HI. REHABILITATION OF ROAD AND Facilities

A. The Current Maintenance Situation

Unlike other transportation modes, the railroads own and maintain the network over which they haul traffic--namely, track and roadway. Recent estimates indicate that the Class I railroads currently have a $32-billion investment in roadway and facilities. This investment includes:

- Land traveled by the right-of-way.
- Physical plant attached to the roadbed (including rail, ties, and spikes).
- Bridges and tunnels.
- Supportive equipment, such as signaling systems, located along the right-of-way.
- Yard facilities.
- Terminal facilities.

Ownership of these facilities carries with it costs of maintenance and modernization. In 1974 the Class I railroads spent $2.3 billion to maintain roadways and facilities; this is equivalent to 14 cent from each dollar of revenue collected during that year. In that same year $.5 billion was spent on modernization projects to upgrade the quality of these facilities.

The amount of maintenance that was not performed, but which should have been, has received greater attention recently than the maintenance that was actually done. For the last 15 to 20 years, railroad management has not engaged in enough maintenance of way and structures to avoid the aggregate deterioration of these facilities. [1]

According to a recent Federal Railroad Administration study, in 1972 (the latest year for which appropriate data were available) the Class I railroads would have had to lay an additional 372, 000 tons of rail and some 6 million ties

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[1] Yearly maintenance expenditure at a level which avoids any increased deterioration of roadway and facility is referred to as maintenance at normalized levels.

in order to meet normal replacement rates. At 1972 cost levels, this work represents an additional $364 million that should have been spent to keep pace with roadway repair. Instead, this maintenance was deferred. Data on the aggregate of deferred maintenance in track materials are shown in Exhibit III-1. If the Class I railroads had undertaken a concerted effort in 1972 to correct this maintenance deficit, and if they had amortized the cost of this effort over ten years, the additional cost in 1972 for ties and rail would have been some $583 million (at 1972 prices).

A number of important questions evolve from this deferred maintenance issue:

(i) Why was maintenance deferred in the first place?

(ii) What would federal assistance in the rehabilitation of fixed plant involve ?

(iii) What are the reasons for federal involvement in rail fixed plant ?

(iv) What are the concerns regarding federal involvement in rail fixed plant ?

B. Why Maintenance Is Deferred

The high level of deferred maintenance among the bankrupt railroads is usually interpreted as an indication of the dismally cash-short conditions which they faced in the years prior to bankruptcy. Further, the existence of deferred maintenance among the solvent railroads is regarded by many observers as an indication of the same shortages of cash in the industry generally.

Undoubtedly, railroads in a deteriorating financial position will be very likely to defer maintenance programs which, under normal circumstances, should be undertaken. This might mean that the number of miles of track included in the yearly planned maintenance program might be reduced. It might also mean that the level of rail, ties, and spike replacement which occurs on trackage included in the planned maintenance program is drastically curtailed.

In the extreme case the entire planned maintenance program might be discontinued, with maintenance being performed only when it becomes absolutely necessary. However, there are alternative steps which can be taken to avoid the need for maintenance. These might include:

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EXHIBIT III-1
ESTIMATE OF DEFERRED MAINTENANCE IN TRACK
MATERIALS FOR 25 RAILROADS

District	Miles of Track	Deferred Maintenance (in 1974 dollars) Ties (000,000)	Rail (000,000)	Total (000,000)
East	87,200	$1,000	$1,100	$2,100
West	111,100	1,300	600	1,900
South	38,000	--	100	100
Total	236,300	$2,300	$1,800	$4,100

Source: Estimate of Deferred Maintenance in Track Materials for Twenty-Five Railroads, by Thomas K. Dyer, Inc., for the Federal Railroad Administration, Contract DOT-FRA45005.

- Orders to reduce train speed.
- The rerouting of traffic around poor quality roadways.
- The reduction of train size over dilapidated trackage areas.

Each of these steps would reduce the need to send a specialized maintenance crew out to maintain trackage.

Railroad accounting further magnifies the reluctance of the financially weak railroads to invest in maintenance of right-of-way because the bulk of the dollars involved appear on financial statements as expenses, and thus depress reported earnings.

Although high levels of deferred maintenance may be indicative of railroad cash-flow problems, this does not necessarily mean that the decision to defer maintenance is always inappropriate, or that it is always limited to cash-starved roads. The decision to defer maintenance might be based on conscious attempts to invest funds in areas that promise to be most beneficial to the overall profitability of the company. If the returns gained through the investment of funds in certain maintenance-of-way projects are not as high as the returns gained from other kinds of projects, it would make sense to use the available funds elsewhere. Consequently, the less profitable maintenance projects are deferred.

A related observation by knowledgeable rail industry sources is that fixed plant maintenance expenditures produce a return that is spread over a long period of time. Alternate projects with a quicker payback are likely to be favored by rail management.

c. Rehabilitation and Modernization Projects

The proposals for federal assistance in the rehabilitation of rail fixed plant involve the provision of public monies or loan guarantees to the railroads to enable them to better maintain and modernize their fixed assets. There are many such proposals which differ in a number of respects.[1] However, in terms of what gets done with the public investment, the proposals generally do not distinguish between historical levels of fixed plant maintenance, normalized maintenance, catch-up of deferred maintenance, or capital projects to modernize or upgrade the fixed plant.

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[1] See "A Review of Alternative Approaches to Federal Funding of Rail Rehabilitation," U.S. Congress, Office of Technology Assessment, September 1975.

Some of the projects that might be considered in a roadway and facilities rehabilitation program for improvement, modernization, and/or repair are roads and tracks, and yards and terminals. Some specific rehabilitation projects are discussed below.

1. Roads and Tracks

Rehabilitation projects on roads and tracks might include the following:

- Replacement of Obsolete Rail and Ties. It has been estimated that the nation's rail system today needs about $5.8 billion just to replace worn-out rail and ties.[1] Annual replacement requirements are calculated for each railroad by estimating tie and rail life based on physical characteristics (for example, average system weight of rail) and use (average system gross ton-miles). The results vary by railroad and over time but, overall, the average life of a tie is estimated at 33.4 years and two-position rail has an estimated life expectancy of 54.2 years.[2]

- Eliminate Steep Grades and Curves. Some routes, which may have been laid out a hundred years ago, contain steep grades and curves which slow the movement of traffic and often require added motive power. Further, given the change in locomotive technology, many routes are not suitably laid out for high-speed diesel engines. Modern construction techniques can eliminate many of these problems and improve the design of the routes.

- Renovate Bridges. A washed-out bridge could put a railroad or a large section of its network out of business since, in many cases, a bridge may be the only link between two points. At times it might be possible to reroute traffic over an alternative route, but very often the strategic position of bridges makes them vital to the functioning of a rail system. Bridge renovation projects may be considered as important elements of a rehabilitation project.

- Renovate Tunnels. Tunnels, like bridges, are vital links between points. Many years ago tunnels provided the only way to get from one side of a mountain to the other. Their age and the technological conditions under

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[1] A United States Rail Trust Fund, Prescription for a Modern Rail Transportation, by Milton J. Shapp (Pennsylvania Department of Transportation, 1974), p. 15.

[2] Ibid., p. 45.

which many tunnels were built imply that renovations or rehabilitation are nec - essary for them. Further, unless tunnels are well maintained, leaks and cave-ins could be serious threats to the continuation of rail service.

- Improvements to Clearances. Equipment and machinery are much larger and heavier today than they were years ago when many rail clear - ances were built under bridges and tunnels. The undertaking of a clearance ren-ovation project could result in a modal shift of this equipment traffic from track to rail.

2. Yards and Terminals

Many of the greatest inefficiencies and much of the unnecessary cost in the railroad industry can be traced to yards and terminals. In many large metropolitan areas old scattered terminals are a factor leading to the dispro– portionately high costs of originating and terminating freight. High per diem rentals for cars and underutilization of the nation's freight car fleet can also be traced to yard and terminal inefficiencies. Switching improvements for tracks and traffic lanes could reduce the time that cars spend in the yard, and cons e - quently both improve their utilization and reduce their per diem cost.

D. Reasons for Federal Government Involvement

The reasons why the Federal Government should provide public monies for the rehabilitation and modernization of rail fixed plant fall into two broad categories. One relates to the financial viability of the railroad industry; the other involves non-financial public objectives associated with rail transportation.

1. Financial Viabilitv of the Railroad Industrv

Those who see the primary benefits of Federal Government involvement in terms of enhanced financial viability of the railroad industry visualize two main effects of improved fixed plant:

- Attraction of new traffic and avoidance of future traffic losses (the result of improvements in transit time and reliability of service).

- lmproved operating efficiencies.

One of the major concerns of shippers is the amount of time their freight spends on the road between origin and destination points. If shippers

could be guaranteed that their freight would arrive within a specified and reasonable time period, they might be willing to ship by rail. However, as long as the transit time by rail is longer than necessary and the movement is unreliable--anything may be lost in transit from hours to days--shippers will refuse to suffer the inconveniences of rail.

Improved operating efficiencies imply reduced operating costs. Examples of such inefficiencies which have been corrected and which can improve operating costs have been cited by the United States Railway Association. While specifically concerned with the bankrupt railroads, the same problems are associated with deteriorated rail fixed plant in the railroad industry overall:

- Because of slow orders, through-freight trains between some major yards and terminals now require up to twice the travel time previously needed when track was maintained adequately. This often makes it necessary to reduce the length of some crew districts and to recrew more trains en route.

- Slow orders also prevent efficient operation of high-priority piggyback trains which must be dependable and fast in order to compete in the time-sensitive markets.

- Portions of some key yards are out of service because the track cannot meet minimum Federal Railroad Administration standards. This results in yard congestion and traffic delays.

- Inadequate maintenance of facilities other than track also results in traffic delays such as those caused by signal interruptions, inability to move controlled switches, and communications system failures.

- Freight loss and damage payments from derailments from operations on poorly maintained track continue to increase.

- The frequency of yard and mainline derailments makes "crisis"[f] operations the norm, reducing planning or control of operations. [1]

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[1] See [f]Final Systems Plan, Supplemental Report, " United States Railway Association, September 1975, p. 64.

2. Non-Financial Public Objectives

The non-financial reasons for federal involvement in the rehabilitation of rail fixed plant include:

- Public Interest Considerations--the desire for a transportation system which is speedy, reliable, and efficient.

- Environmental Considerations--a hope that railway rehabilitation can avoid future traffic shifts toward alternative modes that are more harmful to the environment, or that it will attract traffic away from alternative modes which are more harmful to the environment.

- Energy Considerations--a hope that roadway rehabilitation can avoid future traffic shifts toward less energy-efficient alternative modes, or that it will attract traffic away from energy-inefficient modes.

- Military Considerations--the need for an efficient rail network to transport defense-related materials.

To the extent that these considerations indicate that roadway rehabilitation is beneficial to the public sector, it would make sense to invest funds in rehabilitate ion.

3. Energy and Environmental Benefits

The impact of freight movement by both railroads and trucks on energy consumption and the environment are discussed in the following paragraphs.

a. Energy Consumption. In 1972 the U. S. railroads consumed some 4.5 billion gallons of fuel in carrying some 784.3 billion cargo ton-miles of freight, thus averaging 173.5 cargo ton-miles per gallon. In the same year trucks moved 470 billion ton-miles using 9.4 billion gallons of fuel, for an average fuel consumption of 50 ton-miles per gallon. Thus, on the average, the railroads needed less than one-third (28 percent) of the fuel required by the trucks to move one ton-mile of freight. On this basis, if 10 percent of the freight traveling by rail in 1972 had been forced to go by truck because of railroad bankruptcies, abandonments, or other factors, an additional 1, 117 million gallons of fuel would have been required. Conversely, a 10 percent shift from truck to rail would have saved 669 million gallons in 1972. The ability to make such diversions from truck to rail and, thereby, to achieve major fuel savings, would obviously be of

particular importance in terms of the national defense since, if the entire U.S. rail network were to collapse, and if all of the freight carried by rail were diverted to truck, the additional fuel required (based on 1972 consumption rates) would amount to some 11, 166 million gallons, or 265.9 million barrels of crude oil. At current world prices this would add $3.5 billion to our deficit of payments.

b. Environmental Impact. A further decline of the railroads? traffic volume would have serious environmental and land-use consequences for this nation. Consider, for example, the relative impact of rail and truck service on air quality. Based on 1972 fuel consumption data, railroads and trucks, overall, emitted the following average number of grams of carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NOx) per cargo ton-mile:

	CO	HC	NOx
Rail	0.34	0.25	0.97
Truck	2.04	0.34	3.36

Thus, on the average, rail produced only one-sixth the amount of carbon monoxide, three-quarters the amount of hydrocarbons, and less than one-third the amount of nitrogen oxides as trucks. If 10 percent of the freight traveling by rail in 1972 had been diverted to truck, the combined rail-truck emissions of carbon monoxide, hydrocarbons, and nitrogen oxides would have increased by *10.9* percent, 2.0 percent, and 8.0 percent respectively. A total diversion of rail traffic to truck in 1972 would have more than doubled carbon monoxide emissions and increased hydrocarbons and nitrogen oxide emissions by 20 percent and 80 percent respectively. In terms of land use, highway rights-of-way consume 13.5 times as much land per mile of right-of-way as do railroads, excluding interchanges. 1

If investment in rail rehabilitation either avoids further traffic diversion or attracts traffic from other modes, this may be sufficient to justify public investment in rehabilitation, even if there is no measurable financial benefit to be gained from such an investment.

E. Concerns Regarding Federal Involvement in Rail Fixed Plant

Those who oppose public investment in rail fixed plant, and even some of those who favor it, have several concerns about the amount of assistance

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[1] See discussion paper prepared by Harbridge House for the New England Regional Commission, dated May 1975.

that should be provided as well as the way in which the assistance program is structured,

1. Financial Impact

The concerns regarding the financial impact of federal involvement in rail fixed plant rehabilitation are twofold. One is that the returns to the railroads in terms of financial viability may not be significant. The other is that whatever the return, the public monies may simply replace private capital.

The impacts of rehabilitation efforts on projected cash flows of the railroad industry is a function of the cost of money and the rate of return on expenditures. The industry-wide average cost of capital for the railroads has been estimated at about 10 percent. For the weaker railroads this cost may be substantially higher. Government assistance in rehabilitation has been proposed at a cost to the railroads ranging from 0 percent (outright grants) to approximately 8 percent in the form of loans or loan guarantees.

The other side of the cost vs. return relationship presents a problem since no one knows the rate of return for expenditures on rehabilitation. To a large extent the return is not explicitly calculated by the railroads themselves. Further, the benefits are frequently intangible, or are at least difficult to measure. For example, it is very difficult to attach a dollar estimate to the avoidance of future traffic losses through improved service quality resulting from rehabilitation. Even the United States Railway Association (USRA), in its very comprehensive and sophisticated analysis of the Northeast and Midwest bankrupts, presented a major rehabilitation program without explicit justification in terms of rate of return.

Despite the absence of a definitive analysis of rates of return on rehabilitation expenditures, there is some evidence that they are generally low:

- The report of the Task Force on Railroad Productivity explored the marginal return on capital expenditures for the industry as a whole and estimated it to be approximately 5 percent. Because the analysis included roadway improvements and new equipment, whose return is generally regarded as relatively high, the implication is that the return on new investments in fixed plant is relatively low.

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[1] Improving Railroad Productivity, A Report to the National Commission on Productivity and the Council of Economic Advisers (Washington, D. C. , November 1973).

- The deferred maintenance that currently exists is, in itself, evidence that the return on such expenditures is low. Although the more financially precarious railroads may defer maintenance because it is discretionary and because they have sharply limited cash resources, the fact that even some well-managed and financially healthy roads have deferred maintenance indicates that such expenditures are deemed to be unattractive in terms of the rate of return. Exhibit III-2, a summary report of deferred maintenance by the railroads, indicates that deferred maintenance is not restricted to the weaker roads.

- The Association of American Railroads, in its Staff Memorandum 75-20 (September 30, 1975), estimated the rate of return on the USRA rehabilitation program to be approximately 1 percent. If a well-planned rehabilitation program for the bankrupt roads with the deepest historical deferral of maintenance does not show a measurable and significant financial return, it is unlikely that the financial return for rehabilitation in the rest of the industry can be high.

Appendix A of this report presents a series of computations, using purely hypothetical numbers, to illustrate the impact of federal funding for rehabilitation if financial returns are in fact low. The line of thought is that:

- if the total range of rehabilitation projects available includes relatively few high-return projects and an increasing amount of lower return projects;

and

- if the large amount of investment with the lower returns in fact has low returns (e, g. , the 1 percent estimated by the A A R) ;

and

- if the federal assistance is structured so that it is used in addition to the large amounts the railroads would spend on fixed plant in the absence of government participation;

then

- the return on the public investment in terms of financial benefits to the solvent railroads is very low (and, in fact, well below the opportunity cost of capital to the government of 10 percent established by the Office of Management and Budget). [1]

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[1] Office of Management and Budget, Circular A-94, revised March 27, 1972.

EXHIBIT III-2

SUMMARY OF RAILROAD REPORTS

(Required by Ex Parte 305 for the 4th quarter 1974)

(Thousands of Dollars)

Railroad	Deferred Maintenance	Miles of Slow Orders	% of Track Slow Order
Boston & Maine	$ 14, 725	39.8	1.7
Burlington Northern	54,804	-1,710.8	13.8
Chessie*			
Chicago & North" Western	692,159	7,960	53.6
Delaware & Hudson	22,534	443	35.8
Denver Rio Grande	10,013	45	1.4
Erie Lackawanna	24,030	658.3	10.8
Illinois Central Gulf	99,024	1,153	7.6
Kansas City Southern	14,559	247	9.4
Louisville & Nashville	48,192	1,053.6	9.8
Missouri-Kansas-Texas	65,434	1,931	57.8
Missouri Pacific	44, 823	178	1.4
Milwaukee	81,612	3,254	21.5
Norfolk & Western	64, 060	895.8	6.0
Penn Central	920,290	10,494	26.7
Reading	69,843	27.9	1.1
Rock Island	234,564	4,710.8	43.3
Santa Fe	—	1,494	7.2
Seaboard Coast Line	77,594	666	4.7
Soo Line	--	1,358	28.8
Southern	32, 854	1,503.5	15.2
Southern Pacific	61,134	3,736	20.3
St. Louis San Francisco	26, 842	65	9.7
St. Louis Southwest	13,257	634	29.3
Union Pacific	8,722	144	.9
Western Pacific	7,382	67	2.8
TOTAL	$2,668,478	47,469.5	

* Chessie System failed to file reports.

Source: Pennsylvania Department of Transportation, based on ICC data.

Although the evidence is hardly conclusive, it does suggest that there is a significant danger that public monies may be invested for a marginal financial return.

Another issue illustrated numerically in Appendix A is that if federal assistance is structured in such a way that the public money replaces (rather than being used in addition to) private capital which would otherwise be invested in fixed plant, the financial return is higher. However, if the federal investment simply enables private investors to disinvest in railroads, it appears that the public objectives are not being advanced.

2. Non-Financial Impact

As discussed earlier, two of the arguments in favor of federal involvement in the rehabilitation of rail fixed plant involve non-financial benefits. One argument relates to the public interest in a speedy, reliable, and efficient transportation system, which, in the case of rail, would be enhanced by fixed plant rehabilitation. The other involves external benefits related to energy consumption and the environment.

In the case of deeply deferred maintenance with markedly deteriorated plant, as with a bankrupt railroad, the presence of a valid public interest is clear.[1] Incremental investment in rehabilitation improves the efficiency, speed, and reliability of transportation and attracts traffic to a mode with favorable characteristics in a social sense. Such rehabilitation, as noted above, also tends to provide a favorable financial return to the railroad involved.

Where the measurable financial return is low, however, as in the rehabilitation of fixed plant owned by a well-managed and relatively affluent railroad, the picture changes. Although there is even less analysis of social and service benefits in relation to the costs of rehabilitation than of financial returns, the study team is convinced that a high return on a rehabilitation project tends to be a high return in all three senses (money, service quality, and external benefits), and is skeptical that low dollar returns are often accompanied by high social or service benefits.

If the dollar return from a given rehabilitation project is low, what is the value of the service benefits ?

- Speed. If speed is of value to shippers, decreases in transit time will attract traffic and produce dollar benefits. (In fact,

[1] Assuming non-redundant fixed plant.

much evidence shows that existing and potential rail traffic is inelastic with respect to transit time,)[1]

- Reliability. Again, its value to society can be measured by the value placed on it by shippers and the resulting dollar returns. (Traffic is more elastic with respect to reliability than speed.[1] However, there are many reasons for Poor reliability other than the condition of the fixed plant. These include waybilling, blocking, and scheduling procedures. Further, the reliability improvement associated with rehabilitation may be small in relation to the cost.)

- Efficiency. Efficiency gains should appear as cost savings in the financial analysis.

Similarly, external social benefits such as energy conservation and environmental advantages are generally linked to traffic shifts which, in turn, if significant, should show up as dollar returns in any financial evaluation. This suggests the need for a rigorous cost-benefit analysis of projects requiring federal assistance.

F. Summary and Observations

Several key points can be noted here:

- The financial rate of return on incremental fixed plant rehabilitation and modernization (i. e. , beyond that done by the solvent railroads without government assistance) is hard to determine, is seldom calculated or presented, and is probably low.

- As a solution to the financial problems of the solvent railroads, additional debt at a cost comparable to private capital costs is of little use as a source of funds for rehabilitation.

- Selective rehabilitation can preserve the fixed plant which keeps some federal options open (e. g. , Confac).

- The form of assistance used is important--for example, incremental investment vs. replacing available railroad funds.

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[1] Forecast of Traffic and Revenues 1974 - 1980, Part 111, prepared by Temple, Barker & Sloane, Inc. , under USRA Contract No. 50000, October 1974.

- Danger exists of a major non-selective expenditure of federal funds for rehabilitation of fixed plant which contributes little to the cash needs of the industry.

- The non-financial returns, such as service quality and energy conservation, for those marginal rehabilitation projects with low financial returns are probably not significant.

- Selective federal assistance in rehabilitation can be of significant use to a financially weak railroad.