many different types of equipment
- The high proportion of common expenses that must be allocated in some fashion to the traffic
- Inadequate expense accounting that fails to capture expenses precisely enough to support detailed costing
- Lack of knowledge of causal relationships between various railroad services and various railroad expenses
- Lack of information on movements of empty cars (The expense of moving empty cars can be considerable and must be taken into account in costing carload movements.)

Typically, and consistent with regulatory practices, railroad companies have taken a simplified approach to costing and profitability analysis by using systemwide averages, a technique that produces very unreliable results. To the extent that

inadequate costing techniques are used, they hamper cost control and the proper pricing of rail services, and, thus, hurt profitability.

EFFICIENT USE OF ASSETS

The proper understanding, control, and utilization of assets are essential to profitability. Railroads have made little progress in asset management relative to other industries. The totally regulated nature of the railroad industry contributes to this problem by establishing a cumbersome system of accounts that is not functionally organized, making accurate and detailed analysis of costs difficult and expensive. The internally hierarchical structure of the railroads does not permit the most effective assignment of responsibility for the productivity of assets.

An excellent example of this problem can be found in the trends in utilization rates of freight cars. In 1976, for every 100 miles of loaded freight car movement, freight cars ran 80 miles empty. In comparison, all trucks on the interstate highway system during 1976 are estimated to have run empty only 26 miles for every 100 miles of loaded movement.[10]

The high level of empty railcar mileage is caused, in part, by the specialized transportation market that rail serves, but poor asset management is also a factor. An example of poor freight car utilization is the fact that the standard serviceable freight car (not in car repair shops) averaged only 56.6 miles per day in 1976.

Table 2-3 presents car utilization by car type during 1976, corroborating the poor utilization illustrated by the daily mileage statistic. The average number of trips per year for all car types was 16.9, but the figure by car type ranged from a low of 3.2 for livestock cars to a high of 47.3 for trailers on flatcars (TOFC).

Two primary factors account for the lengthy average time period between loads. No matter how efficiently cars are handled, during months of low demand, cars will sit empty for longer periods. Balancing car supply with demand is complicated by competitive and operational factors.

The other factor is the slow, inefficient manner in which cars are handled from shipper to receiver. Figure 2-6 shows the various components of the car movement cycle based on a broad sample of car movements in 1971 for all car types and commodities. During the total car cycle, 58 percent of the time is spent loaded and 42 percent, empty.

Car utilization is a concern because railroad cars represent a substantial and growing portion of rail investment. In 1975, outstanding equipment obligations were $5.2 billion, equal to 57 percent of total funded debt. Capitalization of outstanding equipment leases including equipment of car companies owned by railroads would add at least another $1 billion.

TABLE 2-3. RAILCAR UTILIZATION BY CAR TYPE, 1976

Car type	Average No. of trips	Average days/ car cycle[a]
Boxcars:		
Unequipped	11.9	30.8
Equipped	14.5	25.2
Refrigerator	10.3	35.5
Tanks	8.5	43.1
Gondolas:		
Unequipped	16.5	22.2
Equipped	18.7	19.6
Covered hoppers	15.7	23.3
Hoppers:		
General service	23.3	15.7
Special service	42.7	8.6
Flatcars:		
General service	9.3	39.4
Multilevel	18.8	19.5
TOFC	47.3	7.7
Other	9.7	37.7
Stock	3.2	114.4
All others	23.4	15.6
Average of all car types	16.9	21.7

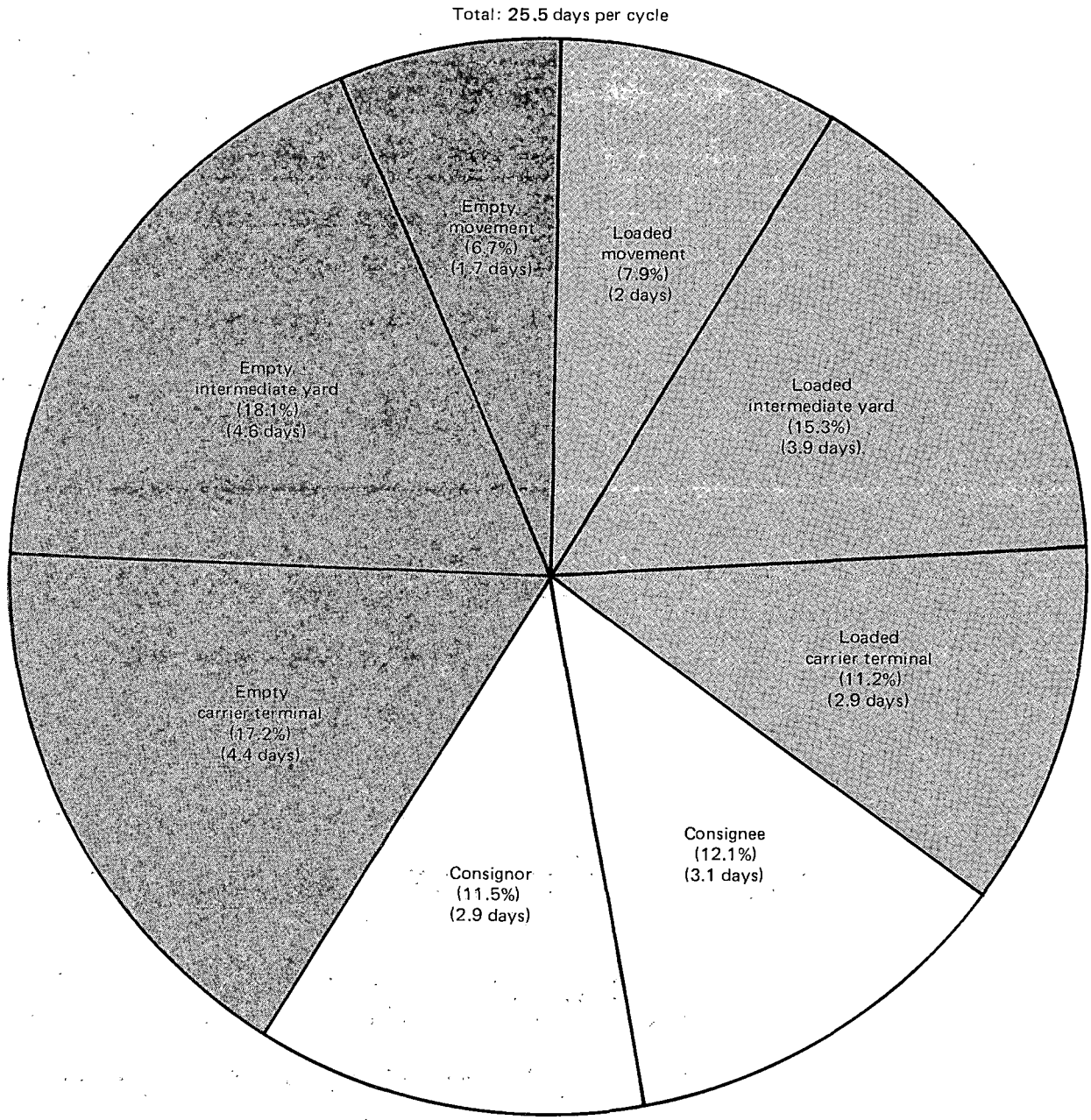
[a]Determined by dividing 366 days by the average number of trips during 1976.

SOURCE: Association of American Railroads, Car Service Division.

Railroads have sought to improve productivity and remain competitive by purchasing larger capacity freight cars, many with capacities of 100 tons or over. From 1955 to 1976, average freight car capacity increased from 53.7 tons to 73.5 tons. The larger car sizes result in heavier axle loadings, causing a more rapid deterioration of track. In some instances, track life expectancy has been cut to less than half. This increases track maintenance expenses and offsets, to an undetermined extent, the productivity improvements desired from the increased car capacity.

EFFECTS OF THE NATIONAL ECONOMY

Although all businesses are subject to the cyclical nature of the economy, the railroads are especially susceptible to economic downturns because of their capital intensiveness. Rail assets per employee in 1976 were $56,950, making railroads as capital intensive as the steel and chemical industries. While workers may be laid off, the physical plant



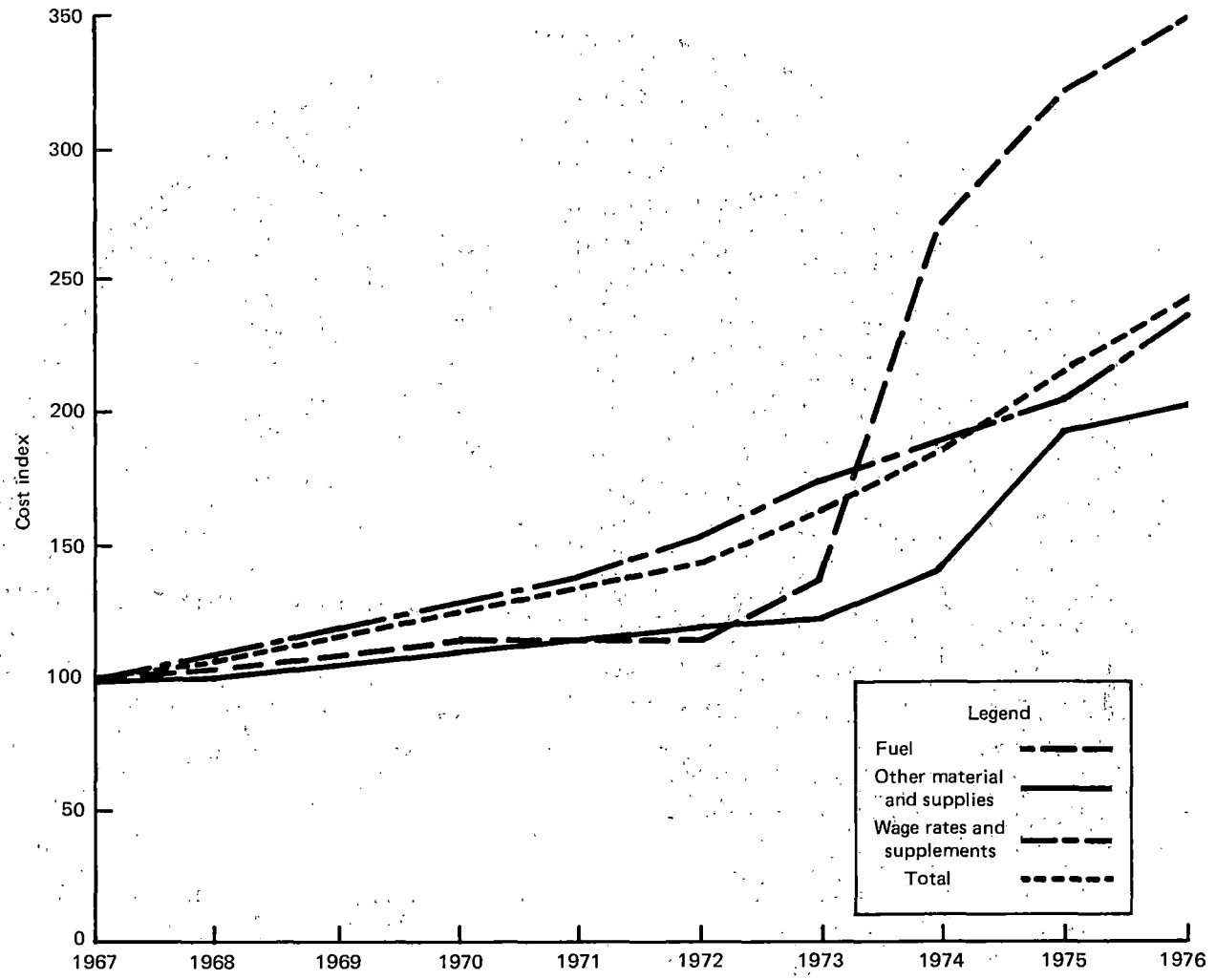
SOURCE: Reebie Associates, *Toward An Effective Demurrage System,* for Department of Transportation, Federal Railroad Administration, Washington, D.C., July 1972.

FIGURE 2-6. OPERATION SEGMENTS OF A TYPICAL CARLOAD CYCLE.

remains and must be cared for (although at a lower standard than in healthy economic times) even though the result is increased expenses per unit of output. Since it is difficult to raise prices during a recession, the outcome is a lower profit margin. A healthy industry previously earning a satisfactory rate of return can easily weather a recession, but an industry earning an inadequate rate of return for many years is seriously hurt by a recession.

INFLATION

The phenomenon of persistent inflation poses a serious problem for the railroads, as indeed it does for the economy as a whole. Figure 2-7 shows index values for the primary components of operating expenses, namely, wage rates (including supplements), fuel, and other material and supplies. From



NOTES: Wage indexes for 1970, 1971 and 1975 include retroactive wage increases paid in 1971, 1972, and 1976, respectively. Wage supplements include payroll taxes, health and welfare benefits, and other allowances.

SOURCE: Association of American Railroads, Economics and Finance Department, Series QMPW-95.

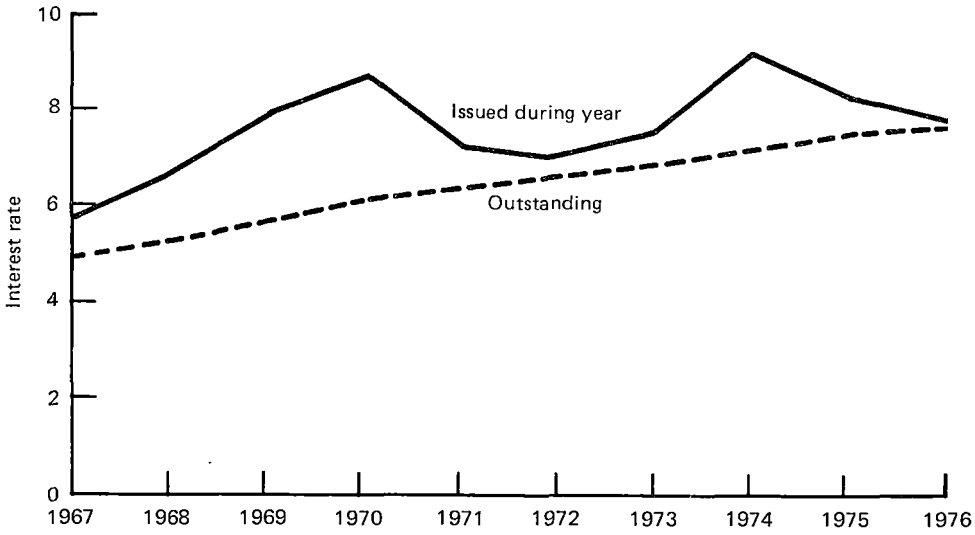
FIGURE 2-7. INDEX OF CLASS I RAILROAD MATERIAL PRICES AND WAGE RATES.

1967 to 1976, the cost of material and supplies doubled, wage rates including supplements more than doubled, and fuel prices more than tripled.

Persistent inflation drives up not only the price of railroad capital goods, but also the industry's interest charges on the amount financed. The interest rate on newly issued equipment debt has climbed, and the effect (shown in fig. 2-8) has been to raise the average interest rate on outstanding equipment obligations to 7.65 percent in 1976 from 4.87 percent in 1967.

Interest payments also increase when it becomes necessary to refinance funded debt as it matures, particularly mortgage bonds. Old funded debt usually has extremely long maturity periods (100 years is not uncommon) and low-interest rates of 2-1/2 to 5 percent. Refinancing old debt at high-interest rates of 8 percent or more has doubled or tripled annual interest payments. Debt refinancing at high-interest rates will continue to adversely affect railroad fixed expenses in the future. Also important is the shortened (25 years or less) maturity period for refinanced debt because the industry will have to face substantially higher current debt maturities in the years ahead.

Fast-rising expenses squeeze railroad earnings and intensify the effects of regulatory lag. Increases in freight rates to compensate for the increased expenses have been sought repeatedly by the railroad industry and, in general, have been approved by the ICC, but only after some delay. Regulatory lag, long a problem for the railroad industry, has become



NOTE: Average interest rates include prime rate at time of issue on certain conditional sales agreements tied to prime rates in each year. The rate for these obligations would increase or decrease with changes in the prime rate.

SOURCE: Association of American Railroads, Economics and Finance Department.

FIGURE 2-8. AVERAGE INTEREST RATE ON EQUIPMENT OBLIGATIONS OF CLASS I RAILROADS, 1967-1976.

more important during the extraordinary economic conditions of recent years.

Inflation also adds to the industry's capital needs. Of total capital expenditures during the last 10 years, slightly more than 70 percent ($10.2 billion) was used to purchase rail equipment. The cost of an average new freight car nearly doubled between 1967 and 1976, increasing from $14,590 to $27,980, with most of the increase occurring in 1974 and 1975. While part of this increase is attributable to larger car sizes and a shift in fleet car mix towards more specialized car types, most of the increase is the direct result of inflation.

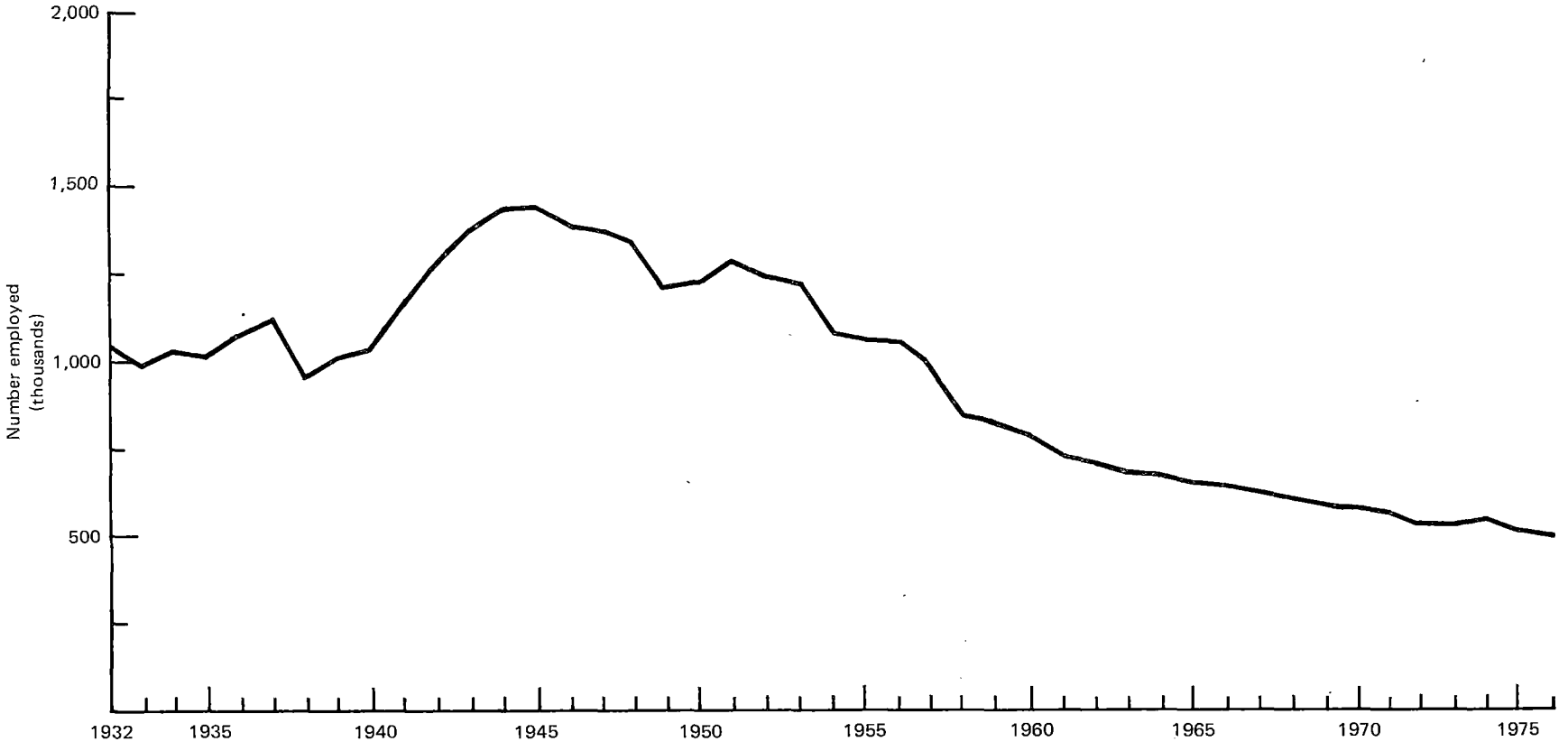
Most capital intensive industries suffer cash flow problems because of inflation. Long asset depreciation lives in industries such as steel and railroads result in a widening gap between depreciation expenses and capital expenditures during inflationary periods. A cash flow problem can occur if retained earnings are inadequate to make up the difference. This may be resolved either by taking on additional debt or deferring capital expenditures, which results in higher costs in the future.

THE ENVIRONMENT OF LABOR-MANAGEMENT RELATIONS

The railroad industry is now devoting a major portion of its revenues to labor. In 1976, total labor expenses consisting of wages charged to expenses, payroll taxes, and health and welfare benefits were equal to 51.6 percent of total Class I railroad operating revenues. Because of the high level of labor expenditures, both labor productivity and labor compensation are of vital concern to the railroad industry. Labor-management relations, however, are constrained by complex institutional, work, and compensation issues, making resolution of long-standing problems difficult for both parties.

The long-term decline in railroad employment has been one of the most significant causes of the various labor problems relating to productivity and compensation. Railroad employment (as shown in fig. 2-9) has declined considerably since its peak of slightly more than 2 million in 1920. During the past 2 decades, railroad employment has fallen to one-half its previous level. The sharp decline in railroad employment has been caused by the changing railroad role in transportation and by technological innovation. Fewer railroad employees have been needed because of reductions in labor intensive rail services, such as passenger service, less-than-carload service, mail, and express, among other reasons.

Technological innovations such as the diesel locomotive, centralized traffic control, maintenance-of-way machinery, larger cars, automatic hump yards, roller-bearing axles, electronic communications, and computers have also permitted employment reductions. The decline in the railroad industry's share of the transportation market has led to a



NOTE: 1970-1974 is from *Statistic Abstract of the U.S., 1975 and 1976.* Figures for 1975 and 1976 are estimated, based upon actual Class I employment.
SOURCE: Series Q398-409, *Railroad Employment and Wages, and Accidents and Fatalities*; 1890-1970, *Historical Statistics of the U.S. Colonial Times to 1970.*

FIGURE 2-9. U.S. RAILROAD EMPLOYMENT, 1932-1976.

situation in which increases in traffic have been insufficient to offset the effects of improved technology on employment.

In this environment, labor-management relations become difficult because the planning of both labor and management tends to be oriented toward expansion and improvement. When the course of events runs counter to this, agreements do not work as they were designed, mutual suspicions develop, and relationships become acrimonious.

Managements have long used the layoff of workers as a hedge against fluctuations in revenues. Understandably, the labor unions have countered with bargaining designed to stabilize the employment and workload of their members. This divergence of interests has been further emphasized by the long-term pressure toward lower industry employment levels. At the same time, labor also has sought substantial wage increases in order to maintain or improve members' standard of living.

Another facet of the problem is the extremely narrow craft and class divisions that determine union jurisdictions. This union structure evolved during the late 1800's and largely predated any of this country's labor laws. The Railway Labor Act (RLA) of 1926 was designed to accommodate and preserve the institutional structure in existence at that time.

In a number of cases, the class and craft divisions detract from efficient deployment of the work force. Solutions to this problem are difficult because they tend to shift membership across union boundaries and aggravate rivalries between unions representing closely related crafts.

Operating policies and procedures dating back to the era of steam locomotion and telegraph communication still remain in effect, resulting in many outmoded practices. Management often blames these on restrictive union agreements. On the other hand, union leaders counter that insufficient management attention has been brought to bear on the problem. The unions must know what changes will be made before they can adjust work rules. Labor has not been willing to give management unlimited discretion in this area.

On management's side, there is a reluctance to include union personnel in the planning, not to say the decision-making process. Management, even at this critical stage of the industry's existence, does not seem to appreciate rail labor's anxieties and its wish to be considered as a partner with a valid interest in the industry's future.

The large number of unions and resulting labor agreements are other factors that divert management resources from the design of more efficient and competitive practices.

Some progress in consolidating these class and craft divisions into broader categories by merging unions with related jurisdictions has already been accomplished through the initiative of certain unions.

COLLECTIVE BARGAINING

The collective-bargaining process under the RLA was carefully designed to minimize the likelihood of strikes. This was accomplished by requiring that contracts would not expire but could be amended periodically. The rigid strike deadline imposed by contract expiration was replaced by a flexible system that provides time as needed and the required intervention of the National Mediation Board before a strike is legitimized. Under the RLA, the Government can do much to influence the negotiating process and the timing of a strike threat. The RLA, however, stops short of authorizing the Government to prohibit a strike. Such a feature would remove the economic pressure inherent in the ultimate possibility of a strike, which is a fundamental factor in the collective-bargaining process.

By and large, the RLA has been successful in minimizing strikes over minor disputes, but it does not contain adequate provisions to cope with the catastrophic effects of a simultaneous shutdown of the national railroad system. The threat of such a shutdown has led to Federal Government intervention at the last minute in the form of special legislation. The expectation of intervention often results in deferral of serious bargaining over legitimate contract issues between labor and management.

Experience with this system has taught the unions that they can forestall special legislative intervention by selectively striking only a few major railroads at a time. Thus, they are able to bring to bear either the economic pressure of a strike or Government intervention, as they choose. Railroad managements are not able to use pressure from outside sources to the same degree.

Railroad institutions and traditions were firmly in place long before the emergence of most modern industrial management techniques. The industry has grown up with a strong belief that it is unique among industries, and it possesses a strong reliance on self-education and experience as the principal qualifiers of both the work force and management. As a result of these strong ties to the past and a declining employee population, many elements within the industry have been slow to perceive a need to adopt modern management techniques and institutions, including those pertaining to personnel selection, training, and labor relations. This relationship could be vastly improved by better labor-management cooperation, as examples in the less controversial problem areas have demonstrated.

COMPENSATION AND BASIS OF PAY

Relatively high pay levels in the rail industry are augmented by the dual basis of pay for operating

employees and the payment of arbitraries. The dual basis of pay pertains to the long-standing method of compensating train crews according to a "day's pay" (equal to the hourly rate multiplied by 8 hours) for every 100 miles traveled. Originally, this method was devised to provide an incentive for improved productivity when 100 miles was a full day's work. Improvements in technology have increased train speeds, and trains can easily cover several hundred miles in a single day, so that train crews can receive several "day's pay" for work conducted during a single 8-hour period. Alternatively, this means that a number of crew changes are needed for a single run that could be performed by a single crew in a normal working day. Provisions for the negotiation of the longer runs by a single crew were included in the 1972 national agreement. Progress in adapting such provisions, however, has been less than complete.

Arbitraries are additional miscellaneous payments to labor for extra work or hardships endured on the job. They are commonly used by the railroad industry as a means of getting labor to accept technological innovations, or changes in working practices. For example, until several years ago the use of radio devices required an extra payment of $1 or $2 per day. Also, locomotive engineers are paid an extra $1.50 per day for working without firemen. Arbitraries also serve as penalties for inefficient management practices, such as poor scheduling of crews.

JOB-RELATED ISSUES

Many years ago, a number of labor practices were signed into agreements when the railroad industry was faced with different market demands and operated under different technological constraints. In the operating craft area, work assignment boundaries reflect traffic patterns in use when these agreements were reached, and although traffic patterns have changed over the years, the agreements have not. Management believes there are many instances where greater efficiency would result if the road train were to switch cars to customers en route rather than bringing the cars into the yard for the yard crew to handle. Usually, this has been not permissible under contracts between unions and management. Other contract features impose restrictions on train operations that cross internal railroad divisions and on the interchange of trains between railroads. Ordinarily, one railroad crew is not allowed to go directly into another railroad's yard; instead, the first crew must leave the train at a specific track location for pickup by the second railroad crew.

The 1972 national agreement modernized some provisions, permitting operating flexibility between over-the-road crews and yard crews. Further areas of agreement on this issue are being found as a result of labor-management cooperation projects such as the FRA- and AAR-sponsored experimental effort to improve St. Louis railroad yard practices. The first phase of the project involved representatives from management and labor who teamed up to streamline work practices that had impeded efficient operations in the St. Louis terminal district of the Missouri Pacific Railroad. The average time for a freight car to transit the terminal was reduced by 25 percent. Building on the St. Louis experience, projects are now in progress involving all the railroads serving Houston, St. Louis, and Chicago terminal areas to streamline interchange activities among the railroads. This second phase has begun to achieve significant savings through the coordination of empty car returns. In St. Louis, these savings are estimated to be $40,000 per week at present, with a potential of over $100,000 per week. Such work practice improvements will doubtless become important elements in future collective-bargaining settlements.

Current national rules require minimum four-person crews consisting of the engineer, conductor, and two brakemen on all yard and road trains. Crew size requirements vary depending on the type of train operation (through, local, yard, etc.), but management argues that smaller crews (engineer and one or two brakemen) could be used just as safely on some trains. Similarly, some industry observers contend that conductors are no longer necessary in many instances, since the use of computers largely eliminates the need for the on-train paperwork traditionally handled by the conductor. Management also contends that technological innovations, in the form of more reliable wheel bearings, hot-box detectors, signal and interlocking systems, radios, and location-passing detection systems, have also reduced or eliminated the need for a lookout at the end of the train and that the caboose is no longer needed on most trains. As the size of the train increases, however, some difficulties are encountered in eliminating the need for crew members and the caboose.

Organized labor opposes efforts to reduce crew size and to change many other operating practices because of concern over safety and job security. Rail unions believe it would be unsafe and inefficient to operate all trains with reduced crews. Union leaders contend that crew size should be negotiated locally (railroad by railroad), where all the particulars of each work situation could be considered, and they are opposed to a national rule that would dictate crew size irrespective of the work performed. A breakthrough in the crew consist issue took place when a moderating formula was agreed upon by the largest operating union, the United Transportation Union (UTU) and management of the Chicago, Milwaukee, St. Paul and Pacific. The present contract negotiations are also leading to new concepts in regionally negotiated crew consists as a

concession from the UTU. This far-reaching development in the crew consist will doubtless lead to new methods and productivity concepts in the industry and will force management also to rethink its operating practices. For many railroads, the new crew consists might mean operating more frequent and shorter freight trains.

In the nonoperating areas, maintenance of equipment and maintenance of way, changes of rules can be expected in the coming years, so that operating rules more adequately reflect technological improvements. Over the last 10 to 15 years, railroads have made significant strides in the application of computers and computer techniques to improve quality control and information. Using such developments in day-to-day operations involves negotiating with specific unions. Management is unaccustomed and frequently unwilling to invite labor participation in that kind of planning and sharing of responsibilities. Similarly, in the shop craft area, new repair facilities and new equipment have been introduced, but railroad managements have not been able to take advantage of many labor-saving devices. In the shop crafts, this is due primarily to the large number of unions with tightly defined work classifications. Management contends that a single, well-trained worker could possibly do the work now done by several persons.

The main problem in maintenance of way is the effect of the seasonal nature of the work on the preservation of a quality workforce. Workers are laid off as winter approaches, and only 60 percent return the following year. Thus, each year, large numbers of new employees need to be trained and absorbed into the mainstream of the complicated wage and fringe benefit packages. Railroad managements have introduced sophisticated equipment into maintenance of way, but the inability of most railroads to schedule year-round track maintenance work limits the productivity advantage of such equipment.

PROTECTION AGAINST DECLINING EMPLOYMENT

The Emergency Transportation Act of 1933 and the Washington Agreement of 1936 sought to ease the impact of reorganizations and mergers on employees. Under the terms of the Washington Agreement, employees discharged because of merger receive a monthly allowance equal to 60 percent of their last year's average monthly pay. Depending upon the employee's length of service, these payments are made for a period ranging from 6 months to 5 years. In 1940, a new section was added to the Interstate Commerce Act, requiring the ICC to provide for labor protection when granting merger approval. As a result of voluntary agreements and ICC rulings, labor protection was further extended during the 1960's to allow employment reduction only by attrition in most, but not all, merger cases. Finally, with Government involvement, such as in the creation of Amtrak and Conrail, employee protection features were increased. For example, the Regional Rail Reorganization Act (1973) continued on Conrail a lifetime protection package that was part of the Penn Central merger (1968).

Employee protection is not unique to the railroad industry, but it adds to railroad operating expenses, and it has a greater impact on railroading than on the competing modes of transport because of the declining trend in railroad employment.

THE RAILROAD RETIREMENT SYSTEM

The structure of the Railroad Retirement System constitutes a problem for the industry. Since passage of the Railroad Retirement Act (RRA) of 1937, the Federal Government has administered the industry's old-age and survivor insurance plans. Owing to congressional changes in the RRA and the decline in railroad employment, the cumulative contributions per employee made by railroad employers over time have exceeded, by far, similar payments made by competing modes. This is reflected in higher freight rates, which, in turn, harm the industry's competitive position.

To keep the Railroad Retirement System solvent in the face of legislated improvements in benefits and declining employment, the employer contribution rose from 2.75 percent of wages in 1937 to 15.35 percent in 1977. Until 1973, employee and employer contributions were equal. In that year, however, the employee contribution was reduced, by an amendment to the RRA, from 10.60 percent to the social security tax level of 5.85 percent, and the employer's contribution rate was increased to make up the difference. To enable the railroads to carry this additional financial burden, the amendment authorized a general rate increase of 2.8 percent.

The RRA of 1974 restructured the Railroad Retirement System by correcting a 1951 congressional oversight that resulted in many retired employees collecting both social security and railroad retirement benefits. Due to the complex link between social security and railroad retirement, the added cost of these "dual benefits," approximately $4 billion, was paid almost entirely out of the Railroad Retirement Account. The RRA of 1974 eliminated the payment of dual benefits to new retirees but provided for continuing the payment to those already receiving dual benefits, with the Railroad Retirement Account to be reimbursed by the U.S. Treasury. No retroactive reimbursement to the Railroad Retirement Account was made. The first Treasury appropriation to compensate for the

dual benefits was $250 million in fiscal 1976. Despite overall combined increases in contributions over the years, the subsidy of existing dual benefits, and the elimination of future dual benefits, the Thirteenth Actuarial Valuation of the Railroad Retirement Board in 1976 predicted the Railroad Retirement Account will become exhausted and unable to pay benefits by 1986. Unless there is Government assistance, an increase in employee contributions, or a reduction in retirement benefits, railroad contribution levels will have to be raised even higher.

The railroad industry also bears the burden of higher unemployment insurance contributions than the rest of industry. In 1939, a separate unemployment insurance program was enacted to cover only railroad employees. Previously, railroad employees had been covered under the unemployment insurance provisions of the Social Security Act of 1936. Payroll tax rates and taxes per employee under the Railroad Unemployment Insurance Act program, except for the period 1948–1956, have always been equal to, or higher than, the national average.

In recent years, unemployment insurance contributions per employee have been 60 percent greater than those for all other industries. In 1976, the employer contribution rate was raised from 4 percent to 5.5 percent. Despite this increase, disbursements from the Railroad Unemployment Insurance Account during fiscal 1975–1976 were nearly double the total income of $114.6 million. On June 30, 1976, the net balance in the Railroad Unemployment Insurance Account was only $10.5 million.

CONCLUSION

The worsening financial condition of the rail industry is the result of a variety of causes not all of which are within the industry's control. The industry has tried to adapt to the loss of the passenger market, the changing freight transportation market, the rise of competition from other modes, and the changing economic environment. At the same time, Government regulation, labor unions, fragmented industry structure, long life of railroad assets, lack of reliable costing, and other factors have limited the rate at which the industry can adapt. Government support for the development of rights-of-way for other modes (ch. 5) has had a direct effect on the competitive capability of the rail mode. Also Government taxation, rising interest rates, and increasing railroad retirement contributions have added directly to the industry's financial difficulties. Taken together, these problems comprise an institutional environment for the railroad industry that has impeded its ability to respond to change. The net effect has been deteriorating levels of service and profit.

The restoration of the railroad industry to financial and operational health will require the resolution or alleviation of most or all of the problems described in this chapter. Much of the responsibility for resolving these problems falls upon the railroad industry, both management and labor, but part of the responsibility also falls upon Federal and State Governments.

REFERENCES

[1] Reebie Associates, *National Intermodal Network Feasibility Study.* Prepared for Department of Transportation, Federal Railroad Administration, May 1976.

[2] Department of Transportation, *Study of Federal Aid to Rail Transportation,* Jan. 1977, app., table 12, pp. iv-27.

[3] "Intercity Domestic Transportation System for Passenger and Freight," Committee on Commerce, Science and Transportation, U.S. Senate, 1977, p. 68.

[4] U.S. House of Representatives, Subcommittee on Transportation and Commerce, "Material Concerning the Effects of Government Regulation on Railroads and an Economic Profile of Railroads in the United States," Dec. 1975.

[5] William M. Capron, Editor, "Technological Change in Regulated Industries," Brookings Institution, Washington, D.C., 1971, pp. 175–178.

[6] *ICC* v. *New York, New Haven and Hartford Railroad Co.,* 372 U.S. 744, 757.

[7] Department of Transportation, "Analysis and Evaluation of Past Experience in Rationalizing Railroad Networks," Oct. 1974, p. 104.

[8] Day & Zimmerman, Inc., *The National Core Rail System Study,* prepared for the Department of Transportation, Sept. 6, 1977.

[9] *Improving Railroad Productivity,* Final Report of the Task Force on Railroad Productivity of the National Commission on Productivity and the Council of Economic Advisors (Washington: GPO), Nov. 1973, pp. 237–246.

[10] Interstate Commerce Commission, Bureau of Economics, Bureau of Operations, "Empty/Loaded Truck Miles on Interstate Highways During 1976," Apr. 1977.

3. ESTIMATED CAPITAL REQUIREMENTS, 1976–1985

The Federal Railroad Administration's (FRA) estimates of the railroad industry's sources and uses of funds (excluding the Consolidated Rail Corporation (Conrail) and the Long Island Railroad (LIRR)) indicate that unless actions are taken to reverse current trends, the industry faces a potential capital shortfall of between $13.1 billion and $16.2 billion[1] during the period 1976–1985. About 50 percent of the shortfall is concentrated in marginal or bankrupt companies that together generate only about 20 percent of the rail industry's revenues.

An FRA study that estimated annual maintenance expenditures the industry should make to gradually overcome existing deferred maintenance and to maintain facilities at appropriate levels in the future concluded that roadway maintenance expenses over the 1976–85 period, excluding depreciation, should range between $40.5 billion and $43.8 billion.[1] Of these totals, deferred maintenance ranges between $2.8 and $6.1 billion.

Even without these expenditures for deferred maintenance, the industry faces a capital shortfall of approximately $10.2 billion. In other words, beyond the need to overcome the inadequate expenditures on facilities in past years, if recent trends continue, the industry will generate insufficient funds to meet its needs over the next 10 years. This insufficiency is the consequence of fundamental economic and institutional problems (discussed in ch. 2).

If current trends persist, the resultant shortfall in capital funding will continue to propel the industry along a downward spiral. The FRA estimates indicate that the greatest shortfall between funds flow from operations and capital expenditures is likely to occur in the near future. The timing of the needs is such that even if actions are taken immediately to improve earnings and correct underlying problems, additional bankruptcies and further deterioration of facilities and service are likely.

The shortfall can be reduced by increasing the source of funds and decreasing the need for funds. Funds may be increased by increasing revenues (possibly through selective rate increases), reducing operating expenses (through improvements in yard and equipment utilization, management, and operations), and abandonment of uneconomic lines. Changes in the physical structure of the railroads can improve

[1]All dollar amounts in ch. 3 are in current year dollars, unless otherwise noted.

profitability while preserving cost-effective services for shippers. Consolidation and coordination efforts should help to reduce costs and needs. These measures, if successful, should enhance the industry's access to external capital.

This chapter presents FRA financial projections, identifies the components and nature of the capital shortfall, compares results to other projections of the industry's financial future, and discusses the significance of the shortfall. The primary methodology employed was an analysis of future sources and uses of funds. Principal uses include funds for capital investment, repayment of debt, and increases in working capital. The analytic methods underlying the projections are discussed in appendix A. Projections were made in both constant (1975) and current year dollars, but the results in this chapter are reported in current year dollars, unless otherwise specified. Also included in appendix A are the computer printouts, by railroad district, that form the basis for the discussions in this chapter.

CALCULATION OF CAPITAL REQUIREMENTS

The framework within which the FRA determined the rail industry's future capital needs and the ability of the industry to meet those needs was the concept of funds flow analysis. Funds flow analysis is a method of tracing the flow of funds in and out of a business. This concept takes into account the interrelationships between the income statement and the balance sheet and brings into single focus a firm's total sources and applications of funds.

Funds flow analysis refers to a methodology whereby the railroad industry's prospective needs for funds (cash needs for working capital, procurement of equipment, improvement of plant facilities, retirement of debt, payment of dividends, etc.) are measured against the industry's ability to obtain funds through operations and from external sources.

Estimates of the potential sources and uses of funds during the period from 1976 to 1985 are derived from a financial-planning model developed by FRA expressly for this purpose. The 10-year analysis period (1976 to 1985) is a statutory requirement of the Railroad Revitalization and Regulatory Reform (4R) Act of 1976. Since financial and operating data are available for 1976, the first year's projections represent actual results.

Since the intent of the exercise was to identify the potential severity of problems the industry faces under present conditions, the model was designed to develop forecasts based on an extension of the status quo. Assumptions are made that the U.S. economy will experience an annual average growth rate of 3.94 percent but that inflation and ordinary business cycles will continue, and current rate and other regulatory policies, trends in operating efficiencies, dividend policies and attitudes, and criteria governing requests for, and availability of, external capital and levels of service will continue. No assumptions are made with respect to further regulatory reform, major technological change, the imposition of waterway user charges, a redistribution of highway user charges, and major changes in the environment, or the present rail structure which might affect the future of the industry. Deviations from the status quo are made, however, with respect to projections of maintenance-of-way expenditures. Expenses in this category were increased to allow the industry to maintain right-of-way facilities at normalized maintenance levels as defined in a study done for FRA[1] and to enable the industry to catch up on maintenance deferred in the past.

The industry's need to overcome deferred maintenance (as explained in ch. 1) is in conflict with the industry's need to smooth out its long-term maintenance cycles so that future costs will better match future revenues. For this reason and because adherence to normalized maintenance levels alone, over the long term, will gradually eliminate deferred maintenance, it would not be prudent for the industry to try to eliminate all existing deferred maintenance within a short time span. Instead, the industry's annual maintenance-of-way expenses should be somewhat above normalized levels for a 10-year period. The total 10-year excess above normalized should be equal to between 25 and 50 percent of existing deferred maintenance. To reflect this range, FRA prepared two sets of projections: the first incorporated a 25-percent deferred maintenance scenario (scenario 1), and the second incorporated a 50-percent deferred maintenance scenario (scenario 2).

The model's projections represent a baseline case that depicts the industry's probable financial future in the absence of change. The projections can serve as a starting point for assessing potential changes in the status quo and solutions to some of the problems.

Given the difficulties inherent in forecasting, the capital forecast cannot represent precisely what will, or should, happen in the future. What is important is that the method, or methods, used to assess the present and the past and to develop the interrelationship of key determinants of the future are sound and

reasonable. The specific assumptions and methods used to derive the projections are explained in appendix A. An inordinate concern with the precise size or range of the shortfall will cloud efforts to understand the nature and complexity of the problems facing the rail industry, an understanding that is crucial to developing, enacting, and implementing the best combination of policies for remedying the railroads' ills.

RESULTS OF THE STUDY

Table 3-1 presents the summary results of FRA's modeling efforts. For the baseline status quo case, the railroad industry's capital requirements (excluding Conrail and LIRR) will total $42.5 billion from 1976 to 1985.

FUTURE CAPITAL REQUIREMENTS

The following discussion of future capital requirements includes road property expenditures, equipment expenditures, debt repayment, and working capital.

Road Property Expenditures

Although the existing rail system was largely in place by the turn of the century, its components must be maintained and renewed periodically or replaced when age or technological obsolescence so require. Under the retirement, replacement, betterment (RRB) method of accounting currently required by Interstate Commerce Commission (ICC) accounting regulations, the costs of annual maintenance and the one-for-one replacement of rail, ties, or ballast are considered operating expenses and are expected to be paid out of railroad revenues. If any of these components is upgraded when it is replaced, the portion of the expense represented by the upgrading is treated as a capital cost and is expected to be paid out of retained earnings or externally derived funds. When old rail is replaced with heavier rail, for instance, the incremental cost between the lighter and heavier weight rail is designated, under current ICC accounting rules, a capital cost. Other examples of capital costs include the cost of constructing new yards, lines, or terminals, installing communication and signaling facilities, and making investments in shops, computer systems, or other facilities.

The FRA's estimate of the expenditures for road property (excluding Conrail and LIRR) includes only those costs that would be treated as capital costs

TABLE 3-1. PROJECTED SOURCES AND USES OF FUNDS, 1976-1985[a]
(Million $)

Category	Scenario 1		Scenario 2	
	Constant $	Current year $	Constant $	Current year $
Sources of funds:				
Funds from operations	12,551	10,142	10,569	6,999
Sales of equipment obligations[b]	11,237	16,755	11,237	16,755
Sale of equity and/or debt	1,664	1,664	1,664	1,664
Other sources	457	911	457	910
Total	25,909	29,472	23,927	26,328
Uses of funds:				
Investment in road property	4,333	6,819	4,333	6,819
Investment in equipment	14,362	21,491	14,362	21,491
Repayment of funded debt	1,643	1,644	1,643	1,644
Repayment of equipment debt	7,688	9,095	7,688	9,095
Increase in working capital	853	3,168	859	3,185
Other uses	0	258	0	258
Total	28,879	42,475	28,885	42,492
Additional funds required[c]	2,970	13,003	4,958	16,164
Peak additional funds required	4,557	13,140	5,364	16,164

[a]Represents annual charge to retained earnings (i.e., ex dividends), net of noncash items.

[b]Conditional sales agreements and equipment trusts.

[c]These amounts are net of annual funding surpluses.

NOTE: Current year dollar amounts reflect the effect of inflation as opposed to constant dollar amounts which do not reflect the effect of inflation and which, therefore, are equivalent in value from year to year.

SOURCE: Federal Railroad Administration study.

under the RRB method of accounting. The methodology used to derive the estimate of capital expenditures is based on the level of such expenditures made by the industry in the recent past. (See appendix A.)

On a constant dollar (1975) basis, the estimated road property investments are expected to be made in approximately equal annual increments over the 10-year period and will average $0.43 billion per year. On a current dollar basis, these expenditures will average $0.68 billion. These differences illustrate the degree to which inflation affects the industry's need for capital. By contrast, the Association of American Railroads (AAR) estimated that the industry's (excluding Conrail's predecessors) capital expenditures for road property averaged $0.34 billion in 1975 dollars per year between 1966–75. The above projections of capital expenditures do not include the cost of maintenance that would have been performed in the past under a normalized maintenance program but that was not done because of inadequate funds or because railroad companies were consciously disinvesting from unprofitable lines. Similarly, the estimates do not include any amounts necessary to raise the industry's ongoing maintenance-of-way expenditures to those levels called for by a normalized maintenance program. These amounts were included, however, in calculating the projections of the industry's net income and funds flow from operations, discussed later in this chapter.

Because Congress and the Department of Transportation (DOT) are concerned with deterioration of the industry's right-of-way facilities, the FRA study[1] estimated the annual maintenance expenditures the industry should make to gradually overcome existing deferred maintenance and to maintain its facilities at appropriate levels in the future.[2] The study concluded that the industry's normalized roadway maintenance expenses over the 1976–85 period, excluding depreciation, should amount to $37.7 billion and that expenditures to overcome deferred maintenance should range from $2.8 billion to $6.1 billion. The 10-year estimate of normalized maintenance is $5.4 billion (in constant 1975 dollars) more than the amount spent from 1966 to 1975. Estimates of future maintenance requirements vary little from year to year and do not change significantly with modest changes in the general economic outlook or changes in traffic projections.

Equipment Expenditures

Capital expenditures for equipment are needed for the following reasons.

- To maintain the capacity of the industry's existing fleet as older equipment is retired
- To rebuild or improve old equipment
- To expand the existing fleet to meet projected traffic growth.

The FRA estimates that the industry (excluding Conrail and LIRR) will spend $21.5 billion for such equipment over the 1976–85 period.

The FRA projects that the industry (excluding Conrail and LIRR) needs to acquire, whether through lease, purchase, or rebuilding, 556,000 freight cars and 8,000 locomotives over the forecast period, at a cost of $27.6 billion. By comparison, the ICC's Ex Parte No. 271 projections called for the industry (excluding Conrail and LIRR) to add approximately 681,000 freight cars and 13,000 locomotives at a total cost of $33.4 billion between 1976 and 1985. The FRA and ICC dollar estimates are significantly higher than equipment expenditures over the past 10 years. Between 1966 and 1975, the industry acquired 902,000 freight cars and 14,000 locomotives, at an estimated cost of $18.5 billion. Per carload capacity of freight cars has increased, thus reducing the number of cars required to meet traffic requirements. The higher capacity cars, however, cost more per unit of capacity than earlier cars, and, consequently, there have been continuous increases in equipment expenditures.

Debt Repayment

The third major need for capital is to repay maturing long-term debt. Outstanding industry debt generally falls into the categories of equipment obligations and mortgage or other funded debt.

Equipment obligations, generally, are repaid in equal annual installments over the life of the obligation (usually 15 years). The FRA estimates the industry (less Conrail and LIRR) will have to repay $9.1 billion in equipment obligations over the 10-year period. This estimate reflects the maturity of those equipment obligations outstanding on December 31, 1975, as well as the maturity of anticipated additional equipment obligations sold by the industry from 1976 to 1985.

Mortgage and other funded debt are generally repaid in one lump sum upon maturity, although some railroad securities require annual payments to sinking fund escrow accounts. Often debt is not retired but is rolled over when the railroad issues new debt securities at higher interest rates to replace the old debt. Projections of expenditures necessary to repay existing mortgage and other funded debt coming due during the 1976–85 period are taken from railroad company submissions to FRA and total $1.6 billion.

[2]For purposes of analysis, "appropriate" or "normalized" levels of maintenance were defined as "the average annual material requirement based on the total number of material units in the track divided by the average material life."[1] The study is described more fully in ch. I.

Working Capital

Working capital is defined as the arithmetic difference between the book value of a firm's current assets and current liabilities at a given point in time. Working capital, generally, represents the amount of cash, receivables, other liquid assets, and materials a firm has on hand to meet day-to-day operating expenses (wages, payroll taxes, and purchase of materials), short-term debt obligations, and progress payments for capital improvement projects. To allow for the possible shrinkage in value of some assets, such as inventories or decreases in receivables due to seasonal fluctuations or business downturns, most businesses try to maintain working capital at a level that will provide a margin of safety for adversities. A popular rule-of-thumb is that the level of current assets should be twice as great as the level of current liabilities, although this varies with the quality and character of the current assets and the type of industry under consideration.

Industry observers, financial experts, and railroad executives have long maintained that present working capital levels are inadequate. As profits decline and access to external capital becomes increasingly limited, many railroads are forced to use working capital to help finance capital expenditures. As a result, total working capital, excluding the current portion of long-term debt, for the industry (less Conrail and LIRR) has dropped from $1.06 billion in 1955 to $0.22 billion in 1975. The 1975 total represents a ratio of current assets to current liabilities of 1.29.

Any estimate of the industry's future needs for capital must consider replenishment of working capital to levels in keeping with long-term financial strength. The FRA estimate, determined on a regional basis, is that $3.2 billion in working capital will be required over the 1976–85 period. This figure represents the sum of additional capital needed to make each region's ratio of current assets to current liabilities[3] at least equal to the average ratio prevailing among solvent companies in that region in 1975 and 1976. The totals include an assumption that cash and temporary investments (the most liquid portion of working capital) at the end of each forecast year should equal at least 15 days of operating expenses for that year.

ABILITY TO MEET PROJECTED CAPITAL REQUIREMENTS—BASE CASE

To assess the ability of the railroad industry to undertake the above capital expenditures, FRA projected the annual level of funds the industry is likely to obtain from all traditional sources over the forecast period and compared it to the projected capital requirements described above. The sources include cash generated from railroad operations after payment of dividends (net income less undistributed earnings in affiliates and other noncash items plus depreciation, amortization, deferred taxes, and other noncash expenses), proceeds from equipment financing, proceeds from the sale of debt and equity securities, and proceeds from the sale of property or other assets.

As shown in table 3-1, the projections indicate that the railroad industry will be able to generate internally and obtain externally between $26.3 billion and $29.5 billion over the 1976–85 period. Thus, the industry faces a capital shortfall of between $13.1 billion and $16.2 billion.[4]

Regardless of the scenario, the shortfall is not due solely to the need to make up deferred maintenance.[5] Even without these expenditures, the industry faces a shortfall of $10.2 billion. Totally apart from the need to overcome the lack of adequate spending on facilities in past years, if recent trends continue, the industry will generate insufficient funds to meet its needs over the next 10 years. This insufficiency is the direct consequence of the fundamental economic and institutional problems discussed in chapter 2.

Figure 3-1 shows the margin by which the industry's capital needs are expected to exceed cash generated from operations (after dividends) over the forecast period. Even the healthiest industry does not rely solely upon internally generated cash to finance current capital expenditures—virtually all industries obtain additional funds through the sale of equity or debt. With some exceptions, however, railroad earnings are too low to attract new equity or debt other than for equipment purchases or rollover of old debt. Revenue equipment is funded because it serves as its own collateral and can be recovered and transferred in the event of bankruptcy. Mortgage debt is refunded because the debt is secured by the liquidation value of the fixed assets and because the holders of the debt prefer not to place the existing debt in default.

[3]Excluding current portion of long-term debt.

[4]The methods and assumptions used to develop projections of cash flow from operations are discussed in appendix A. Equipment-financing projections were based on the assumptions that private ownership equipment purchases would be held at 1975 proportions and that all equipment purchases would be financed by a combination of 80% equipment trusts and 90% conditional sales agreements (CSA). Estimates of new debt were taken from individual railroad's submissions to FRA. Based on the magnitude and timing of these forecasts, it appears that most of the industry expects to be able to roll over mortgage debt coming due, and a few railroad companies expect to obtain additional debt or equity.

[5]The shortfall represents the arithmetic sum of the difference, if any, between sources and uses of funds in each of the 10 years for which projections were made. For purposes of the analysis, the shortfall in each year was treated as a balancing item, so that any effects from not making up a given year's shortfall (such as a drop in volume due to an inability to buy enough equipment) were ignored. Further, the total shortfall does not include any interest costs associated with financing each year's shortfall.

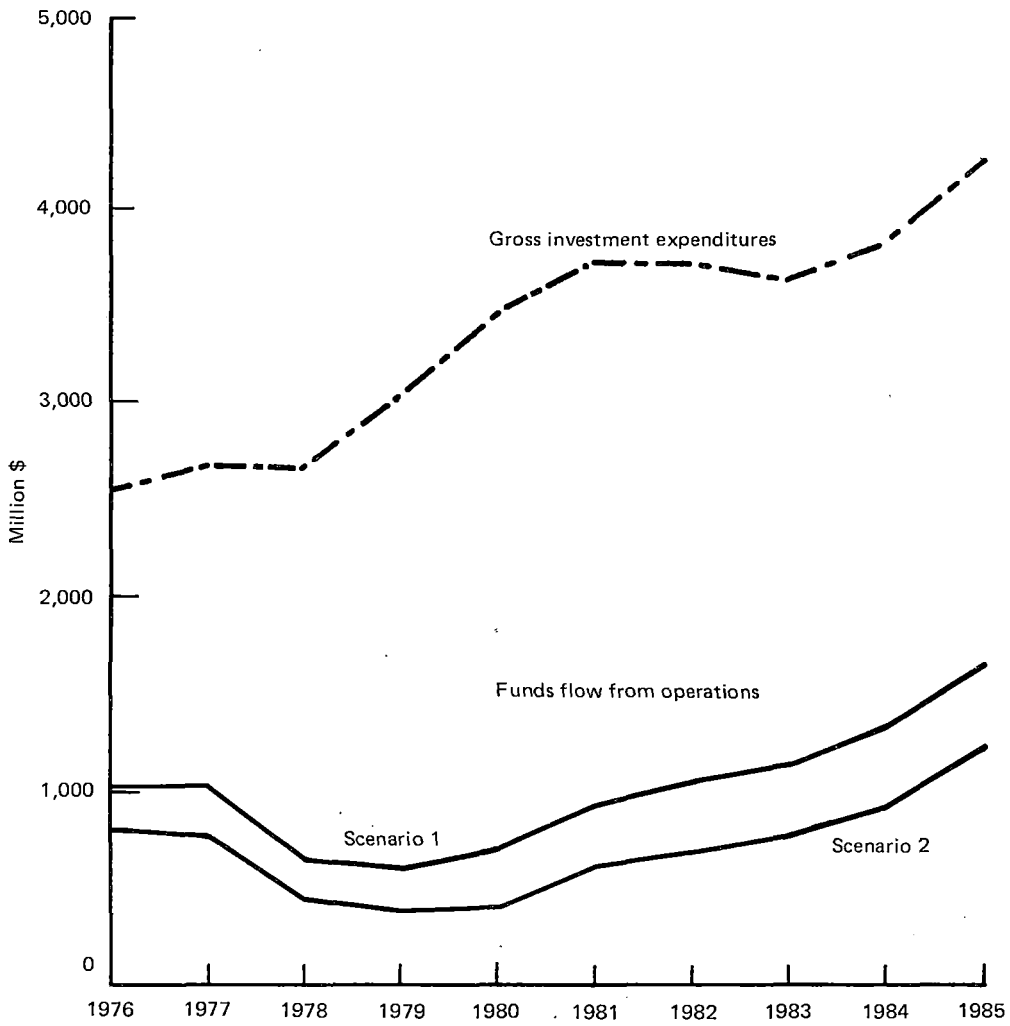


FIGURE 3-1. COMPARISON OF INVESTMENT EXPENDITURES TO FUNDS FLOW.

Investor reluctance exists because the industry's average cost of capital exceeds the return on investments made with the capital. As a result, the availability of private capital for future investments may be curtailed, because investors believe that returns generated with the investment of additional capital will not equal returns from alternative investments with similar risk.

Unfortunately, unless basic changes occur in the economic and institutional factors that govern the industry's performance, there is little hope that earnings will improve enough over the next decade to change this prognosis significantly. Based on FRA projections for the base case, each region's annual rate of return over the next decade is projected to range between minus 23 percent and 5.7 percent. These levels are far below the 11- to 11.6-percent return on investment viewed by the industry as necessary to attract and retain adequate amounts of capital over the long term. Indeed, it is even lower than the industry's embedded cost of senior capital, estimated at 6.6 percent.[6] The FRA projections are also below a recent finding by an ICC coordinator, in Ex Parte No. 271, "that a 6 to 10 percent overall target rate of return would not be unreasonable under present conditions."[7]

These low rates of return projected for the industry question the assumption that future cash flows from operations will automatically be applied to the industry's ongoing need for funds. Since

[6]Verified statement of J. Rhoades Foster before the ICC.[2] Embedded cost of capital is based on an average of contractual rates of debt and preferred stock over time. The 11 to 11.6% return includes both debt and equity and is derived by applying capital structure ratios to the embedded cost of railroad debt and the cost of equity for industries with investment risks comparable to railroads. Foster measured returns against the industry's original cost net investment base.

[7]The coordinator added that "such a rate of return should be a goal of the railroad industry, not a guarantee by government."[3]

stockholders often can earn a greater return elsewhere, management's propensity to reinvest in the railroad industry may be less than assumed in the forecast.

The ICC, in Ex Parte No. 271, has pointed out the need for the industry to earn an adequate rate of return on funds reinvested in railroad company operations. This need must be recognized, or the industry will not be in a position to meet its long-term financial needs. Yet the projected shortfall represents only the amount of additional funds required to make long-term sources of funds equal to long-term uses; if funded, the shortfall would not provide the increased earnings necessary to enable railroad companies to secure additional capital in the private market at reasonable rates.

For the industry to earn a rate of return of 10 percent over the 1976–85 period, net operating income would have to be $31.8 billion greater than forecast in scenario 1 and $34.5 billion greater than in scenario 2. While these differences cannot be considered a capital need, they do represent a dramatic earnings shortfall above and beyond the FRA projection. If earnings could be increased to those levels, private capital would supply all needed capital funds.

Regional Differences

Individual railroads have not been affected equally by competition or changing economic forces; the industry can be viewed as three tiered: one tier consists of companies with strong traffic bases, well-maintained facilities, and enough financial resources to remain self-sufficient; the second tier consists of somewhat less financially secure companies serving areas of potential growth, and probably able to remain self-sufficient given some improvement in regulatory and economic conditions; the third tier consists of railroad companies with below average traffic densities and limited financial resources. To better predict what the future holds for the industry, FRA also developed 10-year projections of the sources and uses of funds for six major regional and economic groups. The five groups that are the major focus of this report are: Eastern, Southern, Western, Marginal East, and Marginal West. The sixth group, which reflects Conrail's predecessor railroads and the LIRR, was included in the analysis only to the extent necessary to complete projections for the rest of the industry.[8] These groups are chosen to reflect regional and financial differences and to mitigate some problems that arise from projecting sources and uses of funds on an aggregate basis.

Railroad companies were assigned regional groupings according to ICC and industry definitions. The companies were selected on the basis of financial condition, using criteria similar to those described by the Rail Services Planning Office (RSPO). Seven railroads representing 20 percent of the total miles operated by Class I railroads and 10 percent of the industry's gross ton-miles in 1973 were included in the Marginal East or Marginal West group for purposes of the study.[9] This total includes the three railroad companies currently operating under section 77 of the bankruptcy law. The results of the FRA projections for the U.S. total and for the five regional groups are shown in tables 3-2 and 3-3. Detailed income statements, balance sheets, and statements of sources and uses of funds are found in appendix A.

Eastern District. As shown in tables 3-2 and 3-3, FRA projections indicate that railroads in the Eastern District, excluding Conrail, the LIRR, and those eastern railroads designated as marginal for purposes of this study, face a capital shortfall over the forecast period of between $0.8 billion and $1.2 billion. This represents between 1.9 percent and 2.7 percent of the total freight revenues over the period. Although the district's net income and cash flow (after dividends) remain positive over the period, improvements in each are modest. In scenario 1, net income and cash flow increase at annual average growth rates of 1.02 and 2.83 percents, respectively. In scenario 2, net income decreases at an annual average rate of 0.06 percent, while cash flow increases at an annual rate of 2.24 percent. By contrast, the average annual tonnage growth rate is 1.79 percent for the 10-year forecast.

Although there is no one expenditure or factor responsible, the Eastern District's shortfall in scenario 1 is roughly equal to the sum of its needs for additional working capital and its need for higher maintenance-of-way expenditures to overcome existing deferred maintenance. In scenario 2, 84 percent of the shortfall is represented by the need to overcome existing deferred maintenance.

Even if the railroads in the district were granted interest-free money to cover these needs, however, the projections do not imply that long-term financial health is assured. Returns on net investment throughout the forecast period remain inadequate; with one exception, returns on investment are less than 5 percent.

Western District. As shown in tables 3-2 and 3-3, FRA projections indicate that railroads in the Western District (excluding those companies in the West designated as marginal for the purposes of this study) face a capital shortfall of between $3 billion and $4.4 billion over the 1976–85 period. These amounts represent between 2.6 and 3.8 percents,

[8]Equipment forecasts, for instance, must be based on fleet requirements for the entire industry, because certain companies may be net users or suppliers of equipment and any forecast ignoring this phenomenon would be invalid.

[9]By contrast, the bankrupt northeastern roads, including the Boston and Maine, accounted for 13% of the miles of road operated in 1973. [4]

TABLE 3-2. SCENARIO 1, PROJECTED SOURCES AND USES OF FUNDS, 1976-1985
(Million current $)

Funds	East	South	West	Marginal		Total
				East	West	
Sources of funds:						
Funds from operations[a]	3,300	2,147	9,104	(500)	(3,909)	10,142
Sale of equipment obligations[b]	3,381	3,844	8,540	26	964	16,755
Sale of equity and/or debt	375	448	686	35	120	1,664
Other sources	177	175	324	31	204	911
Total sources	7,233	6,614	18,654	(408)	(2,621)	29,472
Uses of funds:						
Investment in road property	604	1,403	3,859	71	882	6,819
Investment in equipment	4,375	4,866	10,839	46	1,365	21,491
Repayment of funded debt	556	289	619	26	154	1,644
Repayment of equipment debt	1,921	2,146	4,320	26	682	9,095
Increase in working capital	451	383	1,940	53	341	3,168
Other uses	50	33	112	4	59	258
Total uses	7,957	9,120	21,689	226	3,483	42,475
Net additional funds required	724	2,506	3,035	634	6,104	13,003
Peak additional funds required	761	2,506	3,035	634	6,104	13,140

[a]Represents annual charges to retained earnings (i.e., ex-dividends) net of noncash items.
[b]Conditional sales agreements and equipment trusts.
NOTE: Numbers in parentheses denote negatives.
SOURCE: Federal Railroad Administration study.

respectively, of cumulative projected freight revenues. Net income will increase at an average annual rate of between 10.73 and 11.43 percents, respectively; cash flow from operations (after dividends) will show an average annual growth of between 10.21 and 10.61 percents, respectively. By contrast, tonnage is projected to grow at an average annual rate of 4.88 percent, with coal tonnage movements (at a 12.3-percent per year growth rate) comprising the largest element.

Despite the Western District's greater traffic growth and higher earnings, overall rates of return are poorer than for the Eastern District because the western railroads must make higher levels of capital expenditures to finance growth. Financing this growth in an inflationary environment is difficult for two reasons. First, inflation increases the cost of the new equipment needed to handle additional volume; second, inflation erodes the profitability of carrying more traffic, because rate increases are never sufficient to cover inflationary increases in operating expenses. Even so, projections indicate that without the requirements to make up deferred maintenance and keep working capital at present levels, western railroads should be able to generate enough funds to meet their capital expenditures. In scenario 2, cumulative deferred maintenance ($2.7 billion) and additional working capital requirements ($2 billion) exceed the projected shortfall by $0.3 billion; in scenario 1, these requirements exceed the shortfall by $0.2 billion. If the Western District railroads were given interest-free money to fund annual projected shortfalls, average returns on net investment would range between 3.7 percent and 4.5 percent by 1985.

Southern District. The FRA projections, as summarized in tables 3-2 and 3-3, indicate that railroads in the Southern District face a capital shortfall of between $2.5 billion and $2.8 billion over the 1976–85 period. These amounts are equivalent to between 7 and 8 percents, respectively, of the district's cumulative projected freight revenues, a significantly greater percentage than for the East and West. Moreover, unlike the East and West, the South's shortfall is not so much related to the need to overcome deferred maintenance nor to fund working capital (deferred maintenance ranges from $0.6 billion to $0.3 billion, and working capital needs are equal to $0.4 billion) but to increasingly poor earnings projections.

Although the South's projected tonnage grows at an annual rate of 2.25 percent over the 1976–85 period, its net income decreases at an average annual rate of between 5.94 and 11.23 percents, respectively. Cash flow from operations (after dividends) increases

TABLE 3-3. SCENARIO 2, PROJECTED SOURCES AND USES OF FUNDS, 1976-1985
(Million $)

Funds	East	South	West	Marginal East	Marginal West	Total
Sources of funds:						
Funds from operations[a]	2,826	1,836	7,724	(587)	(4,800)	6,999
Sale of equipment obligations[b]	3,381	3,844	8,540	26	964	16,755
Sale of equity and/or debt	375	448	686	35	120	1,664
Other sources	176	175	324	30	205	910
Total sources	6,758	6,303	17,274	(496)	(3,511)	26,338
Uses of funds:						
Investment in road property	604	1,403	3,859	71	882	6,819
Investment in equipment	4,375	4,866	10,839	46	1,365	21,491
Repayment of funded debt	556	289	619	26	154	1,644
Repayment of equipment debt	1,921	2,146	4,320	26	682	9,095
Increase in working capital	451	383	1,951	52	348	3,185
Other uses	50	33	113	4	58	258
Total uses	7,957	9,120	21,701	225	3,489	42,492
Net additional funds required	1,199	2,817	4,427	721	7,000	16,164
Peak additional funds required	1,199	2,817	4,427	721	7,000	16,164

[a]Represents annual charges to retained earnings (i.e., ex-dividends) net of noncash items.
[b]Conditional sales agreements and equipment trusts.
NOTE: Numbers in parentheses denote negatives.
SOURCE: Federal Railroad Administration study.

at an average annual growth rate of between 2.42 and 1.7 percents, respectively. These patterns persist, however, only in the inflated projections.

Although inflation similarly affects all regions' revenues, expenses, and capital expenditures, projections indicate that the South's income statement suffers more in an inflationary environment than do the others. The South's net yield from general rate increases granted to offset inflationary cost increases is lower than for the other regions. Historically, southern railroads have experienced more holddowns and exceptions to rate increases than other regions, primarily because they face greater competition from other modes of transportation and must try to maintain competitive rates. The FRA projections are based on the assumption that the South's effective yield from rate increases will remain less than the other regions.

Marginal West. The capital shortfall for the Marginal West railroads is estimated to range between $6.1 billion and $7 billion. These amounts are equivalent to between 22 and 25 percents, respectively, of cumulative freight revenues over the period. Consequently, projections indicate that five Marginal West companies account for between 47 to 43 percent of the forecast shortfall for the entire industry. The primary source of the shortfall is readily apparent. Funds from operations range from a negative $3.9 billion to a negative $4.8 billion over the 10-year period. Worse, total sources are negative throughout the period. In other words, the group's net operating losses alone, before accounting for any capital expenditure, are more than enough to deplete all sources of funds. Deferred maintenance comprises between $0.7 billion and $1.6 billion of this deficit cash flow.

These poor operating results relate, in part, to sluggish traffic forecasts: Annual average tonnage growth for these companies is only 1.77 percent. The results also reflect increasingly inefficient operations that, in turn, are a consequence of relatively low traffic densities.

Marginal East. Projections for the companies comprising the Marginal East group also indicate a bleak financial future. The total shortfall is forecast as between $0.6 billion and $0.7 billion. This amount represents between 25 and 29 percents, respectively, of cumulative freight revenues.

The bulk of the shortfall arises from negative earnings rather than from requirements for capital expenditures. Total funds from operations over the period are projected to range from minus $0.5 billion to minus $0.6 billion. Of this total, the monies allocated for deferred maintenance are only partially

responsible for this deficit; cumulative deferred maintenance is between $0.07 billion and $0.2 billion. Total sources of funds range from minus $0.4 billion to minus $0.5 billion. Even if Marginal East companies could use borrowed funds to finance equipment purchases to offset operating losses, they would still lose $0.4 billion to $0.5 billion over the period.

Estimated growth rates for Marginal East are somewhat higher than for Marginal West; average annual growth is 2.07 percent, but, again, traffic density is relatively low.

Marginal Company Impacts

The capital needs of the marginal railroads are greater on a proportional basis than the financially stronger railroads, but their operating results are so much worse that even if they were able to reduce their capital needs, further bankruptcies may occur as operating expenses begin to exceed revenues. While there are many reasons for the ill health of these companies, one common problem is low traffic density. The average density level of the seven, as a group, is only 4.87 million gross tons in 1973, compared to 9.76 million gross tons for all Class I railroads. To alleviate the problem of low traffic density levels, or excess fixed plant, the DOT has undertaken to work with the railroads in the Midwest to assist them in coordinating their operations and consolidating their fixed plant assets in order to reduce costs.

A second common problem is the difficulty in funding future maintenance requirements. While the entire industry's required maintenance levels for the next 10 years will be far greater than in the last 10, the low-tonnage roads will be especially hard hit on tie replacement requirements. Slightly over 50 percent of the total cross ties belonging to the seven marginal railroads have a remaining life of 10 years or less, but under normal engineering standards, only 30 percent would have a 10-year life or less.

These figures make clear that the traffic carried by these weaker roads will not be sufficient to justify the level of investment needed to rehabilitate and maintain their plants on an individual basis. Average densities could be improved, to some extent, if these companies could abandon uneconomic branchlines. But abandonment of light-density lines alone will be inadequate to raise average density levels to a point where these railroads can be self-sustaining.

The revenue rates at which the traffic is carried are also relevant, but even if these companies were able to raise rates selectively, and thereby reduce the shortfall, low traffic density might remain a problem. It is not coincidence that five of the seven weak companies operate in the Midwestern States containing the greatest rail service redundancy. The two others are located in the Northeast, where the combination of excessive track and declining traffic levels sent seven companies into bankruptcy. Together, the railroads designated marginal account for approximately one-half of the $13.1 billion to $16.2 billion capital shortfall forecast for the entire industry.

THE SHORTFALL

The following discussion of the projected shortfall will focus upon the sensitivity of projections to assumptions, a comparison of FRA's current analysis to other forecasts, the ongoing nature of the shortfall, its effect, and the potential for reducing the shortfall.

SENSITIVITY TO ASSUMPTIONS

The FRA has made every effort to insure that the methods and assumptions used to derive the projections were sound and reasonable. The final results, nonetheless, are bound to be sensitive to changes in assumptions. To evaluate the reasonableness of the forecasts and to help identify Federal and/or industry actions that would reduce the capital shortfall, FRA is conducting sensitivity analyses of the forecast. Those assumptions that are critical to the outcome of the current projections and that might be subject to change include the following.

- The general economic scenario, including inflation and gross national product (GNP) growth rates
- Railroad commodity projections
- The regulatory environment, including rate increases, holddowns, timelags, abandonment, and merger applications
- Diversion of traffic to other modes of transportation
- Equipment utilization
- Labor productivity
- The industry's borrowing capacity
- The industry's commodity market penetration and tariff policies
- Maintenance-of-way expenditure projections
- The size of the railroad track network

COMPARISON OF FORECASTS

When compared to forecasts prepared by the First National City Bank (FNCB) and the ICC (in Ex Parte No. 271), FRA projections do not appear unrealistic. The FNCB, in a study attached to its

analysis of the United States Railway Association's (USRA) *Final System Plan,* concluded that the industry (excluding Conrail) faced at least a $10 billion capital shortfall problem over the 1976–85 period.[5] According to the FNCB analysis, if the railroads (excluding Conrail) tried to catch up on deferred maintenance in addition to their normal capital requirements for equipment, road property, dividends, debt maturities, and interest, there would be a cash shortfall of $21.1 billion generated between 1976 and 1985. Assuming that traditional equipment financing would provide $11.8 billion of this amount, the industry would be left with a "$10 billion financing problem," significantly in excess of the industry's $1.1 to $1.5 billion theoretical debt capacity.[5]

In a review of FNCB projections for the Office of Technology Assessment of the Congress, Harbridge House, Inc., noted that most of this financing problem is associated with the FNCB assumption that annual shortfalls will be financed, as needed, by long-term debt.[6] As a consequence, the 10-year shortfall is "swollen by the interest and repayment requirement for the assumed borrowing." Harbridge House restated the forecasts without this assumption and concluded that the industry faces a shortfall of about $5 billion. The impact of this shortfall is that "internally generated cash will be sufficient to hold maintenance at a 'normalized level,' but not to make a significant reduction in existing deferred maintenance." Harbridge House also stated that the railroads' cash needs would be increased dramatically if equipment financing does not continue to be available, noting that several recent events have raised questions about the continued availability of such financing.

In addition, the Harbridge House report found that the variability between the performance of strong and weak roads could create additional railroad bankruptcies, even if the industry as a whole had no capital shortfall.

In 1976, the ICC projected a capital shortfall significantly greater than that forecast by the FNCB. As part of Ex Parte No. 271, the ICC forecast an $11.5-billion gap over the 1976–85 period for the total industry (excluding Conrail, the National Railroad Passenger Corporation (Amtrak), and the Chicago, Rock Island and Pacific), less assumptions regarding any financing charges that would occur if this shortfall were met by long-term debt. The shortfall varied by region, ranging from $2.7 billion in the East to approximately $4.4 billion in both the South and West.

Many factors might be responsible for the sizeable difference between the $5-billion shortfall forecast by the FNCB (as adjusted by Harbridge House) and the $11.6-billion shortfall forecast by the ICC, but three stand out: The general economic scenario used by the ICC was significantly more pessimistic than the one used by the FNCB; the ICC's 10-year forecast of the industry's capital expenditures was $4 billion higher than the FNCB's forecast (more equipment and less facilities investment); and the FNCB assumed that annual labor productivity equal to 3.7 percent would continue over the 1976–85 decade, while the ICC assumed that labor productivity would diminish over time. In addition, the FNCB projections were not entirely tied to its general economic scenario; revenues were derived by assuming a range of operating ratios. While this analytical method was more than adequate for the purposes of the FNCB analysis, FNCB noted in its summary of key assumptions that it considered its assumption regarding the 1976 operating ratios as particularly "optimistic." The ICC projections, on the other hand, were derived from a computerized financial model that forecast revenues, expenses, and capital expenditures on an individual account level and integrated the accounts with its general economic scenario.

Despite its thoroughness, the ICC was quick to point out: "There is no presumption as to the infallibility of the projections." The ICC model is currently undergoing revision to refine some methodologies and incorporate recommended adjustments.

These adjustments may alter the dollar amount of the projected capital shortfall, but they are unlikely to alter the basic conclusions of this report and the FNCB and ICC studies. The industry, indeed, faces a significant shortfall over the next decade.

ONGOING NATURE OF THE SHORTFALL

Projections of a significant capital shortfall over the next decade will hardly surprise railroad management. The industry has been unable to generate enough funds to meet all its capital needs for some time. To compensate, many segments of the industry have had to delay capital expenditures and defer maintenance. Funds generated from operations have been supplemented by drawing down working capital and by increasing the level of debt financing. Even these measures were not sufficient for some companies. Eight railroads, including the Penn Central (the largest in the country at the time), filed for bankruptcy between 1967 and 1972. Two more companies have since joined their ranks. Although the northeastern bankruptcies were significantly related to regional economic difficulties, all bankrupt railroads are evidence of the increasing inability of the industry to survive by relying on the sort of defensive measures just described.

Current shortfall projections are more meaningful than those of the past because the industry has come close to exhausting its reserves. Total industry

working capital (including material inventories) has declined precipitously over the last 20 years, from $1.06 billion in 1955 to $0.22 billion in 1975, and fixed charge coverage has decreased from 3.78 in 1955 to 1.60 in 1975.[10] These figures indicate that the industry's ability to reduce working capital still further or to obtain external capital much beyond that needed for equipment or for the refinancing of existing debt can be seriously questioned. The industry has come close to exhausting its ability to defer maintenance and delay capital expenditures. Already, failure to adequately maintain rights-of-way facilities is compromising the service quality and cost performance of some railroad companies.

EFFECT OF PROJECTED SHORTFALL

Unless actions are taken to improve railroad earnings by correcting some of the industry's underlying problems, railroad spending levels, in many cases, will continue to be less than needed to support long-run financial health. Unless the status quo is changed, the industry will continue the downward spiral of the past, with such long-range consequences as further deterioration of facilities, poorer quality of service, inability to compete with other modes, and continued losses of traffic and revenue. More specifically, continuation of the status quo and the resultant shortfall in capital funding might cause the following results.

- A continuation of plant deterioration due to inadequate maintenance-of-way budgets and a lack of capital to make major improvements in facilities could occur. This, in turn, could result in slower service, a greater number of train derailments, and the possible closing of some lines. Efforts to improve roadway structure and other long-life assets will suffer most from the projected shortage of capital because such improvements are usually funded by internally generated funds. This is particularly serious because a greater-than-normalized level of maintenance must be performed over the next decade,[11] especially on the marginal railroads least able to afford it.
- There could be equipment shortages due to unduly constrained equipment maintenance budgets, slower train speeds, and the inability of financially weak railroad companies to obtain enough private equipment financing to meet their needs for new freight cars and locomotives.
- There could be a weakening of individual capital structures, as additional borrowings are undertaken on more stringent terms with little, if any, new equity sold.
- The financial failure of some marginal railroad companies (the Milwaukee Road has entered bankruptcy since the start of this report), and the possible downgrading to marginal status of some railroads, not now considered as such, would take place.
- There would be an inability to make those capital improvements that are necessary to adapt to changing economic patterns, thus limiting the industry's ability to retain its current traffic base or to respond to new areas of economic growth.
- The loss of the market share to other modes of transportation would continue.
- The shortening of average debt maturities would occur because of an ever-growing reliance on equipment financing and a decreasing ability to obtain longer term debt. This, in turn, will reduce the industry's flexibility during the economic downturns in the business cycle.
- There would be a decreasing ability to undertake major consolidation and coordination projects (either through mergers or joint agreements) aimed at improving densities and reducing costs where such projects require substantial amounts of capital.
- There is the possibility that even financially healthy companies will find it increasingly difficult to obtain external capital at affordable rates because investors may perceive too great a link between their fortunes and the condition of the entire industry.
- There would be increasing pressure on rail managements by stockholders to increase dividends, to establish and transfer nonessential assets to holding companies with a view toward diversifying, to minimize reinvestment in railroad company operations, and to otherwise disinvest from the rail industry because of low rates of return.

This state of affairs will not, of course, occur overnight. Yet, as shown in figure 3-1, the greatest shortfall between funds flow from operations and capital expenditures is projected for the near future. Even if actions are taken immediately to improve railroad earnings and correct underlying problems, additional bankruptcies and further deterioration in facilities and service may still occur.

REDUCING THE SHORTFALL

Theoretically, the shortfall can be reduced by either increasing the industry's source of funds or by decreasing the need for funds (or some combination). In turn, sources can be increased by increasing revenues, by decreasing expenses, or by enhancing the industry's access to external capital. Realistically,

[10] All figures exclude Conrail's predecessors. Fixed charge coverage represents a ratio of net income available for fixed charges to fixed charges (interest expenses for equipment and other debt).

[11] See fig. 1-6, ch. 1, which describes the long-term maintenance cycle.

however, each of these actions has its limits, and an understanding of these limits is critical to the development of any recommendations the Federal Government might make to help eliminate the projected shortfall. The limitations of particular concern to DOT will be discussed below.

Revenues

The FRA-projected 10-year shortfall represents between 5.7 and 7 percents, respectively, of the industry's projected freight revenues over the period. This percentage suggests that elimination of the shortfall through general rate increases might be feasible. If the level of traffic diverted to other modes because of rate increases does not prove to be self-defeating, such increases could enable the industry to obtain better earnings on its traffic and possibly to eliminate traffic currently carried at rates below variable costs. As the ICC pointed out in Ex Parte No. 271, however, the industry's ability to overcome the shortfall through general rate increases is limited:

> Recent experience shows that even the ordinary general increase to keep pace with operation expenses is most difficult for the railroads to apply without diverting so much traffic to competing modes as to make the increases self-defeating.[3]

Railroads would be in a better position to implement general rate increases without the threat of diversion if implicit and explicit subsidies to other transportation modes were eliminated, or, at least, reduced. If this were to happen, the rates of competitive modes would have to be increased to cover the full economic cost of operations, and this, in turn, would raise the rate level that railroads could charge without diverting traffic to other modes.

The difficulty in implementing rate increases applies more to general rate increases than to selective rate increases. A number of commodities carried below cost or at rates considerably below those justified by market demand theories already have been identified. The need to permit the industry to target rate increases to specific commodities was recognized by Congress in the regulatory reform portion of the 4R Act. Because the ICC, initially, chose to interpret this new legislation in a restrictive manner, little progress has occurred. A recent decision handed down by the ICC in Ex Parte No. 338, however, recognizes the merit in permitting a railroad company suffering from inadequate revenue levels to implement selective rate increases. If the railroad companies are successful in targeting their proposals and if the ICC is generally receptive to these requests, a considerable portion of any projected shortfall could be reduced.

Operating Expenses

The FRA-projected shortfall represents between 6.8 and 8.3 percents, respectively, of total projected operating expenses over the period. Any reduction in operating expenses would have to be over and above the existing level of annual improvements in equipment utilization, labor productivity, and technological change already assumed in the projections.

Room for additional improvements obtains in the following areas: yard and terminal operations; car information and distribution systems; blocking and scheduling; cost accounting and reporting systems; customer detention rates; and labor-management agreements. Although the industry does not foresee any extraordinary technological improvements, the extension of efforts already underway to apply technology from the electronics field to communications, signaling, and car information systems may also yield benefits beyond those already assumed.

Although the industry's opportunities to reduce operating expenses are significant, major savings from restructuring or abandonment of uneconomic branchlines are unlikely to be identified and realized soon enough, even if the capital to implement them were available. Moreover, the industry could not generate enough savings through improvements in operating efficiency to eliminate the shortfall totally.

External Capital

As discussed earlier, the availability of external capital above the amounts needed for equipment financing or the refinancing of debt will be extremely limited. Although there are individual exceptions, projected future earnings are, for the most part, too low to expect the private financial community to be receptive to the industry's need for the additional debt or equity funds required to eliminate the shortfall. If some of the measures described in the preceding paragraphs for increasing revenues and decreasing operating expenses were implemented, however, the industry's borrowing capacity would be enhanced substantially.

Even if these measures are successful, railroad earnings may not improve quickly enough to solve the industry's immediate need for additional capital. Therefore, the Federal Government may be called upon to enhance the industry's borrowing capacity by providing Federal assistance.

Reducing Capital Expenditures

The level of capital expenditures assumed in the forecasts represents the amount of funds the industry should spend to handle projected traffic volumes at current levels of service and to maintain facilities according to engineering principles. These requirements could be reduced if concerted efforts were made to abandon uneconomic lines, consolidate redundant facilities, and otherwise restructure the industry's physical network along the lines to be discussed in chapter 4. In the past, the industry's ability to restructure has been limited because of impediments to the abandonment process, lack of transitional assistance for communities and shippers facing changes in railroad service, and the fact that most railroad property is subject to mortgage covenants that virtually prohibit sales or transfers of substantial railroad assets except through mergers.

As shown in appendix A, one assumption underlying the FRA estimate of the level of capital needed for equipment expenditures is that the proportion of shipper-owned cars available to the rail industry will be held at 1975 levels. Given expectations regarding the demand for transportation of coal over the next 10 years, however, the proportion of shipper-owned freight cars, particularly for coal shipments, may increase. If so, the capital requirements of the rail industry would be less than forecast, although there also would be a reduction in freight revenues.

REFERENCES

[1] Thomas K. Dyer, Inc., for the Federal Railroad Administration, *United States Class 1 Railroads Fixed Plant Equipment Requirements,* Lexington, Mass., Oct. 1977.

[2] Interstate Commerce Commission, Ex Parte No. 338, p. 15.

[3] Interstate Commerce Commission, Ex Parte No. 271, pp. 1605, 1603, 1602, 1575–76, 1756–1758.

[4] Interstate Commerce Commission, Rail Services Planning Office, Initial Paper, *Rail Merger Study,* 1977, p. 290.

[5] "A Capital Market's Analysis of the Final System Plan as Proposed by the United States Railway Association," First National City Bank, Sept. 1975, pp. 75, 88.

[6] U.S. Congress, Office of Technology Assessment, *A Review of National Railroad Issues,* prepared at the request of the U.S. Senate, Committee on Commerce by Harbridge House, Inc., 1975, pp. 11–19.

4.
RESTRUCTURING: ABANDONMENT, COORDINATION, MERGER, PUBLIC OWNERSHIP

Competitive building of railroads in the last century resulted in a vast network of multiple railroad lines and companies. Many lines are no longer needed, and many others could be downgraded or abandoned if existing traffic were consolidated onto the parallel or connecting lines of other rail companies. Consolidation or coordination of parallel services holds the potential for savings in operating costs and avoidance of rehabilitation that otherwise would be needed. Throughout its history, the industry has had extensive experience in seeking consolidation savings from intercorporate mergers, but surprisingly little experience—and, indeed, traditional reluctance—to achieving the same types of savings through actions short of merger. The Department of Transportation (DOT) believes that trackage rights agreements, terminal consolidation projects, market swaps, and coordinated abandonments are appropriate means of restructuring and may avoid some of the disadvantages of merger, while achieving cost savings.

Restructuring activities can be carried out in a manner that will ensure that those services deemed essential will continue to be provided and result in stronger rail companies to the benefit of the vast majority of shippers. The rise of intermodal competition and the continuation of regulatory authority will cushion reductions in interrailroad competition.

The DOT will assist company-initiated restructuring efforts under the authority granted the Secretary of Transportation in section 401 of the Railroad Revitalization and Regulatory Reform (4R) Act of 1976. That authority permits the Secretary to convene conferences of railroad companies and other interested parties to consider arrangements for more effective structuring of the rail system. Rail companies may participate in such conferences free of antitrust liability, but agreements reached require the approval of the Secretary. The Secretary may, if he finds a proposal has merit, urge its adoption by the Interstate Commerce Commission (ICC).

The Carter administration's proposed revisions of the Federal branchline assistance program will provide State Governments with additional flexibility to aid the rehabilitation of some local service lines before these lines reach the point of approval

for abandonment. Careful selection of lines to be upgraded, on the one hand, or abandoned, on the other, will be an important part of future rail-restructuring efforts.

A basic assumption of this chapter and the entire prospectus is that restructuring of the railroad system should come from the initiatives of railroads in the private sector. Federal financial assistance or public ownership of individual facilities should only be used to facilitate and to encourage coordination efforts in the private sector. Public ownership of the fixed rail plant would be an expensive and unnecessary alternative. Furthermore, it would increase Government control over railroad operations and substitute political for economic decisions and thereby impede the attainment of an economical and efficient rail transportation system.

The U.S. railroad industry needs a large amount of physical restructuring to ensure safe and profitable rail service in the private sector. That restructuring will not occur without the enlightened cooperation of carriers, shippers, labor, and Government. Restructuring is no less important than capital financing, regulatory change, and Government policies toward other modes as part of the solution of the railroad problem.

INDUSTRY ORGANIZATION AND ECONOMICS

There is not a single national rail system as such in the United States, but a railroad industry made up of individual, private companies that both compete and cooperate. Two companies may cooperate in the operation of run-through trains over connecting lines, yet may simultaneously engage in intensive competition in other markets. Railroad companies both interconnect and parallel one another; they are dependent on one another and yet are competitors. This is a fundamental characteristic of the industry's structure. It affects the ability of the industry to achieve cost savings through restructuring, while preserving competition in the industry.

The complexity of the industry structure (or organization) of railroads is such that a brief review of several other important characteristics of the industry will be useful.

A PRIVATE INDUSTRY PROVIDING PUBLIC SERVICE

Even though the United States has a private railroad industry,[1] regulatory strictures upon entry and exit for both lines and services make it clear that rail transportation is, in both law and practice, a public service. This has a continuing effect upon the day-to-day operations and system structure of the railroads, but it becomes particularly important when there is a threat of cessation of rail service. When such a threat occurs, concern arises that "essential rail services" will be terminated.

[1]Among other nations, only Canada has a major railroad in private ownership. Canada has two major rail companies, one private and one public.

The recurrence of this type of concern has given rise to proposals that criteria be developed that would permit the specific definition of essential rail services. For example, the Military Traffic Management Command (MTMC) of the Department of the Army has defined a rail network that is "essential" to the provision of rail services under a variety of defense contingencies. Termed "STRACNET"—the Strategic Rail Corridor Network—MTMC's analysis is based upon specific criteria for precisely predictable future needs, and as those needs change, adjustments can be made. Likewise, the Department of Agriculture has expressed an interest in defining a rail network "essential" to the needs of agriculture and rural America.

Although this approach works well enough for defense planning, with its predictable and massive requirements targeted to specific contingencies, such an approach is not deemed feasible for commercial rail traffic. The principal reason for this is that in view of the vastness and the dynamism of the U.S. surface transportation system, it is not possible either to conduct a satisfactory analysis or to predict the extent and location of changes so as to effectively define a nationwide system of essential rail lines and services.

For this reason, the DOT believes that essential rail services need to be defined only in the context of proposals for abandoning lines or discontinuing services, whether through normal proceedings before the ICC or in the event of the financial inability of a railroad company to continue to provide service. In such instances, it becomes apparent that the view as to which services or lines are essential changes a great deal, depending upon the perspective. Service and lines that are essential from a local and regional perspective may well be viewed as nonessential from the standpoint of national transportation requirements.

EXCESS CAPACITY

Excess capacity is found in track and structures built to far higher standards than are needed for existing traffic levels and in multiple mainlines of companies competing for traffic to the same points. Although considerable excess capacity exists for the industry as a whole, capacity constraints may be severe on certain railroad lines or at certain points in the system. Where excess capacity exists on parallel lines, joint operations over a single line system will produce significant cost savings.

ECONOMIES OF GREATER DENSITY

In railroading, unit costs generally decrease as traffic density increases. This is especially true where excess capacity exists. With excess capacity, a railroad could operate additional trains or longer trains over the same facilities, earning additional revenues at the average per car rate while experiencing incremental costs at lower than average per car levels. If an investment in additional capacity is required, however, marginal costs may exceed average costs.

Economies of density differ from economies of scale: the former refers to the incremental costs of handling more traffic on a segment of track; the latter refers to incremental costs related to increasing the size of a firm. If there are economies of density, parallel lines that have excess capacity should be consolidated. If there are economies of scale, railroads could be permitted to grow larger without fear of worsening cost performance. Recent statistical studies seem to confirm the existence of economies of density in railroading but show little if any evidence of economies of scale.[1]

COMPETITION

Traditionally, public policy has valued competition as a regulator of private economic power. Economic theory holds that competition results in the most efficient allocation of resources, since it causes prices (and, hence, the amount of goods purchased) to reflect costs of production at efficient levels. The same type of economic theory holds that regulation can substitute for competition, but it is not usually as adept at allocating resources. Indeed, the best reason for encouraging competition may be to avoid the necessity for public regulation. An ideal industry organization would realize the benefits of both competition and cost efficiency by having the largest possible number of firms, each of which is large enough to exploit all available cost economies in serving existing market demand. That is, the ideal industry would have as many competitive firms as demand and efficient cost peformance would permit.

The railroad industry is more complicated than manufacturing industries because of its geographic market structures. The location of railroad companies affects their traffic mix, cost performance, and profitability. Segmented markets give rise to difficulties in discerning economies of scale and density. Also, markets must be examined on a case-by-case basis to determine if competition is desirable. The goal of public policy should be improvement in rail system profitability without sacrificing the public's interest in having competition allocate resources and control prices.

Competition among railroads, unlike highway and water carriers, depends on ownership of a route or access to the line of another company in the market. A sizeable investment is involved in the ownership of rights-of-way, and owning companies often resist proposals to share their lines. A healthy company may take the view that it should not be required to provide a weaker company access to high-quality track, thereby enabling the weaker company to compete on equal terms for connecting traffic that otherwise would be captive. Changes in competition in a given market are difficult to effect and fairly permanent once made.

Railroads face competition not only from other railroad companies but also from other modes of transportation. In the past, and perhaps to too great an extent in the present, railroads have focused their competitive activities on other railroads rather than on the other modes. If railroads are to increase—or, in many instances, even stabilize their share of the market—they must direct their interest toward a broader share of the market for transportation services, regardless of which mode now carries the traffic. The need for railroads to do this, in DOT's view, has become greater as the capabilities of the other surface modes have increased, thus making them effective competitors for an even larger portion of the traffic traditionally hauled by rail.

This growth in effective intermodal competition has important implications for rail system restructuring. Principally, it means that for markets in which the bulk of traffic is subject to effective intermodal competition, the number of rail competitors can be reduced without fear that shippers will be subjected to the potential abuse of monopoly power by a railroad.

Figure 4-1 summarizes both sides of the continuing controversy on competition among railroads.

TYPES OF RESTRUCTURING

This section discusses various means of adjusting the rail industry's structure and the current

Arguments for interrailroad competition	Arguments against interrailroad competition
Firms of small or moderate size are more efficient than the largest firms.	Larger firms are, at least potentially, more efficient than smaller firms, especially if the latest managerial techniques are employed.
Economies of density can be achieved through creation of proper route structures and extending joint operations.	Economies of density are best achieved by consolidating freight flows over the minimum number of rail facilities.
Railroads already have lost almost all divertible traffic to other modes, so only interrailroad competition is effective.	Interrailroad competition was beneficial in the past, but is largely nonexistent or irrelevant today, because firms in other modes set cost and service standards.
A larger number of competitive firms keeps open a larger number of future restructuring options.	A smaller number of firms allows concentration of scarce managerial talent, and Federal assistance funds can be focussed in limited areas.
Good service to shippers derives from aggressive competition of more than one firm for a given amount of business.	Good service to shippers derives from concentration of traffic flows, enabling more frequent schedules, run-through trains, better plant, etc.
Competitive firms will be financially sound if underlying conditions are adequate, because competition provides incentives to good management and firm size is at optimal scale.	Financial viability is contingent upon minimum plant duplication and avoidance of destructive competition—which undermines the rate level.
Reciprocal switching and short-haul competition are inadequate substitutes for full point-to-point competition, because they depend on cooperation among interlining, or switching, companies that must compete head-to-head in other situations. The conflict from sometimes cooperating and sometines competing is debilitating to the industry.	Reciprocal switching and short-haul competition are substitutes for full point-to-point, long-haul competition.

SOURCE: Adapted from USRA, *Preliminary System Plan*, 1975, p. 110.

FIGURE 4-1. INTERRAILROAD COMPETITION, PRO AND CON.

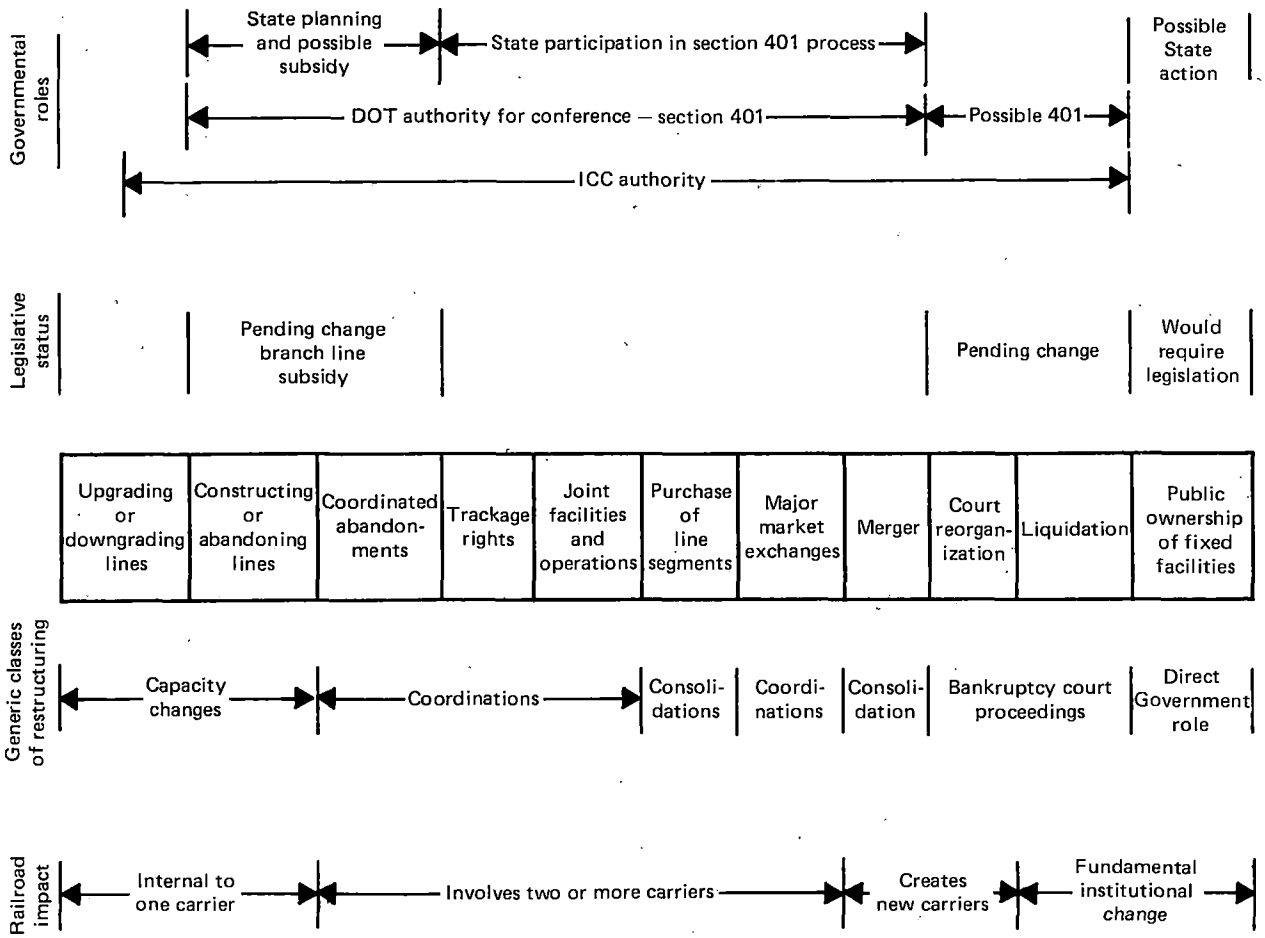
position of DOT regarding restructuring. Considerable change is necessary if the industry is to remain profitable in the private sector. The DOT believes that many rail operations can be coordinated to achieve economies of density without sacrifice of competition. In other cases, existing traffic levels will not sustain profitable operations by competing railroad companies. Often, track abandonment will be necessary, and shippers will have to rely on other modes for service. Rail mergers, historically an important means of restructuring, must be examined on a case-by-case basis. Public ownership, discussed later in this chapter, raises many issues in addition to questions of industry organization.

The structure of the industry can be changed in a variety of ways. Some types of restructuring can occur within a single firm; others cross corporate lines. Some involve only physical facilities; others involve financial structure. Various restructuring mechanisms and Government involvement in each are shown in figure 4-2.

Merger, court reorganization in bankruptcy, and public ownership mechanisms change the institutions that make up the rail industry. Short of merger, existing railroad managements control the restructuring process; with merger, bankruptcy reorganization, and public ownership, new institutions are created, and new managers are brought in to control specific properties and services.

MAINTENANCE STANDARDS AND NEW CONSTRUCTION

To conform to changes in traffic volumes, railroad companies frequently alter the capacity of track segments and yards. Capacity may be increased



SOURCE: Federal Railroad Administration analysis.

FIGURE 4-2. RESTRUCTURING SPECTRUM.

by improving signal systems, lengthening and increasing the number of sidings, improving grades and curves, improving ties and subgrade or by increasing the weight of rail. Capacity is reduced, generally, by deliberately delaying maintenance and repairs. Alterations in operating patterns may also affect capacity.

For the period 1965–1975, there has been an increase of over 12 percent, or 6,650 miles, in the use of heavier weight rail (129 pounds per yard and heavier). Railroads have also upgraded their plant through increasing the amount of welded rail by 187 percent (or 47,000 miles) during the same 10-year period. Over 48,000 miles of a centralized traffic control (CTC) system have been installed. The CTC installations permit railroads either to increase the capacity of the more heavily used routes or to achieve equivalent capacity with fewer tracks.

On the other hand, the railroad industry has deferred between $2.8 and $6 billion of track maintenance, most of which affects lower density lines, especially yards and branchlines. Track downgrading, if not judiciously applied, can result in the loss of profitable traffic. Nevertheless, most companies have been able to modify their existing plants to bring capacity into closer conformity with current traffic levels.[2]

To provide better service to new and changing markets, railroads have constructed 1,500 miles of new lines and built 23 major automated classification yards since 1964. These new additions are modest compared to the changes in market demand and the changes in the physical plant of competing modes. Individual railroads often are hard pressed to justify major additions and improvements to their physical plant.

ICC approval is needed for construction of major new lines. This is likely to continue to be relevant only in the case of lines built to major mineral deposits, particularly newly developed coal fields.

ABANDONMENT AND SUBSIDY OF BRANCHLINES

In the past, rail lines often were built on speculation and in anticipation of traffic that never materialized. With regional shifts in population, industry, and commerce, and with the development of the suburbs and an effective highway system, shippers once dependent on the railroads turned to trucks to move commodities for short and medium hauls. Mergers have also made much trackage redundant. Railroad companies burdened with unprofitable lines typically have deferred maintenance and reduced frequency of service on these lines.

Line abandonments involve complex legal and economic interests of Government agencies, shippers, and communities. The ICC is responsible for determining whether or not abandonments are consistent with the public convenience and necessity. In carrying out this responsibility, the ICC must examine the views of all other potentially affected parties, a process that often becomes time consuming and costly for the railroad and the Government. Even under the expedited procedures established pursuant to the 4R Act, a decision by the ICC on a contested abandonment application takes 12 to 15 months. As a result, companies often pursue only relatively noncontroversial facility abandonments.

Abandonment applications increased in number and importance to individual companies during the 1930's because of the general business decline and the impact of highway competition. Abandonments declined during the higher traffic years of World War II and the Korean War, but, as shown in figure 4-3, abandonment activity increased substantially in the mid-1950's and continues to the present. From 1964 to 1972, railroads sought to abandon 19,767 miles, and 13,958 miles were authorized for abandonment by the ICC. Total route-mileage declined during that period by 8,603 miles, or slightly over 4 percent. In 1976, there were 94 abandonment petitions involving 1,635 route-miles.

Not all abandonments involve small line segments. Since 1970, 13 cases in which the ICC granted abandonment applications have involved more than 100 continuous miles. In three significant instances, the abandonment involved the entire railroad: the 331 miles of the Rutland Railway; the 287 miles of the Tennessee Central Railway; and the 168 miles of the Wichita Falls and Southern Railroad. In the first two cases, however, portions of the operation were reinstated by other railroad companies.

Abandonment produces substantial savings to the railroad companies. A recent study of 25 abandonment applications approved between 1951 and 1969 indicates that the average annual savings in 1973 dollars were $4,600 per mile.[3] If this figure were applied to all mileage abandoned between 1951 and 1972, inclusive, $90 million in annual savings would have resulted by 1973.

Line abandonments also affect labor, shippers, and the communities involved. The effect of abandonments on labor changed abruptly with the enactment of the labor protection provisions of the Transportation Act of 1940. Railroads are required to absorb the costs of compensating employees for any monetary losses incurred over a specific protective period. Although this has reduced the immediate impact of abandonments on labor, abandonments, nonetheless, have resulted in a permanent loss of jobs. The effects of abandonments on rail shippers and receivers are not readily discerned because a number of changes in economic activity often take place during the period prior to the actual discontinuance of operations. Service on the line begins to deteriorate because of the interrelated effects of declining revenues and market requirements and

SOURCE: Department of Transportation, *Analysis and Evaluation of Past Experience in Rationalizing Railroad Networks*, Oct. 1974, p. 420.

FIGURE 4-3. RAIL ROUTE-MILE ABANDONMENTS.
(3-year moving averages)

because of the anticipatory actions of both customer and railroad company. The principal finding of a study by the Massachusetts Institute of Technology (MIT) to assess commercial impacts of abandonments was that a number of small firms suffered severely from a loss of railroad freight service, while larger firms generally adapted successfully to the abandonment.[3]

Similar difficulties are encountered in determining the impact of the loss of rail service on communities. The MIT study examined nine test counties where a substantial portion of railroad route-mileage had been abandoned. Selected economic indicators drawn from the County and City Data Book for these counties were compared to results in nine adjacent control counties. The results indicated that the economies of the test counties were not affected significantly by the loss of rail service. Similar studies of truck service in the same test counties indicate that trucking operations fill the void left by rail abandonments.

Coordinated Abandonment

Coordinated abandonment is a series of abandonment proposals presented by more than one company as a result of systematic regional planning. Consolidation of traffic onto lines of other companies can soften the effect of abandonment of rail lines. Where lines are redundant, coordinated abandonments can improve railroad companies' operating efficiency and profitability, while continuing services for shippers and affected communities. Under section 401(b) of the 4R Act, the Secretary of Transportation may assist in planning, negotiating, or effecting a unification or coordination of operations and facilities with respect to two or more railroads. This authority can be used to help plan the shortest or most efficient routes and eliminate unneeded lines. Thus, section 401 may facilitate consideration of abandonment applications by the ICC.

Federal Assistance

Federal assistance to branchline services has been a feature of recent railroad legislation. Title IV of the Regional Rail Reorganization Act of 1973 provided financial assistance for continuation of those local service lines of railroads in reorganization not included in the United States Railway Association's *Final System Plan.* Congress recognized that abandoning thousands of miles of track at one time throughout the Northeast and Midwest States could cause severe short-term local dislocations. Accordingly, a transitional program of assistance was

provided to help protect service for up to 2 years on lines excluded from the *Final System Plan.* Title VIII of the 4R Act extended the program nationwide, making lines approved for abandonment by the ICC eligible for financial assistance.

Unfortunately, the existing local service assistance program deals only with the least needed lines. Many of the more important and valuable branchlines owned by the railroads continue to deteriorate because the return on the investment for these lines is too low, yet they are ineligible for assistance.

The Carter administration has proposed legislative changes to expand the category of eligible lines to include certain lines that are in danger of future abandonment. Under section 1a(5)a of the Interstate Commerce (IC) Act, railroad companies are required to file a system map depicting all their lines, with each line classified into one of the following five categories: (1) lines the company will seek to abandon within 3 years; (2) lines the company is studying as potentially subject to abandonment; (3) lines pending abandonment before the ICC; (4) lines being operated under subsidy; and (5) all other lines. Under the administration's proposal, lines in categories 1 and 2 would be eligible for rehabilitation if they meet a benefit/cost test, but they would not be eligible for operating subsidies unless abandoned, and then only for a 2-year transitional period.

Other legislative changes already proposed include the following.

- The program would be made permanent, and the Federal share would be set at 80 percent (instead of the present share, which declines over 4 years to 70 percent).
- All lines now eligible would remain eligible until 1981.
- The formula for the allocation of funds among the States would be revised so that lines newly eligible for rehabilitation would determine the allocation of two-thirds the available funds, while those eligible only for subsidy, including all those now eligible, would determine the allocation of the remaining one-third.
- Each State would receive a minimum of $100,000 for planning.
- The administrative costs of developing and measuring new management and marketing techniques would be eligible for assistance, as would project costs for alternative service facilities, such as intermodal transfer terminals.

MAINLINE AND TERMINAL COORDINATION

Railroad coordination involves an agreement among companies to operate the services of more than one company over a single rail facility. Certain coordination projects use more fully the capacity of existing assets while maintaining single-company ownership. In other instances, two or more companies will join in a new ownership agreement involving new assets. Coordination projects may include track, yards, or other support facilities. The arrangement varies according to the type of facilities to be used in common. Coordination approaches, discussed below, include jointly owned companies, trackage rights, joint facilities, and joint operations, but other coordination possibilities may emerge.

Any proposed new coordination arrangements resulting from section 401 of the 4R Act require the approval of the ICC to assure protection of the public interest. The Secretary of Transportation recently stated his position regarding restructuring of rail service in the Midwest. His policy statement relies heavily on the use of section 401 to plan coordination of facilities and, therefore, is reproduced here, in abridged form.

Secretary of Transportation Brock Adams, to the Midwestern Railroad Restructuring Hearing, Chicago, Ill., January 18, 1978:

> The truth is, we face a potentially disastrous rail situation in the Midwest, and the dimensions of that problem—and the costs of coping with it—will only be aggravated by delay or vacillation. It is, therefore, essential that we work toward a solution as swiftly as possible.
>
> We are fortunate in that section 401 of the 4R Act permits rail and Transportation Department officials to get together with all interested parties to search out solutions to the problems of ailing rail lines. It is that authority, which I also view as a responsibility, that is the genesis of this hearing. I believe that everyone concerned—shippers, consumer representatives, labor and management, and Federal, State, and local officials—must share in seeking a resolution to the problem before us. We may not find a solution totally satisfactory to each participant, but we must find one essentially acceptable to all. I ask for the cooperation and good faith of everyone, as we work together to design answers to the railroad problem here in America's heartland.
>
> While there may have been too many rail facilities in the Northeast, the basic problem was not one of "too many carriers" or "redundant facilities" or "excess plant" to the extent that those factors have affected the railroads in the Midwest. The region has been overbuilt for years, and despite several mergers and a succession of consolidation plans, there are still eight carriers operating between Chicago and Kansas City.
>
> But in the years that I have spent on rail matters, I have continually been amazed by the staying power of the railroads. Despite high fixed costs, substandard earnings, and aging facilities, railroads continue to provide service. Railroads are also highly competitive among themselves. While competition is normally a healthy thing, in an overbuilt region like the Midwest, it means that there is too

much service, at rates too low to support the equipment and facility investments that would improve efficiency.

Still, because the problem is primarily one of excess facilities and because none of the marginal or bankrupt carriers in the Midwest is dominant as was Penn Central in the Northeast, I do not believe a Conrail-type solution is either necessary or advisable for the Midwest. There are two reasons for favoring an alternative course of action.

First, much of the "excess plant" can be stripped away without terminating service to important shipping points. This can be done in several ways. Market swaps, for example, can shorten distances and eliminate the need for some secondary tracks or even certain mainlines. Joint-use arrangements can consolidate overhead services on fewer facilities, with old mainlines perhaps reverting to local service or being abandoned. Branchline abandonments can be speeded up, especially where alternative service is available. Purchase of some lines by stronger carriers is another important option.

I've avoided talking about mergers as a means of reducing "excess plant," because I've come to believe that merger per se is far less promising as an effective way to improve the economics of railroading than these other elements I just mentioned.

Let me be clear that I am not against mergers, but I believe any proposed merger must pass two acid tests: Will the consolidation help in the restructuring of the industry to improve profitability? And will it be in the public interest, in terms of service?

The second reason I oppose any Government-sponsored reorganization process in the Midwest is related to the first. I firmly believe the industry should be given a chance to restructure itself before the Government takes over the job.

I propose, therefore, that we pursue the provisions of section 401 of the 4R Act to the fullest. The law allows Government to assist in the restructuring without getting financially involved—it suspends the antitrust restrictions against carrier discussions.

The ICC will be involved in the process, as the Commission must approve property transfers, trackage agreements, or abandonments. I will be willing to argue for such changes before the ICC if DOT can achieve agreement with the parties involved in the 401 process.

This is the last, but it may also be the best opportunity that has come along for a private sector solution of the Midwest railroad problem. To walk away from it now would be to mark the beginning of the end. None of us—carriers, labor, shippers, communities or Government—can afford that. Perhaps it is not a pleasure trip that has brought us to this forum. We meet out of necessity; but also as prudent and responsible people, joined in a common concern for the preservation and improvement of rail service. Let us reason well together. Let us act willingly, wisely, and expeditiously.

The most important benefits associated with coordination are reductions in investment and operating costs through the elimination of duplicate facilities, reduction of maintenance requirements, and lessening of manpower requirements for operations. Many coordinations offer potential for improved service, which, in turn, might result in better equipment utilization. Eliminating surplus fixed plant also raises the possibility of freeing land for different railroad or nonrailroad uses. Coordinations are also used to relieve immediate and unexpected problems, such as floods or hurricanes that damage a section of line. And, occasionally, coordinations are mandated by the ICC as a protective measure to maintain competition in merger cases.

There are some negative aspects of coordination arrangements. Local and through service may be reduced or downgraded on duplicate lines, affecting local businesses. The potential also exists for disputes over liability and control of operations.

Obstacles to coordinations arise from the following causes.

- The need to address the interest of labor when redundant facilities and services (hence, jobs) are targeted for elimination
- The threat of antitrust litigation as a result of the creation of new corporate entities controlled or owned by joint users
- Regulatory impediments such as tariffs, divisions, and routings that have to be changed to effect coordination
- Reluctance of rail managements to participate in joint projects with competitors

Jointly Owned Companies

Many examples exist of railroad companies that are jointly owned. These joint enterprises are either full operating companies, or, more frequently, terminal railroads. In 1976, at least seven terminal companies were owned by at least two Class I companies.

There are a number of jointly owned terminal companies serving major rail centers, particularly at points where large volumes of traffic are interchanged among several railroad companies. For example, the Indiana Harbor Belt is owned by the Chicago and North Western, the Consolidated Rail Corporation (Conrail), and the Chicago, Milwaukee, St. Paul and Pacific. The Indiana Harbor Belt operates both as a short-line railroad for the Chicago area and as a terminal company for its owners. The Terminal Railroad Association of St. Louis is a switching and terminal railroad jointly owned by 14 Class I railroads. The Terminal Railroad Association owns two bridges that cross the Mississippi River, in addition to owning major freight yards and repair shops, thus enabling the owning companies to avoid the construction of many duplicate facilities.

The Kansas City Terminal Railway, founded in 1910, is owned by 12 trunkline companies. This terminal company has no significant impact on its owning carriers' development of yards and terminals but is used to switch its own customers and provide a limited amount of interchange service. Rates are kept artificially low, and losses are billed to the user roads, based on a prorated share of car activity. Similarly, the Toledo Terminal Railroad, owned by Conrail, the Chessie, and the Norfolk and Western, operates on a nonprofit basis and provides interchange switching, industrial switching, and puller arrangements. These jointly owned companies avoid duplication of facilities by their individual owners, and although many terminal companies are identified as operational bottlenecks, if these major interchange points did not exist, there would be even greater impediments to reliable rail service.

Trackage Rights

Trackage rights agreements enable a tenant to operate, for a fee, over the track of the owning railroad. Such agreements lower operating costs for the owning railroad, and the addition of more traffic usually leads to better use of existing capacity and lower unit costs. The tenant enters into this type of arrangement to save the expenses of track construction or rehabilitation, to gain access to a better route, or—in rare instances—gain entry to a new market.

Table 4-1 shows trackage rights statistics for the Nation and regional districts. Nationally, 8.4 percent of total main track was operated under trackage rights agreements in 1974, a rise from 5.5 percent in 1959 and 5.3 percent in 1949. The Western District leads in miles of trackage rights.

Trackage rights contracts usually spell out specific requirements for maintenance, customer access, third-party usage, taxes, signaling, and dispatching. Properties are maintained, usually, to a standard acceptable to both parties. In a few instances, trackage rights agreements have permitted competition for traffic on the lines involved in the agreement. For example, an agreement between the Southern Pacific and the Western Pacific involves 180 miles of track in Nevada, and both companies have unlimited access to customers on either track

TABLE 4-1. NATIONAL TRACKAGE RIGHTS STATISTICS

District	Mileage operated under trackage rights	% of total	Total mileage operated
Eastern District:			
Route-miles	4,397	8.3	52,731
Second main track	2,034	15.9	12,774
Other main track	153	9.0	1,705
Total main track	6,584	9.8	67,210
Yard-switching tracks	1,697	7.7	22,010
Southern District:			
Route-miles	2,729	7.1	38,404
Second main track	303	12.0	2,531
Other main track	120	33.6	357
Total main track	3,152	7.6	41,292
Yard-switching tracks	1,359	14.2	9,584
Western District:			
Route-miles	7,712	6.0	117,344
Second main track	2,261	23.0	9,846
Other main track	122	30.2	404
Total main track	10,095	7.9	127,594
Yard-switching tracks	2,702	11.3	23,922
All districts:			
Route-miles	14,838	7.1	208,479
Second main track	4,598	18.3	25,151
Other main track	395	16.0	2,466
Total main track	19,831	8.4	236,096
Yard-switching tracks	5,758	10.4	55,516

SOURCE: Interstate Commerce Commission, Transport Statistics, Dec. 31, 1974.

(although a relatively small number of customers are located on this track). An agreement between the Denver and Rio Grande Western and the Atchison, Topeka and Santa Fe on a 115-mile line between Denver and Pueblo, Colo., has permitted competition for traffic on a 30-mile segment of the line for the last 5 years.

Typical trackage agreements oblige tenants to pay charges to cover an appropriate share of operating costs and a charge for return on investment. User charges are most aften based on lessee car-miles, but other volume measures, such as ton-miles, train-miles, trains, car count, or engine count, are also used. Trackage rights agreements are filed with the ICC under section 5(2) of the IC Act. The ICC is concerned that user charges not be unreasonable or exorbitant.

Joint Facilities

Joint facilities exist when two or more railroad companies operate through, or in, a rail facility, and the charges for use are allocated on a pro rata share. Although facilities may include yards, terminals, or industrial tracks, yards and terminals constitute the majority of such joint agreements.

In almost every respect, joint facility arrangements are similar to trackage rights in terms of ownership and nature of the contractual agreement. Joint facilities arrangements are used for the same reasons as trackage rights—namely, to avoid redundant investments and to reduce unit costs. An example is the joint use by the Southern Pacific and the Atchison, Topeka and Santa Fe of Wingfoot Yard in Los Angeles, Calif., to serve 130 customers. Duplicate yards are avoided, and each company bills its own traffic, acting as if it were the sole serving company.

Joint Operations

Operating arrangements among railroad companies may supplement or substitute for other forms of restructuring and permit achievement of economies. Some examples follow.

- *Run-through trains* operate directly from origin to destination without reclassification at interchange points. Run-through trains are employed when there is sufficient traffic at origin to assemble a complete train that can operate through to the intended destination.[4]
- *Joint routes* with other transportation modes permit extension of markets or cost savings by elimination of certain rail facilities.
- *Reciprocal switching agreements* permit two railroads to have access to a single market area. Each railroad continues to serve its own switching area, but for an agreed upon, usually equal, charge, one railroad will deliver to the other any cars picked up in its area and routed over the second railroad's line.
- *Pooling* serves two distinct functions. The first involves the joint use of equipment that may be owned by several different rail companies and/or shippers. For the last several years, the Clearinghouse, an equipment-pooling program sponsored jointly by the Association of American Railroads (AAR) and the Federal Railroad Administration (FRA), has resulted in improvements in car utilization of the 10 participating railroad companies. The second function is market pooling, which combines traffic in areas where the total market is too small to justify two separate facilities. The shared, or pooled, market may be served by one railroad during a portion of the year and by another railroad during the balance of the year.

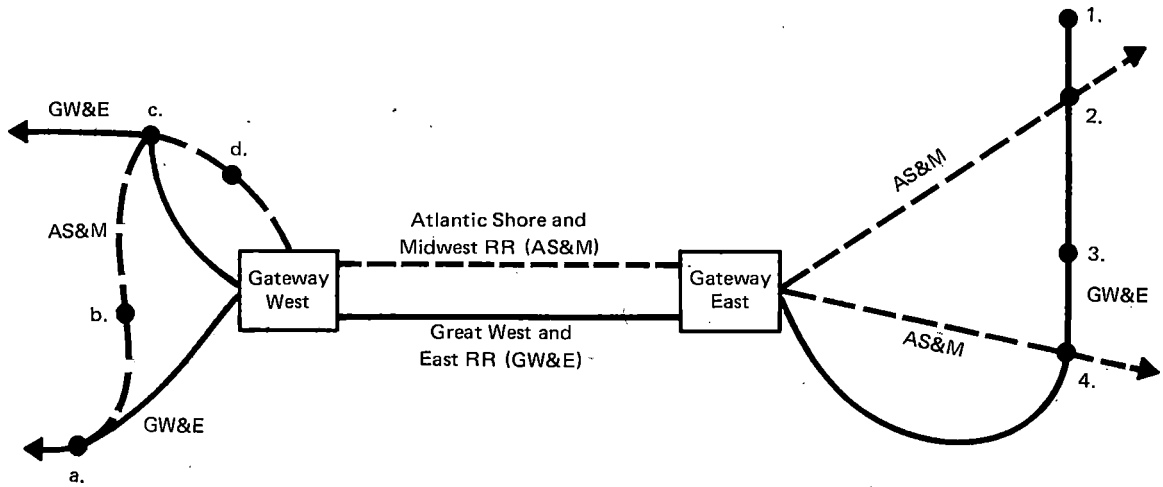
PURCHASE OR TRANSFER OF LINE SEGMENTS

Restructuring can occur as the result of the purchase by one company of a line, or line segments, of another company. The purchase can be part of a merger, as in the case of the Norfolk and Western's purchase of the Pennsylvania Railroad's Sandusky Line (which played an important role in the overall success of the combined Norfolk and Western-Nickel Plate-Wabash system), or the purchase can be a separate undertaking.

Line purchases or transfers may be undertaken to extend markets or achieve cost savings by rerouting traffic over a route with superior physical attributes or shorter distances. The Norfolk and Western, for instance, recently purchased the Penn Central's New Castle, Ind., line to reduce circuity on certain movements to and from the West.

Labor agreements are important to the successful completion of line transfer proposals. The inability of two railroads (the Chessie System and the Southern) and rail labor to reach agreements under the terms of the Regional Rail Reorganization (3R) Act of 1973 was responsible for the failure of these companies to purchase specific lines in the Northeast.

Although there are no major precedents, a specific form of line transfer could take place wherein two railroad companies would agree to exchange whole markets and the lines necessary to serve them. Such a simultaneous exchange, or market swap, might save both companies operating costs through reduction of track-mileage and circuity. Market swaps would probably reduce rail competition and may be advantageous in cases when traffic



NOTE: At present, both railroads serve markets a, c, 2 and 4. Only the AS&M serves markets b and d, but they are in the heart of GW&E's territory. The reverse is true for markets 1 and 3. A swap (or sale) of markets a, b, c and d from AS&M to GW&E and markets 1, 2, 3 and 4 from GW&E to AS&M would save costs while continuing service. Competitive losses would occur at a, c, 2 and 4, and would have to be balanced against the cost savings.

SOURCE: Federal Railroad Administration analysis.

FIGURE 4-4. HYPOTHETICAL MARKET EXCHANGE.

levels cannot support the existing number of railroad companies. An example of a hypothetical market exchange is provided in figure 4-4.

MERGER AND CONSOLIDATION

Mergers have played an important role in the development of the railroad industry, and this topic continues to be an important element in recent legislation and public policy statements.[5] Today's rail industry of approximately 500 separate companies evolved through consolidation over time of some 6,000 independent railroads. Most merger activity occurred in three of the following, distinct periods.

- The unregulated period (prior to 1904)
- The planned merger period (1920 to 1940)
- The regulated but unplanned period (1955 to 1977)

An abundance of merger activity throughout big business occurred in the last few decades of the 19th century. Railroads were no exception, and mergers in the late 1800's produced major systems that dominated railroading in the first two-thirds of the 20th century. These mergers sought to achieve economies of large-scale operation and to reduce competition. This period of intense merger activity effectively ended in 1904 with the "Northern Securities" case (193 U.S. 197) in which the Supreme Court ordered the breakup of the holding company that controlled the Great Northern, the Northern Pacific, and the Chicago, Burlington, and Quincy.

In the aftermath of World War I, Congress passed the Transportation Act of 1920, which launched a new wave of merger planning. The Act directed the ICC to prepare a plan for consolidating all line-haul railroads into a small number of systems of approximately equal financial strength. Congress stipulated that competition be preserved as fully as possible, that existing routes and channels of trade be maintained, and that cost of service and rate of return be similar for all systems. With the aid of Harvard University Professor William Z. Ripley, the ICC issued a tentative system plan in August 1921. The ICC lacked authority to compel its implementation, however, and the railroad industry largely ignored the plan. Profitable railroad companies were unwilling to absorb unprofitable roads and could not secure ICC approval for mergers with other profitable companies.

In 1929, the ICC issued a new consolidation plan calling for the establishment of a railroad system containing 21 companies. No significant attempt was made to implement the plan, and it soon fell victim to the Great Depression. Between 1929 and 1933, rail traffic declined by 50 percent, and many companies were forced into bankruptcy. In response to this crisis, Congress passed the Emergency Transportation Act of 1933, which, among other things, established a Federal Coordinator of Trans-

portation. The Federal Coordinator, Joseph B. Eastman, was charged with encouraging consolidations, but little restructuring or consolidation were accomplished. The Prince Plan, in 1933, was another example of the overall system-planning approach to mergers that characterized this period.

Only two mergers of significance took place from 1920 to 1940—the New York, Chicago and St. Louis (the Nickel Plate) acquisition of the Cloverleaf and the Lake Erie and Western under Ohio State law in the 1920's; and the merger of the Gulf Mobile and Northern, the Mobile and Ohio, and the New Orleans Great Northern into the Gulf, Mobile, and Ohio in 1938.

The Transportation Act of 1940 reestablished the ICC's authority to regulate mergers on a case-by-case basis, pursuant to criteria specified in the Act and without recourse to a national consolidation plan.

By the mid-1950's, economic circumstances caused railroad companies to examine the more liberal merger guidelines set forth in the Transportation Act of 1940. This environment spawned the modern movement, which began with the merger of the Louisville and Nashville and the Nashville, Chattanooga and St. Louis, approved by the ICC in 1957. Between 1957 and 1971, the following merger or control applications, among others, were filed.

- Norfolk and Western—Virginian
- Erie—Delaware, Lackawanna, and Western
- Chicago and North Western—Minneapolis and St. Louis
- Chesapeake and Ohio—Baltimore and Ohio
- Seaboard Air Line—Atlantic Coast Line
- Great Northern—Northern Pacific—Chicago, Burlington and Quincy—Spokane, Portland and Seattle
- Norfolk and Western—Nickel Plate—Wabash
- Pennsylvania—New York Central
- Chicago and North Western—Chicago Great Western
- Illinois Central—Gulf Mobile and Ohio
- Louisville and Nashville—Monon
- Missouri Pacific—Chicago and Eastern Illinois
- St. Louis–San Francisco—Central of Georgia (Denied)
- Southern Pacific—Western Pacific (Denied)
- Atchison, Topeka and Santa Fe—Western Pacific (Withdrawn)
- Union Pacific—Rock Island (Withdrawn)

Implementation time for these mergers ranged from slightly less than 1 year for the Norfolk and Western—Virginian merger to over 8 years for the Burlington Northern. This series of merger applications came to an end, generally, with the bankruptcy of the Penn Central in June 1970.

A new wave of mergers may now be underway, possibly stimulated in part by the revised merger procedures established in the 4R Act. The Burlington Northern and the St. Louis–San Francisco have applied for merger; the Southern Railway and the Illinois Central Gulf have announced discussions of merger; the Chessie with the Norfolk and Western and the Grand Trunk Western have separately applied for control or merger of the Detroit, Toledo and Ironton; and the Chessie and the Seaboard Coast Line are discussing merger plans. These developments may induce responses from other companies.

The principal incentive for railroad companies to merge is the potential economic benefit from cost savings and marketing opportunities that may accrue to the combined system. Mergers have been categorized into two groups: parallel, where merging railroads cover essentially the same geographical area; and end-to-end, where the lines serve different territories but join at complementary interchange points. More often than not, merger proposals display both characteristics, but the categories are useful.

Mergers of companies whose systems are essentially parallel offer possibilities for reduction of capital requirements through reduction or downgrading of mainlines, yards, and terminals, and improved equipment utilization. Parallel mergers, also, are expected to reduce operating costs through the elimination of duplicate services and through increases in labor productivity. End-to-end mergers, on the other hand, are presumed to facilitate better service to customers through faster and more reliable point-to-point service in markets formerly served by interchange service. Both types of mergers have potential for reduction of corporate overhead (e.g., marketing, accounting, and executive departments); improvement in car availability; and elimination of unnecessary interchange facilities.

Mergers may offer other incentives to railroad companies. Mergers have been sought to avert the takeover of an important interchange railroad by an "unfriendly" third railroad. Such consolidations may also help to stabilize the traffic and earnings base for a railroad company with a limited number of commodities subject to seasonal variations or unidirectional movements.

The ICC has often imposed protective conditions to minimize the effects of mergers on other parties. These protective conditions have the effect of diluting the prospective benefits of merger. In many cases, merger savings can only be achieved through investment of capital to establish connections between merged properties, to upgrade key links between sections of the properties, and to redesign yards to accommodate changes in traffic patterns.

The only fair basis for judging the success of railroad mergers is to compare the results with basic objectives. The purpose of any merger is to improve a

railroad company's financial strength and profitability through changes in operations, access to capital resources, and expansion of service areas. Given corporate motives for merger, the current size and scale of most Class I railroad companies, and the protective conditions that have accompanied merger approvals, mergers are far from automatically effective as instruments for restructuring.

Recent FRA case studies of two apparently successful mergers have found that the two mergers achieved a portion of their projected cost savings, but that availability of capital, the need to preserve certain service arrangements (in one instance at least), and the extended period of time required from the initial merger proposal to its actual execution, all diminished the effectiveness of operating changes.[6] The two merger studies showed selected service improvements, but, characteristically, these resulted in more advantages to the railroad companies than to the rail customers. Time savings were more effective in reducing railcar per diem costs than in providing a full day's improvement in transit time or reliability for a shipper. The two mergers did not significantly improve the market penetration or profitability of the merging companies. While the resulting organizations are financially successful by rail industry standards, the act of merger did not improve the intermodal competitive capability of either firm. There was no evidence in the case studies that identifiable blocks of traffic shifted from another mode to rail. One of the mergers, however, did result in a shift of traffic from competing railroads to the newly formed organization.

Similar conclusions were reached in other merger analyses. A DOT staff study in 1969 reported: "The conclusion of the economic evidence is that the cost-savings arguments for large railroad mergers have to be very largely discounted and must be applied to individual cases with very great circumspection."[7] The Task Force on Railroad Productivity concluded: "... there (does not) appear to be any evidence that rail service has generally improved as a result of merger" and "... anticipated cost savings may not be realized because they are based on anticipations of economies of scale or density which either do not exist or are offset by diseconomies of scale."[8] An MIT study said that: "... as a form of rationalization, mergers have proven only moderately successful..."[3] Finally, the Rail Services Planning Office (RSPO) recent *Rail Merger Study* concludes:

> ... economies stemming from parallel mergers have been difficult to realize. Merger savings typically are a relatively small proportion of system revenue. Capital expenditures for new or rehabilitated yards, track connections and facilities, and delays in securing abandonment approvals tend to minimize increased cash flow and return on investment.[5]

With the publications of the Productivity Task Force report and the RSPO merger report, there has been considerable interest in end-to-end mergers. End-to-end mergers, advocates believe, could create a strong intercontinental system, allowing railroad companies to focus attention on managing operations rather than on the problems of cooperating with other railroads to provide through service. End-to-end mergers could also link railroads in fast growth areas to those in slower growth areas and could aid in the balanced development of the industry. These mergers also avoid the possible anticompetitive aspects of parallel mergers.

There have been few large-scale end-to-end mergers. Many perceived advantages of such mergers could be achieved by such means as run-through trains and joint terminal facilities. Since rail freight flows are highly dispersed, end-to-end systems would still have to cooperate with other railroads to provide service for the many important freight movements. Mergers that would produce much larger railroad companies may also run into problems of managerial command and control.

Interest in mergers continues as the railroad companies renew their efforts to adjust to changing times. The role of DOT will not be to determine an ideal set of railroad mergers; rather, DOT will make use of the authority in section 401 of the 4R Act to initiate studies of mergers or coordinations and to sponsor conferences of merger candidates to work out proposals before going to the ICC. This procedure (outside the adversary process) would lay the groundwork for merger applications that could be expeditiously acted upon by the ICC.

The DOT recently submitted preliminary views in the proceedings involving the joint control or merger of the Detroit, Toledo and Ironton and of the Burlington Northern St. Louis–San Francisco. In these cases, the DOT is concerned that the proceeding be completed as promptly as possible to meet the letter and the spirit of the new merger procedures contained in the 4R Act and that the ICC develop a complete evidentiary record on which to judge the application. The record must be sufficient to sustain a finding on the fundamental questions of whether specific benefits to the public and the transportation system as a whole and the particular areas affected by the application are sufficient to outweigh any public costs that may result from the merger.

The DOT has concluded that mergers are a less promising technique to improve the railroad industry than other approaches to restructuring, described earlier in this chapter. The elements of rationalization contained in the concepts of line transfers, joint

use agreements, and abandonments are what actually save costs—not corporate integration per se. The elements that reduce plant and save costs in a good merger are these same factors—service consolidation, optimization of an existing plant shared by two previously independent entities, and abandonment of unneeded facilities. All these elements can occur short of merger. Indeed, there may be instances when restructuring short of merger can serve as a prelude to merger, making the ultimate merger easier to implement.

ISSUES IN BANKRUPTCY REORGANIZATION AND LIQUIDATION

Historically, the function of railroad bankruptcies has been to reorganize the financial structure of debt-ridden companies, and few bankruptcies have resulted in wholesale liquidation of assets. Since the 1960's, however, railroad bankruptcies have changed in character and now require more than reorganization of debt. In the case of the failure of the Penn Central and six other northeastern railroad companies, the Congress recognized that reorganization had to effect a significant change in the use of physical assets of the companies.

Experience with recent railroad reorganizations has demonstrated that section 77 of the Bankruptcy Act (18 U.S.C. 205) is inadequate to deal with the problems of multiple bankruptcies in a single region and with bankrupt railroads that have a negative cash flow or inadequate earnings to support even a reduced debt structure. A need exists to facilitate the restructuring of fixed plant in railroad bankruptcy reorganizations. The DOT has supported those changes in the railroad bankruptcy laws that would have this effect and believes that the Congress should move expeditiously to enact those changes.

There are two principal defects in section 77. The first is the extensive delay involved in the elaborate dual proceedings of the ICC and the reorganization court. Concurrence by both the ICC and the court is required in most of the crucial steps of the reorganization. Inevitably, however, cases occur in which the court and the ICC disagree on the manner in which the debtor's affairs should be run or the manner in which the debtor should emerge from the reorganization. At present, this can result in a case going back and forth between the court and the ICC, frustrating final action. Even when there is agreement upon most issues, ample evidence exists that normal proceedings before the ICC involve inordinate time delays, with an increasing likelihood of adverse consequences.

The DOT supports legislation to remedy this situation by altering the role of the ICC and the courts in railroad reorganizations. Consistent with the recommendations of the 1973 report of the Commission on the Bankruptcy Laws of the United States, the DOT has urged the Congress to make the ICC (and the DOT) a party to railroad reorganization proceedings, with standing to represent the public interest and the right to appeal the decisions of the court. The ICC would also have an advisory role in abandonments and reorganization plans involving the transfer of the debtor's rail lines, but the court would have approval authority.

The second major defect in section 77 is that it fails to provide either the ICC or the courts with adequate means for dealing with bankrupt railroads that cannot be reorganized on an income basis by merely restructuring the railroad's debt and capital structure. Section 77 fails to provide adequate mechanisms for: consolidating closely related reorganization proceedings; giving expedited consideration of abandonments and mergers; approving mergers and consolidations (except when equity holders approve); and providing explicit authority to liquidate the debtor. These basic inadequacies can result in a railroad reorganization proceeding becoming a prolonged holding action in which the court and the ICC require a bankrupt railroad to keep operating at a deficit, with the court and the ICC hoping that some circumstance will come along to pull the railroad out of its decline and enable a sound reorganization.

Bankruptcy proceedings should be expeditious to avoid further erosion of the company's assets. The trustee, rather than the debtor, should be directed to develop a plan of reorganization. An exact time schedule should be established for a trustee to file a proposed plan of reorganization with the court and for the ICC to consider the transportation implications of a plan involving the transfer of, or operation of, or over, any of the debtor's rail lines by other railroads or entities, and to submit views to the reorganization court. With respect to such plans, the determination of the ICC should create a rebuttable presumption as to whether the transaction is in the public interest. The court, with the advice of the ICC and the DOT, should have sole approval over a plan of reorganization. If restructuring a railroad's debt and capital structure is insufficient to reestablish an ongoing capital structure, transfers of properties from the debtor railroad should be in order. The DOT supports legislation that would authorize the court to convert a section 77 proceeding into a liquidation proceeding if a plan of reorganization cannot be developed within a reasonable period of time.

The DOT has urged Congress to apply the procedural provisions of any new bankruptcy legislation to existing railroad reorganization proceedings in order to ensure the necessary flexibility in the courts to effectively deal with the problems associated with such proceedings. Changes in the Bankruptcy Act that would modify creditor rights,

however, should not be applicable to existing proceedings.

THE ROLE OF PUBLIC OWNERSHIP IN RAIL INDUSTRY STRUCTURE

As noted earlier, railroads, almost exclusively among transportation modes, own their own rights-of-way. Other modes (pipelines being the major exception) benefit from public provision of rights-of-way, as will be discussed in the next chapter. In view of this disparity, the idea of public ownership of rail rights-of-way is one that has been attracting attention. Congress responded to the growing interest in public ownership of rail facilities by inserting requirements in sections 504 and 901 of the 4R Act that the Secretary assess the effectiveness of such an approach for an improved rail system.

Advocates maintain that public ownership of rights-of-way would put rail transport on a more equal basis with other transportation modes. Opponents fear public ownership because they see it as a step toward nationalization of the industry. They fear that high potential public costs would be involved in the acquisition, improvement, maintenance, and operation of a publicly owned railroad fixed plant.

As defined here, the concept of public ownership involves only ownership of some portion of the rail fixed plant by a Government body—Federal, State, or local. Thus, although the Government would take over financial responsibility for owning and possibly maintaining the rail plant, private companies would control operations of the facilities and would pay a type of user fee for the privilege.

Public ownership can take several forms, but the proposals are all directed at one of two objectives: (1) upgrading the existing plant for continuation of current operations; or (2) producing fundamental restructuring of rail operations with access open to all railroad companies in the area covered by the plan. Table 4-2 describes the characteristics of public ownership concepts under discussion. The concepts and their effects on public and private interests are discussed below.

LINE SEGMENTS: CURRENT EXAMPLES

Local public ownership arrangements to ensure continued rail service along certain corridors have been successful for the Cincinnati Southern Railway and the Vermont Railway. These examples show that public ownership of a right-of-way with a private railroad company as operator of the service can work.

Since 1881, the city of Cincinnati has owned the 336-mile, high-density railroad line from Cincinnati, Ohio, to Chattanooga, Tenn. The Cincinnati, New Orleans and Texas Pacific, now part of the Southern Railway system, has had an exclusive lease for use of the facility since that time. In 1962, the railroad undertook a major rehabilitation program, and the city's only role was to secure financing through a bond issue that was repaid in entirety by the railroad company. Formerly known as "the rat hole" because of many long and narrow tunnels, the rehabilitated line resulted in significant service improvements to customers and increases in traffic. The line carries an average of 25 million revenue-tons of traffic annually and serves as an important link in the Southern Railway. The Southern Railway pays rent to the city and can improve the line as if the line were its own. The income from the railway property has been used by Cincinnati to pay principal and interest on expressway bonds and other serial bonds issued by the city. The line's continued operation is not dependent on public ownership, but the city's voters have been unwilling to sell the line to the railroad.

The State of Vermont owns three rail lines that it leases to private operators. In 1963, Vermont acquired the first rail property from the trustees of the defunct Rutland Railroad—a 129-mile line linking communities between Bennington and Burlington. The purchase of the Rutland properties marked the beginning of Vermont's activist role in maintaining existing rail service. The rationale for the action is Vermont's expressed policy to encourage economic development "where transportation facilities already exist ... rather than extending fixed transportation facilities to areas where none now exist"[9] Only lines approved for abandonment are considered for purchase by the State. Since its initial purchase, Vermont has acquired an additional section of the former Rutland in 1965 and the St. Johnsbury and Lamoille County Railroad in 1973. Unlike the Cincinnati Southern case, the Vermont lines continue in operation only because they are State owned.

The Cincinnati and Vermont cases have the following similarities.

- Limitation of access to the facility to one operator
- Encompassing the facilities of only a single line segment
- Provision for acquiring the property through purchase
- An ongoing maintenance-of-way program financed and carried out by the operator
- Rental payments that provide sufficient revenues to cover public expenditures for the property

Vermont's public ownership of fixed facilities permits private operators to provide continued service over a usable plant, even if only at a modest

TABLE 4-2. RANGE OF PUBLIC OWNERSHIP CHARACTERISTICS

Characteristic	Interstate Rail Network	Confac Plan	New England Proposal	Select facilities	Line segments
Objective:					
Assist industry as currently structured		X	X		X
Provide fundamental restructuring of rail operations	X			X	
Method of acquisition:					
Exchange for operating rights	X	X	X		X
Purchase				X	
Voluntary transfer	X	X	X	X	X
Mandatory acquisition					X
Scope of facilities:					
Structures, such as bridges and tunnels	X		X	X	
Single right-of-way				X	X
Mainlines	X		X	X	
Branchlines	O		O	X	
Yards and terminals	X		O	X	
Total system	O	X		X	
Access:					
Single railroad company[a]		X	X		X
Several railroad companies with franchises	X			X	X
Open	O				
Asset management and maintenance:					
Maintenance: [b]					
Owner	X				
User		X	X	X	X
Planning:					
Owner	X		X		O
User	O	X	O		X
Control:					
Owner	X			X	O
User		X	X		X
Changes in physical plant:					
Rehabilitation	X	X	X	X	X
Modernization	X	O	X	X	O
Consolidation	X	X	O	X	O
Relocation	X	O			
New technology	O			O	
Duration of arrangement:					
Temporary (includes long-term leases)		X	X		X
Permanent	X			X	O
Financing:					
User charge	X	X	X	X	X
Subsidy	O	O	X	O	O
Lease or rental payment			X		X

[a]Under some plans, access is also provided for bridge carriers.
[b]Entity carrying out the activity does not necessarily provide the funds.
NOTES: X = element of the proposal; O = depends upon version of the proposal.
SOURCE: Federal Railroad Administration analysis.

profit. The State benefits from user fees, tax payments, and the retention of industrial firms that might otherwise move to other regions. Shippers benefit from lower cost freight service than that offered by other modes. This approach results in upgrading the plant for existing operators, and there is no ongoing public subsidy involved because the initial public investment is repaid.

SELECT FACILITIES

Another concept envisions Government investment and/or subsidy of selected rail fixed facilities. Public funds would be employed to rebuild, improve, or construct lines, yards, terminals, or other facilities, such as bridges, tunnels, and sidings for joint use by railroads in particular market areas or traffic lanes.

In certain areas where rail service is significant over the long term, Government funds could encourage needed facility consolidation and modernization by providing otherwise unavailable capital. Private ownership of the operating companies would continue, and the upgraded facilities would be owned by Government. User fees would be collected to finance capital investment and can be used to maintain the facilities.

Most projects would be directed toward consolidation of excess facilities and would involve several railroads. A select facilities project might accomplish more than individual railroads could afford to do. Rail companies could realize crew and locomotive efficiencies and reach new markets where rail offers a potential cost or service advantage.

The select facilities approach is applicable to projects designed to enhance the urban environment through redevelopment of underutilized rail properties for new industrial, commercial, or public purposes. Redevelopment could result in great employment opportunities as well as increased tax revenues. A former rail yard in Spokane, Wash., for example, became the site of Expo '74 and now serves as a civic center, comprising an opera house, convention center, parks, and an ice rink.

REHABILITATION PROPOSALS— CONFAC AND NEW ENGLAND PRO-RAIL

The Consolidated Facilities Corporation (ConFac) concept and the New England Public Right-of-Way Ownership—Rail (Pro-Rail) proposal are designed to assist marginal railroad companies in retention, rehabilitation, and maintenance of their existing facilities. The purpose is to subsidize railroads to enable them to compete effectively with trucks and barges whose publicly financed rights-of-way provide subsidy assistance.

During the planning process that led to the establishment of Conrail from the bankrupt eastern railroads, consideration was given to the formation of a separate corporate entity that would own the structures and right-of-way over which Conrail would operate. This "ConFac" was based on mixed public ownership of the fixed facilities, although variations of ConFac anticipated either wholly public or private ownership. One purpose of ConFac was to remove the burden of financial rehabilitation of northeast rail lines from Conrail's balance sheet.

The New England plan for rehabilitation, Pro-Rail, calls for voluntary transfer of fixed facilities to the Federal Government (a new Federal Railroad Property Administration would be created within DOT) to provide for rehabilitation and maintenance of the national rail system.

Although these programs differ in several details such as administrative organization, they are similar in a number of respects, including the following.

- Limitation of access to present railroad companies (except that other railroads may be granted limited access to specific lines solely for bridge traffic)
- Focus on rehabilitation, with some modernization and little relocation or consolidation of facilities
- Temporary—the Pro-Rail and ConFac proposals provide for return of the facilities to private railroad companies in 25 and 30 years, respectively
- The financing of maintenance and improvements through a combination of user fees and public investment or subsidy

Unlike the Pro-Rail plan, the ConFac plan includes a contingency provision to enable another operator to provide service in the event the operating railroad companies go bankrupt. Furthermore, the ConFac plan assumes repayment of Government investment through a system of fixed and variable user charges. The annual user fee described in the Pro-Rail plan—20 cents per 1,000 gross ton-miles plus the labor component of the annual maintenance program—would not generate sufficient funds to cover the costs of eliminating deferred maintenance, much less provide for facility improvements. Thus, a significant level of public subsidy is implicit in the proposal.

Neither plan would encourage new entrepreneurs nor eliminate inefficient operators or services, as access is limited to current operators. Under these plans, railroad companies whose properties had been poorly maintained prior to public ownership would now have exclusive, or virtually exclusive, use of much improved property without any additional costs. Stockholders, users, and creditors of these lines would receive substantial benefits, but there would be little incentive to produce the fundamental restructuring necessary to achieve long-term efficiency.

INTERSTATE RAIL NETWORK

Proposals have been put forth in recent congressional sessions to provide public resources to plan and develop a modernized interstate rail network. Some plans have advocated redirecting the talents and the budget of the U.S. Army Corps of Engineers from inland waterway construction projects to rebuilding the physical plant of railroads. These proposals would create a relationship to the Federal

Government analogous to the interstate highway system. The most distinguishing characteristic of the interstate rail network is the provision of open access to a number of railroads, with operating rights between specific cities similar to those of regulated motor carriers.

The railroads would transfer land, tracks, terminals, and structures to the facilities company in exchange for stock in the company, according to values established under ICC supervision. If Federally owned, an exchange for cash might be effected on the same basis, after appropriation by Congress. The current bondholders' investment would be secured through joint guarantees by the track and terminal company and the original railroad.

Such arrangements are not temporary but represent a commitment by the Government to provide a fixed plant for the railroads similar to that provided for competing modes. These plans also are distinct from other recent public ownership proposals in their emphasis on comprehensive planning and modernization programs for the rail system.

The costs of plant rehabilitation and maintenance would come from two sources—a 1-percent tax on revenues obtained from all surface freight shipments (generating approximately $1.3 billion annually during a 6-year period) and a $1 per 1,000 gross ton-miles charge for all rail shipments transported over the system. Although these potential revenue sources are substantial, they are not sufficient to accomplish all the stated goals of these far-reaching proposals.

CONCLUSIONS

Figure 4-5 summarizes the potential advantages and disadvantages of public ownership of railroad fixed facilities. The DOT considers that public ownership of rail rights-of-way is a very difficult and complex method of attempting to bring about basic structural changes in the railroad industry. Unless a public ownership proposal is carefully designed, it is likely to be ineffectual and to result in substantial subsidies to inefficient companies. In all likelihood, therefore, public ownership of rail lines on a large scale would increase Government control over railroad operations and substitute political for economic decisions, thereby impeding the attainment of an economical and efficient rail transportation system.

Federal Government purchase of rail lines would not, by itself, improve service, and the DOT believes it would be preferable to devote the limited public funds available for rail assistance to the rehabilitation rather than the purchase of rail lines. Public ownership of particular lines and select facilities, on the other hand, could have merit in conjunction with the proposed Federal financial assistance program, as described in chapter 7.

Current title V financing rules require repayment security, especially in the case of bankrupt companies. Conceivably, a company could set up a new subsidiary corporation that would pledge its assets to the Government as security for title V funds. Sale of property to other railroads or public agencies would then make the property available for Government assistance and for use by more than one company.

In certain limited situations, public ownership of specific rail lines or system segments could permit a larger degree of coordination and upgrading than other means of ownership. These coordination and rehabilitation efforts could result in service efficiencies and cost reductions, thereby warranting some level of public investment.

POTENTIAL ADVANTAGES	POTENTIAL PROBLEMS/DISADVANTAGES
Puts infrastructure for railroads on same basis, at least in concept, as competing modes: —Reduces level of fixed charges —Eliminates taxation of fixed facilities by State and local Government —Provides opportunity to plan and develop a unified rail network —Helps to balance public funding of the infrastructure for various transport modes	Shifts costs of rail transportation to the general public if user charges are not fully compensatory. Raises difficult issues of cost allocation.
Provides infusion of capital, yet avoids operating assistance to private railroad companies	Acquisition of fixed facilities could be complex, costly, and time consuming. Public funds used for acquisition could not be available for rehabilitation or other public purposes.
Presents opportunity to reduce unit costs through elimination of redundancy	Raises possibility of excessive spending on rail fixed plant. —Would inject politics into system maintenance and improvement decisions —Might produce more fixed plant than necessary to provide good quality rail service —Bifurcates trade-off decision—track investment versus operations
Under forms of open access to rail facilities, significant changes in relationship of railroad companies and associated institutions would occur	Reduced tax revenues to State and local Governments, which would require new sources of funds.
Open access would permit easing carrier entry and exit on a market-by-market basis, thus: —Railroad common carrier requirement might be revised —Increased carrier attention to shipper needs would be required —Technology improvements might occur	Open-access provision raises need for new traffic scheduling and control systems.
	Alters rail industry environment and, particularly when open access is provided, produces uncertainty over the status of present railroad companies.

SOURCE: Federal Railroad Administration analysis.

FIGURE 4-5. PUBLIC OWNERSHIP, PRO AND CON.

REFERENCES

[1] Robert G. Harris, *Rationalizing the Rail Freight Industry: A Case Study in Institutional Failure and Proposals for Reform.* A report prepared for the Department of Transportation, Federal Railroad Administration, Sept. 1977. The bases for much of the analyses in the above report were provided by K. T. Healy, *The Effects of Scale in the Railroad Industry,* Yale University, Committee on Transportation, 1961, and T. E. Keeler, "Railroad Costs, Returns to Scale, and Excess Capacity," *Review of Economics and Statistics,* May 1974.

[2] Peat, Marwick, and Mitchell, *Parametric Analysis of Mainline Capacity,* Draft, Final Report, prepared for the Department of Transportation, Federal Railroad Administration, Sept. 1977.

[3] James Sloss, Thomas J. Humphrey, and Forest N. Krutter (MIT), *An Analysis and Evaluation of Past Experience in Rationalizing Railroad Networks.* A report prepared for the Department of Transportation, Office of the Secretary, Office of University Research, 1974.

[4] For a recent review of these operations, see R. L. Banks and Associates, Inc., *Study of Merger Alternatives: Run Through Trains,* Sept. 21, 1977.

[5] Interstate Commerce Commission, Rail Services Planning Office, *Rail Merger Study,* Issue Papers and Final Report. 10 vol., 1977.

[6] Gellman Research Assoc., Inc., *Analysis of NW-Wabash-Nickel Plate Merger,* Sept. 6, 1977. Stanford Research Institute International, *A Merger Between the Seaboard Air Line and Atlantic Coast Line Railroads: A Case Study.* Jan. 1978.

[7] Department of Transportation, *Western Railroad Mergers,* Washington, D.C., Jan. 1969.

[8] *Improving Railroad Productivity,* Final Report of the Task Force on Railroad Productivity for the National Commission on Productivity and the Council of Economic Advisors, Washington, D.C., Nov. 1973, pp. 253, 254.

[9] Vermont Transportation Agency, *Vermont State Rail Plan.* Submitted to the Federal Railroad Administration, Aug. 1976.

5.

INTERMODAL POLICY

The ability of the railroads to compete with other modes will be further weakened if Federal actions distort prices and enhance the ability of competing modes to divert traffic. With few exceptions, the railroads bear the full costs of constructing and maintaining their rights-of-way. Competing modes which operate on publicly provided rights-of-way may have a substantial advantage over railroads, depending on the level of user charge payments collected from those competing carriers.

The question of equitable investment policies among the various modes of transportation has been debated for decades, particularly with regard to the effect that promotional policies toward highways and waterways have had upon railroads. It is important in any examination of Federal policy affecting railroads to examine current policies with regard to investment policies among the modes, to attempt to settle factual questions pertaining to cost responsibility for use of publicly provided facilities, and to propose needed changes in policy.

Perhaps the most difficult question to answer is whether large, rail-competitive trucks, which pay a variety of charges for use of the public highway system, are paying their fair share of the highway cost burden or are being subsidized by other highway users. An up-to-date and thorough analysis of this subject has been initiated by the Department of Transportation (DOT). Also, additional consideration needs to be given to the relationship between truck user charges and competing railroad rates.

Inland waterway operators, who pay no charges for the use of federally provided inland, coastal, and Great Lakes waterways, can ship bulk commodities at lower rates than railroads. Their present advantage would increase if pressures to enlarge the capacity of the inland waterway system are successful and if appropriate user charges are not imposed.

If a network of coal slurry pipelines is developed as an alternative to unit coal trains, it will be important to assure that regulatory, tariff, and contractual arrangements permit the railroads to compete on fair terms.

In most cases, Federal transportation investments should be accompanied by user charges sufficient to recover the Government's full costs. Public investment in, or support for, new transportation capacity should pass strict tests of economic merit, including explicit consideration of all relevant public costs and benefits and intermodal impacts.

THE 902 STUDY: FEDERAL AID TO RAIL TRANSPORTATION

A simple economic theorem shapes the overall transportation policy of the Railroad Revitalization and Regulatory Reform (4R) Act of 1976. The theorem holds that the various modes (including railroads) can best serve their proper transportation function if allowed to compete freely in a private sector market. Congress has expressed the proposition that consumer choice based on full economic costs and relatively unconstrained service and price competition is the most efficient means of allocating the Nation's transportation resources. All modes should be treated in an even-handed manner so that each one's economic and technological advantages would apply.

Consistent with this theorem, section 902(a) of the 4R Act required the Secretary of Transportation to examine ways and means of developing a rail assistance policy that would encourage the establishment and maintenance of an "open and competitive" intermodal transportation market in which railroads compete for freight on equal terms with trucks, barges, and pipelines. Section 902(a) of the 4R Act states the general policy that each mode's share of the market should be determined by inherent service advantages and competitive prices that reflect their economic costs. An essential corollary of this philosophy is that Government must be willing to evaluate its own investment policies to determine whether such policies encourage fair competition or impose fundamental distortions in the modal mix of transport services.

Governments, historically, have committed large sums to the development of transportation. The advantage of such spending is that it spurs economic growth by causing a more rapid development of transportation facilities than would be possible through private investment alone.[1] The disadvantage is that these promotional expenditures often lead to excess transportation capacity in some areas and the uneven development of competing modes. If the expenditures are not accompanied by adequate user charges, they act as subsidies that artificially lower the costs of a particular mode and distort equitable competition.

According to the DOT report, *Study of Federal Aid to Rail Transportation* (902 Study), between 1789 and 1975, the U.S. Government spent $131.3 billion[1] in direct Federal aid to transportation.[2] Spending for highway construction was $88.8 billion. Another $14.7 billion was spent to build and maintain waterways, $26 billion to develop airport facilities, and $1.8 billion[2] for rail transportation. Railroads, of course, built and maintained their own rights-of-way. The bulk of Federal aid to the railroads in the pre-World War II period was in the form of land grants. From the end of World War II to 1975, the Government spent an estimated $1.3 billion for National Railroad Passenger Corporation (Amtrak) grants, Emergency Rail Restoration (following Hurricane Agnes in 1972), and rail service assistance to bankrupt railroads in the Northeast before the creation of the Consolidated Rail Corporation (Conrail).

Users of the federally provided inland, coastal, and Great Lakes waterways paid no fees for using these rights-of-way. Airport and airway user taxes returned to the Government $3.9 billion (or 15 percent) of the $26 billion total Federal expenditure. Although the Federal Government recovered $96.3 billion in highway user taxes, the question is whether large, rail-competitive trucks paid user charges equal to the cost burden for which they were responsible. The United States receives 29 percent of the St. Lawrence Seaway revenue from tolls collected on the Montreal–Lake Ontario section. These tolls, charged on commodity tonnage carried and vessel register tonnage, cover costs of operation, maintenance, administration, and retirement of bonded debt of the original construction cost (minus interest payments) for the seaway.

When Congress passed the 4R Act in 1976, it recognized the possibility that Federal investment (and regulatory) policies were preventing the railroads from competing on equal terms with other modes. In its report on the omnibus bill that eventually became the 4R Act, the Senate Committee on Commerce concluded that serious anomalies and perhaps inequities have developed as a result of Federal investments in transportation. Section 902(a) directed the DOT to conduct a comprehensive study of the Federal Government's transportation investment policies.

The 902 Study, forwarded to Congress on January 19, 1977, concluded that socioeconomic forces rather than Government investment policies were primarily responsible for the decline of the railroads after World War II. However, the study found that Federal subsidies had caused distortions in the marketplace that "heightened and accelerated" the ability of trucks and barges to drain traffic from the railroads.

To restore a balanced, competitive transportation system, the 902 Study recommended that the intermodal impacts of Federal transportation investments become an explicit consideration in the Government's decision-making process and that most, if not all, Federal subsidies to transportation be eliminated.[2]

These recommendations are relevant because this report adopts the congressional priority that American railroads can best contribute to the national transportation system as profitable, compet-

[1] All dollars are current year.

[2] This figure includes the total value of land grants at the time they were given, an amount estimated at $433 million. As an offset to these grants, the Federal Government enacted legislation providing for reduced rates for Government rail shipments; the savings to the Government under this provision have been estimated at $1 billion.

itive elements in the private sector. Rather than advocating large-scale subsidies or mandatory right-of-way purchases for the industry, DOT emphasizes limited financial assistance, easing of regulatory action, and careful restructuring as means of revitalizing the industry. There are economic and operating advantages for railroads, in many situations, and these advantages are the true bases for revitalization. This market-oriented approach will not work, however, if Federal actions distort prices and give competing modes unfair competitive advantages.

This chapter will discuss a series of cross-modal issues in terms of an overall Government investment framework that would allow all modes (including rail) to compete on equal terms.

INTERMODAL COMPETITION

The economic theory of the 4R Act is valid only if it can be shown that railroads compete actually, or potentially, with other modes for a significant share of the commodity transport market. The long-term decline of the rail market share and the equally deleterious decline in rail rates of return raise serious questions about the ability of railroads to compete at all.

Between 1925 and 1975, the railroad share of domestic intercity freight traffic (measured in gross ton-miles) fell from 79.9 percent to 36.8 percent.[2] In the same period, the intercity trucking industry increased its market share from an almost negligible 0.8 percent to 21.3 percent. If the measure is tons carried rather than ton-miles, trucks actually surpassed railroads in freight dominance by 1975, accounting for 38 percent of intercity tonnage as opposed to 29.3 percent for the rail mode.

While trucks compete with railroads for high-value, lighter weight commodities, barge lines compete for low-value bulk commodities. The overall waterway carrier share (including Great Lakes shipping) of the intercity freight market has been fairly constant, moving from 16.3 percent in 1925 to 17.1 percent in 1975. These gross figures, however, mask the dramatic increase of the inland waterway share—from slightly over 1 percent in 1925 to more than 10 percent in 1975—while the Great Lakes share has been declining.

With railroads and barges engaged in direct competition for the movement of heavy bulk commodities such as grain, coal, and fertilizer and with trucks taking over an increasingly large share of merchandise traffic, it is often assumed that railroads have virtually surrendered all traffic other than select bulk movements to trucks and barges.

This is not yet the case. Table 5-1 shows that for shipments in the 30,000- to 60,000-pound class, rail-truck competition existed in 78 of 117 standard commodity groups. (A given commodity group was considered competitive if the rail share of the tonnage fell between 20 and 80 percent.) Twenty-four of these groups had gross rail freight revenues in excess of $100 million in 1976.

The same data show that the level of competition between rail and trucks increased with only 12 commodity groups (principally motor vehicles and equipment, grain products, household appliances and converted paper) when the distances involved were under 300 miles. In the 300- to 500-mile range, railroads competed for twice as many commodity groups, adding abrasive and asbestos products, paper and paperboard, and pulpmill products. Over 500 miles, railroads were competitive for about 50 commodity groups, entering the market for key items such as sawmill products, miscellaneous food, petroleum products, agricultural chemicals, plywood, and sugar.

The top five competitive commodities in terms of rail revenues were motor vehicles and equipment, industrial chemicals, steel products, sawmill products, and grain mill products. Each represented gross revenues in excess of $500 million in 1976. Indeed, motor vehicles and industrial chemicals each generated rail revenues in excess of $1 billion. In the case of motor vehicles, competition existed between 100 and 300 miles, but for distances over 300 miles, railroads carried over 80 percent of the tonnage. Three commodities (industrial chemicals, steel products, and sawmill products) were in the competitive range, primarily for shipments over 1,000 miles.

In fact, most commodity groups (62 of 78) were competitive in three or fewer mileage blocks, reflecting the advantages of trucks for short hauls and the continued competitive ability of railroads at longer distances. Only one commodity, railroad equipment, was competitive at all mileages.

The above data indicate that competition exists between the truck and rail modes across a broad spectrum of commodity groups, but this static view of the freight market does not adequately portray long-range trends that could cause competition to evaporate.

In 1972, railroads carried more than one-half the ton-mile market for commodities such as transportation equipment, lumber and wood products, chemicals and allied products, primary metals, and tobacco products. The trucking industry dominated the market for transportation of commodities having a higher value per pound, such as textiles, furniture and fixtures, rubber and plastic products, leather products, fabricated metals, instruments, photographic and medical goods.

Even in transportation of bulk commodities, where a service advantage can be provided, the railroads have lost their market share. Barges, proposed coal slurry pipelines, and even trucks provide ready alternatives for the shipment of many traditional rail commodities, such as coal, refined petroleum products, cement, and grain.

TABLE 5-1. MAJOR COMMODITIES SUBJECT TO TRUCK-RAIL COMPETITION
(Miles)

TCC Code	Commodity[a]	Total No. competitive blocks	% tons by rail for 30,000 to 60,000 lb class							Total % tons by rail[b]
			Under 100	100-199	200-299	300-499	500-999	1,000-1,499	Over 1,500	
371	Motor vehicles and equipment	2	14	[c]27	[c]50	83	90	99	88	57
281	Industrial chemicals	2	3	1	3	6	15	[c]27	[c]36	45
242	Sawmill products	3	1	2	4	11	[c]34	[c]60	[c]49	45
204	Grain mill products	6	16	[c]35	[c]39	[c]54	[c]52	[c]32	[c]55	62
331	Steel and rolling mill prod.	2	2	3	2	5	13	[c]23	[c]78	44
329	Abrasive and asbestos prod.	3	4	1	5	[c]21	[c]21	16	[c]70	54
209	Misc. food preparations	3	2	6	7	19	[c]29	[c]44	[c]47	47
291	Refined petroleum prod.	3	1	3	4	8	[c]34	[c]43	[c]23	8
263	Paperboard, etc.	3	2	8	10	[c]22	[c]41	84	[c]53	72
262	Paper	4	8	9	16	[c]23	[c]35	[c]55	[c]44	59
203	Canned fruits, veg., etc.	1	9	2	6	10	12	13	[c]48	35
208	Bev. and flavoring extracts	1	0	1	2	8	17	18	[c]45	15
282	Plastic materials	1	3	2	1	5	11	11	[c]24	45
243	Millwork, plywood, etc.	2	2	3	1	4	[c]26	[c]80	89	50
299	Misc. petro. and coal prod.	1	0	3	13	14	[c]23	14	12	70
287	Agricultural chemicals	3	3	2	1	8	[c]32	[c]43	[c]31	56
264	Converted paper, etc.	5	[c]46	[c]63	[c]73	[c]71	[c]68	89	89	51
289	Misc. chemical products	1	1	2	6	4	13	18	[c]42	30
261	Pulp and pulpmill products	3	4	18	17	[c]78	[c]51	[c]38	95	78
206	Beet and cane sugar	1	5	2	10	14	[c]40	84	0	44
249	Misc. wood products	3	1	3	4	11	[c]34	[c]60	[c]49	38
324	Hydraulic cement	2	0	0	0	0	[c]73	0	[c]58	15
344	Fabricated metal products	3	3	4	5	9	[c]20	[c]32	[c]47	20
363	Household appliances	3	[c]38	[c]56	100	97	85	93	[c]69	58
201	Meat	1	3	2	2	6	13	[c]23	11	19

[a]Ranked in decreasing order of 1976 gross rail freight revenue.
[b]For all weight and distance classes.
[c]Commodity is considered competitive at this mileage.
SOURCES: Department of Commerce, Commodity Transportation Survey, 1972 U.S. Census of Transportation. Interstate Commerce Commission, Bureau of Accounts, Freight Commodity Statistics of Class I Railroads in the United States, Year Ended 31 December 1976.

Loss to trucks of traffic in the more valuable commodities (which, in turn, usually have higher freight rates) is one of the major factors in the long-term decline of railroad profitability. Though total tonnage originated by the railroads over the past 30 years has remained fairly constant, the average revenue per ton-mile has decreased significantly.[3]

Not only are trucks gaining in bulk and higher rated carriage, they are competing for larger shares of certain long-haul commodity markets once dominated by railroads. Figures compiled by the Congressional Office of Technology Assessment, in the 1975 *Review of National Railroad Issues,* clearly illustrate the shift from rail to truck of California fruits and vegetables shipped to markets in the Midwest and East.[4] The figures show railroads dropping from 113,500 carlots in 1966 to 69,800 carlots in 1974 (a 39-percent decline), while trucks increased carlot equivalents from 139,000 to 178,100 (a 27-percent increase). Noting inroads made by the trucking industry into longer haul markets, the Task Force on Railroad Productivity in a 1973 report to the Council of Economic Advisors estimated that 74 percent of all common carrier truck shipments exceeding 10 tons moved 200 miles or more, and 57 percent of all such shipments moved 300 miles or more.[5]

Earlier chapters of this report show that much of the loss in railroad market share can be attributed either to shifts in the type of goods the U.S. economy produces or to competition in areas where other modes have service and cost advantages. The diversion of bulk cargo to trucks and barges and the increased number of long-distance movements by trucks appear to be cases where the railroads have the ability to compete, but where rail opportunities are lost because of out-of-date regulations, Federal investment in other modes, and a failure of railroads to improve marketing and provide efficient service.

The 902 Study ended its review of the railroad industry's competitive status by citing the absence of

major new transportation technologies and the apparent slowdown in the rate of structural economic change that has eroded the railroads' traffic base. The study predicted a stabilization in overall railroad traffic and revenue that, when coupled with projected increases in coal movement, would increase rail's share of the intercity freight market to 40 percent by the mid-1980's.[2]

The 902 Study recognized that at current levels of return on investment, this modest increase in the market share would not overcome the serious long-term erosion of railroad physical and financial health.

Moreover, the 902 Study may have underestimated the continuing effect on the railroad industry of Federal programs that benefit other modes. The interstate highway system, for example, probably will have an increasingly adverse impact on railroads even though it is nearly complete. Shippers and whole communities are still adjusting to the availability of low-cost truck transportation made possible by the interstate system.[4] These groups have traditionally wanted to shift to the new, more aggressively marketed forms of transportation, but in any case, the railroads are still required to remain available at low, fixed rates. This is obviously not a free market condition.

There are also continuing pressures to relax size and weight restrictions on trucks, to increase the capacity of the inland waterway system, and to develop a network of coal slurry pipelines that would provide an alternative to unit trains. Unless the Government responds to these proposals with a rational policy that will promote equitable competition, the market prescription for restoring railroad vitality will fail.

A FRAMEWORK FOR PUBLIC INVESTMENT POLICY

A public investment policy aimed at promoting equitable competition among modes has two major requirements. First, direct Federal expenditures should be accompanied by user charges set at levels that will recover the Government's full costs. Second, any public investment in new transportation capacity should pass strict tests of economic merit. Such tests should include consideration of all relevant public costs and benefits, including the assessment of the impact of such investments on other modes.

Intermodal competition that truly reflects the economic performance of each mode cannot exist without equitable user charge treatment. The 902 Study makes this point, as follows:

> The maintenance of an open and competitive market among mature modal competitors requires the elimination of most if not all Federal subsidies to transportation. If each of the five major modes of intercity transportation is to compete in the marketplace on the basis of whatever cost and service advantages it possesses, the distortions in the marketplace caused by Federal transportation subsidies will have to be eliminated.... Where circumstances require direct Federal financial involvement, full cost recovery from users should be the policy objective. In this connection, a system of cost sharing should be introduced on a phased basis for the inland and coastal waterway system, facilities which are currently improved and maintained at Federal expense. Waterway users do not now pay these costs.
>
> It should be noted that this public policy goal of eliminating Federal subsidies to transportation should not be viewed as precluding the establishment or maintenance of explicit Federal subsidies where there are overriding national interest considerations (as in the Federal subsidy of urban mass transportation). Nor should it be construed as precluding direct Federal financial involvement in national transportation programs where such involvement is otherwise justified and adequate cost recovery mechanisms are in place.[2]

Railroads currently spend an estimated 20 percent of revenues maintaining their rights-of-way. Barges pay nothing for their rights-of-way, while large trucks (as indicated earlier) may pay less than their full share of true costs.

Since extensive transportation facilities already exist, the Government's development emphasis should not be on new programs to increase capacity, but on programs that focus on the maintenance, upgrading, and more effective use of what is already in place. As capacity increases are required, every effort should be made to increase the efficient use of existing systems, including an examination of the total costs and benefits of employing excess capacity in competing modes as an alternative to expanding capacity of the mode in question. In some cases, where the capacity of a particular mode becomes strained, diversion of excess traffic to other modes may be preferred to investment in new facilities unless it can be shown that total capacity is inadequate. It may also be more effective to use modes in combination; for example, use one mode that takes passengers or freight to, or from, a terminal for the short portion of a trip and another mode for the long-haul portion of the trip.

Insistence on review of intermodal impacts is based on economic concerns rather than protection

of the constituencies represented by the rail industry. The DOT would not oppose an otherwise economically desirable investment in another mode purely because such investment would do damage to the railroad industry. In actuality, railroads represent the most efficient mode for moving a number of commodities over long distances, and rail is likely to continue to do so in the foreseeable future. Therefore, while an investment in additional highway capacity to carry more long-haul truck traffic, for example, might pass the traditional benefit/cost tests, the secondary effects, represented by any possible loss of efficiency in the rail industry, should also be taken into account. The cost of moving goods over newly constructed rights-of-way should be compared with the costs of moving goods over rights-of-way that are already built. Such considerations will help avert situations where Federal assistance to railroads is urged as a means of compensating railroads for the advantages given to other modes by Federal law and financial aid.

A serious obstacle to development of good economic analysis of public investments is lack of comprehensive data on the flow of traffic. This, in part, stems from differences in the reporting requirements imposed by Federal regulation. Fairly good data are available on rail, barge, and some truck movements, but virtually no public data exist on unregulated truck carriage. Without complete information on traffic flows and rates, it is difficult for the Federal Government to formulate equitable transportation policy.

Subsidized competition frequently results in cost and price structures that direct traffic away from areas where railroads are energy efficient. The consequences of this energy advantage are suggested in table 5-2.

The relationships among the modes are not as clear as table 5-2 indicates. Size of shipment, length of haul, backhaul, and circuity have an important effect on relative energy advantages; trucks may have the advantage over rail or waterborne freight in certain markets, or vice versa. The use of unit trains provides far greater efficiency for rail than shown by the modes in the table—dropping the Btu per ton-mile to a range of 300 to 400 and providing a significant energy consumption advantage even over barges, in certain places. The central message, however, is clear: The rail freight mode is energy efficient and can be a significant asset in the effort to reduce overall energy consumption. Government policies that result in diversion of traffic to less energy efficient modes will hamper that effort.

TRUCK ISSUES

The trucking industry has benefited from governmental involvement in the construction of the extensive public highway system. That involvement has entailed both financing and regulation of use.

FINANCING

The Government has established a set of excise taxes including taxes on the sale price of the vehicle, fuel, parts, tires, tubes, tread rubber, lubricating oil, and an annual use tax. A tax of $3 per 1,000 pounds is levied on all high-use vehicles whose gross weight exceeds 26,000 pounds. The proceeds from these taxes comprise the Highway Trust Fund, which is used to finance Federal-aid highways.

These user taxes were intended by Congress to secure an equitable distribution of the tax burden among the various classes of users of the Federal-aid highways. It is not clear that tax payments for the large tractor-trailer combinations match the estimated costs attributable to such vehicles. A report of the Federal Highway Administration, *Allocation of Highway Cost Responsibility and Tax Payments, 1969,* estimated that a five-axle, diesel-powered tractor-trailer combination with a 60,000-pound and over gross weight paid an estimated $1,294 in Federal trust fund taxes but imposed an annual Federally funded cost on the highway system of

TABLE 5-2. ESTIMATED ENERGY INTENSITIES BY FREIGHT MODE, 1972, 1974, 1975
(Btu per revenue ton-mile)

Freight mode	1972	1974	1975	1972–75 (% change)	1975 index (rail=100)
Rail	705	649	687	-3.40	100
Combination truck	2,558	2,811	2,161	-15.52	317
Air	17,051	12,408	13,152	-22.87	1,931
Domestic waterway	522	479	535	2.49	79
Oil pipeline	525	525	525	0	77

SOURCE: Department of Transportation, Transportation Systems Center, unpublished staff studies.

$2,011. The report concluded that Federal investment policies provided a substantial subsidy to large (rail-competitive) trucks. Since that time, there have been considerable analyses and debate over the methods used to allocate costs, and this issue is still unresolved. The DOT is conducting a thorough analysis of highway user charges and will recommend changes, as appropriate.

STRUCTURAL VEHICLE LIMITS

The Federal legal maximums (23 U.S.C. 127) for the weight carried on single and tandem axles, for the overall gross weight, and for the width of all vehicles using the interstate highway system are also important issues for the railroads. (Federal law makes no requirements concerning overall vehicle length, height, or number of units in a combination. These are regulated by State laws.) From 1956 through 1974, the overall gross weight of any vehicle using the interstate system could not exceed 73,280 pounds, subject to bridge capacities. In 1974, that limit was increased to 80,000 pounds. The maximum vehicle width has always been 96 inches except for buses, which may not exceed 102 inches.

Federal highway legislation is intended to develop uniform, nationwide size and weight limitations for the interstate system, but implementation by the States has not been uniform. Thirty-four States currently observe the federally specified maximums. A few States do not match the Federal maximums, however, so that movements of 80,000-pound truckloads do not take place on all parts of the interstate system. In the Midwest, Indiana and 8 of the 10 States bordering the Mississippi (excepting Louisiana and Kentucky) have not increased the limits to the maximum. In the Northeast, 6 of the 10 States (excepting Massachusetts, Maine, New Jersey, and New York) do not permit 80,000-pound loads.

It is difficult to determine how truck-rail competition (especially that portion involving private and unregulated trucking) has been affected in the last 2 years by the increase in maximum truck weights. Fifteen States have not increased the limits, and most Western States already had limits above 73,280 pounds on designated roads, which would seem to indicate that, in general, the status quo has been maintained except, perhaps, in the South. In selected markets, increased weight limits have served to reduce truck costs per ton. With offsetting fuel and labor cost increases, however, it is not clear what diversion from rail has occurred as a result of increased weight limits.

Even more difficult to project are the diversions that would occur from rail to truck if the 80,000-pound limit applied in all States or if the limit on the interstate system were increased to 90,000 pounds. A DOT staff analysis, based on *U.S. Census of Transportation* data, was performed to estimate the effect on rail revenues of increased weight limits.

Increasing motor carrier maximum weight limits to 90,000 pounds would reduce certain motor carrier costs of hauling most rail competitive commodities. This would result in substantial motor carrier cost reductions for most traffic in which railroads compete with trucks. Railroads would have to reduce rates to match lower motor carrier rates if the rates are lowered on commodities where they compete. This would have to be analyzed to see if it cuts bulk costs or simply increases truck profits on the traffic that could not be served by railroads.

The DOT estimates the cost in annual revenues to the railroad industry of reducing rates to meet motor carrier competition (or choosing to forego intermodal competition in those instances where that would be the least costly alternative) to be between $1 and $2 billion. The range of estimates is based on the following factors: the total amount of traffic estimated to be subject to diversion; whether or not truck size limits change with truck weight limits; and estimates of the decline in truck rates resulting from changes in truck size and weight limits. The lower estimate assumes no increase in truck size limits, a lower propensity for traffic to be diverted from railroads as motor carrier rates fall, and a lower level of motor carrier rate reductions.

Increases in truck size as opposed to weight would allow significant increases in truck capacity and would result in comparable reductions in truck costs. For example, an increase in width from 96 to 102 inches would allow the load in a standard 45-foot single trailer to increase from 24 to 26 cargo pallets. Two 27-foot trailers currently carry a load of 28 pallets in the standard 65-foot "doubles" configuration. This could be increased to 36 pallets if the width of each trailer were increased to 102 inches and the length to 31 feet.

Implementation of the second doubles configuration discussed above would require a change not only in the Federal width law but also in State laws governing the length of truck combinations. Currently, 15 States do not permit tractor-trailer doubles; 30 States do permit the standard-size doubles of 65 or more feet. In the West, three States permit doubles with 31-foot trailers and four permit triples. Doubles less-than-standard size are permitted in five States (Georgia, Iowa, Mississippi, New Jersey, and New York).

The complex pattern of State laws and the lack of adequate data on truck-rail competition make projections of the changes in Federal policies on the railroads' financial needs through 1985 extremely difficult. Changes in Federal weight and width limits might well indicate other possible changes in long-term design and operating concepts for the interstate highway system, such as increased pavement strength, dedicated and reserved truck lanes, and exclusive truck ways. Such changes should be

carefully measured against effects on other modes and, if implemented, accompanied by user fees sufficient to cover the costs of a more expensive system.

Another important area is the enforcement of truck size and weight limitations. Overloaded trucks damage the highway system and impose costs beyond those intended to be covered by user fees. For example, a particular problem exists in regard to the unregulated carrier, where enforcement is difficult.

As indicated earlier, maximum size and weight limitations for the interstate system are established by Federal statute. State laws establish particular size and weight limitations within the Federal framework. According to current statutes, the Governor of each State is required to certify annually to the Secretary of Transportation that the State is enforcing all State laws relating to maximum vehicle sizes and weights for travel on the Federal-aid systems. States failing to certify face the loss of all Federal-aid highway funds. To date, no State has failed to certify. Nonetheless, DOT found prima facie evidence that 14 States were not adequately enforcing their size and weight laws. Based on this, the Secretary has written to the Governors of these States, stating that they should show cause why Federal-aid highway money for their States should not be withheld. Warning notices have been sent to 12 more States that have marginal enforcement programs. In response to these citations and warnings, the States have proposed significantly improved enforcement efforts. The DOT will continue to monitor this situation.

SPEED LIMITS

The DOT is also reviewing enforcement of the 55-mph speed limit because continued and widespread violations have serious implications for safety and energy conservation. From the railroads' standpoint, however, the effect is that illegal, excessive speeds reduce truck-operating costs by lessening the labor-hours component of the service, and increase truck revenues by permitting illegally speeding trucks to carry more shipments, since the average trip time is less at higher speeds.

WATERWAY ISSUES

The waterways present a clear case of right-of-way subsidy, since the inland barge industry currently pays no user charges for use of the waterway system constructed and maintained at Federal expense.

USER CHARGES

Every administration since that of President Franklin Roosevelt has endorsed the principle of waterway user charges. The Carter administration favors the imposition of waterway user charges that would lead to recovery, within a reasonable time period, of significant levels of operating and maintenance costs as well as new construction costs.

The exact type of charges to be levied raises complex questions. The simplest charge to administer is a fuel tax. Recently submitted legislation has proposed a fuel tax of 6 cents per gallon that would return approximately 25 percent of 1977 operating and maintenance costs. The administration feels that this level of recovery is inadequate.

The difficulty in adopting the fuel tax approach without also adopting other tax measures is that at high levels of recovery, a fuel tax alone would lead to significant cross-subsidies among different sectors of the inland river system, because variations in operating costs among segments are very great. (At low levels of recovery, however, the cross-subsidization effect would not be significant.) This would mean that at high-recovery levels, some waterway services would be overpriced and some underpriced and thus fall short of meeting the objective of permitting the modes to compete in the marketplace on the basis of true cost, service, and market characteristics.

A system of segment charges could correct many of the problems associated with a fuel tax. An all-segment-charge system alone, on existing waterways, is not practical now since this would lead to prohibitive fees on newer stretches of the waterway system that have not yet been developed to their full potential. Some combination of segment charges, licensing fees, fuel taxes, and other charges may be necessary. A suggested system could be developed by DOT within the statutory studies that are expected to be part of any user charge act. The Secretary of Transportation should have flexibility in recommending the nature of the charges that should be phased into the system.

In the aggregate, the barge industry will not be seriously affected by user charges, especially given its growth potential. In June 1977, the DOT Transportation Systems Center (TSC) completed a comprehensive study of the potential economic impact of user charges on inland waterway traffic. The study found that the maximum diversion impact of a fuel tax if there were a recovery of 100 percent of operating and maintenance costs would be, at most, 10 percent, assuming no change in rail rates. If, in addition to complete recovery of operating and maintenance costs, there were a recovery of 50 percent of new construction costs there would be, assuming rail rates

were to remain unchanged, a shift of up to 15 percent.

INVESTMENT CRITERIA

Some changes are warranted in user investment criteria to encourage those water projects that are economically and environmentally sound and to avoid projects that are wasteful or that benefit a few at the expense of many. To accomplish this, President Carter established a Task Force on Revision of Water Resource Planning and Evaluation Criteria to review waterway investment procedures and to make recommendations for improvement. After reviewing the Task Force's recommendations and consulting with members of Congress, State, county, and local officials, and the public, President Carter has proposed reforms. Specifically, the President has issued a directive to the Water Resources Council to improve the implementation of the Principles and Standards Governing the Planning of Federal Water Projects. In addition to retaining the basic planning objectives as equal concerns—national economic development and environmental quality—improvements in the implementation of the Principles and Standards are to include the following.

- Institute consistent, specific procedures for calculating benefits and costs in compliance with the Principles and Standards and other applicable planning and evaluation requirements. Benefit/cost analyses have not been uniformly applied by Federal agencies, and in some cases, benefits have been improperly recognized, "double-counted," or included when inconsistent with Federal policy or sound economic practice.
- Ensure that water projects have been planned in accordance with the Principles and Standards and other planning requirements by creating, through Executive Order, a project review function located in the Water Resources Council. A professional staff will ensure an impartial review of preconstruction project plans for consistency with established planning and benefit/cost analysis procedures and applicable requirements.

The following criteria will be among those considered in determining decisions about specific water projects.

- Projects should have net national economic benefits unless there are environmental benefits that clearly more than compensate for any economic deficits. Net adverse environmental consequences should be significantly outweighed by economic benefits. Generally, projects with higher benefit/cost ratios and few adverse environmental consequences will be given priority within the limits of available funds.
- Projects should have widely distributed benefits.
- The projects' problem assessments, environmental impacts, costs, and benefits should be based on up-to-date conditions.

These reforms should include careful consideration of the intermodal impacts of major waterway projects and should insure that the procedures employed are consistent with those used for other public transportation investments. In addition, the DOT believes that section 7(a) of the Department of Transportation Act should be revised, along with section 4(b)(2). Section 7(a) defines an economic benefit of navigation projects inconsistent with the concept of an efficient national economy, and implementation of section 7(a) often results in an overstatement of the actual benefits of the waterway investment. Section 4(b)(2) limits the Secretary of Transportation's authority regarding investment standards and criteria.

COAL SLURRY PIPELINE ISSUES

Although more than 70 percent of total coal reserves (estimated on the basis of energy value) lie east of the Mississippi River[6], a substantial amount of the expected increase in coal production will be in the West. Western coal reserves are relatively low in sulfur content, close to the surface, and could account for as much as 30 percent of total production in 1985. This would represent a major increase over current production, from 35 million tons in 1974 to 274 million tons in 1985. Only a small percentage of western coal will be consumed near production centers; most will be transported to more distant regions.

Currently, about two-thirds of all coal movements are by rail, and such movements by rail are likely to increase by two-thirds by 1985. As production and demand increase, however, pressure will mount to convey a portion of western coal to large consumers by coal slurry pipeline.[3] The only coal slurry pipeline presently operating in the United States is the 278-mile-long, 5-million-ton-annual-capacity Black Mesa Pipeline between an Arizona

[3]Slurry is prepared by grinding coal into particles and mixing the particles with fluid. Current technology uses water at a rate of 1 ton for each ton of coal.

coal mine and a Nevada powerplant. But a number of new major coal slurry lines have been proposed, including a 183-mile line from Kanab, Utah, to Las Vegas, Nev. (12 million tons per year); a 778-mile line from Gillette, Wyo., to Oregon (10 million tons per year); and three other lines (Colorado–Texas, Wyoming–Arkansas, and southeastern Montana–Texas), a little more than 1,000 miles each. No significant construction has taken place on these lines, primarily because of the difficulty of obtaining rights-of-way across privately owned land, including railroad properties.

Slurry pipelines are capital intensive, and although precise costs are difficult to obtain due to insufficient experience, costs are estimated at around $1.2 billion for a proposed 1,260-mile Wyoming–Texas line (25 million tons per year).[7] Costs to gather and distribute coal, to supply water, and operational and technological uncertainties could increase these estimates substantially. Once built, however, slurry pipelines are not subject to cost inflation and increasing labor costs to the extent the railroads are. Pipelines can be economically justifiable under the following conditions: when high volumes of coal are shipped from large, closely spaced mines over long distances (about 1,000 miles) to a secure market of one or more large customers able to receive coal from a single pipeline; when the terrain is favorable for excavation and construction; when ample water is available at sufficiently low-delivery cost; and where inefficient or circuitous rail operations favor pipelines. The construction phase of coal slurry pipelines would create a substantial number of jobs but would not support continuing employment opportunities at high levels, in contrast to competing rail service.

Legal constraints, water availability, high-construction costs, and limited applicability (pipelines are generally neither cost-effective nor competitive below 500 miles and under 5 to 10 million tons per year) will preclude pipelines from carrying significant amounts of coal in the near future. Recently, legislation was defeated that would have granted Federal eminent domain authority for coal slurry pipelines. If any new legislation on this issue is successful, the growth of the coal slurry pipeline industry could be substantial and have significant competitive effects on the railroad and barge industries.

Coal is the largest single commodity movement on railroads, accounting for about 29 percent of traffic volume and 13.4 percent of revenues received by Class I railroads in 1975. A preliminary assessment of the transportation system's capability to transport coal between 1978 and 1985 indicates that railroads with substantial investment in cars, locomotives, and heavier track should be able to accommodate the increased coal transportation demand on their 200,000-mile network.[8] Moreover, as the railroads make improvements to accommodate heavy coal unit trains, the efficiency of moving other commodities will also improve. On the other hand, if the development of a major slurry pipeline industry is facilitated by the Federal Government, the economic future of competing railroads could be affected adversely—particularly since pipelines currently enjoy significant regulatory advantages over railroads.

Rail must act as a common carrier and accept at approved (not necessarily profitable) rates any commodities offered for transport. Coal profits have sometimes subsidized transport of other commodities where close competition limits the opportunity for the railroads to raise rates and profits. Unlike rail, pipelines can serve selected customers, and operations can be targeted to the most profitable traffic. Pipeline financing depends on long-term purchase contracts with customers (usually electric utilities), which guarantee certain rates of return regardless of fluctuations in production and consumption. Under ICC regulation, railroads have been prohibited from entering into long-term shipping contracts. The ICC is presently reviewing this policy.

The major coal-hauling railroads and their connecting lines are already planning significant investments to handle the increase in coal traffic. But, if coal slurry pipelines are built in these areas, the railroads are likely to find it difficult to attract the capital necessary to strengthen and maintain existing tracks to carry the heavy, 100-car unit coal trains to points not reached by the pipelines. Competition from slurry pipelines for its long-distance, high-volume coal business could leave railroads less able to provide the myriad of transport services (including distribution of coal to industrial users) that slurry pipelines cannot perform.

Several legislative proposals to establish a procedure by which coal pipelines would be certified and granted the right of Federal eminent domain have been considered by the Congress, and the House of Representatives has defeated an eminent domain bill in the current session. The development of a coal slurry pipeline industry is possible without eminent domain authority at the Federal level, however, because the States have the power, in many cases, to grant the authority. Any legislation granting coal pipeline developers the right of eminent domain should require the Federal Government to determine that the project is in the public interest. Such determination should include the following criteria: the project's contribution to meeting national goals for coal production and use; consideration of alternate routes and means and relative costs; environmental disruption; and the balance between the energy consumption needs of one section of the country versus the water supply and social impacts on the coal-producing area.

Determination should also be made as to the

extent to which the project would be likely to impair the financial integrity of other common carrier modes of transportation (barges and railroads), or the level or type of transportation service any such mode is able to offer. The effect of the project on lower transportation rates versus carriage by railroad and on the impact on surface and ground water at destination and disposal sites should also be determined. The administration has recommended that the Department of Energy have a leading role in grants and certification, with the Secretary of Transportation's concurrence required for transportation issues and the Secretary of Interior's concurrence required for water issues and other national resource and environmental impacts. For example, the viewpoint of the Secretary of Transportation on available rail capacity for the relevant route and the impact of slurry pipeline development on the viability of affected railroads should be taken into account. Where pipelines are considered more efficient than existing rail service, there will have to be a careful weighing of the societal benefits and costs involved. Moreover, the effect of current regulatory, tariff, and contractual arrangement policies that inhibit the ability of the railroads to compete effectively should be considered in determining societal cost.

Any decisions affecting the movement of western coal must include consideration of water use now and in the future. Steps also have to be taken to mitigate adverse impacts on communities affected by any significant increases in rail coal traffic.

CONCLUSIONS

Federal subsidies causing distortions in the marketplace have accelerated the decline of the railroad market share and railroad rate of return on investment. For rail to remain competitive over a broad spectrum of commodity groups, in the long term, Government investment and regulatory policies must provide for equitable competition.

To permit the modes to compete in the marketplace on the basis of their true cost characteristics, equitable user charges should be established, and policies favoring other modes at the expense of railroads should be avoided. The administration supports a system of highway and waterway user charges sufficient to recover a reasonable portion of operating, maintenance, and new construction costs. Any Federal legislation granting slurry pipeline developers the right of eminent domain across railroad and other private lands should require the Federal Government to determine if the project is in the public interest and would not impair the financial condition and ability of competing railroads to provide efficient and varied transportation services.

In all cases of transportation investment, the cost of moving goods over newly constructed rights-of-way must be explicitly compared to the cost of moving goods over rights-of-way already in place. Before investing in new programs to increase capacity, every effort should first be made to increase the efficiency of the existing transportation system by proper maintenance, upgrading, and effective use.

REFERENCES

[1] Marvin L. Fair and Ernest W. Williams, Jr., *Economics of Transportation and Logistics,* Dallas: Business Publications, Inc. 1975, p. 11.

[2] Department of Transportation, *Study of Federal Aid to Rail Transportation,* Report of the Secretary of Transportation to the U.S. Congress pursuant to sec. 902 of the Railroad Revitalization and Regulatory Reform Act of 1976, Jan. 19, 1977, pp. 4–5; I-2; 7; VII-2; VIII-3, 4, 5.

[3] U.S. Railway Association, *Preliminary System Plan,* vol. 1, 1975, p. 118.

[4] U.S. Congress, Senate, Office of Technology Assessment, *A Review of National Railroad Issues,* prepared at the request of the U.S. Senate Committee on Commerce, Dec. 1975, pp. 63, 62.

[5] *Improving Railroad Productivity,* Final Report of the Task Force on Railroad Productivity of the National Commission on Productivity and the Council of Economic Advisors, Washington, D.C., Nov. 1973, p. 37.

[6] Georgetown University, Center for Strategic and International Studies, *Where We Agree.* Report of the National Coal Policy Project, Feb. 1978, p. 19.

[7] Department of Transportation, Office of the Secretary, Office of University Research, *Western Coal Transportation: Unit Trains or Slurry Pipelines,* Washington, D. C., 1976, p. 36.

[8] Department of Transportation, *Transporting the Nation's Coal—A Preliminary Assessment.* Report to the Secretary of Transportation from the Coal Transportation Task Force, Jan. 1978, pp. 11–16.

6.
ECONOMIC REGULATION

Regulation of railroads has developed over the past century through the enactment of numerous laws and the promulgation of tens of thousands of rulings touching on nearly every aspect of the railroad industry. Regulation of the industry has been carried out in minute detail, at enormous administrative cost, and with far too little policy focus. The realities of transportation economics have been recognized too slowly or not at all, and the Interstate Commerce Commission's (ICC) interests in protecting specific shippers, communities, or carriers often have been emphasized at the expense of the broader interests of consumers, the railroad industry, and, most recently, taxpayers.

The Railroad Revitalization and Regulatory Reform (4R) Act of 1976 made several changes in the degree of regulation and the procedures by which such regulation is exercised by the ICC. The effect of many of these changes, however, was minimized by the ICC. Thus, despite the 4R Act, reforms are still necessary. Some of the Department of Transportation's (DOT) recommended changes include the following.

- *A provision similar to the recently expired 2-year, 7-percent up or down, no-suspend rate zone contained in the 4R Act should be enacted. Such provision should not be subject to market dominance findings.*
- *The ICC should attempt to make full, beneficial use of authority granted by section 207 of the 4R Act to provide exemption from regulation under circumstances in which effective competition exists. This authority should be employed as extensively as possible within the bounds of congressional intent.*
- *A set of new analytical procedures should be developed to facilitate the collection of specific data and operating statistics to assure accurate estimates of variable costs. The new procedures should permit collection of data more specific than would result from the new, uniform system of accounts recently created by the ICC under the mandate of the 4R Act. That system is suitable primarily for financial oversight purposes.*
- *The regulatory and policy imbalances that currently exist in the treatment of the different modes should be rectified to the maximum extent possible.*
- *Retroactive collection of suspended rates that are later found just and reasonable should be allowed.*
- *The notice periods for initiating and canceling seasonal, regional, and peak-period pricing provisions must be shortened to the point where they are comparable with the rate adjustment times enjoyed by competing modes.*

- *The DOT will examine the impact of sections 2, 3, and 4 of the Interstate Commerce (IC) Act in view of the development of widespread intermodal competition and the growing need for greater railroad industry efficiency.*
- *Rules dealing with the abandonment of rail lines should be modified to encourage more carrier-shipper-locality cooperation.*

THE NATURE AND DEVELOPMENT OF THE REGULATORY SYSTEM

The current system of railroad regulation reflects a series of uncoordinated actions intended to remedy specific problems encountered during the almost 100 years since the regulatory system was first imposed. The result is a hodgepodge of inconsistent and often anachronistic regulations that no longer correspond to the economic condition of the railroads, the nature of intermodal competition, or the often conflicting needs of shippers, consumers, and taxpayers.

The 4R Act was the first comprehensive attempt in many years to reexamine the need for and the assumptions underlying the economic regulation of the railroad industry. The 4R Act made fundamental changes in the regulatory system administered by the ICC, including: minimum and maximum rate regulation; establishment of demand sensitive rates, separate rates for distinct rail services; operations of rate bureaus; merger and abandonment procedures; and accounting and costing methods. Although much was accomplished by the 4R Act, other far-reaching reforms are still needed.

This chapter highlights the rationale and structure of current rail regulation. It addresses briefly the historical development of that regulation and the changing conditions that resulted in its reexamination in the 4R Act. The chapter concludes with a discussion of the regulatory problems that remain—many created by the regulatory system itself—and presents recommendations for resolving those problems.

AREAS COVERED BY REGULATION

Railroads are a fully regulated industry. The ICC is responsible for deciding whether a proposed rail rate is too high, too low, or discriminatory. The ICC may, temporarily or permanently, prohibit any rate from taking effect and may set the rate it thinks appropriate. Even intrastate rail rates are subject to some ICC control. The ICC also has authority to enforce the "common carrier obligation" that requires a railroad to provide service to anyone who seeks it and who is willing to pay the charge contained in a tariff filed with the ICC.

In addition to authority over rates, the ICC has regulatory control over the construction and abandonment of railroad lines, mergers, acquisitions and related activities, rail accounting and costing procedures, and issuance of rail securities. The IC Act, as continuously amended over the years, also gives the ICC the power to exempt railroad ratemaking activities from the jurisdiction of the antitrust laws.

In 1887, when the railroad companies first came under regulation, they generally exercised monopoly control over the individual markets they served. The system of regulation that was established was a reflection of that economic fact. The economic conditions of the railroads, however, changed rapidly and dramatically in the 20th century. The regulatory system changed much more slowly. The 4R Act was the first comprehensive attempt in decades to match rail regulation with the current financial and competitive condition of the rail industry.

The 4R Act modifies significantly the standards the ICC applies in determining the reasonableness of proposed rates, so as to assure greater ratemaking flexibility for rail management and an enhanced ability to compete effectively against other, largely unregulated, transportation modes.

Section 202 of the 4R Act amended section 1(5) and section 15 of the IC Act. Revisions of section 1(5) provided for the establishment of new standards and procedures for determining whether rates charged by railroads are just and reasonable and removed ICC authority to determine whether proposed rates are too high on traffic for which effective competition exists. Additional changes to section 1(5) provide that a proposed rate that contributes to the "going concern value" of the carrier proposing the rate cannot be found unjustly or unreasonably low. A rate that equals or exceeds the carrier's variable cost of providing the service to which the rate pertains is presumed, absent clear and convincing evidence to the contrary, to contribute to the carrier's going concern value. The 4R Act also changes, fundamentally, the so-called rule of ratemaking that sets forth the general policy standards to be applied by the ICC in judging the reasonableness of a proposed rate.

Additionally, the section 1(5) revisions require the ICC to promulgate standards and expeditious procedures for establishment of seasonal, regional, or peak-period rates and for the establishment of rates for distinct rail services. Section 202(f) provides, however, that none of these ratemaking changes are

to be construed to modify sections 2, 3, or 4 of the IC Act (prohibiting undue discrimination, preference, or prejudice) to make lawful predatory or other anti-competitive practices or to affect existing law governing rate relationships between ports and equalization of rates within a port. The revisions to section 1(5) also created a 7-percent, no-suspend rate zone for an experimental period of 2 years (now elapsed), prescribed time limits for ICC investigations of proposed rates, modified the power of the ICC to suspend rates, and reallocated the burden of proof in suspension cases.

Other provisions of the 4R Act require the ICC to establish procedures assuring the railroads adequate revenue levels, modify the provisions governing collective ratemaking, set new procedures and standards to be followed in abandonment and merger proceedings, and authorize the ICC to exempt from regulation those persons and transportation services that are found not to be necessary "to effectuate the national transportation policy." Each of these areas constitutes a part of the regulatory system. The intent of the 4R Act revisions to that system is to subject railroad rates and other regulated activities to more competition and less Government regulation.

The Conference Report on the 4R Act states that the changes in rate regulation embodied in the Act "are intended to inaugurate a new era of competitive pricing."[1] The legislative history makes clear that this new era is to be marked by less reliance on rates set by ICC regulation and greater reliance on rates set by market forces. Congress recognized that the passage of time had dramatically changed the competitive position of the railroads. The Senate Report speaks to this point explicitly:

> Railroads were the first large business to be regulated by the Federal Government. The regulation was called for by the industry's dominance of the market and its ability to price some service monopolistically while engaging in predatory competitive practices in other markets. These problems exist today, but in a very different transportation environment. Railroad regulation therefore warrants reexamination .... Growth of other modes in the past century has raised questions whether protection against rail monopoly is any longer necessary in many markets. It seems clear that in addition to protecting shippers from the exercise of rail monopoly, the current regulatory system should work to permit railroads to effectively compete for the kind of traffic they can best handle. Competition is particularly important because many of the railroads' competitors are not regulated.[2]

Thus, the legislation resulting from these concerns had two major premises: that the dominant position of the railroads had been severely eroded; and that in order to compete for existing traffic, the railroads needed enough ratemaking flexibility to compete effectively with unregulated carriers. From these conclusions came the mandate in the 4R Act for a substantial diminution of the ICC's ratemaking powers and for greater railroad freedom to set rates. The Senate Report states:

> Railroad regulation has failed to assure adequate industry profits and rates of return and has retarded the industry's ability to compete with competitors ... If railroads are to regain lost traffic, they must be able to lower their rates, innovate new services, and respond to new and changing circumstances. If railroads are to increase their revenues and attract the resources necessary to revitalize the industry, they must be able to raise their rates in a timely fashion, free from regulation in markets sufficiently competitive to prevent abuses of monopoly power ... In placing a premium on the status quo and focusing management's attention on the intricacies of the complex regulatory schemes, the present regulatory system has sapped the ability of railroads to respond, compete, innovate, and develop their full service capacity. Less restrictive rate regulation is essential to the achievement of these goals ....[3]

The same conclusion is reflected in the House Report, which states:

> Underlying the regulatory reform provisions of the entire bill is a conviction that competitive market forces, rather than regulation, should be used to set price and service levels where effective competition exists ....[4]

Before reviewing the specific changes made in the 4R Act to accomplish these goals, it is necessary to discuss, briefly, what the regulatory scheme looked like before the 4R Act.

GENESIS OF THE 1887 ACT AND REGULATION PRIOR TO 1920

The development of railroads in the 19th century represented a great advancement in transportation technology. Powerful railroad companies

expanded rapidly, and by the latter decades of the century, they dominated the transportation of America's goods. Regional commercial and financial interests contributed to the rapidly expanding network of rail lines connecting major cities.

The profit opportunities realized by rail companies in many of those market areas often attracted new railroad competitors who, from time to time, would initiate rate wars to attract traffic from the original lines. Competition of this type soon drove out profits for all carriers in the market, and thus led to efforts to pool traffic or divide markets to reestablish monopoly profit levels. A dissatisfied member of such a pooling arrangement might resume a rate war to reattract traffic from other railroads serving the same points. Intermediate points served by only one railroad were captive and, therefore, did not benefit from the price-cutting activities. Accordingly, a railroad rate structure evolved in which rates were generally low, but unstable, between major points served by competing railroads (or in competition with water carriers) and high between points over which shippers had no alternate transportation. One side effect of this rate structure was the accelerated construction of branchlines to very small markets, since traffic that originated at those points did not need to be included in the pooling arrangement.

To complicate matters further, railroads found that by providing rebates, or kickbacks, to selected customers, they could also capture business from competing companies. These practices resulted in different shippers paying varying prices for the same service.

Thus, the transportation market of the late 19th century left almost everyone dissatisfied. The railroads tried to avoid the constant rate wars, rebates to favored shippers, or low rates. Farmers wanted lower rates and protection against discriminatory rate practices. Shippers in competitive markets wanted greater rate stability and assurances that they would not be placed at a competitive disadvantage relative to those shipping the same product from the same or other origins. There was, therefore, pressure for regulation of the railroad industry from many parts of the economy.

The Act to Regulate Commerce in 1887 created the ICC and as amended and clarified through additional legislation in 1903, 1906, and 1910,[5] charged the ICC with assuring that: (1) all rail rates were to be "just and reasonable"; (2) neither undue discrimination nor undue preference nor prejudice between persons, places, or kinds of traffic were to be permitted; (3) no railroad could charge more for a shorter haul than for a longer haul over the same route; (4) revenue and traffic pooling were to cease; and (5) rates were to be published and adhered to. To carry out these responsibilities, the ICC required the railroads to report prescribed operating and accounting information. The ICC orders were made binding on railroad companies, subject to judicial review. In addition, the Mann-Elkins Act of 1910 gave the ICC the right to suspend rates pending investigation.

The 1887 Act, as subsequently amended, gave the ICC the authority to study and change every proposed railroad rate. Although not every rate was examined, the ICC was able, over the years, to establish certain ratemaking policies that shaped the rate structure as a whole. One of the foundations of that structure was a policy whereby the amount charged to transport a product was directly related to the value of that product. This system—called value of service pricing—was designed to permit downward adjustments of rates on specific commodities or of rates to particular geographic areas to encourage development of a particular commodity (e.g., farm products) or a particular part of the country (e.g., the Western States).

By the time the United States entered World War I in 1917, the problems of the railroads were severe, since profits were unevenly distributed, and costs were beginning to increase at a much greater rate than income.[6] Faced with the industry's inability to handle the wartime surge in traffic, President Wilson ordered Government operation of the railroads on December 28, 1917, and it lasted until March 1, 1920.

Unified operation under Federal control was intended to alleviate the car shortages, port congestion, and labor disputes that had been plaguing the railroads and thereby to assure the coordinated, efficient, and dependable transportation of commodities needed for the conduct of the war. Shortages of track materials and funds, aggravated by the terms of the contract between the Government and the railroads, resulted in the continuation, during 1918 and 1919, of the inadequate pretakeover maintenance levels for railroad track. The condition of passenger equipment eroded somewhat, and freight car condition deteriorated severely, but locomotive maintenance actually improved. The continuation of inadequate maintenance levels for track and equipment left the railroads with a badly deteriorated physical plant by the end of the war.

As a response to this physical deterioration and to the completely inadequate rail rate structures that emerged from the war (aggravated by the generally poor postwar economic climate), the Transportation Act of 1920 was preoccupied with the financial well-being of the railroads, a concern not expressed in the earlier legislation.

RAILROAD LEGISLATION AFTER WORLD WAR I

The Transportation Act of 1920 introduced the "rule of ratemaking," which, in its original form, directed the ICC to provide a climate in which the

railroad companies, in the aggregate, could earn a fair rate of return on a fair valuation of their rail property. Specifically, the Act directed the following:

> In the exercise of its power to prescribe just and reasonable rates, the Commission shall initiate, modify, establish or adjust such rates so that carriers as a whole (or as a whole in each of such rate groups or territories as the Commission may from time to time designate) will, under honest, efficient and economical management and reasonable expenditures for maintenance of way, structures and equipment, earn an aggregate annual net railway operating income equal, as nearly as may be, to a fair return on the aggregate value of the railway property of such carriers held for and used in the service of transportation: Provided, that the Commission shall have reasonable latitude to modify or adjust any particular rate which it may find to be unjust or unreasonable and to prescribe different rates for different sections of the country.

Initially, Congress set the rate of return at 5.5 percent but permitted the ICC to increase this rate by an additional 0.5 percent (which the ICC did, 2 years later). Half of all return in excess of the ICC-set percentage was to be "recaptured" and placed in a fund to be loaned at 6 percent to weak railroads, and the other half was to be placed in reserve for lean years. The loan program was generally ineffective, and the "recapture clause" was repealed retroactively by the Transportation Act of 1933. While in effect, the recapture clause and loan program had been the subject of considerable controversy. The railroads and the ICC rarely agreed on the amounts of excess earnings, and few paid any money into the fund, choosing instead to litigate the matter in the courts. Those companies weak enough to qualify for funds were unable to put up sufficient collateral to get them. Further, railroads that were profitable in the 1920's were sometimes unprofitable in the next decade and either failed to put money into the fund, or sought to recapture it themselves.

Prior to 1920, the ICC had been concerned primarily with unreasonably high rates and with discrimination, preference, and prejudice. As one manifestation of the concern about the railroads' financial well being and about the long controversial rate reduction practices of the railroads, the Act of 1920 gave the ICC for the first time the authority to determine minimum as well as maximum rates.

The ICC had no authority over entry of new railroads until the Transportation Act of 1920. Thus, prior to 1920, new lines continued to be constructed, further contributing to the severe overcapacity problem that had existed since 1887. The Rock Island Railroad, for example, consisted of 3,408 miles of railroad in 1891, but operated 14,270 miles of track in 1907 (acquired partly through merger, partly through construction). The Milwaukee Railroad built its western extension in 1909, running almost within sight of the Northern Pacific route for many miles and competing directly with three other roads.

In 1920, the Congress recognized the problems associated with continued expansion of the railroad system in a climate of pervasive regulation and granted the ICC authority over additional construction. A test of "public convenience and necessity" had to be met before new lines could be built. The ICC was also granted authority to compel new construction when the public interest demanded it. Prior to 1920, the States had some control over abandonments of lines. This control was generally exercised to protect local communities and businesses dependent on rail services. The 1920 Act gave the ICC full control over abandonments and provided another public convenience and necessity test. Given the concern of the 1920 Act for the financial health of the railroads, this provision was intended to allow the ICC to balance the local need for continued service against the railroads' need to cease operating unprofitable lines. Control over intercorporate relationships and the issuance of securities were also vested in the ICC in the 1920 Act so as to insure a sound railroad financial structure.

THE MOTOR CARRIER ACT OF 1935 AND THE TRANSPORTATION ACT OF 1940

The Motor Carrier Act of 1935 brought motor carriers under ICC regulation, and the Transportation Act of 1940 did the same for water carriers. These acts did not impose on these industries a regulatory system as rigorous as that imposed on the railroads. By far the most important of the many differences is the large portion of highway and water traffic completely exempted from regulation. Most significant among the motor carrier exemptions are the movements of unprocessed agricultural products (largely the result of pressure from farm State representatives) and all proprietary transportation. The latter exemption is primarily a result of shippers' economic ability to establish their own motor (but not rail) transportation system to carry their own products. For water transportation, commodities carried in bulk "under the custom of the trade" on June 1, 1939, are exempt from regulation, and in fact, some estimates indicate that as little as 10 percent of all tonnage shipped by water is subject to regulation.[7] The primary reason for this exemption was the mistaken notion that water and rail carriers did not compete for the same traffic in 1940 and were

unlikely to do so in the future. Another important difference was the designation of several classes of carriers. As discussed more fully below, the Motor Carrier Act of 1935 established 5 classes: common carriers, contract carriers, private carriers, brokers, and exempt carriers. In contrast, all railroads are common carriers, with the obligation to serve everyone equally.

The Transportation Act of 1940 introduced the concept of a national transportation policy—the first serious attempt to deal with the problems of intermodal competition. The ICC was to administer the Act in a fair and impartial manner so as to "recognize and preserve the inherent advantages of each (mode)." This provision was often used to protect the other modes from railroad competition, as discussed below. Finally, in recognition that the consolidation efforts of the Transportation Act of 1920 had not worked, the 1940 Act eliminated the requirement that consolidations conform to the plans drawn up by the ICC. The ICC was, instead, required to take certain factors into consideration when judging a consolidation proposal, including: (1) the effect of the proposed transaction upon adequate transportation service to the public; (2) the effect upon the public interest of the inclusion, or failure to include, other railroads in the proposed transactions; (3) the total fixed charges resulting from the proposed transaction; and (4) the interest of the company employees affected.

THE REED-BULWINKLE ACT

Another important statutory change was made in 1948 with the passage of the Carrier Rate Bureau Act, commonly called the Reed-Bulwinkle Act. Passed over President Truman's veto, this Act allowed the ICC, at its discretion, to grant rate bureaus (collective ratesetting organizations) antitrust immunity. That is, this Act allows carriers to agree among themselves on rates, charges, and divisions.

Ever since passage of the Sherman Antitrust Act in 1890, collective ratemaking by the railroads had been subject to challenge. The Supreme Court outlawed two rate bureau agreements in 1897 and 1898.[8] Collective ratesetting went on, nonetheless. In the 1940's, after litigation that challenged the lawfulness of rate bureaus was brought once again, Congress moved to legalize the function of the bureaus. Recognizing the unique characteristics of joint service, among other considerations, the Congress enacted section 5a of the IC Act, which permits the ICC at its discretion and under certain conditions to exempt rate bureau operations from the antitrust laws.

THE TRANSPORTATION ACT OF 1958

By 1958, the railroads' financial condition had declined significantly as a result of intense water and motor carrier competition, deteriorated physical plant, economic recession, increasing losses from passenger operations, and the resultant difficulty in attracting capital. The Transportation Act of 1958 gave the ICC greater authority over discontinuance of passenger service since State authorities had been reluctant to accede to discontinuance of unprofitable operations. In the 1958 Act, the ICC was given the authority to determine whether unprofitable passenger operations constituted a burden on interstate commerce, even if the railroad's overall operations were profitable. The rule of ratemaking was again amended, directing the ICC not to keep the rates of one mode high to protect the traffic of another mode. Additionally, because of earlier Supreme Court decisions, the ICC had lost all practical authority over intrastate rates.[9] In the 1958 Act, Congress permitted the ICC to find that a particular intrastate rate was so low as to impose a burden on interstate commerce, without having to investigate whether other intrastate rates were cross-subsidizing the low rate.

Despite the long history of regulation, many problems remained unresolved in the early 1970's. Indeed, the U.S. Railway Association remarked, in its Preliminary and Final System Plans (under the Regional Rail Reorganization (3R) Act), that further regulatory change would be required for the industry to be fully efficient. In 1976, Congress considered and passed the 4R Act, which made extensive revisions in economic regulation of the railroads. The following discussion highlights the major provisions of the 4R Act and notes those areas where problems remain.

RATEMAKING STANDARDS AND ADEQUATE REVENUE LEVELS

The Transportation Act of 1920 first established a rule of ratemaking to guide the ICC in determining the reasonableness of proposed rates. The 1920 standard was amended by the Transportation Act of 1933, which required the ICC to: "give due consideration ... to the effect of rates on the movement of traffic ... and to the need of revenues sufficient to enable the carriers ... to provide service." The 1933 standard, however, also required the ICC to consider the need for rail transportation "at the lowest cost ...." When motor carriers came under regulation in 1935, another rule of ratemaking was enacted,

requiring the ICC, in determining just and reasonable motor carrier rates, to: "give due consideration ... to the inherent advantages of transportation by such carriers." The "inherent advantages" language provided one foundation for an ICC practice known as umbrella ratemaking, or setting the rate of one transportation mode to protect the traffic of another. If, for example, a commodity could move either by barge or rail, and the railroad sought to lower its rates to compete with the unregulated barge rate, the ICC often held the rail rate higher than the lower cost barge rate, because lower costs were thought to be an inherent advantage of water movements. Thus, a ratemaking standard originally intended to assure railroads a fair rate of return became the basis for protecting motor and, later, water carriers from rail competition.

Since the enactment of the National Transportation Policy in 1940, it has been the task of the ICC to try to reconcile these apparently inconsistent goals. Congress, in the 1940 Act, attempted to outlaw umbrella ratemaking, by requiring the ICC to limit its consideration of the effect of a proposed rate to the "carrier or carriers for which the rates are applied."

In the Transportation Act of 1958, the Congress, once again, amended the rule of ratemaking to address these issues, this time requiring that "rates of a carrier shall not be held up to a particular level to protect the traffic of any other mode ... giving due consideration to the objectives of the national transportation policy ...." The relationships among minimum rate regulation, "inherent advantage," and rate of return, however, were never satisfactorily resolved.

With each progressive iteration of the rule of ratemaking, the role of revenue adequacy was further diminished. The concept of fair return on fair value, embodied in the original rule, disappeared entirely. No clear direction was ever provided to the ICC regarding the use of its ratemaking authority to reconcile the needs of railroads to earn revenues adequate to sustain a fair rate of return with the concepts of inherent advantage, intermodal competition, and low rates for shippers.

The 4R Act attempted to provide that direction. The 4R Act established an entirely new rule of ratemaking for railroads, refocusing the ICC's concerns on the question of adequate revenues. Section 205 of the 4R Act reads:

> ... the Commission shall ... develop and promulgate ... reasonable standards and procedures for the establishment of revenue levels adequate under honest, economical, and efficient management to cover total operating expenses, including depreciation and obsolescence, plus a fair, reasonable, and economic profit or return (or both) on capital .... Such revenue should (a) provide a flow of net income plus depreciation adequate to support prudent capital outlays, assure the repayment of a reasonable level of debt, permit the raising of needed equity capital, and cover the effects of inflation and (b) insure retention and attraction of capital ....

In implementing this provision, the ICC announced that it would conduct, on a yearly basis, a proceeding designed to elicit the revenue needs of specific roads and the industry in general. The first proceeding is now pending at the ICC. The ICC also announced that "if the level of railroad revenue is inadequate, every means consistent with a just and reasonable rate structure should be used to help rectify this condition."[10]

The ICC then took an important step toward assuring that rail revenue need will be considered in specific as well as general rate increase proceedings. It announced a new policy relating minimum and maximum rate regulation, costing, and revenue adequacy as follows:

> ... rates cannot be set simply to cover the costs incurred in providing the particular service, but must be set at a higher level where possible to make a contribution to the coverage of fixed costs ... (F)ixed costs cannot be recovered in equal proportions from each service because demand and competitive factors place varying limits on the rates that can be maintained on different types of traffic.[10]

Because this decision is so recent, it is not yet possible to tell whether it effectively meshes appropriate ratemaking standards and overall revenue needs.

OTHER CHANGES IN RATE REGULATION AND RAIL ACCOUNTING PRACTICES

Section 202 of the 4R Act modifies the ICC's authority to declare a rate unreasonably low. The statute reads, in relevant part, as follows:

> No rate which contributes or which would contribute to the going concern value of ... a carrier shall be found to be unjust or

> unreasonable ... on the ground that such rate is below a just or reasonable minimum for the service rendered.... A rate which equals or exceeds the variable costs (as determined through formulas prescribed by the Commission) of providing a service shall be presumed, unless such presumption is rebutted by clear and convincing evidence, to contribute to the going concern value of the carrier ... proposing such rate.

The House of Representatives provided guidance to the ICC in defining variable cost as follows:

> ... it is the Committee's intention that the Commission apply modern cost accounting and financial analysis and that items such as general and administrative expenses, depreciation, interest payments, capital expenses, and other fixed costs or costs which do not vary immediately and directly as a result of this service at issue shall not be included. In other words, it is the Committee's intention that variable cost shall be direct operating expense or cost of providing the service to which the rate, fare, or charge applies.[11]

The Senate Report offers the only other insight into this provision, stating that section 202 was intended "to prevent the Commission from prescribing minimum railroad rates designed to protect another mode."[12] This reflects the concern of Congress that, notwithstanding all previous legislative efforts, the practice of umbrella ratemaking had not ceased.

This section of the 4R Act also reflects another important goal related to the adequate revenue level issue—integration of ratemaking standards with a revised costing system based on a new uniform system of accounts (USOA) mandated elsewhere in the 4R Act. This is the first time rail accounting and costing standards are required to be designed with ratemaking and revenue needs in mind.

The relationship between ratemaking standards and costing and accounting methods, while a highly technical issue, is not trivial. In section 307 of the 4R Act, Congress directed the ICC to revise the USOA, "in order to assure that the most accurate cost and revenue data can be obtained ... (for the purpose of) establishing fair and reasonable rates, and other regulatory areas of responsibility...."

Prior to passage of the 4R Act, the USOA for railroads, prescribed by the ICC, was particularly ill suited to the type of data collection needed to estimate railroad variable costs. That accounting system provided only firm-wide account totals and contained mixed accounts whereby different types of expenses were included in a single account. The costing system had been developed in the 1930's and had not been significantly updated since World War II.

In response to the mandate of the 4R Act, the ICC developed an updated USOA. The system still requires firm-wide totals, but the data are broken down into more discrete data collection and reporting accounts. Additional modifications requiring accounting data to be gathered on a basis more specific than firm-wide account totals will be considered in 1979.

Clearly, the procedures involved in the determination of variable movement costs for the purpose of computing going concern value are not the same as those required for other areas of regulatory responsibility, such as general financial oversight. In that regard, the ICC should give special consideration to the continued development and integration of specific variable costing procedures—both short run and long run. At the same time, the development of uniform accounts for carrier-reporting purposes should enable timely measurement of aggregate firm (and industry) performance and revenue needs.

MAXIMUM RATES AND MARKET DOMINANCE

The best known of the ratemaking reforms enacted by the 4R Act is the so-called market dominance provision. Section 202(b) establishes a framework for determining when the ICC can find a proposed rate to be too high, by providing that no rate can be found unlawful on the basis that it is too high unless the ICC has first found that the proponent railroad has market dominance over the service associated with the rate. The only guidance Congress provided the ICC in defining market dominance was to state that it "refers to an absence of effective competition from other carriers or modes of transportation, for the traffic or movement to which a rate applies."[13] The statute requires the ICC to establish, through a public rulemaking, "standards and procedures for determining ... whether and when a carrier possesses market dominance...."

The statute makes it clear that the market dominance test is not a test of the reasonableness of a proposed rate. Rather, if a proposed rate increase is challenged and the proponent company is found to have market dominance over the affected service, only then may the ICC consider whether the proposed rate is too high.[1]

[1]The Senate Report states:
The market dominance test is not designed to be an ultimate regulatory standard. Instead, it is designed as a threshold test to direct the Commission's regulatory activities into areas where the public interest needs protection, while deregulating and giving flexibility to the railroads in areas where effective competition from other railroads and other modes can supplant the need for maximum price regulation.[14]

The market dominance provision has been implemented by the ICC through the establishment of three criteria, the existence of any one of which would give rise to a rebuttable presumption that a railroad proposing a higher rate had market dominance over the affected traffic. Under these rules, market dominance would be found to exist if: (1) the proponent railroad carried more than 70 percent of the traffic in the relevant market; (2) the proponent railroad would, under the proposed rate, earn more than 160 percent of its variable cost of providing the service; or (3) affected shippers had made a substantial investment in rail-related facilities. In connection with the first, or market share test, the market share of any railroad that had discussed the proposed rate in a rate bureau was added to the share of the proponent railroad.

The railroad industry and the Departments of Justice and Transportation believe this rule is excessively restrictive and will result in inappropriate findings of market dominance. Specifically, the market share test fails to accord necessary consideration to geographic and product competition. The variable cost test fails to set forth a rational basis for the 160-percent figure and is inconsistent with the ICC conclusion, noted earlier, that rates should not be expected to make similar contributions to overhead if the railroads are to attain adequate revenues. The third rule fails to specify the number, amount, or type of investment necessary to invoke the presumption.

The market dominance regulations promulgated by the ICC were challenged in the courts by the railroad industry and the Departments of Justice and Transportation, who contended that the rules were too restrictive. A group of electric utilities contended the opposite. The court upheld the ICC's rules but required the ICC to explain further how its 160-percent figure was developed. The ICC has not as yet done so.

The market dominance provision of the 4R Act is clearly crucial to the effectiveness of the reform provisions of the 4R Act. Fundamental changes in the underlying rules may be necessary before market dominance determinations can accord the railroads the degree of ratemaking flexibility that Congress intended.

SEASONAL, REGIONAL, OR PEAK-PERIOD RATES

Another principal tool of the 4R Act for accomplishing ratemaking and regulatory reform is contained in section 202(d), which adds a new paragraph (17) to the IC Act. This section requires the ICC to establish by rule:

> ... standards and expeditious procedures for the establishment of railroad rates based on seasonal, regional, or peak-period demand for rail services. Such standards and procedures shall be designed to (a) provide sufficient incentive to shippers to reduce peak-period shipments ...; (b) generate additional revenues for the railroads; and (c) improve (i) the utilization of the national supply of freight cars, (ii) the movement of goods by rail, (iii) levels of employment by railroads, and (iv) the financial stability of markets served by railroads.

The ICC rules implementing this 4R Act provision attempt to accommodate the congressional intent to provide rail management with sufficient flexibility to experiment with these new forms of demand-sensitive rates.[15] The definitions and guidelines recognized that, by their very nature, demand-sensitive rates must not be regulated rigidly.

In some important respects, however, the rules governing demand-sensitive rates are still too restrictive. Most importantly, the rules require 30 days' notice of publication or cancellation of a rate. If the railroads are to be encouraged to experiment with demand-sensitive rates, they must be permitted to publish them quickly enough to respond to a change in demand and cancel them promptly in those instances when the experiment proves unsuccessful or becomes outdated. A 30-day delay is too long to be responsive to seasonal or other changes in demand. The 30-day delay requirement is even more troublesome because agricultural commodities—the most important seasonal movement—are transported by motor and water carriers entirely free of regulatory restraint.

The ICC recently has agreed to consider allowing carriers to negotiate contract rates (rates and conditions of service negotiated in advance by shippers and carriers and left in effect for an agreed period of time). Whenever a carrier can preplan demand, equipment utilization and costs of operation can be optimized, shipper uncertainty over future rate levels can be reduced, and service can be tailored more nearly to the needs of particular shippers. Thus, virtually all the goals of section 202(d) would be met through implementation of contract rates. The regulatory imbalance problem relates to this issue as well. Motor contract carriers have already realized the lower operating and capital investment costs associated with negotiated volume and other contract terms. Similarly, the movement of coal by unregulated barge is virtually always performed under long-term contract. Nonetheless, the ICC has, generally, not allowed contract rail rates in the past. Even now, the ICC has only gone so far as to say it will no longer treat all contract proposals as illegal. The ICC has given no indication as to how liberal or restrictive its approval of the use of contract rates will be.[16]

As the earlier discussion makes clear, the old rule of ratemaking, with its emphasis on "inherent advantages," has been repealed. In its place are new statutory mandates requiring the ICC to consider rail revenue needs and to enhance the railroads' ability to compete with unregulated modes and to establish demand-sensitive rates that will smooth the flow of traffic. Contract rates that will help to accomplish these goals were never prohibited by statute and should be permitted and even encouraged by the ICC.

RATES FOR DISTINCT RAIL SERVICES

Another provision of section 202(d) of the 4R Act encourages railroads to separate some services now incorporated in rail tariffs and price these services separately. The provision reads:

> In order to encourage competition, to promote increased reinvestment by railroads, and to encourage and facilitate increased non-railroad investment in the production of rail services, a carrier by railroad subject to this part may, upon its own initiative or upon the request of any shipper or receiver of freight, file separate rates for distinct rail services. Within 1 year after the date of enactment of this paragraph, the Commission shall establish, by rule, expeditious procedures for permitting publication of separate rates for distinct rail services in order to (a) encourage the pricing of such services in accordance with the carrier's cash-outlays for such services and the demand therefor, and (b) enable shippers and receivers to evaluate all transportation and related charges and alternatives.

Currently, most rail tariffs contain a wide variety of services—such as loading and unloading, detention, reconsignment and diversion—all included within the single tariff rate. Not every shipper needs all these services, but every shipper pays the same amount, nonetheless. Disaggregating these separable services from the tariff and pricing them separately would be a significant step toward providing packages of price and service options suited to individual shippers' needs.

The rules adopted by the ICC in implementing this provision, however, do not allow varying qualities of line-haul service to qualify as distinct services; these rules do not set up expedited procedures for considering distinct service rate proposals; and they prescribe rigid formulas for the nature and timing of data submitted in support of rate proposals. Each of these problems makes it less advantageous for the railroad to separate particular services from existing tariffs and price the services separately.

A greater disincentive to distinct service pricing, however, stems from the ICC decision to reaffirm an earlier decision that requires railroad managment to publish a line-haul rate decrease every time a distinct service is disaggregated from an existing tariff.[2] The relevant portion of the ICC decision in that case held that not only must the price for a distinct service be reasonable, but the underlying line-haul rate must be proven reasonable as well. The apparent concern of the ICC was that failure to change the line-haul rate when a distinct service is separated from it would have the effect of increasing that rate. This result would occur in some cases, but not all, depending on how many shippers affected by the rate were taking advantage of the distinct service embodied within the original rate in the first place.

In any event, lessening the rate for the line-haul service to offset the disaggregation of, and separate charge for, the distinct service would thwart one of the fundamental objectives of the 4R Act. The 4R Act is aimed, explicitly, at increasing railroad ratemaking flexibility not only as an end in itself but as a means to increase railroad revenues and the attractiveness of investing in the railroad industry. Strict application of past ICC decisions to all distinct service-pricing proceedings simply results in the substitution of one rigid regulatory policy for another. The railroads are deprived of additional revenues in markets in which demand could accommodate price increases and the ability to compete intermodally in markets served by regulated and unregulated carriers of competing modes.

One final concern that arises in connection with all the 4R Act ratemaking reforms—and section 202(d) in particular—is reconciling flexible-pricing rules with the antidiscrimination provisions of the IC Act. Distinct service pricing may be thwarted by routine protests that distinct services and prices offered to a given shipper must be available to all shippers or that the shippers who are offered such services must all be charged the same rates. The decision to separate services and price them separately should be a reflection of the competitive and other transportation conditions surrounding a particular movement. Thus, if the railroad is able to separate, for example, reconsignment and diversion privileges in connection with lumber movements in a particular

[2]The decision the ICC reaffirmed is *Inspection in Transit, Grain and Grain Products,* 349 I.C.C. 89 (1975). While the 4R Act does not explicitly overrule the decision, the thrust of the Act, particularly those portions aimed at generating additional revenues for the railroads, necessitates limiting application of the case to fact situations essentially similar to that of the case itself. The ICC has applied this decision in every case in which a service now provided under a tariff is priced separately.

geographic area, this does not mean that movements other than lumber in that area, or that shippers of lumber in other areas must have the same service available, or that those to whom it is offered must all be charged the same rate for similar service if costs and competitive circumstances are different. The ICC in promulgating final rules acknowledged the validity of this concern but failed to take any action.

MODIFICATION OF ICC SUSPENSION POWERS

Section 202 of the 4R Act modified the power of the ICC to suspend railroad rates by creating an experimental 2-year, no-suspend zone that allows a railroad to increase or decrease a rate within specified limits without fear of suspension on the grounds that it is too high or too low. This provision has lapsed, although legislation is now pending that would extend and, possibly, amend it.

While the experiment was in effect, the ICC could not suspend a rate filed pursuant to the experimental 2-year, 7-percent, no-suspend zone unless one or more of the following situations arose: (1) the proposed rate would violate the antidiscrimination, preference, or prejudice provisions of the IC Act; (2) the proponent of a proposed rate increase was found to have market dominance over the affected service; (3) the rate proposal was for a decrease that would constitute an unfair, destructive, or predatory practice; or (4) the proposal had general applicability, such as an across-the-board general rate increase.

While the no-suspend zone was in effect, it was tied to the market dominance provision and was thus constrained in its potential contribution to more flexible ratemaking. Indeed, other provisions of the 4R Act provided greater flexibility than the no-suspend zone, which was designed specifically for that purpose. For example, a railroad could reduce a rate by more than 7 percent without fear of suspension so long as the rate was at, or above, variable cost and would not cause substantial injury to a complainant. A rate could be increased by more than 7 percent if there were effective competition and if sections 2, 3, or 4 of the IC Act were not violated. Legislation has been proposed both to renew the no-suspend zone concept and to untie it from the market dominance provision.

Section 202 also prohibited the suspension of a rate on the grounds of unreasonableness unless it is shown, by verified complaint, that without suspension the proposed rate causes substantial injury to the complainant and that the complainant is likely to prevail in a subsequent investigation of the merits of the complaint. This provision has not lapsed, and it represents a significant shift of the burden of proof in suspension proceedings. It should allow railroads to implement new rates more quickly and, therefore, respond competitively to changes in market situations.

RATE BUREAUS

The Reed-Bulwinkle Act of 1948 accorded the ICC the right, at its discretion, to exempt member railroads from the application of the antitrust laws to their collective considerations of proposed rate actions within rate bureaus. By virtue of the exemption, members may collectively consider proposed rate actions. The 4R Act makes several important changes in the Reed-Bulwinkle Act. Foremost among these are: (1) prohibiting carriers from agreeing or voting on single line rates; (2) limiting voting and agreeing on joint line rates to those carriers who can "practicably participate" in the affected movements; and (3) restraining the bureaus from protesting or seeking suspension of independently proposed rates. General rate increases and tariff changes of broad applicability are exempted from these changes. Finally, the statute provides that parties alleging violation of these provisions must carry the burden of proving the allegations. A showing of parallel behavior is not, by itself, sufficient to satisfy the burden.

The 4R Act requires rate bureaus to draft new agreements incorporating these changes and submit them to the ICC for approval. If the changes are properly implemented and if the ICC finds that approving the agreement would further the national transportation policy, the ICC may approve the agreement and thereby immunize the approved operations from the effects of the antitrust laws.

The Senate Report accompanying the 4R Act states that "... the primary purpose of the (the 4R Act changes) is to restrict rate bureau processing of ... rate adjustments to fost(er) greater competition among the railroads... Railroads would thus be encouraged to put into effect rates which applied solely to their own lines without first obtaining the views of other railroads..."[17]

New rate bureau agreements were submitted to the ICC, and extensive hearings have been held. In announcing the Tidewater Coal Demurrage Agreement, the ICC considered three issues: (1) whether the agreement enhances the national transportation policy; (2) whether it harms interests protected by the antitrust laws (such that immunity is required); and (3) whether the benefits of the agreement outweigh the harm done to these interests. The ICC Report and Order states: "... we cannot find that the national transportation policy would be enhanced by this agreement. Even if we could, we would not be able to find that the benefits of the agreement outweigh its disadvantages."[18]

The decision is particularly interesting for its discussion of the relationship between the IC Act and the antitrust laws. The ICC concludes:

> ... the view (of) the courts (is) that in the scheme of national policy, the position of the antitrust laws is "fundamental"... Nor does the general regulatory scheme of the Interstate Commerce Act repeal by implication the antitrust statutes as they apply to common carriers.[18]

More recently, the ICC rejected the major rate bureau agreements covering the Eastern, Western, and Southern Districts. The ICC found that the bureaus had not shown that current transportation conditions still merited antitrust immunity and had relied on the original approvals of the rate bureau agreements. The ICC concluded that the agreements were not in furtherance of the national transportation policy and gave the bureaus 90 days to submit additional evidence. If the agreements are ultimately rejected, a significant change will have to be made in rail rate-setting practices. While interline rates could still be negotiated, some rates now agreed to in rate bureaus would have to be set competitively.

INTRASTATE RATE REGULATION

The Transportation Act of 1920 first gave the ICC authority to raise intrastate rates that were so low as to constitute a burden on interstate commerce. The Supreme Court ruled in 1958 that an intrastate rate could not be raised by ICC simply because by itself it was not compensatory.[19] Rather, the entire structure of intrastate rates had to be shown to be inadequate before the ICC could adjust any one rate. The Transportation Act of 1958 reversed that decision. The Act directed the ICC not to consider the totality of intrastate operations in evaluating individual intrastate rates. Further, it permitted the ICC to institute an investigation of an intrastate rate whether or not the rate was considered by a State authority.

The 4R Act modifies the authority of the ICC to adjust intrastate rates in two respects. First, the 4R Act requires a railroad company to file a request for a rate increase with the appropriate State agency, and the agency is given 120 days to decide the matter, before it could be considered by the ICC. Second, the ICC is, after that time, empowered to raise an intrastate rate to the level charged on similar traffic moving in interstate or foreign commerce. This section assures that if a railroad company cannot raise intrastate rates to interstate levels through the appropriate State agency, the ICC will be able to make the adjustment without undue delay.

EXEMPTION AUTHORITY

Section 207 of the 4R Act requires the ICC, under specified circumstances, to exempt persons, classes of persons, services, or transactions from regulation. Section 207 reads:

> Whenever the Commission determines, upon petition ... or upon its own initiative, in matters relating to a common carrier by railroad ... after notice and reasonable opportunity for a hearing, that the application of the provision of this part (i) to any person or class of persons, or (ii) to any services or transactions by reason of the limited scope of such services or transactions, is not necessary to effectuate the national transportation policy declared in this Act, would be an undue burden on such person or class of persons or on interstate and foreign commerce, and would serve little or no useful public purpose, it shall, by order, exempt such persons, class of persons, services, or transactions from such provisions to the extent and for such period of time as may be specified in such order. The Commission may, by order, revoke any such exemption whenever it finds, after notice and reasonable opportunity for a hearing, that the application of the provisions of this part to the exempted person, class of persons, services, or transactions, to the extent specified in such order, is necessary to effectuate the national transportation policy declared in this Act and to achieve effective regulation by the Commission, and would serve a useful public purpose.

The Conference Report indicates that the purpose of this provision is to remove from regulation any services that could be better performed absent regulation. The report states that section 207:

> ... requires the Commission to exempt from regulation under the Interstate Commerce Act any rail carrier-related person, service or transportation if regulation would serve little or no useful public purpose and it is unnecessary to effectuate the goals of the National Transportation Policy ...[20]

There are many commodities and areas of the economy for which competition from other modes of transport is pervasive. Frequently, railroads compete against unregulated motor and water carriers which set prices and provide services at will. The DOT believes that the ICC is required by the 4R Act to study whether continued regulation of railroad transportation of those commodities is a useful public service. The legislative history of section 207 makes clear, in fact, that this provision was intended to be used for that very purpose:

> The provision is ... addressed to the present inequity of the Interstate Commerce Act which regulates certain commodities for the railroad, but exempts them for other modes. The Committee is particularly desirous that the Commission, by its own action, thoroughly study and review this inequity and take the necessary steps to place the rail industry on an equal footing in terms of competition.[21]

Pursuant to this legislative history, the Southern Pacific recently requested the ICC to exempt from regulation the transportation of those agricultural commodities for which motor carriers are exempt. The ICC dismissed the Southern Pacific petition but published an advance notice of proposed rulemaking seeking comment on the scope of section 207 generally and on the issues raised by the Southern Pacific specifically. The DOT has taken the position, in that proceeding, that the exemption should be applied in all cases where effective competition exists, particularly in the movement of all perishable produce.

Throughout the 4R Act, Congress makes clear its belief that, in situations where it exists (or might exist), competition is a more effective regulator of rates than the ICC. Section 207 provides a clear mandate to seek out those situations and consider whether regulation should be continued. Carrying out this mandate is essential to realizing the overall regulatory purpose of the 4R Act.

CHANGES IN ICC-PROCESSING REQUIREMENTS

Section 202(e) of the 4R Act places time constraints on the ICC when the ICC deems hearings necessary in rate cases. Such hearings must be completed within 7 months of the date on which the proposed rate is to become effective, unless the ICC requests and receives from Congress permission to extend that period by 3 months. Should the ICC fail to comply with this requirement, the proposal will become effective automatically but can subsequently be reversed by the ICC, after a hearing.

This provision, as well as the provision regarding grounds for suspension, lessens significantly the problem of regulatory lag. Rate and other proposals no longer can remain suspended by the ICC until the circumstances giving rise to them no longer exist, or the proponent simply gives up in frustration. By reducing regulatory lag, the ICC simultaneously lessens the amount of time and money expended in the regulatory process.

MERGER PROCEDURES

As noted in earlier chapters, Congress has long been concerned about rail mergers and consolidations. Virtually every major piece of rail legislation since 1887 has addressed this question. The 4R Act is no exception.

The Conference Report summarizes the major changes in merger standards and procedures made by the 4R Act, as follows:

> The most significant features of (this provision) are that the Secretary of Transportation is given a significant role as a catalyst in the studying, developing, and negotiating of railroad mergers. Further, the Secretary is authorized and, under the new "expedited merger proceedings," is directed to appear before the Commission with the result of his studies.
>
> Second, alternative merger procedures, with different standards for review by the Commission, are made available to railroads attempting to merge.
>
> Third, strict time limits are placed upon the Commission for the completion of merger proceedings.[22]

The 4R Act establishes time limits for filing comments, inconsistent applications and petitions for inclusion, and for the completing of the evidentiary hearing and rendering of a decision by the ICC. The Secretary of Transportation is authorized to study and negotiate mergers and consolidations and to appear before the ICC in connection with all merger and consolidation proceedings. Employee protective arrangements provided by existing section 5(2) of the IC Act are also modified and a new section 5(3) is

added that, in the words of the Conference Report:

> ... offers to railroads an alternative procedure for seeking approval of a merger that differs in significant functional aspects from section 5(2) of the Interstate Commerce Act in that (1) the initial planning or review process is undertaken by the Secretary rather than in a hearing before the Commission (however, after the plans are finalized, they are submitted to the Commission for its approval), (2) it establishes public interest as the standard for the Commission's approval of a merger rather than the standards established under section 5(2) of the Interstate Commerce Act, and (3) the Commission is directed to approve, disapprove or modify the application before it, based on the public interest test and without concerning itself with inclusion applications. This stems from the fact that the only merger applications that are permitted to be reviewed by the Commission ... are those that apply to the Secretary, for study, 6 months prior to applying to the Commission. Once such an application is presented to the Commission, it must be acted upon on its own merits.[23]

The standards to be applied under sections 5(2) and 5(3) are different but not necessarily inconsistent. Section 5(2)(b) of the 4R Act provides that a consolidation proposal is to be approved when it is "consistent with the public interest" and the terms and conditions of the proposal are "just and reasonable." In determining whether this standard is met, the ICC is required, under section 5(2)(b), to consider the same four factors that were enacted in the Transportation Act of 1940. In addition to those factors, the courts have required the ICC to consider the effects of the merger on competitors and on the general competitive situation in the industry, in light of the objectives of the National Transportation Policy.[24]

The phrase "consistent with the public interest" has been construed to mean compatible with the public interest, or, at least, not contradictory or hostile to the public interest.[25] The Rail Services Planning Office's (RSPO) recent merger report recommends that there not be a distinction between the two statutory criteria of "consistent with" the public interest and "in" the public interest; the DOT supports this view. The statute also provides that in assessing the public interest, the ICC is not restricted to the specific proposal advanced by the applicants but may also consider modifications suggested by other parties, including requests for inclusion by another railroad or railroads.

Section 5(3) offers railroads an alternative procedure for seeking approval of consolidations. Under this provision, the initial analysis of the proposal is to be made by the Secretary of Transportation, who is directed to study each proposal with respect to the following nine factors.

- The needs of rail transportation in the geographical area affected
- The effect of such a proposed transaction on the retention and promotion of competition in the provision of rail and other transportation services in the geographical area affected
- The environmental impact of such a proposed transaction and of alternative choices of action
- The effect of such a proposed transaction on employment
- The cost of rehabilitation and modernization of track, equipment, and other facilities, with a comparison of the potential savings or losses from other possible choices of action
- The rationalization of the rail system
- The impact of such a proposed transaction on shippers, consumers, and rail employees
- The effect of such a proposed transaction on the communities in the geographical areas affected and on the geographical areas contiguous to such areas
- Whether such a proposed transaction will improve rail service

In the event the consolidation proposal is subsequently submitted to the ICC for approval, the Secretary is directed to submit a report to the ICC setting forth the results of his study of the proposal, and the ICC is directed to give "due weight and consideration" to the report in determining whether the transaction is "in the public interest." However, the standards established under section 5(2) do not govern the determination of "public interest" under section 5(3).[26] A key distinction between review of consolidation proposals under section 5(2) and (3) is that unlike section 5(2) proceedings, the ICC is to review each application submitted under section 5(3) on its own merits, without concern for inconsistent applications or petitions for inclusions.

The reason for the distinction between section 5(2) and (3) is detailed in the House Report, as follows:

> The Committee's Subcommittee on Transportation and Commerce began this session considering various problems surrounding the bankrupt Rock Island Railroad. One of the major reasons for the plight of that railroad was that nearly twelve years elapsed before the Commission adjudicated whether or not it should be allowed to merge with a strong railroad.

The Committee recognizes that to a great extent the plight of the Rock Island is the inadequacy of existing merger provisions. Therefore, Title V of the bill provides an expedited merger procedure with prior evaluation, analysis and assistance by the Secretary.

The changes made in existing law can best be illustrated by comparing existing law with the changes recommended by the Committee.

Under existing law, the Commission would handle each merger through its adjudicative process, and try to accommodate all the conflicting requests of the various groups—the carriers, labor, and the affected communities. Further, all railroads could petition to be included in such merger at any time during the merger proceedings.

This situation brought before the Commission a never-ending series of proposals for inclusions. Further, the Commission does not have a planning staff to study the proposed mergers, and therefore remains at the mercy of the railroads, who many times would submit an infinite number of petitions for Commission consideration. The Commission would have to deal with petitions as they were filed, and as the parties appeared before them, rather than attempting to have a period of time in which to study the proposed merger.

Lastly, there are no limits under existing law in which the Commission is required to complete the merger proceedings.

Therefore, in developing a new policy toward railroad mergers the Committee created an alternative merger procedure rather than repealing the existing section 5(2) of the Interstate Commerce Act. The reason for having alternative methods for railroad mergers was to permit railroads the option of petitioning under either procedure.[27]

Thus far, two major proposals have been accepted for filing by the ICC: a control and acquisition proposal of the Burlington Northern and the St. Louis-San Francisco; and a proposal for the joint control of the Detroit, Toledo and Ironton by the Norfolk and Western and the Baltimore and Ohio. The latter proposal was contested by the Grand Trunk Western Railroad, which has filed an application for the purchase of Detroit, Toledo and Ironton. Hearings are now underway in both proceedings, and it is already clear that the procedures set up by the 4R Act, as well as the time limits imposed, have resulted in more carefully conceived and presented proposals and in prompt action by the ICC and interested parties.

ABANDONMENT PROCEDURES

Sections 802 and 809 of the 4R Act make significant changes in the IC Act's procedures with respect to abandonment of railroad lines and discontinuance of rail service. Briefly, these sections require the ICC to promulgate procedures governing: (1) the public notice required for a proposed abandonment; (2) the opportunity for financially responsible persons to provide financial assistance to maintain operations over a line proposed for abandonment; (3) the standards to be applied by the ICC in determining whether to permit abandonment or discontinuance; (4) railroad companies' preparation of diagrams of their respective rail systems, identifying lines potentially subject to abandonment and lines that do not earn revenues sufficient to cover the costs of their operation; (5) calculation of avoidable costs and attributable revenues for lines proposed for abandonment; and (6) definition of terms such as "significant user" for purposes of determining whose interests need to be protected when abandonments are proposed. Additionally, section 303 of the 4R Act places time limits on the ICC in processing abandonment applications.

The ICC conducted a rulemaking proceeding to implement these changes, but the rules were challenged in the courts, on several grounds. First, the regulations set forth four actions that the ICC could take if a decision were made to issue a certificate of public convenience and necessity for the abandonment of a line, but parties were unable to execute a financial assistance agreement to continue the line in operation. One of the actions the ICC proposed to take under these circumstances would be to "reopen the underlying abandonment or discontinuance proceeding to reevaluate the application on its merits in light of the financial assistance offer." This portion of the regulation was found invalid by the U.S. Court of Appeals for the Seventh Circuit because the failure of subsidy negotiations is unrelated to the issues on which the decision in the underlying abandonment proceeding is based and cannot, therefore, properly constitute a ground for reopening that proceeding.[28] In addition to the Court's rationale, DOT believes the ICC's proposed action would allow the abandonment proceeding to drag on endlessly, in

direct contravention of the 4R Act requirement that abandonments be handled expeditiously.

The challenged regulations also set forth rules for the computation of off-branch costs as part of the total computation of the avoidable cost of providing rail service over a line proposed for abandonment. The 4R Act directs a reexamination of the accounting and costing methods upon which these ICC rules are based. The court also required fundamental changes in these accounting and costing procedures.

The rail branchline abandonment problem has as its fundamental cause the inability of the carriers to cover the continuing costs of operation and maintenance of certain light-density lines, due to the decline in their usefulness as pickup and delivery mechanisms. Although some lines can continue operation and service through implementation of innovative carrier-shipper arrangements, other lines may have permanently lost their function in a modern transportation environment. Accordingly, the primary test of the public convenience and necessity in abandonment proceedings should reflect the total benefits and costs—both public and private—of continued line operation in the context of other transportation alternatives. Clearly, the potential opportunity for continued operation of some lines through increased flexibility in pricing, costs, and service arrangements can only be assessed by that type of comparative analysis. It would also be the foundation for shipper-carrier cooperation that could result in a renewed economic usefulness for those lines that were shown to have clear potential as a result of a more benefit/cost-oriented public convenience and necessity standard, but without placing the burden of continuing nonremunerative services solely on the private railroad companies.

ADDITIONAL PROBLEMS IN THE REGULATORY SYSTEM

The 4R Act, if properly implemented, would resolve many problems in the regulatory system. Most fundamentally, it recognizes that the railroads are no longer the monopoly power that they were in the 19th century and that a regulatory system created to deal with that situation is no longer appropriate. The discussion in the preceding sections dealt with the issues confronted by the 4R Act and pointed out where problems still remain.

A number of important issues, however, are not addressed fully by the 4R Act, and they remain significant impediments to the financial viability of the railroads. These issues include: (1) regulatory and policy imbalances among different modes; (2) subsidies to shippers or geographical areas built into the rate structure; and (3) the meaning and application of the antidiscrimination provisions of the IC Act. Those issues are discussed in this section.

THE REGULATORY IMBALANCE

Every major product or commodity that travels by rail is regulated. This means that the railroads must publish and adhere to approved rates, apply to initiate, change, or cancel rates at least 30 days in advance of proposed movements, and maintain a supply of cars adequate to move any traffic that shippers wish to move by rail. All railroad companies are common carriers, subject to the common carrier obligation that requires a railroad to serve at any time any shipper who is willing to pay the published tariff charge.

On the other hand, the interstate motor carrier industry includes regulated carriers, private carriers, exempt carriers, and individual owner-operators. Regulated carriers comprise only about 40 percent of the motor carrier industry in ton-miles. Only this segment of the industry is regulated in ways essentially similar to the railroads. Unregulated trucking operations include: (1) private carriers (trucks owned and used by businesses to carry their own goods); (2) exempt carriers, largely owner-operators, a category that includes all unprocessed agricultural commodities; and (3) contract carriers, who are regulated only as to safety and operating authority but not with respect to rates. In addition, the vast majority of commodities that travel by water are unregulated.

Perhaps nowhere else does this difference in regulatory treatment of the several modes of surface transport become as apparent as when a shortage of transportation equipment appears. From time to time, every mode of transportation runs short of equipment. While primary attention has focused upon the supply of railroad freight cars, there also have been occasions when the supplies of barges and trucks were inadequate to meet the demands of shippers. In the case of unregulated barge and truck traffic, however, the ability to price and offer services provides a means of rationing equipment in response to demand and alleviating shortages. In times of great demand, the rates charged by motor and water carriers hauling unregulated commodities are quickly raised to a level where a shortage no longer exists because the market for transport by these carriers clears at the new price level. Thus, the pricing mechanism used by carriers of unregulated commodities permits a workable solution to equipment shortages regardless of the supply or demand for service at any particular time. By contrast, railroads are hampered in their ability to react to changes in

market conditions because of the rigidity of regulated rates.[3]

Particularly in the rail movement of bulk agricultural commodities, the lack of a responsive-pricing capability means there is little economic incentive for shippers to smooth the peaks in the annual rail movements of such large-volume commodities as grain. One result of rail-pricing rigidity is that the railroads must attempt to maintain a supply of cars throughout the year sufficient to meet peak-period demand. Those cars sit idle for the rest of the year, and the rates charged for their peak-period use are not permitted to reflect their year-round use. A further result is that growers and distributors have little incentive to store their products until the off-peak period, ship them at lower rates, and even out the demand for railcars over the year. This problem, although most apparent in the context of unregulated agricultural commodity movements by truck and barge, also arises in many competitive situations involving manufactured, processed, and other commodity transportation.

The record in Ex Parte No. 324—the ICC proceeding that implemented the 4R Act provision for seasonal and peak-period pricing—is replete with references to the problems faced by shippers and railroads in this context. Pittsburgh Plate Glass (PPG) Industries, for example, contrasted its experience in the shipment of potash in the United States, where seasonal rates do not exist, and in Canada, where railroad companies have access to seasonal pricing. PPG industries found that fluctuations in potash shipments in the United States were far greater. PPG Industries concluded the following:

> A program of seasonal rates would be of advantage to both railroads and shippers by making more efficient use of the supply of cars and improving the availability of cars as needed. Also, an improvement in service would be realized by not only having the equipment available when needed, but being able to move the product to market quickly and efficiently.
>
> The advantage we see for the railroads under a seasonal rate structure would be better car utilization. It would mean fewer cars in the system as well as a more even cash flow. The business which is lost as the result of less than satisfactory transit or insufficient car supply during the seasons is ... generally not regained ... [30]

The continuing growth and expansion of private truck and barge operations and the inroads of contract carriage have further undermined the foundation of rail traffic to the point where rail rate flexibility has become a matter of competitive necessity. Trucks with rates that vary over the year experience a far less severe fluctuation in demand. For example, the variation in demand for produce movements between California and Chicago over the year is approximately 200 percent. The variation in demand for rail service for the same commodities and between the same points is over 600 percent.[31] Traditional concepts of rate stability and fairness, as applied to rail ratemaking, have proven inadequate to maintain the rail industry's competitive presence in many markets. The ability of other carriers to attract traffic from railroads is made a great deal easier by imposing upon the railroads procedural conditions not imposed on other carriers.

THE POLICY IMBALANCE

This report consistently notes the fundamental imbalance in Federal policy on the question of whether transportation companies should pay for their own rights-of-way. Water carriers do not pay at all for rights-of-way nor for locks, dams, and other water facilities. No user charge legislation currently exists that would require water carriers to pay a significant portion of the full cost of building and maintaining their rights-of-way. Although motor carriers pay some costs of the highway system, through fuel and excise taxes as well as motor vehicle registration fees, the taxpayer also makes a significant contribution to the building and maintenance of the highway system. The relative portion borne by the motor carrier industry has long been the subject of controversy.

A railroad company, on the other hand, must make the massive investments to build and maintain all its rights-of-way and pay property taxes that barge and motor carrier firms do not. This imbalance has important regulatory implications. In ratemaking practice, the imbalance in right-of-way costs has meant that low water carrier variable costs—because of the assumption of right-of-way costs by the Federal Government—were often compared to "fully distributed" rail costs in cases involving intermodal competition. Rail rates were held high by the ICC so as to contribute to the rails' high fixed charges. When

[3]The wide-ranging and quick-moving powers of the ICC over railcar service under section 1(11) and 1(15) of the IC Act offer an interesting contrast to the procedures normally employed in rate cases. As an example, in late December 1977, two large grain elevators were destroyed by an explosion in Westwego, La., and Galveston, Tex. On Dec. 30, 1977, the ICC issued two Service Orders directing the railroads to move the total of some 1,900 loaded grain cars stuck at those elevators to "... any other grain elevator ... located on the Gulf of Mexico." The ICC voided all railroad diversion and reconsignment charges and specified that upon arrival at the new destination, the rate would be computed as if it arrived from the initial origin. In case of failure of the railroad companies to agree on rate divisions, the ICC would establish them, and in the absence of a tariff route, any route could be used.[29]

a railroad competes against an unregulated barge, the rail rate inevitably forms the ceiling for that market, because the barge pays no right-of-way charges. The water carrier's "low cost" is thereby maintained and enhanced at the railroad's—and the taxpayer's—expense. To some degree, this problem is resolved by the 4R Act's mandate that any rate contributing to the railroad's "going concern value" is presumed lawful. However, the need to maintain and upgrade existing rights-of-way from revenues generated by the rate structure continues to place the railroads at a competitive disadvantage.

THE CROSS-SUBSIDY ISSUE

The term cross-subsidy is used to describe different things in different contexts. For purposes of the following discussion, four types of cross-subsidy have been identified. A below-cost cross-subsidy occurs whenever a commodity moves at a rate that does not cover incremental cost. Since railroads would save money by not moving such commodities at all, shippers of other commodities are forced to subsidize the movement of such commodities to the extent of the loss.

Two less obvious forms of cross-subsidy are product and geographical cross-subsidy. Product cross-subsidy occurs whenever rates are held down in order to encourage production and sale of particular products. Geographical cross-subsidy occurs whenever rates to or from a geographical area are held down to stimulate the growth of the area. Such subsidies do, however, necessitate increasing the costs to some shippers in order to reduce costs to others. Finally, an owner-shipper cross-subsidy occurs whenever rail rates are held to levels below those needed to produce an adequate rate of return to equity holders.

Historically, some rates were held down to levels that did not cover incremental costs, although there has been debate whether rates were held to those levels by regulatory fiat or because railroads failed to change them. Section 202(b) of the 4R Act puts an end to the debate by stating that any rate increase from a level below incremental cost to one that equals incremental cost will be presumed to be just and reasonable. Implementation of that provision must be carefully monitored to assure that below cost cross-subsidies become a diminishing problem.

Geographical cross-subsidy has taken several forms. For a long time, the ICC was thought to exercise a policy of maintaining low rates to the West to encourage western development. Another example of forced geographical cross-subsidy concerns port equalization. The rates on export wheat traffic from points within the hard winter wheat belt are equalized (i.e., set at the same level) to many Gulf ports, although the length of haul and the costs of port terminal operations vary significantly.

Product cross-subsidy has been enforced by the ICC to help depressed industries, to permit producers in one locality to compete more effectively with producers from another locality, and to stimulate the growth of specific industries. Congress also has enacted resolutions designed to further social goals by directing that rates on certain commodities be held down. During the 1930's, the Hoch-Smith Resolution stressed the desire of Congress for low rates on agricultural products. Many general increase cases included holddowns on specific products. For example, the ICC has, in the past, accepted the argument of California wine producers that the producers require low rates on movements to the East in order to compete effectively with foreign wine makers.[32]

In Ex Parte No. 310, *Increased Freight Rates and Charges, 1975, Nationwide,* the ICC directed that rates be held down on certain enumerated commodities on the grounds that the industries producing them were depressed and in need of assistance. There were 35 commodities exempted from the increase, including coal, asphalt, iron ore, fertilizer, grain and related commodities, motor vehicles, sugar, paper, fresh fruits and vegetables, lumber, and all recyclable materials. The 4R Act also ordered the ICC to perform a special study of the rail rates for recyclables as compared with virgin materials, so as to promote the national policy in favor of recycling. Similar policy considerations also have been invoked in recent coal rate cases before the ICC and in the courts.[33]

Owner-shipper cross-subsidy occurs whenever rates are held down for social reasons or as a result of social policy, and the effect of such holddowns is to generate substandard rates of return for railroads. Many have argued that the ICC has been preoccupied with setting equitable levels for specific rates without considering the railroads' need for adequate revenue levels overall. As discussed above, section 205 of the 4R Act directs the ICC to assure that railroads have the opportunity to earn adequate rates of return, suggesting that to the extent that owner-shipper cross-subsidy has been encouraged by ICC action in the past, it is not to be so in the future.

Some rates make a larger contribution to fixed, common, and overhead costs than do others. When such differences are based on the different characteristics of different commodities, or on the ability of a railroad to attract traffic from competing modes, such differences are "cross-subsidies" only in the loosest sense. Such differences in contribution to fixed, common, and overhead costs are virtually inevitable for any multiproduct firm selling different outputs under different demand conditions. It is, however, important to distinguish between this type of demand-based differential pricing and the exter-

nally imposed holding down or raising up of particular rates on individual commodities or to particular locations, which represents a public policy of cross-subsidy.

When railroads were in a monopoly position, it was a fairly simple matter to rely on cross-subsidies to achieve specific societal goals. As other modes developed, however, it became clear to motor and water carrier managements that shippers by rail, forced to pay high rates to cross-subsidize other shippers, could be enticed to transport by another mode. A significant portion of the diversion of high-rated traffic to motor carriers is a direct result of the traditional patterns of cross-subsidy.

THE ANTIDISCRIMINATION PROVISIONS OF THE INTERSTATE COMMERCE ACT

Sections 2, 3, and 4 of the IC Act are generally referred to as the antidiscrimination provisions. These sections were not changed by the 4R Act but are often misunderstood. The following brief discussion attempts to clarify those sections of the law.

Section 2

Section 2 states:

> ... if any common carrier subject to the provisions of this part shall, directly or indirectly, by any special rate, rebate, drawback, or other device, charge, demand, collect, or receive from any person or persons a greater or less compensation for any service rendered, or to be rendered in the transportation of passengers or property, subject to the provisions of this part, than it charges, demands, collects, or receives from any other person or persons for doing for him or them a like and contemporaneous service in the transportation of a like kind of traffic under substantially similar circumstances and conditions, such common carrier shall be deemed guilty of unjust discrimination, which is hereby prohibited and declared to be unlawful.

To prove a section-2 violation, it must be shown that a particular railroad company is charging two shippers different rates for the same service over the same line and between the same origin and destination. If any ingredient is missing, a "like and contemporaneous service" is not provided.[34] In *Standard Milling,* the ICC said the following:

> Section 2 of the Act is directed only to discrimination between shippers located at the same points or in the same communities, and involves the movements of said shippers' like traffic to the same destinations; if destinations of the traffic are different, then the service which the carrier is rendering is not like and contemporaneous and there can be no violation of Section 2.[35]

Section 3(1)

Section 3(1) prohibits a carrier from charging different rates to shippers, if the different rates result in undue preference or prejudice among the shippers. This provision reads as follows:

> It shall be unlawful for any common carrier subject to the provision of this part to make, give, or cause any undue or unreasonable preference or advantage to any particular person, company, firm, corporation, association, locality, port, port district, gateway, transit point, region, district, territory, or any particular description of traffic, in any respect whatsoever; or to subject any particular person, company, firm, corporation, association, locality, port, port district, gateway, transit point, region, district, territory, or any particular description of traffic to any undue or unreasonable prejudice or disadvantage in any respect whatsoever: Provided, however, that this paragraph shall not be construed to apply to discrimination, prejudice, or disadvantage to the traffic of any other carrier of whatever description.

Section 3(1) is concerned with situations in which, for example, two shippers in different cities, shipping to a single destination via the same railroad, are charged different rates even though the distance is approximately the same from both origins. A section-3(1) violation occurs only if one of the shippers can prove competitive harm because of the lower rate given to the other shipper.[36] If the distances to the common destination from the different origins are different, but the shippers nonetheless compete, the difference in the rates must be commensurate with the difference in the distance. Differing transportation conditions, including the

presence of competition over one route but not the other, justify a rate difference. Thus, a carrier violates section 3(1) only if there is an unjustified disparity between the rates that particular carrier charges and those of a different carrier.

Difficulties arise in interpreting section 3(1) when a railroad company serves one shipper directly and other shipper in a second city via joint-line service, and both are shipping to a common destination. In that case, a section-3(1) violation arises only if one carrier has the ability unilaterally to create or eliminate the difference in rates. The ICC and the Supreme Court have firmly established the principle that a carrier in such a situation commits a violation only if it has "control" over the joint-line rate.[37] Even then, a carrier that is shown to be responsible for a preference or prejudice can still argue that the difference in rates is justified by a difference in transportation conditions. This principle was established in *Interstate Commerce Commission* v. *Baltimore and Ohio Railroad Company,* where the Supreme Court said that "any fact which produces an inequality of conditions and change of the circumstances justifies an inequality of charge."[38] The ICC has held that competition from water or truck carriers justifies a rate difference.

Section 3(4)

Section 3(4) of the IC Act prohibits a railroad from discriminating among connecting companies in its rates, fares, or charges and from unduly prejudicing any connecting line in the distribution of its traffic, as follows:

> All carriers subject to the provisions of this part shall, according to their respective powers, afford all reasonable, proper, and equal facilities for the interchange of traffic between their respective lines and connecting lines and shall not discriminate in their rates, fares, and charges between connecting lines, or unduly prejudice any connecting line in the distribution of traffic that is not specifically routed by the shipper. As used in this paragraph the term "connecting line" means the connecting line of any carrier subject to the provisions of this part or any common carrier by water....

Thus, a railroad cannot favor one connecting line over another by entering into a lower joint rate. Section 3(4) does not, however, prevent a carrier from charging different rates for single-line and joint-line service (if the joint-line carrier refuses to concur in the lower rate).

Section 4(1)

Section 4(1) of the IC Act prohibits a carrier, except in special circumstances, from charging or receiving any greater compensation for the transportation of passengers or property for a shorter than for a longer distance over the same line in the same direction. Special circumstances are found to exist if the lower rate for the longer distance is required to meet competition.[39]

Reevaluation of Sections 2, 3, and 4

The economic and legal bases underlying sections 2, 3, and 4 of the IC Act were derived from considerations of equity that reflected the market power railroads enjoyed in an earlier era. Railroad companies and shippers alike have responded by adapting movement patterns, competitive relationships, and economic activities to conform to the strictures of these sections. Yet, pervasive changes in transportation competitive conditions since the passage of the IC Act call for a careful examination of the continued need for sections 2, 3, and 4 in their present form. Such an examination should focus upon whether rail transportation is sufficiently unique to warrant specific regulatory treatment or whether existing laws governing other commercial relationships are more applicable, with appropriate modification. In any event, careful consideration should be given to the increased need to recognize and respond to differences in the demand for rail transportation between and among users. With the advent of distinct service pricing, and seasonal and peak-period pricing, a clear statement of policy with respect to these provisions is imperative.

CONCLUSIONS AND RECOMMENDATIONS

Railroads were the first of the modern transportation modes. In the absence of competition, it was possible to use railroad rates as instruments of social policy. But the emergence of motor carriers, pipelines, and a modern water carrier industry has altered the situation dramatically and permanently. The railroads, for the most part, no longer enjoy monopoly power. The 4R Act is a reflection of that change and would, if fully implemented, provide a basis for modern regulation. Many of its provisions, however, have not been implemented or have been improperly interpreted, and there are some remaining regulatory problems that the 4R Act does not address.

Congress intended that the market dominance provision of the 4R Act be used in a manner that

reflects the generally competitive nature of the transportation markets served by railroads. As interpreted by the ICC, however, the market dominance provision is far narrower than Congress intended. In view of the court's affirmation of the ICC's interpretation, additional congressional action should be considered.

The implementation of other 4R Act provisions must be reexamined as well. In connection with the seasonal, regional, and peak-period pricing provision, the notice periods for initiating and canceling such rates must be shortened to periods comparable to those of the competing modes so as to encourage demand-sensitive pricing by railroads. The ICC's pending proposal to permit contract rates should be expanded and promptly implemented. The rules governing establishment of distinct service prices must be amended to allow greater coverage of services, more flexible rules for submission of data, and expedited ICC approval procedures. Most importantly, the ICC must reverse current policy requiring underlying line-haul rates to be lowered if a distinct service is removed from an existing tariff and priced separately.

Yearly proceedings to establish individual and general railroad revenue needs will be held by the ICC. The first is now pending. Industrywide as well as specific rate increase requests will be measured against the findings of the annual need assessment. The ICC's actions on these requests must receive thorough scrutiny.

Section 207 of the 4R Act gives the ICC authority to provide exemptions from regulation when continuing such regulation would serve little or no useful public purpose. In view of the congressional intent to place the rail industry on an equal, competitive footing with other modes, the ICC should make extensive use of that authority. Careful consideration should be given to the ICC's rulemaking proceeding on general exemption authority, since the findings will set a precedent.

The ICC should give special emphasis to the continued development of specific variable-costing procedures to be used by a carrier. Such procedures must be designed to give the maximum weight to specific conditions and circumstances associated with the movement in question, as well as the capacity utilization of the proponent carrier at the time. These requirements must be carefully distinguished from the more general accounting approach embodied in the USOA, useful only for financial oversight purposes. In this manner, the continued preoccupation with costing in ratemaking proceedings can be refocused in line with congressional intent—as a measure of going concern value, variable, and incremental cost, rather than as a substitute for demand-sensitive pricing by the railroads.

The ICC has recently issued a decision on the major rate bureau agreements submitted for approval, pursuant to 4R Act standards. The ICC proposed to reject those agreements unless the bureaus submit evidence within 90 days of the need for antitrust immunity in view of transportation conditions. That evidence will be used to decide whether a grant of immunity would further the national transportation policy. This issue requires further examination.

Pending legislative enactment of increased regulatory flexibility for all rates, DOT recommends that the ICC initiate a new proceeding seeking recommendations to lead to improved carrier-shipper cooperation on branchline rate and service issues, in the context of an overall examination of the public convenience and necessity standard for rail branchlines. Similarly, more ratemaking freedom should be afforded railroad company management in the area of eliminating port differentials or equalization when no market dominance is found.

One important provision of the 4R Act—the 2-year, 7-percent, no-suspend zone—has already expired. As originally enacted, it offered the railroads no more ratemaking flexibility than other provisions of the 4R Act because it was tied to findings of market dominance. Another no-suspend provision should be enacted, for an experimental period and with percentage restrictions, but the provision must allow a true experiment in flexible ratemaking by not subjecting no-suspend proposals to market dominance findings. Rates proposed under this provision would still be subject to the current antidiscrimination statutes and would still be subject to investigation as to lawfulness and refund with interest if rates are found unlawful. A new no-suspend provision will allow the railroads to compete more effectively against unregulated carriers.

Many problems continue to impede the achievement of a financially healthy railroad industry. Most importantly, regulatory and policy imbalances in the treatment of different transportation modes must be reconsidered. As indicated above, the ICC should use the powers granted by the 4R Act to exempt certain commodities from regulation where it finds that such exemption will not harm the public interest. If use of the 4R Act is inadequate to redress the competitive disadvantage faced by the railroads, additional specific legislative exemptions should be considered.

The DOT will study trends in the use of rail rates as an instrument of social policy. This study will examine, specifically, the extent to which rail rates are depressed to aid particular industries or regions and should examine current rail rates below variable cost. Congressional guidance will be sought and appropriate ratemaking standards enunciated for those situations in which rail revenue needs clearly conflict with other important policy goals.

The DOT will undertake a thorough examination of the impact of sections 2, 3, and 4 of the ICA Act, with particular emphasis upon such modernization of those sections as may be necessary to foster

greater carrier efficiency and intermodal competition. Concurrent consideration will be given to those aspects of sections 2 and 3 that may hinder the widespread use of contract rates and service arrangements between carriers and shippers.

Finally, while major progress has been made in reducing delays in the adjustment of rates by setting internal time deadlines, the ICC should consider allowing retroactive collection of suspended rate increases. If a suspended rate is ultimately found to be just and reasonable, it should be made retroactive to the date it would have been effective if not suspended. At present, when the ICC investigates a rate without suspending it, the carriers are often required to set aside the disputed increased amounts and provide refunds with interest if the rate is ultimately found unjust and unreasonable. On the other hand, if the rate is suspended and later found to be just and reasonable, the carrier loses the increased revenues that it deserved. Allowing the carrier to collect the increase retroactively would substantially reduce the costs of so-called regulatory lag and the number of suspension requests made by shippers desiring only to postpone the effective date of an increase.

REFERENCES

[1] Report of the Committee of Conference on S. 2718, Report No. 595, 94th Cong., 2d Sess., p. 148 (1976) (Conference Report).

[2] Report of the Senate Committee on Commerce on S. 2718, Report No. 499, 94th Cong., 1st Sess., pp. 10, 11 (1975) (Senate Report).

[3] Senate Report, pp. 10, 11.

[4] Report of the Committee on Interstate and Foreign Commerce, U.S. House of Representatives, on H.R. 10979, Report No. 725, 94th Cong., 1st Sess., p. 76 (1975) (House Report).

[5] The Elkins Act, Hepburn Act and Mann-Elkins Act, respectively.

[6] For an account of the railroad situation prior to and during the First World War, see Aaron Austin Godrey's *Government Operation of the Railroads, 1918–1920,* Austin, Texas: The San Felipe Press, 1974.

[7] The Interstate Commerce Commission *Annual Report for 1946,* p. 36.

[8] *United States* v. *Trans-Missouri Freight Association,* 166 U.S. 290 (1897); and *United States* v. *Joint Traffic Association,* 171 U.S. 505 (1898).

[9] See *Chicago, Milwaukee, St. Paul & Pacific RR* v. *Illinois,* 335 U.S. 300 (1958) and *Public Service Commission of Utah* v. *United States,* 356 U.S. 421 (1958). In the Illinois case, for example, the court held: "We do not think that the deficit from (a) single operation can fairly be adjudged to work an undue discrimination against the Milwaukee Road's intrastate operations without findings which take the deficit into account in the light of the carrier's other intrastate revenues..." (at 307-8). This finding requires the ICC to study a company's total intrastate operation before finding a given rate unreasonable.

[10] Interstate Commerce Commission in Ex Parte No. 338, served Feb. 3, 1978, pp. 13, 17.

[11] House Report, p. 70.

[12] Senate Report, p. 14.

[13] Section 202(b) of the 4R Act.

[14] Senate Report, p. 47.

[15] The rules were promulgated in Ex Parte No. 324, *Standard and Expeditious Procedures for Establishing Railroad Rates Based on Seasonal, Regional or Peak Period Demand for Rail Services.*

[16] *Guaranteed Rates, Sault Ste. Marie, Ontario, Canada, to Chicago, Illinois,* 315 I.C.C 311 (1961).

[17] Senate Report, pp. 54–55.

[18] Report and Order of the ICC in section 5b application No. 10, Tidewater Coal Demurrage Agreement, served Jan. 30, 1978, at 78, 77.

[19] *Chicago, Milwaukee, St. Paul & Pacific Railroad Co.* v. *Illinois,* 335 U.S. 300 (1958).

[20] Conference Report, p. 135.

[21] House Report, p. 75.

[22] Conference Report, p. 174.

[23] Conference Report, p. 175.

[24] *United States* v. *I.C.C.,* 396 U.S. 491, 504, 519 (1970); *McLean Trucking Co.* v. *United States,* 321 U.S. 67, 83–87 (1944). Both the courts and the ICC, however, have recognized that insistence upon preservation of maximum competition among rail companies is no longer essential to the protection of the public interest given the competition that is present among the modes.

[25] *Seaboard Air Line Railroad Company-Merger-Atlantic Coast Line Railroad Company,* 320 I.C.C. 122 (1963), at 130.

[26] Conference Report, p. 175.

[27] House Report, p. 62.

[28] *Chicago and North Western Transportation Co.* v. *United States,* 7th Circuit, No. 76-2283, May 30, 1978.

[29] Interstate Commerce Commission, Service Orders Nos. 1292 and 1293.

[30] Initial Statement of PPG, Inc., Aug. 19, 1976, in Ex Parte No. 324.

[31] Department of Agriculture, *Fresh Fruit and Vegetable Unloads in Midwestern Cities,* Washington, D.C., May 1977.

[32] See Ex Parte No. 281, *Increased Freight Rates and Charges,* 1972, served Oct. 4, 1972, at 448–450.

[33] See *City of San Antonio* v. *Burlington Northern* (et al.), Docket No. 36180 now pending at the ICC, and *Incentive Rate on Coal-Cordero, Wyoming, to Smithers Lake, Texas,* Docket No. 36608 and *Incentive Rate on Coal, Gallup, New Mexico, to Cochise, Arizona,* Docket No. 36612, both on appeal to the U.S. Court of Appeals for the District of Columbia.

[34] See, for example, *Wight* v. *United States,* 167 U.S. 512, 518 (1897)

[35] *Standard Milling Co.* v. *Illinois Central Railroad Co.,* 321, I.C.C. 252 (1963) at 259.

[36] See, *Boston Wool Trade Association* v. *Boston and Albany Railroad Co.,* 78 I.C.C. 178, 183 (1923).

[37] See, *Ashland Fire Brick Co.* v. *Southern Railway Co.,* 22 I.C.C. 115 (1911). The result reached in the Ashland case was affirmed in *Texas and Pacific Railway Co.* v. *United States,* 289 U.S. 627 (1932).

[38] *Interstate Commerce Commission* v. *Baltimore and Ohio Railroad Co.,* 145 U.S. 263 (1892), at 284.

[39] See, *Iron & Steel from Official to Western Trunk Line Territories,* 318 I.C.C. 449 (1962).

7.
ALTERNATIVES FOR FEDERAL FINANCIAL ASSISTANCE

The financial collapse of much of the northeastern railroad system in the 1970's led to major federally sponsored reorganization and established a new pattern of Government involvement in rail transportation matters. The Railroad Revitalization and Regulatory Reform (4R) Act of 1976 underscored this fundamental change by calling upon the Secretary of Transportation to recommend ways by which the Federal Government should provide future aid to the industry and the amounts, if any, of such assistance.

Earlier chapters stressed segment-by-segment restructuring, intermodal equity, and regulatory flexibility as ways of reducing the need of the industry for outside capital assistance. Even with these changes, the Department of Transportation (DOT) anticipates that substantial Federal assistance will be required if railroads are to continue to fulfill their role in the national transportation system. This chapter outlines a policy of Federal financial assistance based on the different public purposes to be achieved and the proper forms such assistance should take.

The chapter reviews the DOT experience with Federal assistance programs and, in particular, the 4R Act programs of loan guarantees and preference shares. It recommends that future assistance to private railroad companies be provided in the form of repayable securities—loan guarantees and repayable credits, which may be either debt or equity. Grants would be used only to encourage improvements in the industry's productivity. The DOT intends to administer programs of financial assistance to encourage railroad industry restructuring.

The DOT will make recommendations on the amount and types of funding after considering public comment on this report. The degree of public acceptance of the DOT-proposed changes in public policy toward the railroads will have a important influence on the amount and form of Federal assistance to be recommended. The success of Federal aid will be dependent upon the willingness of the industry and the public to make the necessary changes.

SECTIONS 504 AND 901 OF THE 4R ACT

This report has endeavored to fulfill the mante in sections 504 and 901 within the broader context of the 4R Act. The report examines the current condition of the railroad industry and concludes that railroads are in great financial difficulty. With changing markets and increasing competition from trucks, barges, and pipelines, the railroads' share of domestic intercity freight traffic

(measured in gross ton-miles) has fallen from about 80 percent in 1925 to about 35 percent in 1976. With excessive track and a relative decline in traffic, portions of the industry are unable to replace wornout assets, and the industry as a whole is unable to meet its capital requirements over the next decade. The causes of the "railroad problem" are many and varied, as discussed in other chapters. Similarly complex are the potential remedies—no one of which is capable by itself of correcting the problem.

In chapter 3, the central question of section 504 is addressed: How much aid will the industry require in addition to what it can generate internally and obtain from nongovernmental sources? This question, of course, cannot be answered in specific dollar amounts without assumptions about future growth of the economy, inflation rates, demand for rail services, and assumptions that rail operating efficiency (including the extent of the track network), technological changes, labor compensation, and rail rate levels will move in a certain direction.

The analysis indicates that if the Government were to attempt to provide the railroads' total capital requirements, the funding level and subsequent Government involvement would be so large as to require a reversal of the policy that railroads should remain in the private sector. This would come about because even massive aid could not overcome the basic problems of the industry. In this industry of high-fixed costs and limited regulatory flexibility, the actual adjustments of recent years, if continued at the same rate, would be too little and too late to "solve" the problem or to obviate the need for further external assistance. The public should not count on Federal assistance to make up the difference, but should squarely face the policy changes that are necessary.

Chapter 4 examines how the rail network could be tailored to anticipated traffic levels through coordination, consolidation, or abandonment, with the prospect that safe and profitable operations can increase. The chapter concluded that restructuring through the processes established in title IV of the 4R Act will be very important to changing the cost performance of the industry and should be used to reduce the industry's potential need for capital.

Chapter 5 discusses the fact that analyses of cross-modal market tests of efficiency require that all transportation modes start from the same base. If other modes operate over rights-of-way provided by the Government while railroads pay their own way, full cost recovery through user charges is necessary for equitable efficiency comparisons. Compensatory user charges on other modes would raise rates on those modes and either result in a diversion of traffic to railroads or permit increases in rail rates, which, while raising costs to shippers, if traffic levels remain unchanged, would result in a lower external capital requirement. The apparent inflationary impact of such a change is moderated by the fact that if shippers pay relatively more, taxpayers would pay relatively less (in railroad aid and highway maintenance, for example). Indeed, there may be an offsetting shift of some freight from higher cost truck to lower cost rail transport, or combined rail-truck movement, even if rail rates rise to higher levels, because these would still be below the competitive ceiling established by certain high-cost, long-distance truck operations. Shifts to rail would depend, however, on rail service improvement that might occur if the downward cycle of lost traffic, low profits, low productivity, and poor service quality could be broken.

Chapter 6 discusses the need for regulatory flexibility. Railroads are regulated more comprehensively than any other transportation mode and, consequently, have been less able to respond to economic change than other modes. Although the estimate in chapter 3 of outside capital requirements assumed continuation of the historical trend of public regulation, the DOT believes major changes in regulation can be made that will foster improvements in railroad profitability and, thus, reduce the capital gap. Regulatory reform of this type started in the 4R Act by providing new flexibility to railroads. This beginning requires full and vigorous implementation of the 4R Act by railroad companies and the Interstate Commerce Commission (ICC). Legislative change will also be required, and the extent of these changes will depend on the degree to which the railroads and the ICC produce the needed flexibility.

Other fundamental changes are necessary. This report does not emphasize technological change, but that is an area where improvements should also occur. The terms of contracts between management and labor unions for wages and work conditions are crucially important to the rail industry's financial condition and need for outside capital assistance. Despite the seeming impasse in the current contract negotiations, relating to the long-standing problem of work rules, there are indications that labor and management have finally seen the need for tying compensation increases to improvements in productivity. If this cannot be done for the entire industry, it should be done railroad-by-railroad. Regardless of how it is achieved, improved productivity would have a great impact on the financial strength of the industry and its ability to pay higher wages. If this does not happen, coal slurry pipelines and inland waterways, which represent a substitution of capital for labor, will take over more and more traffic, with the prospect of losses of large numbers of jobs. The effect of this type of trade-off must be considered in setting public policy toward the rail industry and its competitors.

Future energy availability also affects the external capital requirement for railroads. If shortages or high cost of petroleum fuels continue to force

national policy in the direction of fuel-saving rail service, capital needs will be greater.

In section 504, Congress explicitly requested the Secretary of Transportation to provide preliminary recommendations as to the amounts of equity and other financing needed through 1985 and the means by which it should be provided. The remainder of this final chapter addresses the extent to which, and by what manner, additional Federal financial assistance should be provided.

EARLIER FEDERAL ASSISTANCE PROGRAMS

Since World War I, Congress has enacted at least nine major laws containing 22 different programs of Federal financial assistance to railroads. These programs have covered a broad range of financing devices, including guarantees of earnings to railroad companies during and for a short period after World War I; direct loans, loan guarantees, grants and loans to the National Railroad Passenger Corporation (Amtrak); grants to States for branchline subsidies; direct grants to northeastern bankrupt railroad companies; purchase of preferred stock in the Consolidated Rail Corporation (Conrail); and purchase of redeemable preference shares.

The Rail Services Planning Office has prepared a report, *The Role of Government in Railroad Restructuring,* that notes the following characteristics of Federal railroad assistance programs through 1970.

- All the programs involved either direct loan or loan guarantees rather than grants or equity financing. (During the New Deal, certain agencies purchased equity in firms of other industries, notably banks, but not in railroads.)
- All required security to protect the Government's investment.
- Most required that the railroad have an earnings potential sufficient to provide a "reasonable" (but not necessarily certain) assurance of repayment.
- All required that the railroad company demonstrate its inability to secure funding from other sources at "reasonable" interest rates.
- All required full repayment of principal and interest within, at most, 15 years.
- None provided interest rates significantly below the Government's own cost of borrowing. In some instances, especially under the loans authorized by the 1920 Act, railroad companies quickly found lower rates in private money markets.
- Most restricted shareholder dividends, either by banning them or prohibiting any increase in dividends until the loan was paid.
- Most allowed wide latitude in the use of the funds, effectively supplementing working capital. For example, the Transportation Act of 1958 restricted aid to capital improvements or to reimbursement of the railroad's treasury for capital expenditures the railroad had already made. Over 85 percent of the loans went to reimburse the corporate treasury or to refinance expenditures already made. In a similar vein, 65 percent of the funds loaned by the Reconstruction Finance Corporation went to pay interest or principal on existing debt.
- No effort was made to use the funds as a means of changing industry operating practices or encouraging restructuring.

On the whole, these assistance programs included major efforts to protect the Government investment. Less effort was made to control actual use of the funds. The programs were directed toward an industry believed to be capable of performing satisfactorily in periods of national economic prosperity.

Beginning in 1970, financial aid programs had to be developed to address the problem of preserving freight service in the Northeast and elsewhere because service was collapsing even in a period of relative prosperity. These programs adopted a different philosophy and recognized the need for reduced interest rates, some operating deficit coverage, and the possibility of foregoing repayment for loans. These programs have the following characteristics.

- Most funds have been directed at railroad companies in bankruptcy and subject to reorganization, mainly the Penn Central and the other bankrupt northeastern railroads, and Conrail, the purchaser of the bankrupts' property.
- Some money was directed, specifically, to cover operating expenses in order to maintain a railroad system in the Northeast.
- For the first time, some assistance programs provide for a charge to the railroad below the Government's own cost of borrowing. For example, the Emergency Rail Facilities Restoration Act of 1972 specified a low ceiling on interest rates.
- Allowable repayment periods were made longer, generally 25 or 30 years, rather than the 15 years under previous programs.
- One program (section 213 of the Regional Rail Reorganization (3R) Act of 1973) established outright grants of approximately $300 million to private railroad companies to maintain necessary service.
- One program (title IV, 3R Act and title VIII, 4R Act) provides for grants through States and regional transportation authorities to continue certain branchline operations. Representing a change in

policy, these programs made funds available to financially weak railroads.

PRESENT FINANCIAL ASSISTANCE POLICY

Federal funding under the 4R Act (sections 505 and 511) is substantially different from earlier assistance programs in that it provides for the purchase of redeemable preference shares by the Government (section 505). Preference shares are equity-type securities, but, although quite different from the traditional debt instruments (loans or loan guarantees), they do contain certain features of debt. With preference shares, the Government becomes a preferred (nonvoting) stockholder in the company. Loan guarantees (section 511) are more liberal in scope than previous loan programs in that the Government may seek its investment security in the earning power of the project to be financed as well as in the more traditional earning power of the borrower and tangible collateral.

Section 505 authorized $600 million for the purchase of preference shares; $320 million have been appropriated through fiscal year 1978 (ending September 30, 1978). In fiscal year 1977, the DOT approved $58 million in preference share purchases. Applications received total $550 million of which the DOT approved $235 million through the end of fiscal year 1978, for a total obligation during fiscal years 1977 and 1978 of $319.3 million.

Section 511 authorizes $1 billion in loan guarantees, $600 million of which have been appropriated through fiscal year 1978. As of September 30, 1978, applications totaling $690 million have been received from five railroads; $97 million have been approved. Loan guarantees can be used for the acquisition, rehabilitation, improvement, development, and establishment of railroad equipment and facilities. The program is open to all railroad companies and eligible persons. The 4R Act requires that the Secretary determine that there is adequate security to protect the Federal investment, and that the applicant provides reasonable assurances that the improved facility or equipment will be used effectively and economically in railroad transportation.

Approved and pending applications for both preference shares and loan guarantees are shown in table 7-1. The FRA section 505 and 511 program policies provide for evaluation of applications to ensure that only justified projects are undertaken, and the railroad's performance in implementing projects is monitored. Application requirements include detailed project descriptions, financial forecasts, financial statements, environmental impact assessments, return on investment analyses and, under section 505, a business plan including system-wide performance and capital expenditure projections. The section 511 program has certain statutory restrictions against increasing shareholder dividend payments while the loans remain guaranteed, and, consequently, the stronger railroads have been reluctant to use section 511 financing. The DOT believes, however, that the statute provides adequate flexibility with respect to dividend restrictions and should not be a major deterrent to section 511 financing.

Congress directed the preference share program toward marginal railroads that, generally, could not prudently service additional conventional debt, even with Federal guarantees. The 4R Act permits an interest rate lower than the market cost of money for projects directed toward correcting deferred track maintenance. The 4R Act sets a minimum rate for such projects at approximately 2 percent and a ceiling on the applicant's rate of return on total capital. Redemption terms, by statute, provided for a 6- to 11-year grace period and a maximum repayment period of 30 years. All track programs funded thus far (salvage materials excepted) have been accorded the maximum grace period. For bankrupt railroad companies, the 4R Act requires that the Government's purchase of trustee certificates under section 505 be secured by the net liquidation value of the railroad company's assets.

The FRA regulations accord funding priority to projects involving rehabilitation of high-density lines and those involving restructuring (i.e., consolidation or coordination of major rail lines, yards, and other facilities). Eligible projects at lower priority are those that facilitate feeder service to priority lines, enhance rail competition, correct specific safety problems, and enable repair of equipment.

While the preference share (and loan guarantee) programs differ markedly from earlier assistance programs, ability to repay remains a prime concern. Virtually all title V recipients are "high risk" in the sense that they could not obtain financing elsewhere or cannot provide the usual security required by private lenders. Since the Government depends upon the earning capability of the title V applicant for repayment (except when earnings provide inadequate security and assets must be used for security), FRA has had to examine the historic and prospective operating and financial performance of the recipient. The FRA must also determine that the Federal assistance will generate rail transportation benefits.

Two other statutory limitations on the preference share program have been controversial: (1) the required finding that alternative sources of funding are not available; and (2) the requirement that, in event of liquidation, repayment of trustee certificates under the preference share program is secured by the net liquidation value of a bankrupt railroad's estate.

These limitations have slowed the implementation of the preference share program by creating a

TABLE 7-1. TITLE V APPLICATIONS RECEIVED AND AGREEMENTS EXECUTED, SEPTEMBER 30, 1978

Category	Section 505 preference shares[a]		Section 511 obligation guarantees	
	Application	Agreement	Application	Agreement
	(million $)			
Applicant:				
Chicago, Milwaukee, St. Paul and Pacific	33.8	[c]33.8	21.4	21.4
Chicago & North Western	[b]147.5	[c]147.5	[d]555.7	17.6
Columbus and Greenville	4.1	4.1		
Chicago, Rock Island and Pacific	[d]166.0		[b]88.2	33.5
Illinois Central Gulf	164.7	[c]107.9		
Boston and Maine	25.9	26.0		
Peoria and Pekin Union	3.5			
Missouri-Kansas-Texas			16.5	16.5
Delaware and Hudson			8.0	8.0
Utah Railway	5.0			
Total	550.5	319.3	689.8	97.0
Type of project:				
Facilities	546.5	319.3	564.0	19.8
Equipment	4.0	0	125.8	77.2
Total	550.5	319.3	689.8	97.0

[a]For bankrupts, trustee certificates convertible to preference shares.
[b]Two applications.
[c]Two agreements.
[d]Three applications.
SOURCE: Federal Railroad Administration, Office of Federal Assistance.

conflict with other legislative objectives. Congress did not intend that the section 505 program be used in place of other available funds (creating a needless subsidy) but that funds be made available for railroad rehabilitation purposes. Applicants must show that a project to be funded under section 505 could not be financed from other sources such as new equity, working capital, or borrowing (including borrowing under the section 511 loan guarantee program). The "no alternative funds" finding excludes the stronger roads, even though a project may have major public benefits, such as acquisition of all or part of the services of a marginal railroad, or development of new capacity to transport coal and thus facilitate national energy policy.

With regard to bankrupt railroad companies, the Government must find security for the Federal investment in the liquidation value of a railroad company's assets. Such a finding may not be difficult for small amounts of assistance and if the bankrupt railroad company has achieved some degree of earnings stability. It is a major problem, however, when large rehabilitation projects are involved or when the bankrupt company is experiencing heavy and continuing losses. Unless the finding can be made that a bankrupt's assets (after any prospective erosion from operating losses) are adequate to protect the public investment, section 505 assistance cannot be made available. Thus a bankrupt company showing heavy, continuing losses and almost no chance of changing its pattern of operations cannot use preference share financing.

Title V has provided a minimal level of assistance to marginal railroads to reduce deferred track maintenance and increase repair of locomotives and freight cars. The program has been restricted in practice by the limited number of railroads that can participate because of the statutory limitations and the inability of applicants (especially bankrupts) to establish adequate security. The DOT believes that a new program of Federal financial assistance should not include all the characteristics of the present title V program. Principal changes recommended are as follows.

- The requirement that railroad companies certify they cannot find other sources of financing should be eliminated, to make more railroads eligible for low-cost preference shares. Such a change should be coupled with a requirement that the funds be used on public benefit projects, such as coordination projects

and rehabilitation of rail lines, or only in conjunction with planning under title IV of the 4R Act.

- The priority for Government-held trustee certificates should be established by legislation; at a minimum these should be senior to all unsecured debt. This would reduce the delays and uncertainties that have occurred in negotiating security positions. The Emergency Rail Services Act of 1970 specifies a level of priority, a feature that has proven helpful in negotiating agreements.
- The differentiation between deferred maintenance and nondeferred maintenance projects as a basis for determination of interest rates should be eliminated. Present regulations allow a lower interest rate only for deferred maintenance projects and require rates at the Government's cost of money for other projects. Deferred maintenance is a difficult concept to define and quantify. The amount of low-interest financing for a project should be determined instead on the basis of the public benefit component of the project, the extent to which it fosters restructuring, and the financial health of the borrower. To eliminate the present limitation on the extent of low-interest financing would permit track in such projects to be upgraded to a higher class, where the deterioration rate would be reduced.
- In financing a public interest project (i.e., one in which the public benefits exceed the railroad benefits) the affected facility might be isolated from the general liens and indentures that encumber it, through establishment of a separate corporation or public acquisition. In this manner, the property and rehabilitation project could provide its own security.

ALTERNATIVE FORMS OF FINANCIAL ASSISTANCE

The DOT believes future programs of Federal assistance to the railroad industry should include a combination of various forms of assistance. The following presentation of alternatives is arranged in an order that leads from those forms of assistance with the least Government exposure to those with the most.

LOAN GUARANTEES

The loan guarantee is a common means of providing public assistance and enables borrowers to obtain loan funds through a pledge of Federal credit, without necessarily requiring the Government to advance the funds. Loan guarantees permit the involvement of the commercial-lending market, although the Federal Financing Bank of the Department of the Treasury may frequently be the lending agent. With a loan guarantee, the borrower should be able to obtain more liberal terms and conditions from lending institutions, since those institutions are fully protected. Government agencies may require additional terms and conditions consistent with the level of risk borne by the Government.

Federal budgeting practice for loan guarantees, unlike direct loans, traditionally does not count guarantees as budget "obligations." Recent changes in Government-budgeting practices, however, bring guarantees under greater control. Even with these changes, Government guarantees could still properly remain as part of a package of financing mechanisms, in order to continue to involve private lenders in cooperation with Government in risk taking. If used, loan guarantees should apply to the same purposes and be subject to the same security standards as direct loans. Their major usefulness would be for equipment purchases for railroad companies unable to enter the private equipment market and track work projects in the stronger parts of the industry.

DIRECT, FULL-COST LOANS

Direct Government loans are also a flexible form of financial assistance and are more appropriate than grants to private enterprise. The Government, as lender, charges interest rates based on its own cost of borrowing, may require collateral, and expects a worthy purpose to be accomplished. The repayment feature of such loans means that the competitive advantage that this type of Federal assistance provides a recipient over other railroads or competing modes is significantly less than with grants.

The value of a direct loan program is that the Government may lend funds without charging a risk premium for high-risk projects that are in the public interest and can lend larger amounts to an individual railroad than could a commercial bank or institutional lender. As long as the Government charges rates based on its own cost of borrowing, the borrower could benefit from interest charges slightly below commercial rates, even though no form of direct interest subsidy is involved.

Direct loans could be a good form of assistance to the stronger parts of the railroad industry and could employ conventional, but liberal, banking practice with regard to security. There should be no provision for forgiveness of principal; rather, the Government should be treated the same as secured private creditors, including a secured position in the event of later bankruptcy.

LOW-INTEREST LOANS AND INTEREST SUBSIDIES

For the firm lacking sufficient earning power to support full-cost interest on debt, low-interest loans

and interest subsidies are useful. The difference between market interest rates and the interest actually charged represents a public subsidy to the borrower.

Low-interest loans have the advantage of permitting aid to marginal companies while preserving the traditional relationship between Government and private firms. This device also permits the Government to make a creditor's claim, based on the negotiated security position, in the event of liquidation. Another use would be to provide capital as an incentive to healthier railroads to participate in restructuring activities when the return on investment is too speculative (for example, with respect to an acquisition). The low-interest rate provides a benefit to the acquiring road, and the debt character allows the Government to obtain a security interest in the acquired property.

Interest subsidies have the advantage that the private financial community remains involved and that the Government does not have to raise the capital for the loans. Although this allows the Government to leverage its investment for the maximum impact, the Government could lose its ability to make a creditor's claim.

REDEEMABLE PREFERENCE SHARES

An earlier section of this chapter described the section 505 preference share program and experience to date. The preference share is an equity-type instrument with certain debt characteristics. It is a program of particular importance for those railroads that cannot achieve traditional equity financing and are at, or near, their debt service limit. The preference share may have a variety of terms and conditions and may be purchased at rates that will provide a subsidy for the company in the form of lower payments for equity. Present DOT policy places a priority on the use of preference shares for rail consolidation and coordination projects in order to produce a more efficient railroad structure.

GRANTS

Direct Federal grants are not normally used to aid private firms. Usually, grants are given when the public interest is large, and repayment is either irrelevant or impossible. Most assistance to States takes the form of grants. In rail-related areas, grants are used to construct and operate publicly owned mass transit and rail commuter systems; purchase equipment for, and subsidize deficits of, Amtrak; continue local service on branchlines approved for abandonment by the ICC; and, in the period just prior to the establishment of Conrail, continue operation of bankrupt rail service in the Northeast. The DOT view is that grants should only be used where the public interest is great in improving the productivity of the industry and where such transitional assistance is necessary to achieve restructuring goals. Such circumstances should be decided principally as a discretionary aspect of the Secretary's authority under section 401 of the 4R Act.

PUBLIC OWNERSHIP OF RIGHT-OF-WAY

Public ownership may provide a financing vehicle for preservation of service. A public body could purchase a rail line or an entire railroad system and permit operations over that line or lines by one or more contract carriers. If only part of the cost were assessed for use of the facilities, there would be, of course, a governmental operating subsidy. If public ownership were to be used for restructuring purposes, as outlined in chapter 4, operations over that system should be conditioned on payment of appropriate user charges and limited to continuation of rail services of overriding public interest when private railroads cannot bear the necessary costs of rehabilitation.

A PROPOSED POLICY OF FEDERAL FINANCIAL ASSISTANCE

The analysis of railroad capital needs, as set forth in chapter 3, shows a substantial shortfall between the amount of capital the railroad industry will require in the coming decade and amount of investment funds it will be able to generate internally or raise in the nongovernmental capital markets. Prudent management, better productivity, regulatory change, and greater equity among the modes must be forthcoming. The long history of circumstances adverse to railroads cannot be surmounted unless actions in these areas are undertaken quickly. Federal assistance will contribute by facilitating these changes.

The DOT does not believe that Federal financial assistance will eliminate the need for abandonment and restructuring, nor should it be used to "bail out" inefficient firms in financial distress; instead, it should be used to encourage restructuring activities in the railroad industry.

The DOT recommends a program of Federal financial assistance that falls well between the extremes of doing nothing and attempting to preserve all existing rail service. To aid restructuring of the industry, the program would provide capital for such projects as major rehabilitation and renewal of track, bridges, tunnels, yards, shops, signaling and

telecommunications facilities, management information systems, and projects for repair and acquisition of locomotives, cars, and maintenance equipment. Electrification and other new construction projects, as well as inter- and intracorporate restructuring and reorganization, would also be appropriate uses for assistance.

The DOT recommends the following purposes for use of Federal assistance.

- Supporting consolidation of facilities and traffic coordinations that reduce or eliminate uneconomic plant, including labor protection aid to assist specific portions of the restructuring process
- Transferring services of railroad companies that cannot be reorganized promptly on an income-producing basis to solvent companies; the remaining lines either to be abandoned or continued in service by State or local authority
- Stabilizing, while restructuring takes place, the operations of marginal and bankrupt railroads that can meet income-based reorganization standards

The analysis of the industry's capital needs indicates an industrywide requirement that varies, in degree, by railroad and by region of the country. Thus, the Federal financial assistance program must be structured to deal with each aspect of the problem, and no railroad should be eliminated from eligibility, automatically. The financial assistance must have variable terms and conditions that can reflect both the needs of the public and the differences in railroads' abilities to repay.

The program should place direct responsibility on DOT to protect the taxpayers in the administration of the program. The DOT expects that all projects proposed for financing meet technical, economic, and financial criteria. The DOT should be permitted to negotiate terms and conditions for the financing agreements that are appropriate for the specific project and railroad, while insuring that the funds are used only for the purpose for which the assistance is given. Any convenants, though, should be realistic, reasonable, and simple. Care must be taken to avoid convenants that impose excessive burdens on management.

The DOT believes that Federal financial assistance should be repaid. Repayment maintains a parity with, and avoids the most serious objections from, competing carriers or industries. If grants are provided to improve the industry's productivity, the Secretary should have discretionary powers to decide the uses of such funds within well-defined limits.

Between discretionary grant funding for purely public purposes, on the one hand, and loan guarantees at near commercial rates for projects fully within the discretion of the borrower, on the other, there is a middle ground. Creative new forms of Federal financial assistance must be developed to address this area of both public and rail benefits. Such assistance could properly include an element of subsidy through low-interest charges and long grace periods. The subsidy element might be variable to reflect the relative financial condition of the railroad and the public's direct interest in the project for which assistance is provided. Lenient security terms might also be negotiated. In view of the subsidy element, however, the Secretary should be enabled to negotiate convenants to facilitate change in the industry as a condition of providing subsidized assistance. As an example, the Secretary must be able to condition the delivery of subsidized assistance upon the consummation of a specific restructuring plan developed pursuant to section 401, as described in chapter 4.

To meet these varied goals, the DOT proposes a program that uses three different financial instruments: loan guarantees, repayable credits, and grants.

- *Loan guarantees* would be the normal mechanism through which most financial assistance would be provided to railroads. This would be accomplished through a continuation of the present section 511 program. Interest rates would reflect the most favorable commercial rate or the rate available through the Federal Financing Bank, as situations warrant. Given the difficulties in gaining full protection for the public investment, because of the railroad industry's mortgages and earnings level, some risk taking with respect to security (as in the current section 511 program) will be necessary to make the assistance fully accessible to the railroads. The Congress and the public should recognize that this risk taking is beyond that of the conventional lender. If it were not, no Federal program would be necessary.
- *Repayable credits* would be the mechanism for providing financial assistance to bankrupt railroads and to marginal railroads facing major difficulties in raising capital. Depending upon the financial structure of an applicant railroad, the repayable credit could be structured as either a debt or an equity instrument. The repayable credits could have variable interest rates and grace periods and could also be structured to include interest subsidies. The credits could also be used to finance substantial public interest projects of stronger railroads.
- *Grants* may be used to encourage improvements in the industry's productivity; they may be made, at the Secretary's discretion, to railroads, public authorities, or to new entities established to carry out a specific project.

AMOUNT OF FEDERAL ASSISTANCE

The DOT cannot at this time make a precise estimate of the amount of Federal funding required over the next decade, but we believe the amount will be substantial. The DOT will conduct extensive public meetings on this report, in the course of formulating a final report for submission to Congress in February 1979. The final report will contain a more definitive recommendation as to the specific amount of Federal assistance. The DOT final recommendations on forms as well as amounts of assistance will consider the extent of rail service genuinely needed, the willingness and ability of the rail industry and public agencies to make needed changes, and the proper relationship between Government and the private railroad industry. The DOT will carefully consider the public's response to this report in preparing recommendations for legislative or administrative actions.

APPENDIX A. ANALYTICAL METHODS

Under section 504(a) of the Railroad Revitalization and Regulatory Reform (4R) Act, the Department of Transportation (DOT) requested two sets of forecasts from each Class I railroad (excluding the Consolidated Rail Corporation (Conrail)).

504(a) SUBMISSIONS: SCENARIOS A AND B

The first set of forecasts (scenario A) was to be based on the current and projected financial capabilities of the railroads, including the raising of funds through normal commercial channels but excluding any Federal funding. See table A-1. The second set (scenario B) was to be based on the assumption that any capital shortfall encountered by the railroads could be funded by some interest-free source. The initial expectation was that the difference in the sources and uses of funds statements between scenarios A and B would define the size of the capital shortfall.

The submissions from individual railroads were reviewed, and a computerized data base was prepared. It represented virtually all rail industry freight revenues, less Conrail. This information was aggregated and totaled into the three districts.

Unfortunately, the scenario B results were highly misleading: Several railroads failed to submit any scenario B data, thus creating an anomalous situation in which scenario B's unconstrained applications of funds were $3 billion below scenario A. In addition, in some individual submissions, the logic underlying dramatic increases in capital spending was neither evident nor justified.[1] Some railroad managements, for example, included electrification of some lines without indicating the benefits of such large investments. On the basis of current performance, other railroads would seem to be logical candidates for interest-free external funding, but their managements stated that they were not facing a capital shortfall.

Aggregation of the scenario A submissions showed that projections of the railroad industry's sources and uses of funds (excluding Conrail and Amtrak) would essentially balance. Total sources of funds for the 1976–85 period were estimated to be $41.8 billion, and total uses were projected to be $41.2 billion. After reviewing and comparing the results of scenario A to other analyses, the Federal Railroad Administration (FRA) concluded that the projected sources and uses of funds derived from the industry submissions (table A-1) were unrealistic. Flaws in the initial instructions as well as the following reasons were responsible for the lack of verity.

- The economic scenario that the railroad companies were told to follow was highly optimistic and out

[1]The scenario B sources and uses totaled $33.5 billion and $38.2 billion, respectively, leaving a shortfall of $4.7 billion.

TABLE A-1. PROJECTED SOURCES AND USE OF FUNDS, SCENARIO A

(Million current $)

Category	East		South		West		United States	
	$	%	$	%	$	%	$	%
Sources:								
Funds from operations	4,832	50.9	4,824	50.9	13,303	58.2	22,958	54.9
Equipment financing	3,819	40.3	3,693	38.9	7,503	32.8	15,015	35.9
Sale of debt or equity	403	4.3	488	5.1	763	3.4	1,658	3.9
Sale of property	316	3.3	481	5.1	661	2.9	1,454	3.5
Other	117	1.2	(3)	.0	624	2.7	738	1.8
Total	9,487	100.0	9,483	100.0	22,854	100.0	41,823	100.0
Applications:								
Investment in facilities	1,660	17.6	2,269	24.6	6,888	30.5	10,826	26.2
Investment in equipment	5,032	53.0	4,279	46.5	10,615	47.1	19,926	48.3
Repayment of funded or other debt	586	6.2	329	3.5	732	3.2	1,647	4.0
Repayment of equipment obligations	1,975	20.8	2,253	24.4	3,874	17.2	8,102	19.7
Other	227	2.4	63	1.0	425	2.0	743	1.8
Total	9,489	100.0	9,193	100.0	22,561	100.0	41,244	100.0
Change in working capital (sources less applications)	(2)		290		293		579	

NOTE: Parentheses denote negative numbers.
SOURCE: Railroad companies 504 Submissions.

of line with the current consensus on future economic expectations.

- The projected additions to the equipment fleet, when aggregated, were significantly less than would be expected given the high-growth rates used in the survey.
- No program to rectify the deferred maintenance problem was incorporated in the scenario A forecast.
- Expectations of annual cash flows from operations were significantly higher than have been realized in the past.

SCENARIO A RESERVATIONS

This section will discuss the economic scenario provided to the railroads for their section 504(a) submissions, investment in equipment, deferred maintenance, and cash flow from operations.

Economic Scenario

The railroads were provided with an economic forecast that called for the gross national product (GNP) to grow steadily at an average annual rate of 4.9 percent and for annual inflation to remain constant at 5 percent.[2] The GNP growth projected for the first-half of the forecast period (1976–80) was even higher, since it averaged 5.5 percent per year.

The economic scenario provided to the railroads was out of line with other long-term forecasts of the U.S. economy because it failed to incorporate cyclical considerations of the U.S. economy's real growth, inflation trends, and unemployment levels. Two forecasts that do consider cyclical fluctuations are: the Interstate Commerce Commission (ICC) Ex Parte No. 271 forecast based, generally, on an economic forecast prepared by Data Resources, Inc.; [1] and the FRA financial planning model (discussed in a later section) which uses the Chase Econometrics Associates' January 28, 1978, standard, general economic scenario. The real annual growth rates in the GNP incorporated in each forecast are shown in table A-2. In contrast to the high, steady growth and the relatively low, constant inflation levels contained in the general economic scenario given to the railroads, the ICC (Ex Parte

[2]Figures for first 5 years of this forecast were provided by the Council of Economic Advisors.

TABLE A-2. ANNUAL FORECASTS OF GNP GROWTH RATES
(Percent of 1972 $)

Year	ICC[a]	Chase Econometrics[b]	FRA survey	Actual
1976	8.82	6.1	6.2	6.0
1977	4.49	4.09	5.7	4.9
1978	-.99	3.9	5.9	
1979	3.49	4.1	6.5	
1980	4.3	4.4	6.5	
1981	4.89	3.8	4.9	
1982	3.8	3.4	3.6	
1983	3.66	3.3	3.6	
1984	-3.17	3.5	3.6	
1985	3.45	3.5	3.6	
1976–85	2.6	3.94	4.9	

[a]Ex Parte No. 271.
[b]Standard Macroeconomic Forecast, Jan. 28, 1978.
SOURCES: Interstate Commerce Commission, Ex Parte No. 271; Chase Econometrics, Jan. 28, 1978; and Federal Railroad Administration directive.

No. 271) projects recessions from 1977 to 1978 and 1983 to 1984; Chase forecasts a slight downturn in 1978 and steady, but moderate, growth throughout the decade.

Any forecast applied to the railroad industry that does not incorporate cyclical considerations is deficient in projecting the financial performance of railroad companies, because the industry's regulatory and competitive environments make it difficult for companies to quickly or fully recoup cost increases due to inflation, and because the railroads are extremely susceptible to short-term volume fluctuations. Railroad managements cannot easily adjust operating and capital levels to ups and downs in the economy, and they do not benefit as much from the dramatic upward surges as they are penalized by the drops. A financial forecast for the rail industry based on 10 years of steady growth, therefore, would be more favorable than one based on year-to-year or cyclical fluctuations.

Investment in Equipment

Perhaps the most difficult data to interpret in the submissions were the projections of equipment additions. The railroads were asked to report constant- and inflated-dollar equipment costs, but not the number of absolute units. The FRA estimates, however, that scenario A projections imply acquisiton of approximately 374,000 freight cars and 10,837 locomotives during the 1976–85 period. These totals are extremely low compared to estimates shown in table A-3, particularly considering that the totals are based on a general economic scenario that

TABLE A-3. FREIGHT CAR REQUIREMENTS, 1976–1985

Analysis	Annual GNP growth rate (%)	Annual traffic growth rate (%)	Freight cars required[a] (000)
504(a) submission	4.9	4.6	374
Ex Parte No. 271	2.6	4.1	681
AAR, Astro II	n.a.[b]	3.5	752
American Railway Car Institute	3.7	3.9	511

[a]Excluding Conrail and Amtrak.
[b]Not available.
SOURCES: Federal Railroad Administration directive; Interstate Commerce Commission, Ex Parte No. 271, Association of American Railroads; and American Railway Car Institute.

called for greater annual freight demand than did the other freight car projections.

This phenomenon might have been expected, since the railroad companies generally perceived the survey as asking what they could do during the next 10 years, rather than what they should do in view of the given economic scenario. Railroad companies may have projected only what they could afford to spend. Or, they may have understated equipment purchases because they were counting on supplementing their fleets with privately owned cars or cars owned by other railroads. Or, they may have overestimated the utilization of their fleets. In any event, aggregating the projections prepared by individual railroads is not the most reliable method for estimating the industry's total equipment needs under a given economic scenario.

Deferred Maintenance

The scenario A submissions do not include any estimates of the amount of money that should be spent over the next 10 years to correct for deferred maintenance. According to a study done for FRA, an additional $1.8 billion (constant 1975 dollars) above normalized levels would be required during the 1976–85 period to gradually make up maintenance deferred in the past.[2] The FRA estimates this would be equivalent to $2.3 billion before taxes and $1.5 billion after taxes. The unprofitable railroad companies would experience a cash drain equal to these maintenance costs since they are not paying taxes in the scenario A submissions.

Cash Flow From Operations

The cash flow from operations forecast by the railroads appears to be higher than historical experience would indicate. From 1965 to 1975, funds

from operations, net of dividends, ranged from between $748 million to $1.1 billion. Yet, the railroads projected that from 1976 to 1985 funds from operations, net of dividends, would average $2.3 billion per year. Since such funds are net of inflated expenses and the adjusted revenues to compensate for such inflation, the cash flow from operations would not change dramatically except when rate increases that improve rates of return, or real growth, occur. Despite this fact, the aggregated railroad projections include a sudden, significant change in cash flow, without explanatory logic.

If the level of cash flow, net of dividends, to gross ton-miles of traffic is held throughout the forecast period to the level prevailing in 1976, funds from operations would be about $5.7 billion less than forecast by the railroads over the 1976–85 period. Even allowing for the relatively favorable economic scenario on which the railroad projections are based, this review suggests a significant overstatement of funds flow.

Adjusting Scenario A Results

When scenario A results are adjusted to reflect the reservations just described, the projections would show that the rail industry faces a capital shortfall ranging from between $11.4 and $12.5 billion. This projected shortfall consists of the following.

- $2.0 to $2.8 billion in additional funds are needed to insure that future maintenance-of-way expenditures are adequate to rectify the effect of deferred maintenance in the past.
- $3.7 to $4 billion in additional funds are needed to insure that future equipment expenditures are adequate to handle projected demand.
- $5.7 billion in additional funds are needed to offset the railroad companies' overly optimistic projections of funds from operations.

THE FRA FINANCIAL-PLANNING MODEL: SCENARIOS 1 AND 2

The decision to develop a model to derive an independent set of projections of the industry's capital needs over the next decade stemmed, primarily, from concern over the inadequacy of the survey results. The FRA recognized that this could readily be accomplished because of the extensive computerized forecasting methods and programs already developed by the United States Railway Association (USRA) and by the ICC in the Ex Parte No. 271 analysis.

MODEL OUTPUT

The FRA model forecasts income statements, balance sheets, and sources and uses of funds statements by applying a series of equations to a set of traffic forecasts for a specific economic scenario. The econometric equations are developed from least squares regression analysis of historical 1962–76 data, linear trend and factor analyses, industry averages or normative values, and actual data for the future (such as debt requirements). The design of the model is such that it can generate pro forma financial projections for a designated railroad or group of railroads when it is provided with the required initial inputs and functional activity algorithms.

The primary output of the FRA financial-planning model is the funds flow (sources and uses of funds) statement. The advantage of the funds flow statement over other financial statements is that projected funds from both operations and the capital markets are brought into a single focus, that is, the array of sources and uses of funds are clearly indicated.

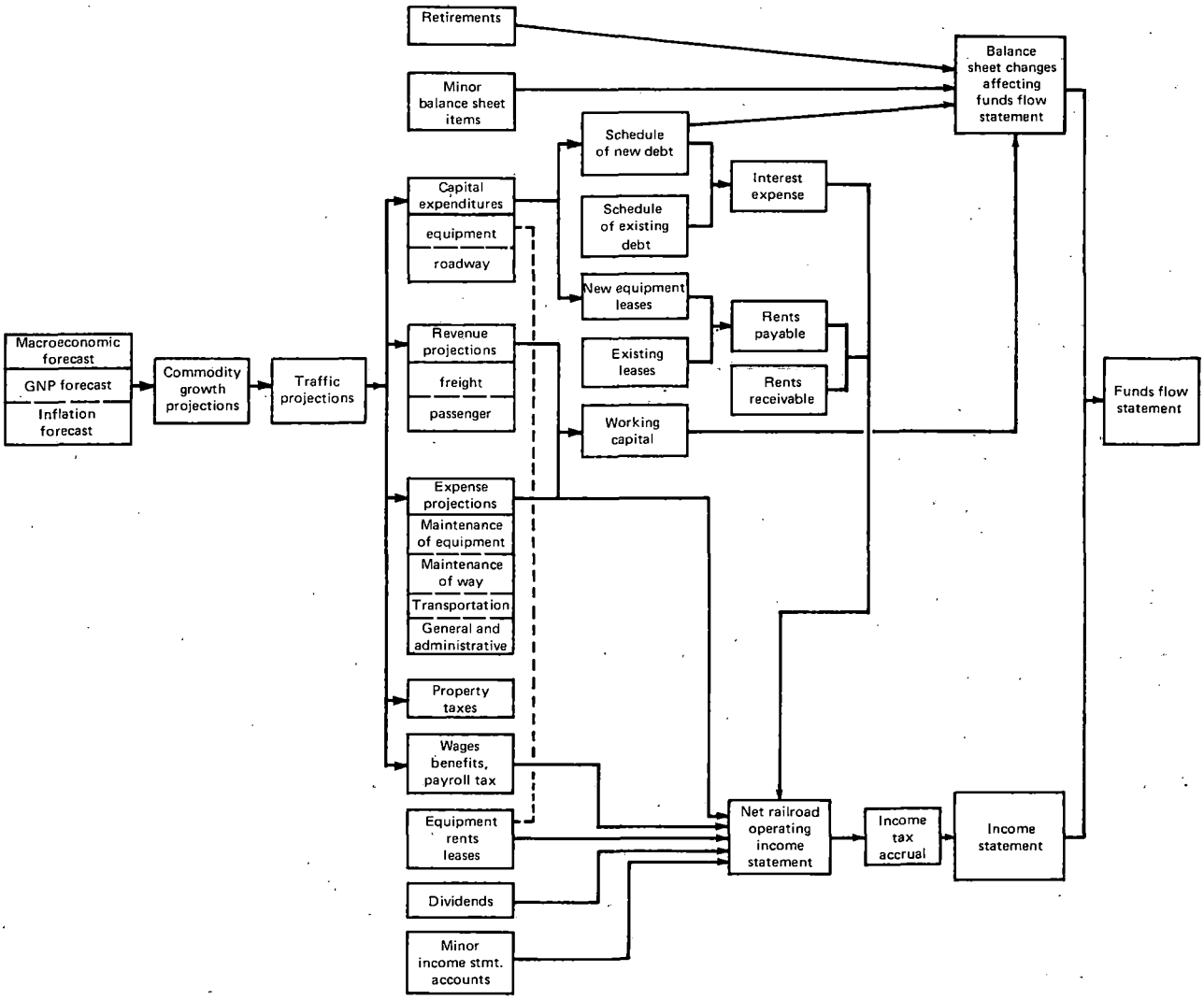
TREATMENT OF SHORTFALL

Since the objective of the 504 analysis is to determine the approximate total magnitude of any shortfall of funds over a 10-year period, the model is programed to treat any shortfall as a balancing item in the funds flow forecast. As a result, the shortfall identifies the total amount of funds that the rail industry must obtain to achieve the spending levels needed to arrest deterioration of essential portions of the rail plant and maintain service levels. Given a continuation of current freight revenue rate policies, operational efficiencies, and financing strategies and capabilities, the capital shortfall represents an amount greater than the rail industry can be reasonably expected to generate. The ICC stated the following in describing the Ex Parte No. 271 model.

> [The model] seeks to project something closer to a "what should be" world, ... [rather than a] "what will be." A "what will be" scenario is undesirable because it would project spending levels constrained within the limits of the railroads' future earning power, and as a consequence, would most likely understate the capital needs of the industry to arrest the deterioration of the plant.[1]

MODEL STRUCTURE

The model's funds flow methodological framework is depicted in figure A-1. The model follows a



SOURCE: Federal Railroad Administration analysis.

FIGURE A-1. FUNDS FLOW METHODOLOGY.

path of separate but interrelated forecast modules with each module having a special functional relationship to the other modules. The modular development of the model closely follows the conceptual design of the ICC Ex Parte No. 271 forecast tool and the analytical organization and methods of the USRA *Final System Plan.* The model produces totally simulated computerized pro forma financial statements on a regional and industrywide basis for a 10-year period.

As figure A-1 indicates, the projections are tied to a general economic scenario. Freight revenues, for example, reflect estimates of commodity volume growth that are, in turn, tied to forecasts of GNP, industrial production growth, and estimates of general rate increases likely to be granted to offset increases in expenses due to inflation.

The expense projections are derived, primarily, by applying algorithms developed from regression analyses of historical operating activity data, from trend and factor analysis, or from industry averages to the projected traffic levels. Separate labor and materials' costs associated with both the equipment maintenance (MOE) and transportation operating (TGA) expenses are developed from a regression analysis of historical operating labor costs with freight, switch, and passenger train-miles. One major exception is the maintenance-of-way (MOW) account. Projections of this expense are taken from the analysis of the industry's 10-year normalized maintenance requirements.[2]

DATA FILE

The basic historical data file, including categories of revenue, expense, fleet size and type, operating statistical factors, and balance sheet data, is developed from each individual railroad's annual R-1 reports and supplemental schedules submitted to the ICC over the 1962–75 period. The traffic and commodity data are obtained from the rail carriers' 1967–76 Quarterly Commodity Statistics as reported to the ICC, and FRA's One-Percent Waybill samples from 1972–76. The data are collected and separated into functional traffic and operating elements.

The historical traffic data are aggregated into 10 basic commodity groups (farm, coal, ore, food, forestry, chemicals, metals, nonmetallic ores, transportation equipment, and all others), covering originated and received tonnage for each grouping. Equations of originated and received tonnage are made for each commodity grouping by district, using an econometric analysis that includes variables expressing expectations regarding that commodity's growth for the entire United States (Federal Reserve Board Index), a relative Truck-Rail Price Index, and a time variable to represent nonquantifiable factors. Most equations for all groups in the Eastern District (East, Marginal East, and Conrail) include a variable tied to projections of the East's disposable income to better reflect the economic realities of slower growth for that area.

The historical operating data are converted into constant 1975 dollars, using specific labor and material price components of the Association of American Railroads' (AAR) Annual Wage and Price Index. These constant values were then transformed into operating activity cost equations by using, primarily, regression analysis.

The resultant commodity and operating cost equations were then tested and calibrated to actual 1976 data. Using the model to predict results for 1976 and comparing these results to actual 1976 data assures reliability of the projections. Adjustments were made in the equations, where appropriate, to enable the model to predict 1976 results accurately. Adjustments affecting predictions of subsequent years were restricted to those needed to make the individual and regional forecasts sum to a national forecast, in view of historical trends and general economic patterns.

Principal Assumptions

Commodity and traffic projections are derived from the following.

- Chase Econometrics Associates' Standard Macroeconomic Forecast, January 1978, is used for the basic projections.
- Annual passenger revenues (constant dollars) and operating statistics are maintained at 1976 levels.
- Annual average length of haul for each specific commodity is held at 1976 levels.
- Ton per car, by commodity, is based on the historical average annual growth rate from 1967–76. (These range from between 0.5 and 1.95 percent on the 1976 base level.)
- Revenues per ton-mile are decreased from 1976 base levels, consistent with the commodity elasticity relationships contained in Ex Parte No. 271.
- Absorbed switch and other freight revenues are maintained at the prevailing 1973–76 average percentage of commodity revenues
- Diversions to trucking are held to historical experience for those commodities significantly susceptible to truck price competition

Roadway and equipment capital projections are derived from the following.

- Annual roadway additions and equipment betterments are maintained at the 1973–76 average level of gross constant dollar expenditures.
- Annual roadway retirements are maintained at the 1975 activity level for both income and balance sheet accounts.
- Bad-order ratios by equipment type are maintained at the 1975 level.
- Annual industry retirement rates by equipment type are based on the Iowa Survivor Curve.
- Industry equipment utilization, by type, is based on average 1973–76 levels with annual 1-percent improvements.
- Private equipment ownership is held at 1975 levels.
- Lease versus buy financing levels are based on 1973–76 actual acquisitions.
- Equipment purchase financing is based on the 1973–76 actual proportional level of conditional sales agreements (CSA) and equipment trust financing by type of equipment purchase. (The model assumes that equipment trust financing involves a 20-percent carrier downpayment and that CSA financing involves a 10-percent carrier downpayment and an 0.5-percent interest rate premium over the equipment trust level.)
- Lease equipment is not capitalized.
- Depreciable assets and economic life by equipment type are set at maximum historical ICC-reported levels.
- Salvage value for equipment is computed at 10 percent of the original purchase value. Roadway salvage is based on 5 percent of the original recorded value.
- The proportion of cars and locomotives that are acquired versus those built are set at the 1967–75 average ratio.
- Prices for rebuilding and acquisition, by equip-

ment type, are based on the AAR 1975 unit price schedule (for constant dollar forecast).
- Effective interest rates for leases and purchases (equipment trust and CSA) are set at the 1975 computed levels for the constant dollar forecast; interest rates for the current dollar forecast are tied to the general economic forecast.
- Roadway capitalization and depreciation are calculated according to the ICC's retirement, replacement, betterment (RRB) method of accounting.

Projections of operating and other net expenses are derived from the following.

- Equipment time and mileage rates are set at the average 1975–76 levels in terms of 1975 dollars.
- Maintenance-of-way expenses are calculated according to the ICC RRB method of accounting and include normalized and deferred maintenance, as determined in a separate study.[2] This study concluded that the degree to which maintenance-of-way expenses should be increased to overcome deferred maintenance depended upon the extent to which the industry should strive to eliminate deferred maintenance as quickly as possible rather than to stabilize the annual level of maintenance-of-way expenses. As a result, two series of deferred maintenance levels were incorporated into the model. The first series represents annual expense levels above and beyond normalized maintenance equal to 25 percent of existing deferred maintenance (scenario 1). The second series represents annual expense levels above and beyond normalized maintenance equal to 50 percent of existing deferred maintenance (scenario 2).
- Equipment and locomotive net operating leases are reduced 1/15 each year from the 1976 levels.
- State property tax accruals are held at 1976 levels in terms of 1975 dollars.
- Annual deferred and current Federal income tax accrual levels are based on the average 1965–75 ratios of pretax income.
- Sale of mortgage and other debt are based on the railroad companies' section 504 submissions under scenario A.
- Equity-affiliated earnings from companies (other income) are maintained at 1975 levels.

Assumptions of working capital and other sources and uses are derived from the following.

- Cash and temporary cash coverage levels are set to equal at least 15 days of operating expenses, the suggested minimum according to the ICC. As of the start of the forecast period, any amount above this level is maintained throughout the projections.
- The model is set to maintain minimum working capital levels throughout the forecast period. For the Eastern, Southern, and Western regions, the minimum is equal to each region's 1975 and 1976 average current ratios. For the Marginal West, the minimum is a ratio of 1.31; for the Marginal East, the minimum is 1.5.
- Annual dividend payments are assumed to equal cash dividends paid by the railroad companies in 1976.
- Annual levels of accounts receivable, materials and supplies, and other current assets and liabilities are developed from regressions of operating expense categories.

Freight revenue rate relief and inflation projections are derived from the following.

- Modification of requested ex parte general rate increases are based on the historical level of holddowns imposed by the ICC and are equal to 88.32 percent.
- Modification of granted general rate increases are based on regional economic and competitive considerations on the part of each group and are equal to the 1970–76 average yield levels experienced in each district.
- The elapsed monthly timetable for rate actions following cost occurrence is as forecast by USRA in its *Final System Plan.*
- Unrecovered increases in freight costs are continually carried over and included in succeeding years' general ex parte applications.
- Passenger annual cost increases and subsequent balancing reimbursements are deducted from the total annual gross cost increases.
- Total annual cost increases are developed under the ICC's RRB accounting method.
- Specific inflation equations for labor, material, fuel, and similar expense categories are developed and applied to the variables of the economic forecasts to generate annual increases in functional cost categories.
- The projected general freight rate increase requests are computed to maintain annual pre-inflation financial performance in each district.

Figures A-2 to A-11 are the sources and uses of funds statements for the East, West, South, Marginal East and Marginal West regions, and figures A-12 to A-21 are the income statements for these regions.

EAST
SOURCES AND USES OF FUNDS
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 25 % DEFERRED MAINTENANCE CATCHUP.

YEAR:	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
NET INCOME	110823	72142	40536	42662	51338	77982	83513	89409	103520	132851	804775
ADD: DEPRECIATION	152409	163408	172795	183835	198313	214572	230434	245228	260188	276656	2097840
ADD: CHANGE IN DEFERRED TAXES	76979	57800	42282	41941	44467	54752	55522	56428	60889	71854	562914
ADD: CHANGE IN RESERVES	52242	37312	32779	30082	30674	32478	33779	34338	35536	38464	357685
ADD: OTH NCI	-39870	-42103	-44671	-47262	-49956	-53103	-56396	-59723	-63067	-66599	-522750
FUNDS FROM OPERATIONS	352583	288559	243721	251258	274836	326682	346852	365680	397066	453226	3300463
EQUIP FIN OBLIG	331578	235176	213840	299292	362500	409869	374614	356463	377370	420234	3380935
EQUIP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
SALE OF EQUITY & OTH DEBT	36554	102881	11000	31169	50552	4181	8884	7210	27346	95611	375388
OTH OBLIGATIONS	0	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT PROCEEDS	368132	338057	224840	330461	413052	414050	383498	363673	404716	515845	3756323
SALVAGE PROCEEDS	13028	11270	10737	10021	9866	9882	9692	9631	9673	9720	103520
CHANGE IN OTH LIAB	6314	6516	6724	6940	7162	7391	7627	7871	8123	8383	73051
TOTAL SOURCES	740057	644402	486023	598680	704916	758004	747669	746854	819577	987174	7233357
INVESTMENT:ROAD	41471	44889	49220	53112	57469	61937	66501	71411	76539	81908	604457
INVESTMENT:EQUIP	420650	308591	285495	388871	465778	523954	483786	463950	490498	543048	4374619
INVESTMENT:OTH	0	0	0	0	0	0	0	0	0	0	0
TOTAL INVESTMENT	462121	353480	334715	441982	523247	585891	550286	535361	567037	624956	4979076
REPAYMENT OF FUNDED DEBT OTH	53100	78300	45600	61100	72700	60300	64400	56000	35200	29600	556300
REPAYMENT OF EQ OBLIG	140203	147443	157135	165023	178121	193791	207182	224737	244261	262991	1920888
REPAYMENT OF EQP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
TOTAL REPAYMENT OF DEBT	193303	225743	202735	226123	250821	254091	271582	280737	279461	292591	2477188
OTHER USES	3446	3939	4493	4544	4724	5470	5719	5791	5836	6155	50118
TOTAL USES	658870	583162	541944	672649	778792	845452	827587	821890	852333	923703	7506382
CHANGE IN WORKING CAPITAL	95779	47547	42258	33098	40510	39636	37114	36867	37844	40670	451323
FUNDING SURPLUS (SHORTFALL)	-14592	13693	-98178	-107068	-114386	-127084	-117033	-111903	-70600	22802	-724348
NET ADDITIONAL FUNDS REQ	14592	0	98178	107068	114386	127084	117033	111903	70600	0	760843

SOURCE: Federal Railroad Administration analysis.

FIGURE A-2. COMPUTER PRINTOUT OF SOURCES AND USES OF FUNDS, EAST, SCENARIO 1.

WEST
SOURCES AND USES OF FUNDS
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 25 % DEFERRED MAINTENANCE CATCHUP.

YEAR:	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
NET INCOME	101897	83934	7090	12424	51809	167099	238913	314250	430881	607909	2016206
ADD: DEPRECIATION	394563	430052	466579	503737	546226	591914	636715	679392	721846	769538	5740563
ADD: CHANGE IN DEFERRED TAXES	56512	49110	23222	24220	36006	71556	92226	113395	147048	198881	812175
ADD: CHANGE IN RESERVES	147952	107504	70535	58390	58680	61940	66317	70315	77100	89640	808372
ADD: OTH NCI	-20850	-22017	-23360	-24715	-26124	-27770	-29491	-31231	-32980	-34827	-273365
FUNDS FROM OPERATIONS	680074	648582	544066	574056	666598	864740	1004679	1146121	1343895	1631141	9103951
EQUIP FIN OBLIG	780872	812365	720703	773999	911786	954162	907773	813726	851863	1012721	8539971
EQUIP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
SALE OF EQUITY & OTH DEBT	110500	77920	151130	88259	49829	63699	91089	6420	36772	9900	685518
OTH OBLIGATIONS	0	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT PROCEEDS	891372	890285	871833	862258	961615	1017861	998862	820146	888635	1022621	9225489
SALVAGE PROCEEDS	26751	21648	20985	19536	19338	18935	18632	17890	17810	17832	199356
CHANGE IN OTH LIAB	9875	10389	10929	11497	12095	12724	13386	14082	14814	15584	125376
TOTAL SOURCES	1608073	1570904	1447813	1467348	1659646	1914259	2035559	1998238	2265154	2687178	18654172
INVESTMENT:ROAD	264759	286579	314228	339073	366891	395415	424549	455899	488634	522915	3858943
INVESTMENT:EQUIP	973801	1017376	913928	981792	1150237	1205454	1155133	1048196	1098464	1294872	10839252
INVESTMENT:OTH	0	0	0	0	0	0	0	0	0	0	0
TOTAL INVESTMENT	1238559	1303955	1228155	1320865	1517128	1600869	1579682	1504095	1587098	1817788	14698194
REPAYMENT OF FUNDED DEBT OTH	88000	63000	35000	25100	36300	95200	81400	80000	73900	41200	619100
REPAYMENT OF EQ OBLIG	332469	326166	323537	351061	390285	448394	472891	506981	555052	613113	4319949
REPAYMENT OF EQP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
TOTAL REPAYMENT OF DEBT	420469	389166	358537	376161	426585	543594	554291	586981	628952	654313	4939049
OTHER USES	7696	8818	10080	10188	10594	12293	12857	13015	13109	13831	112482
TOTAL USES	1666724	1701940	1596772	1707215	1954307	2156756	2146830	2104091	2229158	2485932	19749725
CHANGE IN WORKING CAPITAL	33666	303285	118567	173149	181157	198171	198960	210635	237761	284431	1939781
FUNDING SURPLUS (SHORTFALL)	-92318	-434320	-267527	-413016	-475818	-440668	-310231	-316488	-201766	-83184	-3035335
NET ADDITIONAL FUNDS REQ	92318	434320	267527	413016	475818	440668	310231	316488	201766	83184	3035335

SOURCE: Federal Railroad Administration Analysis.

FIGURE A-3. COMPUTER PRINTOUT OF SOURCES AND USES OF FUNDS, WEST, SCENARIO 1.

SOUTH
SOURCES AND USES OF FUNDS
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 25 % DEFERRED MAINTENANCE CATCHUP.

YEAR:	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
YEAR											
NET INCOME	20715	47852	6664	-6541	-18666	-14737	-25300	-37086	-41881	-30422	-99402
ADD: DEPRECIATION	141999	157183	172770	189113	208777	229656	249896	269257	288355	309312	2216317
ADD: CHANGE IN DEFERRED TAXES	16755	23389	11855	8026	4596	5492	2549	-627	-1870	1200	71365
ADD: CHANGE IN RESERVES	57806	26424	17583	15281	15881	16893	18068	19196	20626	22995	230754
ADD: OTH NCI	-20748	-21910	-23246	-24594	-25996	-27634	-29347	-31079	-32819	-34657	-272029
FUNDS FROM OPERATIONS	216528	232939	185625	181284	184593	209670	215866	219661	232411	268429	2147005
EQUIP FIN OBLIG	312626	343879	288581	357812	420840	444732	426259	390154	397938	461271	3844092
EQUIP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
SALE OF EQUITY & OTH DEBT	17853	95633	30415	37038	92870	42046	42803	39502	24416	25272	447848
OTH OBLIGATIONS	0	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT PROCEEDS	330479	439512	318996	394850	513710	486778	469062	429656	422354	486543	4291940
SALVAGE PROCEEDS	9781	8539	8411	7975	7985	7999	7976	7630	7408	7430	81136
CHANGE IN OTH LIAB	6852	7318	7816	8347	8915	9521	10168	10860	11598	12387	93780
TOTAL SOURCES	563640	688308	520848	592456	715203	713968	703072	667807	673771	774788	6613861
INVESTMENT:ROAD	96283	104219	114273	123309	133425	143799	154393	165794	177699	190166	1403361
INVESTMENT:EQUIP	391779	431474	367917	452098	528944	559328	539322	498375	509598	586906	4865742
INVESTMENT:OTH	0	0	0	0	0	0	0	0	0	0	0
TOTAL INVESTMENT	488063	535693	482190	575407	662369	703126	693716	664170	687297	777072	6269103
REPAYMENT OF FUNDED DEBT OTH	29900	20500	17500	18500	64800	25300	27400	27600	29400	28500	289400
REPAYMENT OF EQ OBLIG	146276	154838	168511	187032	204443	219758	234360	256863	276687	297655	2146424
REPAYMENT OF EQP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
TOTAL REPAYMENT OF DEBT	176176	175338	186011	205532	269243	245058	261760	284463	306087	326155	2435824
OTHER USES	2202	2522	2882	2912	3027	3511	3671	3715	3740	3945	32127
TOTAL USES	666440	713552	671083	783851	934639	951696	959147	952348	997125	1107172	8737054
CHANGE IN WORKING CAPITAL	61882	52525	-220	17133	34655	36538	39314	43140	46337	51254	382557
FUNDING SURPLUS (SHORTFALL)	-164682	-77769	-150014	-208528	-254092	-274266	-295388	-327680	-369690	-383639	-2505749
NET ADDITIONAL FUNDS REQ	164682	77769	150014	208528	254092	274266	295388	327680	369690	383639	2505749

SOURCE: Federal Railroad Administration analysis.

FIGURE A-4. COMPUTER PRINTOUT OF SOURCES AND USES OF FUNDS, SOUTH, SCENARIO 1.

MEAST
SOURCES AND USES OF FUNDS
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 25 % DEFERRED MAINTENANCE CATCHUP.

YEAR:	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
NET INCOME	-28588	-42309	-48727	-53209	-58517	-61606	-65853	-69937	-73846	-78003	-580596
ADD: DEPRECIATION	6098	6091	6180	6243	6328	6433	6544	6667	6836	7056	64475
ADD: CHANGE IN DEFERRED TAXES	-1137	0	0	0	0	0	0	0	0	0	-1137
ADD: CHANGE IN RESERVES	1901	3011	1840	1417	1561	1640	1736	1775	1893	2177	18951
ADD: OTH NCI	-96	-101	-107	-113	-120	-127	-135	-143	-151	-160	-1253
FUNDS FROM OPERATIONS	-21821	-33308	-40815	-45662	-50748	-53660	-57708	-61639	-65269	-68930	-499560
EQUIP FIN OBLIG	3374	3131	1482	1591	2353	2514	2361	2373	3232	3881	26293
EQUIP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
SALE OF EQUITY & OTH DEBT	29700	1000	3000	1000	0	0	0	0	0	0	34700
OTH OBLIGATIONS	0	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT PROCEEDS	33074	4131	4482	2591	2353	2514	2361	2373	3232	3881	60993
SALVAGE PROCEEDS	1047	470	473	465	527	526	557	515	520	526	5627
CHANGE IN OTH LIAB	2115	2182	2252	2324	2399	2476	2555	2637	2721	2808	24468
TOTAL SOURCES	14415	-26524	-33607	-40282	-45469	-48144	-52235	-56114	-58795	-61715	-408471
INVESTMENT:ROAD	4879	5281	5791	6249	6761	7287	7824	8402	9005	9637	71115
INVESTMENT:EQUIP	5184	5036	3170	3356	4306	4539	4390	4446	5515	6332	46274
INVESTMENT:OTH	0	0	0	0	0	0	0	0	0	0	0
TOTAL INVESTMENT	10063	10317	8961	9604	11068	11826	12214	12848	14520	15969	117390
REPAYMENT OF FUNDED DEBT OTH	1200	1900	2500	700	700	3500	3500	6400	3000	2800	26200
REPAYMENT OF EQ OBLIG	4512	2929	2783	2886	2817	2479	1942	1700	1686	1823	25558
REPAYMENT OF EQP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
TOTAL REPAYMENT OF DEBT	5712	4829	5283	3586	3517	5979	5442	8100	4686	4623	51758
OTHER USES	283	325	373	376	391	455	476	482	485	512	4158
TOTAL USES	16059	15472	14617	13566	14976	18260	18132	21429	19691	21104	173305
CHANGE IN WORKING CAPITAL	18492	753	885	680	3732	4845	4787	5005	5661	6915	51755
FUNDING SURPLUS (SHORTFALL)	-20135	-42748	-49110	-54529	-64177	-71249	-75154	-82548	-84148	-89733	-633531
NET ADDITIONAL FUNDS REQ	20135	42748	49110	54529	64177	71249	75154	82548	84148	89733	633531

SOURCE: Federal Railroad Administration analysis.

FIGURE A-5. COMPUTER PRINTOUT OF SOURCES AND USES OF FUNDS, MARGINAL EAST, SCENARIO 1.

MWEST
SOURCES AND USES OF FUNDS
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 25 % DEFERRED MAINTENANCE CATCHUP.

YEAR:	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
NET INCOME	-219352	-257792	-363026	-429294	-491910	-537619	-600923	-669099	-732494	-781539	-5083049
ADD: DEPRECIATION	75521	78807	83014	86686	90887	95356	99696	103896	108165	113040	935069
ADD: CHANGE IN DEFERRED TAXES	-130003	0	0	0	0	0	0	0	0	0	-130003
ADD: CHANGE IN RESERVES	54649	53554	32273	24077	21925	21484	21992	22948	24677	27084	304863
ADD: OTH NCI	4839	5110	5422	5736	6063	6445	6845	7249	7655	8083	63447
FUNDS FROM OPERATIONS	-214147	-120320	-242318	-312794	-373035	-414333	-472390	-535006	-591997	-633333	-3909673
EQUIP FIN OBLIG	92018	134171	95301	91732	101241	98927	93236	79860	81742	95599	963829
EQUIP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
SALE OF EQUITY & OTH DEBT	10529	0	0	1874	57437	30000	0	10000	10248	0	120088
OTH OBLIGATIONS	0	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT PROCEEDS	102547	134171	95301	93606	158678	128927	93236	89860	91990	95599	1083917
SALVAGE PROCEEDS	9860	8058	7461	6802	6554	6246	6162	5767	5610	5491	68012
CHANGE IN OTH LIAB	10749	11308	11896	12514	13165	13850	14570	15327	16124	16963	136465
TOTAL SOURCES	-90991	33217	-127659	-199872	-194637	-265311	-358422	-424051	-478273	-515280	-2621279
INVESTMENT:ROAD	60475	65459	71775	77450	83804	90319	96974	104135	111612	119442	881444
INVESTMENT:EQUIP	125150	177354	132756	129650	142028	140343	134624	119788	123066	140569	1365327
INVESTMENT:OTH	0	0	0	0	0	0	0	0	0	0	0
TOTAL INVESTMENT	185625	242814	204530	207100	225832	230662	231598	223922	234677	260011	2246771
REPAYMENT OF FUNDED DEBT OTH	4300	3400	9300	22700	39800	23100	9400	9100	21200	10300	152600
REPAYMENT OF EQ OBLIG	88397	81310	77955	74601	67762	63885	57645	52053	56472	62309	682389
REPAYMENT OF EQP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
TOTAL REPAYMENT OF DEBT	92697	84710	87255	97301	107562	86985	67045	61153	77672	72609	834989
OTHER USES	3989	4592	5271	5323	5536	6452	6750	6828	6870	7254	58866
TOTAL USES	282311	332116	297056	309724	338929	324099	305394	291904	319219	339874	3140626
CHANGE IN WORKING CAPITAL	164466	17801	10513	8634	9154	8689	12308	31912	37379	41255	342111
FUNDING SURPLUS (SHORTFALL)	-537768	-316700	-435229	-518229	-542720	-598099	-676124	-747867	-834871	-896408	-6104015
NET ADDITIONAL FUNDS REQ	537768	316700	435229	518229	542720	598099	676124	747867	834871	896408	6104015

SOURCE: Federal Railroad Administration analysis.

FIGURE A-6. COMPUTER PRINTOUT OF SOURCES AND USES OF FUNDS, MARGINAL WEST, SCENARIO 1.

EAST
SOURCES AND USES OF FUNDS
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 50 % DEFERRED MAINTENANCE CATCHUP.

YEAR:	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
NET INCOME	87180	46577	12513	12403	18575	42636	45546	48623	59791	86038	459882
ADD: DEPRECIATION	152409	163408	172795	183835	198313	214572	230434	245228	260188	276656	2097840
ADD: CHANGE IN DEFERRED TAXES	66668	46960	30696	29727	31527	41074	41111	41220	44854	54955	428791
ADD: CHANGE IN RESERVES	53043	37881	33212	30443	31005	32800	34094	34658	35873	38826	361835
ADD: OTH NCI	-39870	-42103	-44671	-47262	-49956	-53103	-56396	-59723	-63067	-66599	-522750
FUNDS FROM OPERATIONS	319431	252723	204544	209147	229463	277979	294789	310006	337639	389876	2825597
EQUIP FIN OBLIG	331578	235176	213840	299292	362500	409869	374614	356463	377370	420234	3380935
EQUIP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
SALE OF EQUITY & OTH DEBT	36554	102881	11000	31169	50552	4181	8884	7210	27346	95611	375388
OTH OBLIGATIONS	0	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT PROCEEDS	368132	338057	224840	330461	413052	414050	383498	363673	404716	515845	3756323
SALVAGE PROCEEDS	13028	11270	10737	10021	9866	9882	9692	9631	9673	9720	103520
CHANGE IN OTH LIAB	6314	6516	6724	6940	7162	7391	7627	7871	8123	8383	73051
TOTAL SOURCES	706904	608565	446846	556568	659543	709302	695606	691181	760151	923824	6758491
INVESTMENT:ROAD	41471	44889	49220	53112	57469	61937	66501	71411	76539	81908	604457
INVESTMENT:EQUIP	420650	308591	285495	388871	465778	523954	483786	463950	490498	543048	4374619
INVESTMENT:OTH	0	0	0	0	0	0	0	0	0	0	0
TOTAL INVESTMENT	462121	353480	334715	441982	523247	585891	550286	535361	567037	624956	4979076
REPAYMENT OF FUNDED DEBT OTH	53100	78300	45600	61100	72700	60300	64400	56000	35200	29600	556300
REPAYMENT OF EQ OBLIG	140203	147443	157135	165023	178121	193791	207182	224737	244261	262991	1920888
REPAYMENT OF EQP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
TOTAL REPAYMENT OF DEBT	193303	225743	202735	226123	250821	254091	271582	280737	279461	292591	2477188
OTHER USES	3446	3939	4493	4544	4724	5470	5719	5791	5836	6155	50118
TOTAL USES	658870	583162	541944	672649	778792	845452	827587	821890	852333	923703	7506382
CHANGE IN WORKING CAPITAL	95779	47547	42258	33098	40510	39636	37114	36867	37844	40670	451323
FUNDING SURPLUS (SHORTFALL)	-47745	-22143	-137355	-149179	-159759	-175786	-169095	-167576	-130027	-40548	-1199214
NET ADDITIONAL FUNDS REQ	47745	22143	137355	149179	159759	175786	169095	167576	130027	40548	1199214

SOURCE: Federal Railroad Administration analysis.

FIGURE A-7. COMPUTER PRINTOUT OF SOURCES AND USES OF FUNDS, EAST, SCENARIO 2.

WEST
SOURCES AND USES OF FUNDS
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 50 % DEFERRED MAINTENANCE CATCHUP.

YEAR:	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
NET INCOME	27909	3938	-80591	-82235	-50672	56556	120193	186733	294190	461610	937631
ADD: DEPRECIATION	394563	430052	466579	503737	546226	591914	636715	679392	721846	769538	5740563
ADD: CHANGE IN DEFERRED TAXES	33005	24399	-3189	-3616	6521	40393	59400	78759	110536	160413	506619
ADD: CHANGE IN RESERVES	149185	107935	70778	58604	58906	62184	66562	70576	77385	89954	812069
ADD: OTH NCI	-20850	-22017	-23360	-24715	-26124	-27770	-29491	-31231	-32980	-34827	-273365
FUNDS FROM OPERATIONS	583812	544307	430217	451774	534858	723278	853378	984228	1170977	1446687	7723517
EQUIP FIN OBLIG	780872	812365	720703	773999	911786	954162	907773	813726	851863	1012721	8539971
EQUIP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
SALE OF EQUITY & OTH DEBT	110500	77920	151130	88259	49829	63699	91089	6420	36772	9900	685518
OTH OBLIGATIONS	0	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT PROCEEDS	891372	890285	871833	862258	961615	1017861	998862	820146	888635	1022621	9225489
SALVAGE PROCEEDS	26751	21648	20985	19536	19338	18935	18632	17890	17810	17832	199356
CHANGE IN OTH LIAB	9875	10389	10929	11497	12095	12724	13386	14082	14814	15584	125376
TOTAL SOURCES	1511811	1466629	1333964	1345066	1527906	1772797	1884258	1836346	2092236	2502724	17273738
INVESTMENT:ROAD	264759	286579	314228	339073	366891	395415	424549	455899	488634	522915	3858943
INVESTMENT:EQUIP	973801	1017376	913928	981792	1150237	1205454	1155133	1048196	1098464	1294872	10839252
INVESTMENT:OTH	0	0	0	0	0	0	0	0	0	0	0
TOTAL INVESTMENT	1238559	1303955	1228155	1320865	1517128	1600869	1579682	1504095	1587098	1817788	14698194
REPAYMENT OF FUNDED DEBT OTH	88000	63000	35000	25100	36300	95200	81400	80000	73900	41200	619100
REPAYMENT OF EQ OBLIG	332469	326166	323537	351061	390285	448394	472891	506981	555052	613113	4319949
REPAYMENT OF EQP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
TOTAL REPAYMENT OF DEBT	420469	389166	358537	376161	426585	543594	554291	586981	628952	654313	4939049
OTHER USES	7696	8818	10080	10188	10594	12293	12857	13015	13109	13831	112482
TOTAL USES	1666724	1701940	1596772	1707215	1954307	2156756	2146830	2104091	2229158	2485932	19749725
CHANGE IN WORKING CAPITAL	33666	309202	119135	173666	181735	198767	199565	211286	238440	285142	1950603
FUNDING SURPLUS (SHORTFALL)	-188579	-544513	-381943	-535814	-608136	-582726	-462137	-479031	-375362	-268349	-4426591
NET ADDITIONAL FUNDS REQ	188579	544513	381943	535814	608136	582726	462137	479031	375362	268349	4426591

SOURCE: Federal Railroad Administration analysis.

FIGURE A-8. COMPUTER PRINTOUT OF SOURCES AND USES OF FUNDS, WEST, SCENARIO 2.

SOUTH
SOURCES AND USES OF FUNDS
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 50 % DEFERRED MAINTENANCE CATCHUP.

YEAR:	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
NET INCOME	3417	29143	-13842	-28676	-42626	-40579	-53050	-66889	-73826	-64609	-351537
ADD: DEPRECIATION	141999	157183	172770	189113	208777	229656	249896	269257	288355	309312	2216317
ADD: CHANGE IN DEFERRED TAXES	12205	18605	6742	2638	-1110	-538	-3802	-7328	-8933	-6241	12237
ADD: CHANGE IN RESERVES	57966	26445	17602	15301	15904	16918	18092	19223	20656	23027	231134
ADD: OTH NCI	-20748	-21910	-23246	-24594	-25996	-27634	-29347	-31079	-32819	-34657	-272029
FUNDS FROM OPERATIONS	194839	209467	160025	153781	154948	177823	181789	183183	193432	226833	1836120
EQUIP FIN OBLIG	312626	343879	288581	357812	420840	444732	426259	390154	397938	461271	3844092
EQUIP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
SALE OF EQUITY & OTH DEBT	17853	95633	30415	37038	92870	42046	42803	39502	24416	25272	447848
OTH OBLIGATIONS	0	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT PROCEEDS	330479	439512	318996	394850	513710	486778	469062	429656	422354	486543	4291940
SALVAGE PROCEEDS	9781	8539	8411	7975	7985	7999	7976	7630	7408	7430	81136
CHANGE IN OTH LIAB	6852	7318	7816	8347	8915	9521	10168	10860	11598	12387	93780
TOTAL SOURCES	541951	664836	495248	564952	685558	682122	668996	631329	634792	733192	6302976
INVESTMENT:ROAD	96283	104219	114273	123309	133425	143799	154393	165794	177699	190166	1403361
INVESTMENT:EQUIP	391779	431474	367917	452098	528944	559328	539322	498375	509598	586906	4865742
INVESTMENT:OTH	0	0	0	0	0	0	0	0	0	0	0
TOTAL INVESTMENT	488063	535693	482190	575407	662369	703126	693716	664170	687297	777072	6269103
REPAYMENT OF FUNDED DEBT OTH	29900	20500	17500	18500	64800	25300	27400	27600	29400	28500	289400
REPAYMENT OF EQ OBLIG	146276	154838	168511	187032	204443	219758	234360	256863	276687	297655	2146424
REPAYMENT OF EQP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
TOTAL REPAYMENT OF DEBT	176176	175338	186011	205532	269243	245058	261760	284463	306087	326155	2435824
OTHER USES	2202	2522	2882	2912	3027	3511	3671	3715	3740	3945	32127
TOTAL USES	666440	713552	671083	783851	934639	951696	959147	952348	997125	1107172	8737054
CHANGE IN WORKING CAPITAL	61882	53858	-92	15672	34655	36538	39314	43140	46337	51254	382557
FUNDING SURPLUS (SHORTFALL)	-186371	-102574	-175743	-234570	-283736	-306112	-329465	-364159	-408669	-425234	-2816634
NET ADDITIONAL FUNDS REQ	186371	102574	175743	234570	283736	306112	329465	364159	408669	425234	2816634

SOURCE: Federal Railroad Administration analysis.

FIGURE A-9. COMPUTER PRINTOUT OF SOURCES AND USES OF FUNDS, SOUTH, SCENARIO 2.

MEAST
SOURCES AND USES OF FUNDS
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 50 % DEFERRED MAINTENANCE CATCHUP.

YEAR:	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
NET INCOME	-34571	-48781	-55821	-60866	-66806	-70544	-75451	-80245	-84894	-89825	-667805
ADD: DEPRECIATION	6098	6091	6180	6243	6328	6433	6544	6667	6836	7056	64475
ADD: CHANGE IN DEFERRED TAXES	-1137	0	0	0	0	0	0	0	0	0	-1137
ADD: CHANGE IN RESERVES	1923	3030	1857	1433	1576	1655	1751	1790	1908	2193	19116
ADD: OTH NCI	-96	-101	-107	-113	-120	-127	-135	-143	-151	-160	-1253
FUNDS FROM OPERATIONS	-27783	-39761	-47892	-53304	-59021	-62583	-67292	-71931	-76301	-80736	-586603
EQUIP FIN OBLIG	3374	3131	1482	1591	2353	2514	2361	2373	3232	3881	26293
EQUIP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
SALE OF EQUITY & OTH DEBT	29700	1000	3000	1000	0	0	0	0	0	0	34700
OTH OBLIGATIONS	0	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT PROCEEDS	33074	4131	4482	2591	2353	2514	2361	2373	3232	3881	60993
SALVAGE PROCEEDS	1047	470	473	465	527	526	557	515	520	526	5627
CHANGE IN OTH LIAB	2115	2182	2252	2324	2399	2476	2555	2637	2721	2808	24468
TOTAL SOURCES	8454	-32977	-40684	-47923	-53742	-57068	-61819	-66407	-69828	-73521	-495515
INVESTMENT:ROAD	4879	5281	5791	6249	6761	7287	7824	8402	9005	9637	71115
INVESTMENT:EQUIP	5184	5036	3170	3356	4306	4539	4390	4446	5515	6332	46274
INVESTMENT:OTH	0	0	0	0	0	0	0	0	0	0	0
TOTAL INVESTMENT	10063	10317	8961	9604	11068	11826	12214	12848	14520	15969	117390
REPAYMENT OF FUNDED DEBT OTH	1200	1900	2500	700	700	3500	3500	6400	3000	2800	26200
REPAYMENT OF EQ OBLIG	4512	2929	2783	2886	2817	2479	1942	1700	1686	1823	25558
REPAYMENT OF EQP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
TOTAL REPAYMENT OF DEBT	5712	4829	5283	3586	3517	5979	5442	8100	4686	4623	51758
OTHER USES	283	325	373	376	391	455	476	482	485	512	4158
TOTAL USES	16059	15472	14617	13566	14976	18260	18132	21429	19691	21104	173305
CHANGE IN WORKING CAPITAL	18492	753	885	680	4150	4878	4820	5040	5699	6954	52352
FUNDING SURPLUS (SHORTFALL)	-26097	-49201	-56186	-62170	-72868	-80205	-84771	-92876	-95217	-101578	-721171
NET ADDITIONAL FUNDS REQ	26097	49201	56186	62170	72868	80205	84771	92876	95217	101578	721171

SOURCE: Federal Railroad Administration analysis.

FIGURE A-10. COMPUTER PRINTOUT OF SOURCES AND USES OF FUNDS, MARGINAL EAST, SCENARIO 2.

MWEST
SOURCES AND USES OF FUNDS
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 50 % DEFERRED MAINTENANCE CATCHUP.

YEAR:	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
NET INCOME	-280520	-323914	-435498	-507520	-576584	-628935	-698980	-774408	-845361	-902317	-5974038
ADD: DEPRECIATION	75521	78807	83014	86686	90887	95356	99696	103896	108165	113040	935069
ADD: CHANGE IN DEFERRED TAXES	-130003	0	0	0	0	0	0	0	0	0	-130003
ADD: CHANGE IN RESERVES	55076	53657	32334	24127	21974	21536	22044	23003	24737	27149	305638
ADD: OTH NCI	4839	5110	5422	5736	6063	6445	6845	7249	7655	8083	63447
FUNDS FROM OPERATIONS	-275088	-186340	-314728	-390971	-457659	-505598	-570395	-640260	-704804	-754045	-4799887
EQUIP FIN OBLIG	92018	134171	95301	91732	101241	98927	93236	79860	81742	95599	963829
EQUIP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
SALE OF EQUITY & OTH DEBT	10529	0	0	1874	57437	30000	0	10000	10248	0	120088
OTH OBLIGATIONS	0	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT PROCEEDS	102547	134171	95301	93606	158678	128927	93236	89860	91990	95599	1083917
SALVAGE PROCEEDS	9860	8058	7461	6802	6554	6246	6162	5767	5610	5491	68012
CHANGE IN OTH LIAB	10749	11308	11896	12514	13165	13850	14570	15327	16124	16963	136465
TOTAL SOURCES	-151932	-32803	-200070	-276048	-279262	-356576	-456427	-529305	-591080	-635992	-3511494
INVESTMENT:ROAD	60475	65459	71775	77450	83804	90319	96974	104135	111612	119442	881444
INVESTMENT:EQUIP	125150	177354	132756	129650	142028	140343	134624	119788	123066	140569	1365327
INVESTMENT:OTH	0	0	0	0	0	0	0	0	0	0	0
TOTAL INVESTMENT	185625	242814	204530	207100	225832	230662	231598	223922	234677	260011	2246771
REPAYMENT OF FUNDED DEBT OTH	4300	3400	9300	22700	39800	23100	9400	9100	21200	10300	152600
REPAYMENT OF EQ OBLIG	88397	81310	77955	74601	67762	63885	57645	52053	56472	62309	682389
REPAYMENT OF EQP CAP LEASES	0	0	0	0	0	0	0	0	0	0	0
TOTAL REPAYMENT OF DEBT	92697	84710	87255	97301	107562	86985	67045	61153	77672	72609	834989
OTHER USES	3989	4592	5271	5323	5536	6452	6750	6828	6870	7254	58866
TOTAL USES	282311	332116	297056	309724	338929	324099	305394	291904	319219	339874	3140626
CHANGE IN WORKING CAPITAL	164466	17801	10513	8634	9154	8689	17270	32279	37762	41655	348222
FUNDING SURPLUS (SHORTFALL)	-598709	-382719	-507640	-596405	-627345	-689364	-779091	-853487	-948061	-1017521	-7000342
NET ADDITIONAL FUNDS REQ	598709	382719	507640	596405	627345	689364	779091	853487	948061	1017521	7000342

SOURCE: Federal Railroad Administration analysis.

FIGURE A-11. COMPUTER PRINTOUT OF SOURCES AND USES OF FUNDS, MARGINAL WEST, SCENARIO 2.

EAST
REGIONAL INCOME STATEMENT
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 25 % DEFERRED MAINTENANCE CATCHUP.

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
REV-FREIGHT	2948122	3252980	3492732	3770933	4095787	4458484	4780132	5107093	5464010	5882325	43252597
REV-OTHER FREIGHT	160673	173384	186163	200991	218305	237637	254781	272208	291232	313528	2308901
REV-PASSENGER	18263	19712	21395	23081	24889	26768	28708	30805	33000	35300	261921
TOTAL REVENUE	3127058	3446076	3700290	3995004	4338982	4722889	5063622	5410106	5788241	6231153	45823420
MOW: LABOR	199655	217883	238952	260386	282806	306476	332374	361523	392686	425436	3018177
MOW: FRINGE BENEFITS	11722	12397	13181	14064	15032	16051	17001	17911	18771	19644	155774
MOW: MATERIALS&OTH	237438	255239	280175	299742	323130	346191	368522	391416	414799	439252	3355905
MOW: DEPRECIATION	31023	31688	32431	33256	34164	35160	36246	37427	38709	40095	350199
MOW: DEFERRED MAINT.	32624	35298	38707	41759	45167	48646	52229	56087	60124	64355	474997
TOTAL MOW	512462	552504	603447	649208	700298	752525	806373	864364	925089	988782	7355052
MOE: LABOR	287015	306938	337176	367794	400402	434615	471265	511834	555317	601654	4274009
MOE: FRINGE BENEFITS	20080	20809	22163	23672	25360	27123	28724	30216	31630	33102	262876
MOE: MATERIALS&OTH	77922	82109	90313	96742	104563	112230	119472	126727	134164	142099	1086342
MOE: INJURIES	9123	10119	11099	12288	13659	15200	16976	18934	21068	23450	151915
MOE: DEPRECIATION	121387	131720	140364	150579	164149	179412	194187	207801	221480	236561	1747641
TOTAL MOE	515526	551695	601115	651074	708133	768580	830624	895512	963658	1036865	7522784
TGA: LABOR	778740	897412	990253	1083132	1186626	1293550	1402040	1516725	1640535	1777610	12566622
TGA: FRINGE BENEFIT	54482	60840	65089	69711	75156	80726	85455	89538	93442	97801	772240
TGA: MATERIALS&OTH	198006	258934	285657	306549	332727	358148	381152	403231	426022	451249	3401677
TGA: FUEL	147427	177890	195845	221764	247302	270944	294156	317356	342517	371025	2586228
TGA: INJURIES	24752	29586	32596	36187	40481	45240	50504	56107	62240	69283	446976
TGA: LOSS AND DAMAGE	41419	40438	45406	48901	52578	56747	61028	64740	68076	71526	550859
TGA: PENSIONS	31074	36469	40518	44913	50200	55803	60890	65956	71625	78300	535748
TOTAL TGA	1275901	1501569	1655365	1811158	1985071	2161158	2335225	2513653	2704457	2916793	20860349
TOTAL OPERATING EXPENSES	2303889	2605768	2859927	3111440	3393503	3682263	3972222	4273529	4593204	4942441	35738185
NET REVENUE: OPERATIONS	823169	840307	840363	883564	945479	1040626	1091400	1136577	1195037	1288712	10085235
PAYROLL TAX	203302	228569	249727	271899	298679	328679	353189	377912	402446	428647	3143050
PROPERTY TAX	73037	77127	81832	86578	91513	97279	103310	109405	115532	122002	957614
NET FREIGHT RENTS	118806	162866	187337	199930	213025	222232	230978	237290	243590	252860	2068913
NET NON-REV EQPT RENTS	13104	14294	15692	16729	17696	18665	19416	19899	20322	20896	176714
NET JOINT FACILITY RENTS	7446	5279	5351	5410	5494	5566	5600	5610	5628	5663	57046
TOTAL RENTS	139356	182438	208380	222069	236214	246462	255994	262799	269540	279419	2302672
NET OPERATING INCOME	407474	352173	300425	303018	319072	368206	378907	386460	407519	458644	3681898
OTHER INCOME	49522	54871	60468	66696	73699	81290	88769	96847	105757	115592	793510
INTEREST INCOME	28815	29976	31165	32202	33269	34403	35536	36679	37872	39159	339074
INCOME FROM EQUITY	50855	53703	56978	60283	63719	67734	71933	76177	80443	84948	666774
TOTAL OTHER INCOME	129192	138550	148611	159181	170687	183426	196238	209703	224072	239698	1799358
NET MISC DEDUCTIONS	19242	20319	21559	22809	24109	25628	27217	28823	30437	32141	252284
INC AVAIL. FOR FIXED CHARGES	517424	470404	427477	439390	465651	526005	547928	567339	601154	666201	5228971
FIXED CHARGES	124199	143075	153991	162283	173763	188727	201228	210595	220371	235450	1813682
NET ORDINARY INCOME	393225	327328	273486	277107	291888	337277	346700	356744	380783	430751	3415289
INCOME TAXES	61736	51391	42937	43506	45826	52953	54432	56009	59783	67628	536200
DEFERRED INC TAXES	100666	83796	70012	70939	74723	86343	88755	91327	97480	110272	874314
NET INCOME	230823	192142	160536	162662	171338	197982	203513	209409	223520	252851	2004775
DIVIDENDS	120000	120000	120000	120000	120000	120000	120000	120000	120000	120000	1200000
RETAINED NET INCOME	110823	72142	40536	42662	51338	77982	83513	89409	103520	132851	804775

SOURCE: Federal Railroad Administration analysis.

FIGURE A-12. COMPUTER PRINTOUT OF REGIONAL INCOME STATEMENT, EAST, SCENARIO 1.

WEST
REGIONAL INCOME STATEMENT
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + M RATE RELIEF WITH 78-85 CARRYOVER, 25 % DEFERRED MAINTENANCE CATCHUP.

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
REV-FREIGHT	7260974	8234735	8919097	9742819	10718604	11845883	12930144	14064208	15333377	16855427	115905267
REV-OTHER FREIGHT	159015	200928	217626	237725	261534	289040	315496	343167	374134	411272	2809936
REV-PASSENGER	26017	28104	30489	32880	35451	38107	40849	43805	46905	50176	372782
TOTAL REVENUE	7446006	8463767	9167212	10013424	11015589	12173029	13286488	14451179	15754417	17316876	119087985
MOW: LABOR	553354	603876	662270	721676	783812	849418	921193	1001982	1088353	1179121	8365056
MOW: FRINGE BENEFITS	32490	34358	36533	38980	41662	44487	47120	49641	52024	54443	431737
MOW: MATERIALS&OTH	661700	711035	780147	834378	899200	963115	1025007	1088458	1153266	1221039	9337346
MOW: DEPRECIATION	74018	78998	84472	90472	96997	104087	111753	120024	128935	138517	1028272
MOW: DEFERRED MAINT.	88122	95345	104554	112796	122002	131399	141078	151499	162403	173832	1283030
TOTAL MOW	1409684	1523611	1667976	1798303	1943673	2092506	2246151	2411604	2584981	2766953	20445442
MOE: LABOR	536240	577004	635368	699356	774006	852951	935384	1023438	1121786	1240487	8396020
MOE: FRINGE BENEFITS	35542	37059	39565	42642	46442	50428	54011	57238	60532	64657	488116
MOE: MATERIALS&OTH	290341	307832	339402	366863	403107	439262	472919	505355	540506	584293	4249879
MOE: INJURIES	24710	24730	27189	30375	34326	38780	43803	49217	55327	62853	391310
MOE: DEPRECIATION	320545	351054	382107	413265	449229	487828	524962	559368	592911	631021	4712290
TOTAL MOE	1207377	1297679	1423630	1552501	1707109	1869249	2031079	2194617	2371062	2583312	18237616
TGA: LABOR	1637464	2050503	2277316	2521109	2795213	3088930	3405706	3755249	4142248	4585937	30259676
TGA: FRINGE BENEFIT	108530	131697	141810	153721	167719	182623	196654	210020	223516	239030	1755320
TGA: MATERIALS&OTH	743999	839426	933468	1014811	1117064	1220661	1321271	1422858	1531489	1657502	11802547
TGA: FUEL	543558	618430	686758	788687	892980	994423	1099670	1209572	1332112	1476980	9643170
TGA: INJURIES	75453	87883	97453	109499	123964	140441	159484	180589	204298	232361	1411426
TGA: LOSS AND DAMAGE	107560	125174	128425	131222	135140	139044	143090	145909	148695	152443	1356701
TGA: PENSIONS	50838	63515	70873	79505	89934	101389	112690	124648	138326	154936	986655
TOTAL TGA	3267401	3916629	4336102	4798553	5322015	5867511	6438566	7048845	7720684	8499189	57215495
TOTAL OPERATING EXPENSES	5884463	6737919	7427708	8149357	8972798	9829266	10715796	11655066	12676727	13849454	95898553
NET REVENUE: OPERATIONS	1561543	1725848	1739503	1864066	2042791	2343764	2570692	2796113	3077689	3467422	23189432
PAYROLL TAX	468115	554418	608431	668542	742079	825902	899001	975005	1053334	1141669	7936496
PROPERTY TAX	214061	226049	239838	253748	268212	285109	302786	320651	338607	357569	2806631
NET FREIGHT RENTS	293707	355441	384120	403992	421122	434509	451045	469814	490561	516387	4220698
NET NON-REV EQPT RENTS	29461	34652	39648	46255	53933	62430	70861	78819	86826	96148	599032
NET JOINT FACILITY RENTS	13160	9714	9923	10167	10468	10775	11049	11304	11593	11953	110105
TOTAL RENTS	336328	399806	433691	460414	485523	507714	532955	559936	588979	624488	4929834
NET OPERATING INCOME	543038	545574	457544	481362	546978	725039	835950	940521	1096769	1343696	7516472
OTHER INCOME	145655	161385	177847	196165	216762	239089	261085	284844	311049	339977	2333858
INTEREST INCOME	32532	35776	38767	41413	44302	47446	50696	54090	57741	61828	464591
INCOME FROM EQUITY	76653	80945	85883	90864	96043	102094	108424	114821	121251	128041	1005018
TOTAL OTHER INCOME	254839	278107	302496	328442	357108	388629	420204	453755	490041	529846	3803467
NET MISC DEDUCTIONS	27599	29145	30923	32716	34581	36760	39039	41342	43657	46102	361863
INC AVAIL. FOR FIXED CHARGES	770279	794536	729118	777088	869505	1076908	1217116	1352934	1543152	1827440	10958075
FIXED CHARGES	277019	327576	374666	414827	449580	488183	523245	548761	568218	593313	4565387
NET ORDINARY INCOME	493260	466960	354451	362261	419925	588725	693870	804173	974935	1234127	6392688
INCOME TAXES	49326	46696	35445	36226	41993	58872	69387	80417	97493	123413	639269
DEFERRED INC TAXES	107037	101330	76916	78611	91124	127753	150570	174506	211561	267806	1387213
NET INCOME	336897	318934	242090	247424	286809	402099	473913	549250	665881	842909	4366206
DIVIDENDS	235000	235000	235000	235000	235000	235000	235000	235000	235000	235000	2350000
RETAINED NET INCOME	101897	83934	7090	12424	51809	167099	238913	314250	430881	607909	2016206

SOURCE: Federal Railroad Administration analysis.

FIGURE A-13. COMPUTER PRINTOUT OF REGIONAL INCOME STATEMENT, WEST, SCENARIO 1.

JAN 1978 STANDARD CHA
E + S + W RATE RELIEF

YEAR	1976	1977
REV-FREIGHT	2434200	2687385
REV-OTHER FREIGHT	55013	67722
REV-PASSENGER	6105	6572
TOTAL REVENUE	2495318	2761678
MOW: LABOR	177799	194032
MOW: FRINGE BENEFITS	10439	11039
MOW: MATERIALS&OTH	212901	228753
MOW: DEPRECIATION	25133	26856
MOW: DEFERRED MAINT.	19060	20622
TOTAL MOW	445331	481302
MOE: LABOR	191769	207143
MOE: FRINGE BENEFITS	12946	13551
MOE: MATERIALS&OTH	118016	125608
MOE: INJURIES	7392	8286
MOE: DEPRECIATION	116866	130327
TOTAL MOE	446990	484916
TGA: LABOR	601920	631994
TGA: FRINGE BENEFIT	40634	41343
TGA: MATERIALS&OTH	139853	169576
TGA: FUEL	164255	193342
TGA: INJURIES	23202	25282
TGA: LOSS AND DAMAGE	33087	37340
TGA: PENSIONS	15351	16576
TOTAL TGA	1018303	1115452
TOTAL OPERATING EXPENSES	1910623	2081670
NET REVENUE: OPERATIONS	584695	680009
PAYROLL TAX	157335	167470
PROPERTY TAX	60217	63589
NET FREIGHT RENTS	129219	157770
NET NON-REV EQPT RENTS	12188	12682
NET JOINT FACILITY RENTS	3642	4348
TOTAL RENTS	145049	174800
NET OPERATING INCOME	222095	274150
OTHER INCOME	45423	50329
INTEREST INCOME	9749	10421
INCOME FROM EQUITY	46415	49015
TOTAL OTHER INCOME	101587	109764
NET MISC DEDUCTIONS	17346	18317
INC AVAIL. FOR FIXED CHARGES	306336	365597
FIXED CHARGES	136554	157648
NET ORDINARY INCOME	169782	207949
INCOME TAXES	17318	21211
DEFERRED INC TAXES	31749	38886
NET INCOME	120715	147852
DIVIDENDS	100000	100000
RETAINED NET INCOME	20715	47852

SOURCE: Federal Railroad Administration analysis.

FIGURE A-14. COMPUTER

SOUTH
REGIONAL INCOME STATEMENT
INFLATED DOLLARS (000)
ASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
WITH 78-85 CARRYOVER, 25 % DEFERRED MAINTENANCE CATCHUP.

1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
2863457	3076780	3322603	3601877	3865143	4136059	4426919	4772391	35186813
72159	77535	83730	90767	97402	104229	111558	120264	880379
7114	7659	8242	8843	9464	10133	10831	11563	86525
2942730	3161973	3414575	3701487	3972009	4250420	4549308	4904218	36153717
212795	231882	251848	272927	295990	321948	349700	378865	2687784
11738	12525	13386	14294	15140	15950	16716	17493	138722
250959	268384	289212	309749	329635	350023	370847	392623	3003086
28760	30854	33140	35631	38331	41252	44405	47802	352163
22613	24396	26387	28420	30513	32767	35125	37597	277501
526865	568042	613973	661021	709609	761940	816793	874380	6459256
227206	248244	271115	295237	321304	350099	380989	414708	2907815
14410	15417	16569	17778	18896	19943	20939	22016	172464
137950	148012	160487	172815	184640	196489	208649	222021	1674686
9075	10063	11222	12529	14043	15714	17538	19612	125475
144010	158259	175637	194025	211565	228005	243949	261510	1864154
532652	579994	635030	692384	750448	810249	872065	939867	6744594
693297	759350	833537	911715	995339	1086259	1184084	1294274	8991769
43972	47158	50940	54900	58538	61876	65077	68710	533147
187734	203212	222759	242489	261400	280478	300458	322786	2330746
211826	240351	268977	296011	323701	352020	382647	418195	2851324
27691	30783	34503	38689	43504	48756	54508	61208	388125
39783	42472	45672	48966	52314	55555	58890	62472	476550
18270	20226	22521	25007	27438	30008	32852	36139	244389
1222574	1343550	1478909	1617778	1762233	1914952	2078515	2263784	15816050
2282091	2491586	2727912	2971183	3222291	3487142	3767372	4078032	29019900
660639	670388	686663	730305	749718	763279	781936	826186	7133817
182242	198633	218553	241123	260441	280385	300213	321771	2328165
67468	71381	75450	80203	85176	90201	95253	100587	789526
165790	167932	170008	170545	172146	173332	173692	174698	1655132
13553	14410	15584	17014	18512	19894	21070	22323	167230
4384	4434	4508	4579	4636	4683	4733	4801	44749
183727	186776	190100	192138	195294	197909	199495	201822	1867111
227202	213597	202560	216840	208807	194784	186975	202006	2149015
55463	61175	67599	74561	81421	88830	97003	106024	727830
10936	11473	12050	12671	13309	13973	14675	15435	124692
52004	55021	58157	61821	65654	69527	73421	77532	608567
118403	127669	137806	149053	160383	172331	185099	198992	1461088
19434	20562	21734	23103	24535	25983	27438	28974	227425
326171	320704	318632	342790	344656	341132	344636	372024	3382678
176151	189258	204238	222871	239592	252645	262894	274164	2116014
150019	131447	114394	119919	105064	88487	81742	97859	1266664
15302	13408	11668	12232	10717	9026	8338	9982	129200
28054	24581	21392	22425	19647	16547	15286	18300	236866
106664	93459	81334	85263	74700	62914	58119	69578	900528
100000	100000	100000	100000	100000	100000	100000	100000	1000000
6664	-6541	-18666	-14737	-25300	-37086	-41881	-30422	-99472

PRINTOUT OF REGIONAL INCOME STATEMENT, SOUTH, SCENARIO 1.

MEAST
REGIONAL INCOME STATEMENT
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 25 % DEFERRED MAINTENANCE CATCHUP.

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
REV-FREIGHT	156960	184461	194991	206741	224068	243281	261514	280146	301028	326891	2380081
REV-OTHER FREIGHT	3092	5276	5577	5913	6408	6958	7479	8012	8609	9349	66673
REV-PASSENGER	17773	19232	20874	22494	24251	26069	27949	29981	32109	34347	255080
TOTAL REVENUE	177825	208969	221442	235148	254728	276309	296942	318140	341746	370587	2701834
MOW: LABOR	15831	17276	18947	20647	22424	24301	26355	28666	31137	33734	239318
MOW: FRINGE BENEFITS	930	983	1045	1115	1192	1273	1348	1420	1488	1558	12352
MOW: MATERIALS&OTH	18797	20209	22186	23737	25592	27420	29191	31006	32861	34799	265799
MOW: DEPRECIATION	2208	2276	2354	2440	2537	2644	2761	2890	3030	3183	26324
MOW: DEFERRED MAINT.	4918	5321	5835	6295	6809	7334	7874	8455	9064	9702	71608
TOTAL MOW	42684	46066	50367	54235	58554	62972	67529	72438	77580	82976	615401
MOE: LABOR	16464	20578	22325	24089	26440	28775	31266	33920	36833	40272	280961
MOE: FRINGE BENEFITS	1055	1278	1344	1420	1534	1645	1745	1834	1921	2029	15804
MOE: MATERIALS&OTH	10132	12478	13555	14363	15651	16843	17967	19037	20172	21560	161758
MOE: INJURIES	346	550	592	645	727	813	911	1014	1129	1275	8002
MOE: DEPRECIATION	3890	3815	3826	3803	3791	3790	3782	3777	3805	3873	38151
TOTAL MOE	31886	38699	41642	44319	48143	51866	55673	59581	63860	69008	504676
TGA: LABOR	50258	69240	74769	80332	88577	96578	105025	113809	123571	135635	937795
TGA: FRINGE BENEFIT	3220	4299	4501	4735	5138	5520	5862	6153	6446	6834	52706
TGA: MATERIALS&OTH	20665	21116	23014	24459	26568	28554	30442	32280	34207	36460	277765
TGA: FUEL	11367	13848	15109	16995	18886	20621	22415	24270	26284	28563	198359
TGA: INJURIES	935	1488	1601	1743	1966	2199	2464	2741	3052	3446	21634
TGA: LOSS AND DAMAGE	4065	5315	5588	5865	6296	6703	7113	7488	7887	8353	64674
TGA: PENSIONS	751	986	1073	1171	1309	1451	1587	1727	1885	2081	14023
TOTAL TGA	91263	116292	125655	135300	148739	161626	174908	188468	203332	221373	1566956
TOTAL OPERATING EXPENSES	165834	201056	217663	233853	255436	276464	298110	320486	344773	373356	2687032
NET REVENUE: OPERATIONS	11991	7913	3779	1294	-708	-156	-1168	-2347	-3026	-2770	14802
PAYROLL TAX	13678	17683	19013	20428	22565	24846	26765	28664	30604	32920	237167
PROPERTY TAX	4253	4492	4766	5042	5329	5665	6016	6371	6728	7105	55768
NET FREIGHT RENTS	17802	22081	23428	24705	26758	28718	30731	32565	34543	37079	278410
NET NON-REV EQPT RENTS	2003	2459	2610	2541	2561	2670	2781	2918	3216	3699	27458
NET JOINT FACILITY RENTS	1866	2062	2051	2040	2070	2088	2100	2103	2112	2138	20629
TOTAL RENTS	21671	26602	28090	29285	31389	33476	35612	37586	39870	42917	326498
NET OPERATING INCOME	-27611	-40864	-48090	-53461	-59991	-64143	-69561	-74968	-80229	-85712	-604631
OTHER INCOME	6727	7454	8214	9060	10011	11043	12059	13156	14366	15702	107792
INTEREST INCOME	337	456	523	563	609	663	716	771	828	893	6358
INCOME FROM EQUITY	106	112	119	126	133	141	150	159	168	177	1392
TOTAL OTHER INCOME	7170	8022	8856	9749	10754	11847	12925	14085	15362	16773	115542
NET MISC DEDUCTIONS	832	879	933	987	1043	1109	1177	1247	1317	1390	10914
INC AVAIL. FOR FIXED CHARGES	-21273	-33721	-40167	-44699	-50280	-53405	-57814	-62130	-66184	-70330	-500002
FIXED CHARGES	7314	8588	8561	8510	8237	8201	8039	7807	7662	7674	80594
NET ORDINARY INCOME	-28588	-42309	-48727	-53209	-58517	-61606	-65853	-69937	-73846	-78003	-580596
INCOME TAXES	0	0	0	0	0	0	0	0	0	0	0
DEFERRED INC TAXES	0	0	0	0	0	0	0	0	0	0	0
NET INCOME	-28588	-42309	-48727	-53209	-58517	-61606	-65853	-69937	-73846	-78003	-580596
DIVIDENDS	0	0	0	0	0	0	0	0	0	0	0
RETAINED NET INCOME	-28588	-42309	-48727	-53209	-58517	-61606	-65853	-69937	-73846	-78003	-580596

SOURCE: Federal Railroad Administration analysis.

FIGURE A-15. COMPUTER PRINTOUT OF REGIONAL INCOME STATEMENT, MARGINAL EAST, SCENARIO 1.

MWEST
REGIONAL INCOME STATEMENT
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 25 % DEFERRED MAINTENANCE CATCHUP.

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
REV-FREIGHT	1976225	2245214	2358922	2506373	2680737	2875806	3051821	3236839	3443338	3687709	28062985
REV-OTHER FREIGHT	78851	96993	101905	108275	115808	124235	131839	139831	148752	159309	1205799
REV-PASSENGER	84925	91626	99310	106919	115051	123423	132057	141368	151103	161280	1207062
TOTAL REVENUE	2140001	2433834	2560137	2721568	2911596	3123464	3315716	3518038	3743193	4008299	30475847
MOW: LABOR	204007	222633	244161	266063	288971	313157	339619	369404	401246	434710	3083971
MOW: FRINGE BENEFITS	11978	12667	13469	14371	15360	16401	17372	18301	19180	20072	159170
MOW: MATERIALS&OTH	244171	262360	287840	307833	331731	355295	378113	401506	425399	450385	3444633
MOW: DEPRECIATION	16874	17906	19051	20317	21702	23217	24863	26647	28577	30661	229816
MOW: DEFERRED MAINT.	50169	54281	59524	64216	69457	74807	80317	86250	92458	98965	730444
TOTAL MOW	527199	569846	624045	672800	727221	782878	840284	902108	966860	1034793	7648034
MOE: LABOR	189591	209312	228438	248987	271481	294682	319251	346915	377680	411530	2897866
MOE: FRINGE BENEFITS	12403	13269	14041	14985	16078	17196	18195	19150	20115	21172	166605
MOE: MATERIALS&OTH	70969	77203	84365	90299	97750	104919	111592	118430	125811	134012	1015349
MOE: INJURIES	8176	9624	10487	11601	12916	14373	16038	17897	19982	22368	143460
MOE: DEPRECIATION	58647	60901	63962	66370	69185	72139	74834	77249	79588	82379	705254
TOTAL MOE	339786	370308	401293	432241	467410	503310	539909	579642	623176	671461	4928535
TGA: LABOR	582045	671971	731713	793409	859770	928629	1001102	1081600	1169271	1263961	9083470
TGA: FRINGE BENEFIT	38078	42599	44974	47750	50919	54191	57057	59707	62276	65027	522576
TGA: MATERIALS&OTH	212941	251281	273253	290260	311817	332507	350803	368803	387936	409040	3188641
TGA: FUEL	145864	184407	201063	227009	252240	275411	298860	323613	351255	382491	2642213
TGA: INJURIES	25099	30895	33590	36967	40903	45292	50290	55798	61864	68701	449400
TGA: LOSS AND DAMAGE	43244	63412	66630	70340	74749	79042	83303	87485	92002	96868	757075
TGA: PENSIONS	8933	10254	11241	12363	13653	15034	16356	17771	19360	21156	146123
TOTAL TGA	1056203	1254818	1362463	1478099	1604052	1730106	1857772	1994777	2143964	2307244	16789498
TOTAL OPERATING EXPENSES	1923188	2194973	2387800	2583140	2798683	3016293	3237965	3476527	3734001	4013498	29366066
NET REVENUE: OPERATIONS	216814	238861	172337	138428	112913	107172	77752	41512	9192	-5199	1109780
PAYROLL TAX	165890	187672	203139	219970	240060	262666	281317	300886	320589	341352	2523541
PROPERTY TAX	44384	46869	49728	52612	55611	59115	62780	66484	70207	74139	581930
NET FREIGHT RENTS	193937	227140	242908	257901	274493	290391	305961	320908	336611	355810	2806060
NET NON-REV EQPT RENTS	26352	34423	42400	46867	50874	54547	57699	60282	62470	64764	500677
NET JOINT FACILITY RENTS	9010	7863	7818	7820	7856	7871	7861	7852	7874	7927	79751
TOTAL RENTS	229299	269426	293126	312588	333223	352809	371521	389042	406955	428501	3386489
NET OPERATING INCOME	-222759	-265106	-373656	-446742	-515981	-567419	-637866	-714900	-788559	-849192	-5382179
OTHER INCOME	60556	67096	73940	81556	90120	99402	108547	118425	129320	141346	970308
INTEREST INCOME	5710	8419	9396	10193	11033	11921	12814	13735	14719	15782	113723
INCOME FROM EQUITY	13008	13737	14575	15420	16299	17326	18400	19486	20577	21729	170555
TOTAL OTHER INCOME	79275	89252	97911	107170	117452	128649	139761	151645	164615	178858	1254587
NET MISC DEDUCTIONS	8784	9276	9842	10413	11006	11700	12425	13158	13895	14673	115173
INC AVAIL. FOR FIXED CHARGES	-152268	-185130	-285587	-349986	-409535	-450470	-510531	-576413	-637839	-685007	-4242766
FIXED CHARGES	67084	72662	77439	79308	82375	87149	90392	92686	94655	96532	840283
NET ORDINARY INCOME	-219352	-257792	-363026	-429294	-491910	-537619	-600923	-669099	-732494	-781539	-5083049
INCOME TAXES	0	0	0	0	0	0	0	0	0	0	0
DEFERRED INC TAXES	0	0	0	0	0	0	0	0	0	0	0
NET INCOME	-219352	-257792	-363026	-429294	-491910	-537619	-600923	-669099	-732494	-781539	-5083049
DIVIDENDS	0	0	0	0	0	0	0	0	0	0	0
RETAINED NET INCOME	-219352	-257792	-363026	-429294	-491910	-537619	-600923	-669099	-732494	-781539	-5083049

SOURCE: Federal Railroad Administration analysis.

FIGURE A-16. COMPUTER PRINTOUT OF REGIONAL INCOME STATEMENT, MARGINAL WEST, SCENARIO 1.

EAST
REGIONAL INCOME STATEMENT
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 50 % DEFERRED MAINTENANCE CATCHUP.

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
REV-FREIGHT	2948122	3252980	3492732	3770933	4095787	4458484	4780132	5107093	5464010	5882325	43252597
REV-OTHER FREIGHT	160673	173384	186163	200991	218305	237637	254781	272208	291232	313528	2308901
REV-PASSENGER	18263	19712	21395	23081	24889	26768	28708	30805	33000	35300	261921
TOTAL REVENUE	3127058	3446076	3700290	3995004	4338982	4722889	5063622	5410106	5788241	6231153	45823420
MOW: LABOR	199655	217883	238952	260386	282806	306476	332374	361523	392686	425436	3018177
MOW: FRINGE BENEFITS	11722	12397	13181	14064	15032	16051	17001	17911	18771	19644	155774
MOW: MATERIALS&OTH	237438	255239	280175	299742	323130	346191	368522	391416	414799	439252	3355905
MOW: DEPRECIATION	31023	31688	32431	33256	34164	35160	36246	37427	38709	40095	350199
MOW: DEFERRED MAINT.	69558	75260	82528	89035	96301	103719	111359	119584	128191	137213	1012749
TOTAL MOW	549396	592466	647268	696484	751433	807598	865502	927862	993156	1061640	7892804
MOE: LABOR	287015	306938	337176	367794	400402	434615	471265	511834	555317	601654	4274009
MOE: FRINGE BENEFITS	20080	20809	22163	23672	25360	27123	28724	30216	31630	33102	262876
MOE: MATERIALS&OTH	77922	82109	90313	96742	104563	112230	119472	126727	134164	142099	1086342
MOE: INJURIES	9123	10119	11099	12288	13659	15200	16976	18934	21068	23450	151915
MOE: DEPRECIATION	121387	131720	140364	150579	164149	179412	194187	207801	221480	236561	1747641
TOTAL MOE	515526	551695	601115	651074	708133	768580	830624	895512	963658	1036865	7522784
TGA: LABOR	778740	897412	990253	1083132	1186626	1293550	1402040	1516725	1640535	1777610	12566622
TGA: FRINGE BENEFIT	54482	60840	65089	69711	75156	80726	85455	89538	93442	97801	772240
TGA: MATERIALS&OTH	198006	258934	285657	306549	332727	358148	381152	403231	426022	451249	3401677
TGA: FUEL	147427	177890	195845	221764	247302	270944	294156	317356	342517	371025	2586228
TGA: INJURIES	24752	29586	32596	36187	40481	45240	50504	56107	62240	69283	446976
TGA: LOSS AND DAMAGE	41419	40438	45406	48901	52578	56747	61028	64740	68076	71526	550859
TGA: PENSIONS	31875	37357	41496	45992	51392	57117	62326	67523	73335	80170	548582
TOTAL TGA	1276702	1502456	1656343	1812237	1986263	2162472	2336660	2515219	2706167	2918663	20873183
TOTAL OPERATING EXPENSES	2341624	2646617	2904726	3159795	3445829	3738651	4032787	4338593	4662982	5017168	36288771
NET REVENUE: OPERATIONS	785434	799458	795564	835209	893153	984239	1030835	1071513	1125259	1213985	9534649
PAYROLL TAX	205918	231425	252834	275274	302365	332719	357532	382576	407427	433952	3182022
PROPERTY TAX	73037	77127	81832	86578	91513	97279	103310	109405	115532	122002	957614
NET FREIGHT RENTS	118806	162866	187337	199930	213025	222232	230978	237290	243590	252860	2068913
NET NON-REV EQPT RENTS	13104	14294	15692	16729	17696	18665	19416	19899	20322	20896	176714
NET JOINT FACILITY RENTS	7446	5279	5351	5410	5494	5566	5600	5610	5628	5663	57046
TOTAL RENTS	139356	182438	208380	222069	236214	246462	255994	262799	269540	279419	2302672
NET OPERATING INCOME	367123	308467	252518	251288	263061	307779	313999	316733	332760	378612	3092341
OTHER INCOME	49522	54871	60468	66696	73699	81290	88769	96847	105757	115592	793510
INTEREST INCOME	28888	30130	31332	32383	33466	34615	35765	36924	38136	39441	341080
INCOME FROM EQUITY	50855	53703	56978	60283	63719	67734	71933	76177	80443	84948	666774
TOTAL OTHER INCOME	129265	138703	148778	159363	170884	183639	196466	209948	224336	239981	1801364
NET MISC DEDUCTIONS	19242	20319	21559	22809	24109	25628	27217	28823	30437	32141	252284
INC AVAIL. FOR FIXED CHARGES	477147	426851	379737	387842	409835	465790	483249	497858	526659	586452	4641420
FIXED CHARGES	124199	143075	153991	162283	173763	188727	201228	210595	220371	235450	1813682
NET ORDINARY INCOME	352948	283776	225746	225559	236073	277063	282021	287263	306288	351002	2827738
INCOME TAXES	55413	44553	35442	35413	37063	43499	44277	45100	48087	55107	443955
DEFERRED INC TAXES	90355	72647	57791	57743	60435	70928	72197	73539	78410	89857	723901
NET INCOME	207180	166577	132513	132403	138575	162636	165546	168623	179791	206038	1659882
DIVIDENDS	120000	120000	120000	120000	120000	120000	120000	120000	120000	120000	1200000
RETAINED NET INCOME	87180	46577	12513	12403	18575	42636	45546	48623	59791	86038	459882

SOURCE: Federal Railroad Administration analysis.

FIGURE A-17. COMPUTER PRINTOUT OF REGIONAL INCOME STATEMENT, EAST, SCENARIO 2.

WEST
REGIONAL INCOME STATEMENT
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 50 % DEFERRED MAINTENANCE CATCHUP.

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
REV-FREIGHT	7260974	8234735	8919097	9742819	10718604	11845883	12930144	14064208	15333377	16855427	115905267
REV-OTHER FREIGHT	159015	200928	217626	237725	261534	289040	315496	343167	374134	411272	2809936
REV-PASSENGER	26017	28104	30489	32880	35451	38107	40849	43805	46905	50176	372782
TOTAL REVENUE	7446006	8463767	9167212	10013424	11015589	12173029	13286488	14451179	15754417	17316876	119087985
MOW: LABOR	553354	603876	662270	721676	783812	849418	921193	1001982	1088353	1179121	8365056
MOW: FRINGE BENEFITS	32490	34358	36533	38980	41662	44487	47120	49641	52024	54443	431737
MOW: MATERIALS&OTH	661700	711035	780147	834378	899200	963115	1025007	1088458	1153266	1221039	9337346
MOW: DEPRECIATION	74018	78998	84472	90472	96997	104087	111753	120024	128935	138517	1028272
MOW: DEFERRED MAINT.	187880	203280	222913	240487	260113	280149	300784	323002	346250	370618	2735474
TOTAL MOW	1509441	1631546	1786335	1925993	2081784	2241255	2405857	2583107	2768828	2963738	21897886
MOE: LABOR	536240	577004	635368	699356	774006	852951	935384	1023438	1121786	1240487	8396020
MOE: FRINGE BENEFITS	35542	37059	39565	42642	46442	50428	54011	57238	60532	64657	488116
MOE: MATERIALS&OTH	290341	307832	339402	366863	403107	439262	472919	505355	540506	584293	4249879
MOE: INJURIES	24710	24730	27189	30375	34326	38780	43803	49217	55327	62853	391310
MOE: DEPRECIATION	320545	351054	382107	413265	449229	487828	524962	559368	592911	631021	4712290
TOTAL MOE	1207377	1297679	1423630	1552501	1707109	1869249	2031079	2194617	2371062	2583312	18237616
TGA: LABOR	1637464	2050503	2277316	2521109	2795213	3088930	3405706	3755249	4142248	4585937	30259676
TGA: FRINGE BENEFIT	108530	131697	141810	153721	167719	182623	196654	210020	223516	239030	1755320
TGA: MATERIALS&OTH	743999	839426	933468	1014811	1117064	1220661	1321271	1422858	1531489	1657502	11802547
TGA: FUEL	543558	618430	686758	788687	892980	994423	1099670	1209572	1332112	1476980	9643170
TGA: INJURIES	75453	87883	97453	109499	123964	140441	159484	180589	204298	232361	1411426
TGA: LOSS AND DAMAGE	107560	125174	128425	131222	135140	139044	143090	145909	148695	152443	1356701
TGA: PENSIONS	52071	64882	72379	81165	91769	103413	114901	127060	140959	157815	1006413
TOTAL TGA	3268634	3917995	4337607	4800214	5323850	5869535	6440776	7051256	7723317	8502068	57235253
TOTAL OPERATING EXPENSES	5985453	6847220	7547573	8278708	9112744	9980039	10877712	11828980	12863208	14049118	97370755
NET REVENUE: OPERATIONS	1460552	1616547	1619639	1734715	1902845	2192990	2408776	2622199	2891209	3267758	21717230
PAYROLL TAX	475642	562637	617373	678254	752684	837525	911496	988425	1067666	1156932	8048636
PROPERTY TAX	214061	226049	239838	253748	268212	285109	302786	320651	338607	357569	2806631
NET FREIGHT RENTS	293707	355441	384120	403992	421122	434509	451045	469814	490561	516387	4220698
NET NON-REV EQPT RENTS	29461	34652	39648	46255	53933	62430	70861	78819	86826	96148	599032
NET JOINT FACILITY RENTS	13160	9714	9923	10167	10468	10775	11049	11304	11593	11953	110105
TOTAL RENTS	336328	399806	433691	460414	485523	507714	532955	559936	588979	624488	4929834
NET OPERATING INCOME	434521	428054	328737	342299	396426	562642	661538	753187	895956	1128769	5932130
OTHER INCOME	145655	161385	177847	196165	216762	239089	261085	284844	311049	339977	2333858
INTEREST INCOME	32722	36171	39198	41882	44809	47994	51285	54723	58420	62555	469760
INCOME FROM EQUITY	76653	80945	85883	90864	96043	102094	108424	114821	121251	128041	1005018
TOTAL OTHER INCOME	255029	278502	302927	328911	357615	389177	420794	454388	490720	530573	3808636
NET MISC DEDUCTIONS	27599	29145	30923	32716	34581	36760	39039	41342	43657	46102	361863
INC AVAIL. FOR FIXED CHARGES	661951	677411	600741	638494	719460	915059	1043294	1166233	1343019	1613240	9378902
FIXED CHARGES	277019	327576	374666	414827	449580	488183	523245	548761	568218	593313	4565387
NET ORDINARY INCOME	384932	349835	226075	223667	269880	426876	520048	617472	774802	1019927	4813515
INCOME TAXES	38493	34984	22608	22367	26988	42688	52005	61747	77480	101993	481352
DEFERRED INC TAXES	83530	75914	49058	48536	58564	92632	112851	133991	168132	221324	1044533
NET INCOME	262909	238938	154409	152765	184328	291556	355193	421733	529190	696610	3287631
DIVIDENDS	235000	235000	235000	235000	235000	235000	235000	235000	235000	235000	2350000
RETAINED NET INCOME	27909	3938	-80591	-82235	-50672	56556	120193	186733	294190	461610	937631

SOURCE: Federal Railroad Administration analysis.

FIGURE A-18. COMPUTER PRINTOUT OF REGIONAL INCOME STATEMENT, WEST, SCENARIO 2.

SOUTH
REGIONAL INCOME STATEMENT
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 50 % DEFERRED MAINTENANCE CATCHUP.

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
REV-FREIGHT	2434200	2687385	2863457	3076780	3322603	3601877	3865143	4136059	4426919	4772391	35186813
REV-OTHER FREIGHT	55013	67722	72159	77535	83730	90767	97402	104229	111558	120264	880379
REV-PASSENGER	6105	6572	7114	7659	8242	8843	9464	10133	10831	11563	86525
TOTAL REVENUE	2495318	2761678	2942730	3161973	3414575	3701487	3972009	4250420	4549308	4904218	36153717
MOW: LABOR	177799	194032	212795	231882	251848	272927	295990	321948	349700	378865	2687784
MOW: FRINGE BENEFITS	10439	11039	11738	12525	13386	14294	15140	15950	16716	17493	138722
MOW: MATERIALS&OTH	212901	228753	250959	268384	289212	309749	329635	350023	370847	392623	3003086
MOW: DEPRECIATION	25133	26856	28760	30854	33140	35631	38331	41252	44405	47802	352163
MOW: DEFERRED MAINT.	41644	45058	49410	53305	57655	62096	66670	71595	76748	82149	606331
TOTAL MOW	467916	505738	553662	596951	645241	694697	745766	800768	858415	918932	6788085
MOE: LABOR	191769	207143	227206	248244	271115	295237	321304	350099	380989	414708	2907815
MOE: FRINGE BENEFITS	12946	13551	14410	15417	16569	17778	18896	19943	20939	22016	172464
MOE: MATERIALS&OTH	118016	125608	137950	148012	160487	172815	184640	196489	208649	222021	1674686
MOE: INJURIES	7392	8286	9075	10063	11222	12529	14043	15714	17538	19612	125475
MOE: DEPRECIATION	116866	130327	144010	158259	175637	194025	211565	228005	243949	261510	1864154
TOTAL MOE	446990	484916	532652	579994	635030	692384	750448	810249	872065	939867	6744594
TGA: LABOR	601920	631994	693297	759350	833537	911715	995339	1086259	1184084	1294274	8991769
TGA: FRINGE BENEFIT	40634	41343	43972	47158	50940	54900	58538	61876	65077	68710	533147
TGA: MATERIALS&OTH	139853	169576	187734	203212	222759	242489	261400	280478	300458	322786	2330746
TGA: FUEL	164255	193342	211826	240351	268977	296011	323701	352020	382647	418195	2851324
TGA: INJURIES	23202	25282	27691	30783	34503	38689	43504	48756	54508	61208	388125
TGA: LOSS AND DAMAGE	33087	37340	39783	42472	45672	48966	52314	55555	58890	62472	476550
TGA: PENSIONS	15511	16752	18465	20440	22758	25268	27724	30319	33192	36511	246938
TOTAL TGA	1018462	1115628	1222768	1343764	1479146	1618039	1762519	1915263	2078854	2264156	15818599
TOTAL OPERATING EXPENSES	1933367	2106282	2309081	2520709	2759417	3005120	3258733	3526280	3809334	4122955	29351279
NET REVENUE: OPERATIONS	561951	655396	633649	641265	655158	696367	713276	724140	739973	781263	6802438
PAYROLL TAX	158952	169235	184163	200719	220831	243620	263125	283267	303291	325050	2352253
PROPERTY TAX	60217	63589	67468	71381	75450	80203	85176	90201	95253	100587	789526
NET FREIGHT RENTS	129219	157770	165790	167932	170008	170545	172146	173332	173692	174698	1655132
NET NON-REV EQPT RENTS	12188	12682	13553	14410	15584	17014	18512	19894	21070	22323	167230
NET JOINT FACILITY RENTS	3642	4348	4384	4434	4508	4579	4636	4683	4733	4801	44749
TOTAL RENTS	145049	174800	183727	186776	190100	192138	195294	197909	199495	201822	1867111
NET OPERATING INCOME	197734	247772	198291	182388	168777	180405	169681	152762	141934	153804	1793549
OTHER INCOME	45423	50329	55463	61175	67599	74561	81421	88830	97003	106024	727830
INTEREST INCOME	9780	10485	11007	11550	12133	12760	13405	14077	14786	15554	125537
INCOME FROM EQUITY	46415	49015	52004	55021	58157	61821	65654	69527	73421	77532	608567
TOTAL OTHER INCOME	101619	109829	118474	127746	137888	149143	160480	172435	185210	199111	1461933
NET MISC DEDUCTIONS	17346	18317	19434	20562	21734	23103	24535	25983	27438	28974	227425
INC AVAIL. FOR FIXED CHARGES	282007	339284	297330	289572	284932	306445	305626	299214	299707	323941	3028057
FIXED CHARGES	136554	157648	176151	189258	204238	222871	239592	252645	262894	274164	2116014
NET ORDINARY INCOME	145453	181636	121179	100314	80694	83575	66034	46569	36812	49777	912043
INCOME TAXES	14836	18527	12360	10232	8231	8525	6735	4750	3755	5077	93028
DEFERRED INC TAXES	27200	33966	22660	18759	15090	15628	12348	8708	6884	9308	170552
NET INCOME	103417	129143	86158	71324	57374	59421	46950	33111	26174	35391	648463
DIVIDENDS	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1000000
RETAINED NET INCOME	3417	29143	-13842	-28676	-42626	-40579	-53050	-66889	-73826	-64609	-351537

SOURCE: Federal Railroad Administration analysis.

FIGURE A-19. COMPUTER PRINTOUT OF REGIONAL INCOME STATEMENT, SOUTH, SCENARIO 2.

MEAST
REGIONAL INCOME STATEMENT
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 50 % DEFERRED MAINTENANCE CATCHUP.

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
REV-FREIGHT	156960	184461	194991	206741	224068	243281	261514	280146	301028	326891	2380081
REV-OTHER FREIGHT	3092	5276	5577	5913	6408	6958	7479	8012	8609	9349	66673
REV-PASSENGER	17773	19232	20874	22494	24251	26069	27949	29981	32109	34347	255080
TOTAL REVENUE	177825	208969	221442	235148	254728	276309	296942	318140	341746	370587	2701834
MOW: LABOR	15831	17276	18947	20647	22424	24301	26355	28666	31137	33734	239318
MOW: FRINGE BENEFITS	930	983	1045	1115	1192	1273	1348	1420	1488	1558	12352
MOW: MATERIALS&OTH	18797	20209	22186	23737	25592	27420	29191	31006	32861	34799	265799
MOW: DEPRECIATION	2208	2276	2354	2440	2537	2644	2761	2890	3030	3183	26324
MOW: DEFERRED MAINT.	10485	11345	12441	13421	14517	15635	16787	18027	19324	20684	152666
TOTAL MOW	48252	52089	56972	61361	66262	71273	76442	82009	87840	93958	696458
MOE: LABOR	16464	20578	22325	24089	26440	28775	31266	33920	36833	40272	280961
MOE: FRINGE BENEFITS	1055	1278	1344	1420	1534	1645	1745	1834	1921	2029	15804
MOE: MATERIALS&OTH	10132	12478	13555	14363	15651	16843	17967	19037	20172	21560	161758
MOE: INJURIES	346	550	592	645	727	813	911	1014	1129	1275	8002
MOE: DEPRECIATION	3890	3815	3826	3803	3791	3790	3782	3777	3805	3873	38151
TOTAL MOE	31886	38699	41642	44319	48143	51866	55673	59581	63860	69008	504676
TGA: LABOR	50258	69240	74769	80332	88577	96578	105025	113809	123571	135635	937795
TGA: FRINGE BENEFIT	3220	4299	4501	4735	5138	5520	5862	6153	6446	6834	52706
TGA: MATERIALS&OTH	20665	21116	23014	24459	26568	28554	30442	32280	34207	36460	277765
TGA: FUEL	11367	13848	15109	16995	18886	20621	22415	24270	26284	28563	198359
TGA: INJURIES	935	1488	1601	1743	1966	2199	2464	2741	3052	3446	21634
TGA: LOSS AND DAMAGE	4065	5315	5588	5865	6296	6703	7113	7488	7887	8353	64674
TGA: PENSIONS	773	1010	1100	1201	1342	1487	1627	1770	1932	2133	14375
TOTAL TGA	91285	116316	125681	135329	148772	161663	174948	188511	203379	221424	1567308
TOTAL OPERATING EXPENSES	171423	207104	224295	241009	263176	284802	307062	330101	355080	384390	2768442
NET REVENUE: OPERATIONS	6402	1865	-2854	-5861	-8449	-8493	-10120	-11961	-13333	-13803	-66608
PAYROLL TAX	14079	18121	19489	20945	23129	25465	27431	29379	31367	33732	243137
PROPERTY TAX	4253	4492	4766	5042	5329	5665	6016	6371	6728	7105	55768
NET FREIGHT RENTS	17802	22081	23428	24705	26758	28718	30731	32565	34543	37079	278410
NET NON-REV EQPT RENTS	2003	2459	2610	2541	2561	2670	2781	2918	3216	3699	27458
NET JOINT FACILITY RENTS	1866	2062	2051	2040	2070	2088	2100	2103	2112	2138	20629
TOTAL RENTS	21671	26602	28090	29285	31389	33476	35612	37586	39870	42917	326498
NET OPERATING INCOME	-33601	-47349	-55198	-61134	-68296	-73099	-79179	-85297	-91299	-97558	-692010
OTHER INCOME	6727	7454	8214	9060	10011	11043	12059	13156	14366	15702	107792
INTEREST INCOME	343	469	537	578	626	681	736	792	850	917	6529
INCOME FROM EQUITY	106	112	119	126	133	141	150	159	168	177	1392
TOTAL OTHER INCOME	7177	8035	8870	9764	10771	11865	12944	14106	15384	16797	115713
NET MISC DEDUCTIONS	832	879	933	987	1043	1109	1177	1247	1317	1390	10914
INC AVAIL. FOR FIXED CHARGES	-27257	-40194	-47261	-52356	-58568	-62343	-67412	-72438	-77231	-82152	-587211
FIXED CHARGES	7314	8588	8561	8510	8237	8201	8039	7807	7662	7674	80594
NET ORDINARY INCOME	-34571	-48781	-55821	-60866	-66806	-70544	-75451	-80245	-84894	-89825	-667805
INCOME TAXES	0	0	0	0	0	0	0	0	0	0	0
DEFERRED INC TAXES	0	0	0	0	0	0	0	0	0	0	0
NET INCOME	-34571	-48781	-55821	-60866	-66806	-70544	-75451	-80245	-84894	-89825	-667805
DIVIDENDS	0	0	0	0	0	0	0	0	0	0	0
RETAINED NET INCOME	-34571	-48781	-55821	-60866	-66806	-70544	-75451	-80245	-84894	-89825	-667805

SOURCE: Federal Railroad Administration analysis.

FIGURE A-20. COMPUTER PRINTOUT OF REGIONAL INCOME STATEMENT, MARGINAL EAST, SCENARIO 2.

MWEST
REGIONAL INCOME STATEMENT
INFLATED DOLLARS (000)
JAN 1978 STANDARD CHASE MACRO ECONOMIC SCENARIO, CURRENT RATIO NORMALIZED,
E + S + W RATE RELIEF WITH 78-85 CARRYOVER, 50 % DEFERRED MAINTENANCE CATCHUP.

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL
REV-FREIGHT	1976225	2245214	2358922	2506373	2680737	2875806	3051821	3236839	3443338	3687709	28062985
REV-OTHER FREIGHT	78851	96993	101905	108275	115808	124235	131839	139831	148752	159309	1205799
REV-PASSENGER	84925	91626	99310	106919	115051	123423	132057	141368	151103	161280	1207062
TOTAL REVENUE	2140001	2433834	2560137	2721568	2911596	3123464	3315716	3518038	3743193	4008299	30475847
MOW: LABOR	204007	222633	244161	266063	288971	313157	339619	369404	401246	434710	3083971
MOW: FRINGE BENEFITS	11978	12667	13469	14371	15360	16401	17372	18301	19180	20072	159170
MOW: MATERIALS&OTH	244171	262360	287840	307833	331731	355295	378113	401506	425399	450385	3444633
MOW: DEPRECIATION	16874	17906	19051	20317	21702	23217	24863	26647	28577	30661	229816
MOW: DEFERRED MAINT.	107005	115776	126957	136966	148144	159556	171308	183962	197203	211081	1557957
TOTAL MOW	584035	631341	691478	745550	805908	867626	931275	999820	1071605	1146909	8475547
MOE: LABOR	189591	209312	228438	248987	271481	294682	319251	346915	377680	411530	2897866
MOE: FRINGE BENEFITS	12403	13269	14041	14985	16078	17196	18195	19150	20115	21172	166605
MOE: MATERIALS&OTH	70969	77203	84365	90299	97750	104919	111592	118430	125811	134012	1015349
MOE: INJURIES	8176	9624	10487	11601	12916	14373	16038	17897	19982	22368	143460
MOE: DEPRECIATION	58647	60901	63962	66370	69185	72139	74834	77249	79588	82379	705254
TOTAL MOE	339786	370308	401293	432241	467410	503310	539909	579642	623176	671461	4928535
TGA: LABOR	582045	671971	731713	793409	859770	928629	1001102	1081600	1169271	1263961	9083470
TGA: FRINGE BENEFIT	38078	42599	44974	47750	50919	54191	57057	59707	62276	65027	522576
TGA: MATERIALS&OTH	212941	251281	273253	290260	311817	332507	350803	368803	387936	409040	3188641
TGA: FUEL	145864	184407	201063	227009	252240	275411	298860	323613	351255	382491	2642213
TGA: INJURIES	25099	30895	33590	36967	40903	45292	50290	55798	61864	68701	449400
TGA: LOSS AND DAMAGE	43244	63412	66630	70340	74749	79042	83303	87485	92002	96868	757075
TGA: PENSIONS	9159	10505	11518	12669	13991	15407	16763	18215	19845	21686	149757
TOTAL TGA	1056430	1255069	1362740	1478404	1604389	1730478	1858178	1995221	2144449	2307774	16793132
TOTAL OPERATING EXPENSES	1980250	2256718	2455511	2656195	2877708	3101413	3329362	3574682	3839230	4126144	30197213
NET REVENUE: OPERATIONS	159751	177115	104626	65373	33888	22051	-13645	-56644	-96037	-117845	278633
PAYROLL TAX	170103	192272	208143	225405	245995	269171	288310	308396	328610	349895	2586300
PROPERTY TAX	44384	46869	49728	52612	55611	59115	62780	66484	70207	74139	581930
NET FREIGHT RENTS	193937	227140	242908	257901	274493	290391	305961	320908	336611	355810	2806060
NET NON-REV EQPT RENTS	26352	34423	42400	46867	50874	54547	57699	60282	62470	64764	500677
NET JOINT FACILITY RENTS	9010	7863	7818	7820	7856	7871	7861	7852	7874	7927	79751
TOTAL RENTS	229299	269426	293126	312588	333223	352809	371521	389042	406955	428501	3386489
NET OPERATING INCOME	-284034	-331452	-446371	-525233	-600941	-659044	-736256	-820566	-901809	-970380	-6276085
OTHER INCOME	60556	67096	73940	81556	90120	99402	108547	118425	129320	141346	970308
INTEREST INCOME	5817	8642	9639	10458	11320	12230	13146	14092	15102	16193	116640
INCOME FROM EQUITY	13008	13737	14575	15420	16299	17326	18400	19486	20577	21729	170555
TOTAL OTHER INCOME	79382	89476	98154	107434	117738	128958	140093	152002	164998	179268	1257503
NET MISC DEDUCTIONS	8784	9276	9842	10413	11006	11700	12425	13158	13895	14673	115173
INC AVAIL. FOR FIXED CHARGES	-213436	-251252	-358059	-428212	-494209	-541786	-608588	-681722	-750706	-805785	-5133756
FIXED CHARGES	67084	72662	77439	79308	82375	87149	90392	92686	94655	96532	840283
NET ORDINARY INCOME	-280520	-323914	-435498	-507520	-576584	-628935	-698980	-774408	-845361	-902317	-5974038
INCOME TAXES	0	0	0	0	0	0	0	0	0	0	0
DEFERRED INC TAXES	0	0	0	0	0	0	0	0	0	0	0
NET INCOME	-280520	-323914	-435498	-507520	-576584	-628935	-698980	-774408	-845361	-902317	-5974038
DIVIDENDS	0	0	0	0	0	0	0	0	0	0	0
RETAINED NET INCOME	-280520	-323914	-435498	-507520	-576584	-628935	-698980	-774408	-845361	-902317	-5974038

SOURCE: Federal Railroad Administration analysis.

FIGURE A-21. COMPUTER PRINTOUT OF REGIONAL INCOME STATEMENT, MARGINAL WEST, SCENARIO 2.

REFERENCES

[1] Interstate Commerce Commission, Ex Parte No. 271.

[2] Thomas K. Dyer, Inc., for the Federal Railroad Administration, *United States Class I Railroads Fixed Plant Equipment Requirements,* Lexington, Mass., Oct. 1977.

APPENDIX B. HIGH-SPEED INVESTMENTS

In accordance with the mandate of the Railroad Revitalization and Regulatory Reform (4R) Act of 1976, the Federal Railroad Administration (FRA) has analyzed freight lines to determine which lines should be upgraded for high-speed service. The basic findings are as follows.

- *Significant benefits to both railroads and shippers could be attained by reductions in door-to-door transit times.*
- *For most companies, however, significant mainline speed increases are not an economic way of reducing transit times because of the high costs of upgrading rights-of-way and operating high-speed freight trains and the limited impact of mainline speed increases on door-to-door transit times.*
- *Reduction in transit times may be achieved more effectively through low-cost service improvements unrelated to mainline speeds, such as improved pickup and delivery, scheduling, through trains, and blocking of cars. Since freight cars, on the average, move only 16 percent of the time in the total car cycle, a 50-percent line-haul-speed increase provides less than a 10-percent improvement in the overall transit time.*
- *Railroad companies may find that upgrading certain lines for high-speed operations is economically desirable in lieu of other investments to increase capacity. In such cases, however, the decision likely would be based on the merits of alternative investments and not on traffic increases expected as a result of the investment for high-speed service.*
- *No significant investments in facilities for major increases in passenger train speed outside the Northeast Corridor appear to be justified. (This was discussed in the Department of Transportation (DOT) report, "A Reexamination of the Amtrak Route Structure," issued May 1978.)*

UPGRADING ROUTES FOR HIGH-SPEED FREIGHT SERVICE

The rail routes selected for analysis were the 100,000 miles designated as A and B mainlines in the *Final Standards, Classification, and Designation of Lines of Class I Railroads in the United States,* a report by the Secretary of Transportation, submitted in accordance with section 503(e) of the 4R Act.

COST

The costs of upgrading and maintaining these rail lines to permit high-speed operations depend on a wide range of variables, including the following.

- Terrain features, such as grades, drainage conditions, bridges and tunnels
- Track curvature, whether dictated by the terrain or able to be minimized by realignment of the right-of-way
- Current speeds, rail type, track, and roadbed conditions
- Signaling systems
- Grade crossings and local speed restrictions

In the absence of thorough, site-specific engineering studies, FRA developed a range of costs for each of four traffic density categories. (See table B-1.)

The cost range is not the upper and lower bound of possible costs. The variability of costs is so wide that some lines undoubtedly would exceed the high value, and others would fall below the low-value costs. Determining an actual ranking of routes would require specific site studies of costs.

The FRA analysis considered two categories of operating cost increases. The first, track maintenance, is estimated to increase by $4,250 annually per mile of track for a 50-percent increase in average speed. The second category, energy consumption, increases as the square of speed.

The benefits associated with high-speed freight service include savings as a result of reduced inventory costs for shippers, increased equipment productivity (the rail cars and motive power can perform the same haul in less time), and potential energy savings because some traffic will be diverted from truck to rail.

FREIGHT FLOW

Projected 1985 freight flows used in the FRA analysis are based on interregional commodity flow projections. The following assumptions are made regarding these flows.

TABLE B-1. RANGE OF COSTS FOR UPGRADING TRACK

Annual gross tons (Million)	Low value (Thousand $)	High value (Thousand $)
0-10	250	500
10-20	300	600
20-30	375	750
Over 30	500	1,000

SOURCE: Federal Railroad Administration, staff study.

- Each region's labor productivity in relation to other regions is assumed to continue unchanged. This assumption allows the use of projected regional earnings as a proxy for regional production.
- For each industry, the relationship of tons shipped to gross output is assumed to continue unchanged over the forecast period, at both national and regional levels.
- The distribution of destinations for each commodity originating at a given point is assumed to continue unchanged over the forecast period.
- Modal shares for each commodity flow between each origin-destination pair are assumed to continue unchanged over the forecast period.

Other data determining future freight traffic flows come from an aggregated version of the FRA 1972 *Carload Waybill Statistics,* which contains records of individual rail shipments, showing the number of carloads, weight in tons, through revenues, and commodity. Each commodity was assigned to one of the three following classifications.

Low value..... under $200 per ton
Medium value... between $200 and $1,000 per ton
High value..... over $1,000 per ton

For calculation purposes, the commodity values used are the approximate midpoint value for each category: $100 per ton for the low-value commodities; $600 per ton for the medium value; and $2,000 per ton for the high value.

The FRA calculated the benefit of reduced inventory costs for all commodity flows. The annual inventory carrying cost used in the calculation is 7 percent, the average rate on prime commercial short-term loans for the period 1970 to 1975.

ENERGY SAVINGS

Energy savings are estimated on the basis of ton-miles diverted from truck to rail because of shorter transit times resulting from higher speeds.

Table B-2 shows the levels-of-diversion estimates and indicates the percentage increase in the rail share associated with a range of percentage decrease in rail door-to-door transit times and the range of original rail market share. Even increases of 50 percent in average mainline speeds, however, would produce relatively small reductions in door-to-door transit times and, thus, would result in fairly low levels of diversion.

In order to estimate energy savings derived from track improvements for high-speed operations, FRA used, as a starting point, the 1968 statistics of 2,680

TABLE B-2. INCREASE IN RAIL REVENUE RESULTING FROM DECREASE IN DOOR-TO-DOOR TIME[a]

% of market before the decrease	10	20	30	40	50 (percent)	60	70	80	90
10	2.87	6.21	10.00	14.65	20.37	27.55	37.49	52.60	81.52
20	2.54	5.49	8.79	12.82	17.70	23.76	32.00	44.18	66.44
30	2.22	4.77	7.61	11.04	15.15	20.19	26.92	36.63	53.68
40	1.90	4.06	6.45	9.31	12.71	16.82	22.22	29.84	42.73
50	1.57	3.36	5.32	7.64	10.38	13.64	17.86	23.69	33.24
60	1.26	2.67	4.21	6.02	8.13	10.62	13.79	18.09	24.94
70	.94	1.99	3.12	4.45	5.98	7.76	10.00	12.98	17.61
80	.62	1.32	2.06	2.92	3.91	5.04	6.45	8.30	11.09
90	.31	.65	1.02	1.44	1.92	2.46	3.12	3.98	5.25

[a]Based on a time elasticity of $E = -0.3\ (1-P_r)$, where P_r is the rail share for a given origin-destination pair.
SOURCE: Federal Railroad Administration, staff study.

Btu per ton-mile for truck shipments and 700 Btu per ton-mile for rail shipments, with a circuity factor of 15 percent for rail compared with trucks.

> Rather precise estimates of Btu per ton-mile are obtained by using existing data and software (although line-specific data for current speeds are unavailable). A number of train performance measures exists and appears to give reasonable results, as does the Transportation Systems Center operating cost model. Use of either (particularly the train performance measures) requires extremely detailed inputs on train-by-train, mile-by-mile bases, an analysis with high-computation cost. This effort is unjustified because of the macro approach of the analysis and the impossibility of obtaining equally precise figures for highway movements.[1]

An energy saving of 1,868 Btu per ton-mile (or 0.0137 gallons of gasoline per ton-mile) was calculated for freight traveling by rail instead of highway.

The study calculated equipment utilization benefits on the basis of the following assumptions.

- Equipment costs

  — Freight cars: average price (1975), $30,000; useful life, 30 years; salvage value, 10 percent

  — Locomotives: average price (1975), $500,000; useful life, 20 years; salvage value, 10 percent

- Cost of capital—8 percent
- Utilization of locomotives improves by 10 percent with a 50-percent increase in running speed

BENEFIT/COST RATIOS

Benefit/cost ratios are calculated for each line segment in the 100,000-mile network. The best line segment is a ratio of 0.41 when calculated with low costs and 0.13 when calculated with high costs. Approximately 1,000 miles have benefit/cost ratios greater than 0.2, and the remaining 99,000 miles have even lower benefit/cost ratios.

Since the benefit/cost ratios do not even approach 1.0, (i.e., rates of return are negative), the principal conclusion is that the benefits gained from the upgrading of track for high-speed operations do not cover the costs. The only exceptions would be those cases where the upgrading might be carried out in lieu of more capital intensive alternatives for increasing track capacity. Other conclusions are as follows.

- To improve reliability, transit time, and consequent attractiveness of rail freight service, more benefits can be gained by directing attention to the pickup, delivery, and terminal operation portions of the shipment than by the line-haul (terminal-to-terminal) portions.
- To the extent there are specific mainline segments on which high-speed upgrading is warranted (for increased capacity), these can best be identified and assigned a proper priority by the owner railroad company.
- The cooperative research and demonstration approach already underway between Government and the rail industry in the areas of intermodal

network design and demonstration, development, and testing of freight car management information systems—plus research into terminal operations—offers the best hope of improving the speed and reliability of rail service.

REFERENCE

[1] W. E. Mooz, *The Effect of Fuel Price Increases on Energy Intensiveness of Freight Transport,* Rand Corp., Palo Alto, Calif., Dec. 1971.

APPENDIX C. ELECTRIFICATION INVESTMENTS

In accordance with the mandate of the Railroad Revitalization and Regulatory Reform (4R) Act of 1976, the Federal Railroad Administration (FRA) has analyzed the feasibility of railroad electrification. The basic findings of that analysis follow.

- *The investment in electrifying a network of 10,000 miles of high-density, mainline railways would yield a financial rate of return greater than 12 percent and reduce petroleum consumption by 31 million barrels, annually.*
- *The investment in electrification on 26,000- and 40,000-mile networks would yield financial rates of return between 9 and 10 percent and reduce annual petroleum consumption by 56 and 77 million barrels, respectively.*
- *The investment in electrifying individual route segments of 300 to 1,000 miles of very high density (between 70 and 100 million gross tons) rail lines would yield financial rates of return between 18 and 21 percent.*
- *The national benefits, particularly in terms of reduction of petroleum consumption, do not appear to be sufficiently large as to warrant Government sponsorship of a major program of railroad electrification.*
- *The rates of return for individual route segments appear to be sufficient to justify some investment in electrification by railroad companies. The proposed financial assistance program described in chapter 7 would be structured to permit loans to be made to any railroad company for those electrification projects that are economically and financially justified.*

EVALUATION

Electrification is not essential for revitalization of railroads. In fact, the benefits of electrification can be realized only when the railroad system is well maintained and financially healthy. Electrification is most effective when not hindered by poor quality lines and inefficient yard and terminal operations.

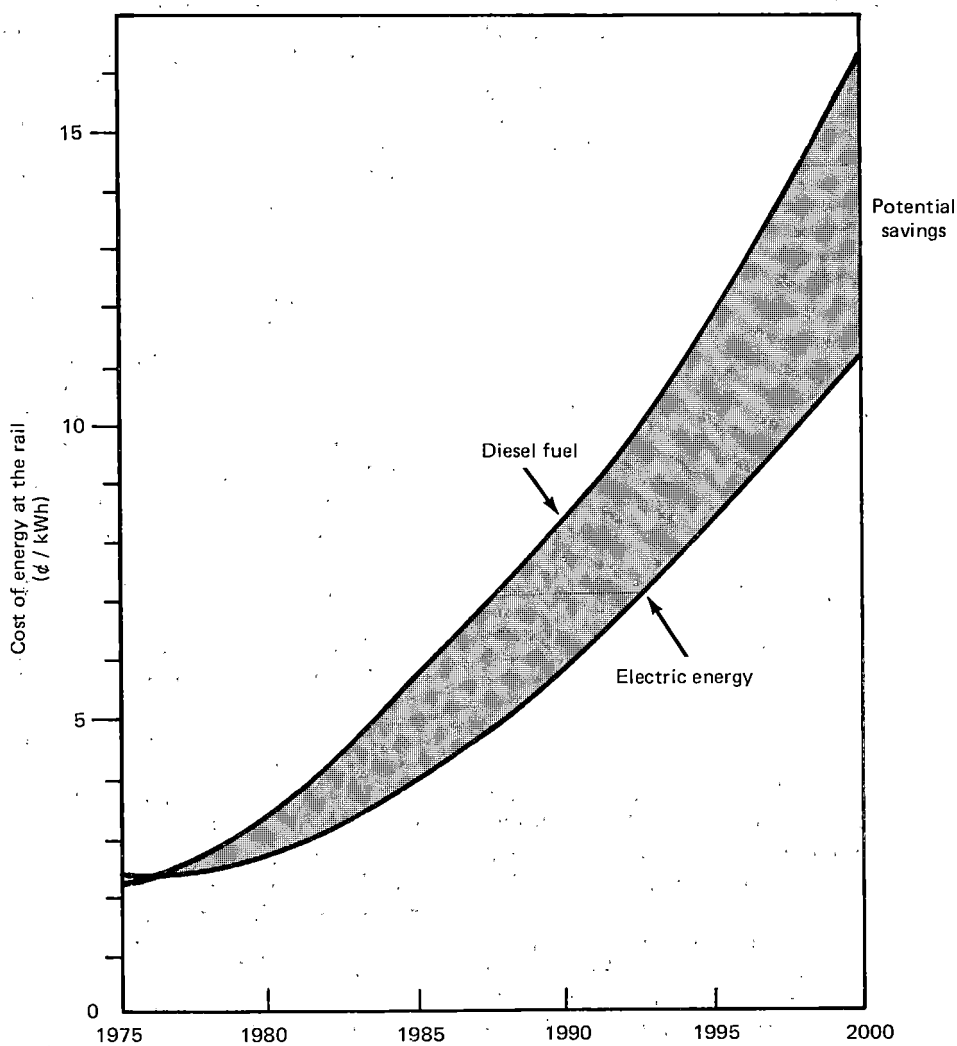
Shifting railroads to electric power for line-haul movement would make the Nation's long-haul goods movement less dependent on imported petroleum. Lower maintenance and operating costs and the longer operating life of electrified equipment would generate financial rates of return to the railroads in the range of 9 percent to 12 percent for electrification

projects, thereby enhancing the potential for the long-term financial viability of the railroads. Should there be increases in petroleum prices, the rate of return for electrification would increase to 18 percent to 24 percent, provided that the cost of coal-produced electricity did not follow the rise in petroleum prices. If large modal shifts were to occur as a result of petroleum scarcity and high prices, there would be significant financial gains to railroads and environmental benefits to the Nation. (See fig. C-1.)

Despite projected satisfactory rates of return of electrification projects, railroad companies remain uncertain of the ability of electrification to assist them in achieving improved performance and profits. Companies are heavily committed to diesel electric operations because they believe these operations have the potential of providing benefits nearly equivalent to electrification. They also have other projects with a higher priority for available financing.

The net environmental effect of electrification would be relatively minor. Most polluting emissions would be reduced, but there would be slight increases in water consumption, solid waste production, and land usage.

Although railroad electrification is a relatively mature technology overseas (especially in Europe and Japan), U.S. railroad companies continue to have reservations about certain technical aspects. Among the technical uncertainties are the potential interferences with present signaling and communications systems, maintenance costs, and installation



SOURCE: *An Evaluation of the Costs and Benefits of Railroad Electrification*, an FRA staff study conducted pursuant to section 901(7) of the 4R Act, p. 49.

FIGURE C-1 ENERGY COST DIFFERENTIAL.
(1977 dollars)

techniques to minimize interference with normal operations. The electrification of the New Haven to Boston line, as part of the Northeast Corridor Improvement Program, the first major mainline electrification project in the United States since the 1930's (except for specialized coal-hauling railroads), should serve to reduce some technical uncertainties.

COSTS AND BENEFITS OF ELECTRIFICATION

The FRA study, *A Report on U.S. Railroad Electrification,* calculated the costs and rate of return on investment for electrification of three rail networks of varying size. The three networks are: a 10,000-mile network that includes only lines with traffic levels of 40 million gross tons or more per year; a 26,000-mile network that includes all the 40-million-gross-ton lines and a significant portion of lines with more than 20 million gross tons per year, since 20 million gross tons is the minimum density for classification as an "A" mainline; a 40,000-mile network that includes essentially all lines with greater than 20 million gross tons per year.

Capital Costs

Electrification requires relatively large initial capital investments that comprise the following major costs.

- Catenary
- Substations
- Civil reconstruction (to provide catenary clearance)
- Modifications to signaling and communications systems
- Electric locomotives

Capital costs will be affected by economic region, local terrain, obstructions to be modified, existing operations, type of service, and the like. Cost factors, stated in 1977 dollars, are shown in table C-1.

The costs of the catenary and power delivery system, civil reconstruction, and modifications to signaling and communications systems for the 10,000-mile network structure would be approximately $3.4 billion. Traffic estimates for the network project a minimum requirement of 1,800 electric locomotives, costing about $1.8 billion. For the 26,000-mile network, capital costs would be $7.7 billion, with a minimum of 3,400 locomotives at a cost of about $3.4 billion. For the 40,000-mile network, capital costs for fixed facilities would be $11.2 billion, and a minimum of 4,740 locomotives would cost about $4.7 billion. The financial rate of return, before taxes, for each network was calculated utilizing the cost factors shown in table C-1, on the basis of a 30-year period, a zero-inflation rate, no energy cost differential, and a 2-percent annual traffic growth. The tabulation of investments and credits for each network are shown in table C-2. The investment in the electrification of a 10,000-mile network would yield a rate of return of 12 percent. With an energy cost differential, as shown in figure C-1, the rate of return would increase to 24 percent. The investment in electrification of either the 26,000-mile or the 40,000-mile network would yield a 9- to 10-percent rate of return. With an energy differential, shown in figure C-1, the rate of return would increase to 18 to 20 percent. The petroleum cost sensitivities are such that if there were a tenfold jump in petroleum prices relative to the price of electricity, the rate of return for electrification projects would increase to greater than 100 percent. Results of the analysis of specific rail line electrification projects studied by individual railroads are also included. The rates of return before taxes on these projects were calculated on the basis of a 30-year period, an inflation rate of 5 percent per year, and a traffic growth rate of 3.2 percent per year.

The first scenario, Mixed Freight Over Difficult Terrain, involves the proposed electrification of 260 route-miles and 92 alternate miles (1,078 track-miles), with a traffic density of 97 million gross tons per year. The route traverses terrain ranging from gently rolling to mountainous with many curves and gradients. For this scenario, the rate of return for investment in electrification is computed to be 20 percent on an investment of $145 million (see table C-3).

The second scenario, High-Speed Freight over Moderate Terrain, involves 750 double track and 215 single track route-miles (2,227 track-miles) with a traffic density of 70 million gross tons per year. The route ranges from flat, long runs with only slight grades to areas with grades approaching 2 percent, but with few curves. Civil reconstruction is not extensive. The greater portion of the route is accessible for off-track construction; much has a parallel access road. This route carries high-speed freight, some coal traffic, and no more than one passenger train per day. Electrification would yield a rate of return of 18 percent on an investment of $304 million (see table C-4).

The third scenario, Unit Coal Trains Over Flat Terrain, involves 365 route-miles (628 track-miles) with a traffic density of 70 million gross tons per year. The route is over very level terrain with only an occasional gentle curve. Civil reconstruction requirements are minimal. Available access permits almost all construction to be done off-track. The traffic is nearly all unit coal trains. Several manifest freight

TABLE C-1. ELECTRIFICATION COST FACTORS

Category	Costs		
	Single track (thousand $/route-mile)		
	Low	High	Arithmetic Average
Capital costs:			
Catenary	64.0	143.0	103.5
Substations and breaker stations	20.3	47.7	34.0
Signal and communications modifications	40.0	65.0	52.5
Civil reconstruction	5.0	50.0	27.5
Total	129.3	305.7	217.5
	Double track (thousand $/route-mile)		
Capital costs:			
Catenary	106.0	275.0	190.5
Substations and breaker stations	39.2	84.8	62.0
Signal and communications modifications	60.0	95.0	77.5
Civil reconstruction	7.5	75.0	41.25
Total	212.7	529.8	371.25
Utility connect costs	$10,000/route-mile		

	Per gallon (cents)	Per kWh (cents)	Per mile (cents)	Per route-mile (thousand $)
Operating costs:				
Diesel energy	42.0			
Electric energy		2.7		
Diesel locomotive maintenance			68.0	
Electric locomotive maintenance			29.0	
Catenary maintenance				2

	hp	Cost (thousand $)	$/hp	Lifetime (years)
Locomotive costs:				
Diesel electric	2,550	500	196	20
Electric	5,000	1,000	200	30

SOURCE: Federal Railroad Administration, staff study.

trains per day operate intermixed with the coal trains, and there is no significant passenger traffic projected. The rate of return for investment in electrification would be 21 percent on an investment of $56 million (see table C-5). Rate of return sensitivity to petroleum costs, the cost of electricity, and traffic growth for each scenario are shown in table C-6.

Reduced Petroleum Consumption

By 1990, electrification would result in a net reduction in diesel oil requirements per year of approximately 31 million barrels for the 10,000-mile network. At a price of $16 per barrel, the savings in imports would approach $496 million per year in

TABLE C-2. BASIS FOR CALCULATING RATES OF RETURN OF THREE NETWORKS

Category	10,000-mile network	26,000-mile network	40,000-mile network
Route-miles:			
Single track	3,700	15,600	28,000
Double track	6,300	10,400	12,000
Traffic density (mgt/yr)	502,470	945,800	1,317,570
Investments (million $):			
Catenary:			
Single track	440.4	1,614.6	2,898.0
Double track	1,220.2	1,981.2	2,286.0
Substations	516.4	1,175.2	1,696.0
Utility connects	100.0	260.0	400.0
Signaling and communications	682.5	1,625.0	2,400.0
Civil reconstruction	361.6	858.0	1,265.0
Electric locomotives	1,800.0	3,400.0	4,744.0
Diesel locomotives	-1,700.0	-3,200.0	-4,480.5
Net investments	3,401.1	7,714.0	11,208.5
Annual cost and credits (million $):			
Diesel locomotive replacement	-94.0	-178.0	-249.0
Diesel energy	-398.8	-739.2	-1,004.0
Electric energy	381.0	706.1	959.7
Diesel locomotive maintenance	-370.0	-696.3	-975.0
Electric locomotive maintenance	96.6	182.4	254.5
Catenary maintenance	20.0	52.0	80.0
Net annual savings	365.2	673.0	933.8

SOURCE: Arthur D. Little, Inc., for the Department of Transportation, Transportation Systems Center, *Engineering Cost Data Analysis for Railroad Electrification,* Oct. 1976.

1977 dollars. For the 26,000-mile network, savings would approach 56 million barrels at $896 million per year, and for the 40,000-mile network, 77 million barrels at $1.23 billion per year.

Impact on Power Facilities

The reserve margin of electrical generating capacity in the United States was 33.5 percent in 1975 and is expected to range between 23 and 29 percent by 1985.[1] Electrification of the 10,000-mile network would require about one-half of 1 percent of the total projected 1985 generating capacity and $5 billion in utility construction. The 26,000-mile network would require 1 percent of the Nation's generating capacity and about $8 billion in utility construction; the 40,000-mile network would require 1.3 percent and $11.2 billion.

The demand imposed by electric locomotives varies widely between acceleration or pulling up a steep grade and idling or braking. The electric transmission system must be the proper size to provide the peak demand at each traction substation. Approximately 20 percent of the transmission lines that would serve electrified railroads would have to be reinforced to meet peak demands.

Fossil Fuels Required To Generate Additional Power

The electric power to supply each of the three electrified network structures would be generated by consuming the amounts of fossil fuels shown in table C-7 (based on projected 1985 mix).

Environmental Impacts. The environmental impact of the conversion from diesel to electric operation would be small.[2] Diesel operations cause only minimal air pollution, and electrified operations will reduce even that pollution by a large amount. Diesel operations, however, distribute the pollution, but electric power generation at fixed sites concentrates it. Offsetting the concentration aspect, electric powerplant emissions are rigidly controlled to conform to national air pollution standards.

TABLE C-3. MIXED FREIGHT OVER DIFFICULT TERRAIN[a]

Investment schedule	Thousand $
Catenary:	
1,015 mainline miles at $86,000/track-mile	87,290
63 siding and yard miles at $65,000/track-mile	4,095
Substations:	
19 at $560,000 each	10,640
Switching stations:	
19 at $94,000	1,786
Signaling and communications modifications:	
369 signaled route-miles at $62,000/route-mile	22,878
Civil reconstruction, additional increment for catenary:	
Clearance only	10,380
Electric locomotives:	
70 at $880,000 each	61,600
Diesel locomotives transferred:	
157 at $340,000 each	(53,380)
Net investment	145,289
Annual costs and credits	**Thousand $/yr**
Diesel locomotive replacement:	
8.7 average at $500,000 each	(4,350)
Diesel fuel:	
47 million gal at 49¢/gal	(23,030)
Diesel locomotive maintenance:	
18.18 million miles at 58¢/mile	(10,544)
Electrical energy:	
531 million kWh at 3¢/kWh	15,930
Electric locomotive maintenance:	
10.89 million miles at 28¢/mile	3,049
Catenary maintenance:	
1,078 miles at $1,400/mile	1,509
Net annual savings	17,436

[a]Route-miles = 960 + 92 alternate; track-miles = 1078; traffic density = 97 mgt/yr, rate of return = 20%.

NOTE: Numbers in parentheses indicate negatives.

SOURCE: Arthur D. Little, Inc., for the Department of Transportation, Transportation Systems Center, Engineering Cost Data Analysis for Railroad Electrification, Oct. 1976.

TABLE C-4. HIGH-SPEED FREIGHT OVER MODERATE TERRAIN[a]

Investment schedule	Thousand $
Catenary:	
2,227 miles at $83,000/track-mile	184,800
Substations (owned by utility)	0
Signaling and communications modifications:	
1965 route-miles at $64,000/route-mile	62,600
Civil construction	18,300
Electric locomotives:	
198 at $1,054 each average	208,700
Diesel locomotives transferred	
397 at $430,000 each av.	(170,700)
Net investment	303,700
Annual costs and credits	**Thousand $/yr**
Diesel unit replacement:	
21.6 at $500,000 each	(10,800)
Diesel fuel:	
124 million gal at 48.8¢/gal	(60,500)
Diesel unit maintenance:	
63.4 million miles at 60¢/mile	(38,000)
Electrical energy:	
165 billion kWh at 4.04¢/kWh	63,000
Electric unit maintenance:	
36.9 million miles at 28¢/mile	10,310
Catenary maintenance:	
2,227 miles at $1,200/mile[b]	2,700
Net annual savings	33,300

[a]Route-miles = 750 double and 215 single track; track-miles = 2,227; traffic density = 70 mgt/yr and 27 mgt/yr on single-track sectors. Rate of return = 18%.

[b]Substation maintenance by utility.

NOTE: Numbers in parentheses indicated negatives.

SOURCE: Arthur D. Little, Inc., for the Department of Transportation, Transportation Systems Center, *Engineering Cost Data Analysis for Railroad Electrification,* Oct. 1976.

Electric power generation, whether fueled by coal or uranium, consumes large amounts of water for cooling, emissions control, ash removal, sluicing (in the case of coal), and sanitation. Petroleum refineries also consume water for cooling, processing, and sanitation but in much smaller amounts. The total amount of water required for electric power generation under maximum electrification would constitute only an insignificant percentage of the available surface and ground water resources on a national basis.

Land use requirements to provide space for coal storage, additional generation capacity, and solid waste disposal would increase. The percentage increase, however, would be small in the context of total available land area.

The high voltages carried by the catenaries of an electrified railroad would pose hazards to trespassers and accidental intruders encroaching on the right-of-way.

GOVERNMENT POLICY CONSIDERATIONS

For electrification to be implemented in the private sector, the railroad companies and the investment community must conclude that rail freight traffic will grow at a rate necessary to provide rates of return to support the investment. Railroad companies now see higher priorities for available funds and are quite hesitant to invest in such a long-term venture as electrification. Companies also fear that Federal regulations would deprive them of the ability to reap the benefits of the reduced operating costs.

TABLE C-5. UNIT COAL TRAIN SCENARIO[a]

Investment schedule	Thousand $
Catenary:	
595 miles main-line at $64,000/track-mile	38,100
34 miles yard wiring at $55,000/track-mile	1,900
Substations:	
3 single track at $506,000 each	1,500
6 double track at $905,000 each	5,400
Switching stations:	
3 single track at $72,200 each	200
6 double track at $94,000 each	600
Signal modifications (microwave now installed):	
365 route-miles at $30,000/route-mile	11,000
Civil reconstruction	2,300
Electric locomotives	28,200
Diesel locomotives transferred:	
79 at $416,000 each	(32,900)
Net Investment	56,300
Annual Costs and Credits	**Thousand $/yr**
Diesel unit replacement:	
4.6 at $500,000 each	(2,300)
Diesel fuel:	
22.3 million gal at 42.6¢/gal	(9,500)
Diesel unit maintenance:	
11.7 million miles at 60¢/mile	(7,000)
Electrical energy:	
314 million kWh at 2.87¢/kWh	9,000
Electric unit maintenance:	
5.9 million miles at 28¢/mile	1,700
Catenary maintenance:	
628 miles at $1.400/mile	900
Net annual savings	7,200

[a]Route-miles = 365; track-miles = 629; traffic density = 70 mtg/yr; rate of return = 21%

NOTE: Numbers in parentheses indicate negatives.

SOURCE: Arthur D. Little, Inc., for the Department of Transportation, Transportation Systems Center, *Engineering Cost Data Analysis for Railroad Electrification*, Oct. 1976.

Railroad companies are doubtful about the economics of electrification. They consider the projections of capital costs, locomotive prices, and maintenance and operating costs (especially) to be uncertain. Furthermore, companies are unsure about certain technical aspects, including standardization, interference with signaling and communications systems, safety, adhesion, and regenerative braking. To reduce this uncertainty, FRA will support further research and development for electrification. A demonstration project should also be undertaken to test equipment and operating procedures and to obtain better measures of costs and benefits. The Consolidated Rail Corporation (Conrail) is currently studying electrification of its line from Harrisburg to Pittsburgh, Pa. That line will be the prime candidate for a demonstration project and should the study indicate that the project is economically, financially, and operationally feasible, the FRA is prepared to guarantee loans for the project, as directed by section 606 of the 4R Act.

TABLE C-7. FUEL CONSUMPTION

Fuel type	Fuels consumed by network size (miles) 10,000	26,000	40,000	Railroad load (%)
Coal (million tons/yr)	4.8	6.5	9.4	45.7
Gas (billion cu. ft/yr)	19.5	45	58.5	11.2
Oil	(Netted out of oil savings)			5.7
All other	(Nonfossil fuels)			37.4

SOURCE: Federal Railroad Administration, staff study.

FINANCIAL AND OWNERSHIP ARRANGEMENTS

Financial and ownership issues arise from the great magnitude of the investment required and the lengthy time period before benefits will accrue. Financing options are interdependent on ownership options. Three ownership choices should be considered. In a traditional arrangement, the railroad would own the right-of-way, the catenary, the power delivery system, and the locomotives. The electric

TABLE C-6. RATE OF RETURN SENSITIVITIES
(Percent)

Scenario	Base ROR	ROR with petroleum cost + 40%	ROR with petroleum cost + 100%	ROR with electricity cost + 40%	ROR with traffic growth 0%
Mixed freight	20	27	35	14	12
High-speed freight	18	27	38	6	10
Unit coal train	20	27	37	13	13

NOTE: ROR indicates rate of return.

SOURCE: Federal Railroad Administration, staff study.

utilities would deliver power to the traction substations along the railroad track. In the typical financing arrangement, the railroad would borrow all funds necessary for the capital investment. Increased investment tax credits and accelerated depreciation would increase the financial rate of return and, thereby, provide some motivation for the railroads to electrify.

A second ownership arrangement would involve a third-party owner for some components in the system (perhaps, the catenary, power delivery system, right-of-way, or power-generating plant), and this third party would lease the components back to the railroad. The third party could be a regional authority, the Federal Government, or a private investor. In this case, the capital burden and long-term investment risk would be taken by a party willing to speculate.

A third arrangement would be railroad ownership of the entire system, including the power-generating plant. Should railroads choose to invest aggressively in electrification, appropriate Government action might include tax incentives and deferred payment loans. In any of these potential ownership arrangements, Federal assistance for electrification projects would be available to the railroads under the proposed new program described in chapter 7.

CONCLUSIONS

- Although the electrification of a sizeable portion of the rail network would result in substantial reductions in petroleum consumption, these reductions are relatively small in comparison to national petroleum consumption figures. These petroleum reductions alone do not appear to be sufficient justification for the Government to embark on a major program of railroad electrification.
- Nevertheless, since electricity can be generated using domestic coal and uranium as power sources, electrification could provide the Nation with a transportation mode immune to drastic fluctuations of oil supplies or sharp increases in oil prices.
- On the other hand, the benefits that accrue to railroad companies through lower operating, maintenance, and energy costs appear to be sufficiently large to justify industry investment in electrification of routes having more than 20 million gross tons per year. Recognizing that such large sums of capital could be raised only with some difficulty by the railroad industry, the new program of Federal financial assistance should be structured to permit loans to be made to any railroad for railroad electrification projects.

REFERENCES

[1] Federal Energy Administration, *National Energy Outlook,* Feb. 1976.

[2] Department of Transportation, "Draft Northeast Corridor Project Initial Assessment," Contract No. DOT-FR-660019, Nov. 1976.