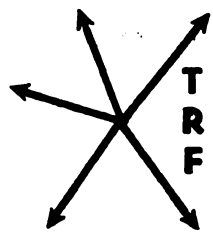
PROCEEDINGS —
Seventeenth Annual Meeting

Theme:
"Beyond The Bicentennial:
The Transportation Challenge"

October 28-29-30, 1976
Sheraton-Boston Hotel
Boston, Massachusetts

Volume XVII • Number 1 1976



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I INTRODUCTION

THE RAILROAD INDUSTRY has been praised for its rapid rate of technological innovation during the last three decades. Many new inventions were adopted to raise the level of service in comparison to the competing modes. These technological advances have occurred in all areas of a railroad's operation, but many have affected the movement of the trains—and freight—, and, thereby, the employment of the thousands of workers in the train and engine service.

Unfortunately, the work rules of the many operating unions have proven to be restrictive in light of the new technology. They have curtailed the intended improvements. The quality of service has suffered versus that of the competition. The railroads have lost a large proportion of their traffic to highway or water carriers.[1] Amendments are needed in the contracts to improve operations and prevent any further decline.

The following paper is a preliminary investigation of several important restrictive rules in the contracts of the train and engine service unions and their consequences on the operations of the railroads. The work rules have affected the industry's level of productivity. The union leaders will not agree to any changes necessary for today's technology. The carriers' management has reacted by making further capital improvements. This substitution of capital for labor is often counterproductive. Better service might be provided without the influx of so much new automated equipment.

Management and labor are going to be forced to awaken to the reality that the work rules must be changed to function better in today's environment. The rules are both inefficient for the effective management of the industry and inequitable or unjust for the employees themselves. Amendments should be made that keep these two normative principles in mind. Any changes made should not intentionally hurt either party. Without improved relations between the two sides, the future results could be disastrous. The financial position of the industry has already deteriorated to a poor level.[2]

II THE DIESEL LOCOMOTIVE AND RAILROAD PRODUCTIVITY

The existence of work rules in the railroad labor-management agreements has been widespread for nearly a century. The rules were originated to counteract many of the unique hazards faced by the railroad employees. Railroading consists of operations geographically scattered across a state or over a region. It is impractical to have supervisory personnel directing all operations around the clock. The avoidance of the perpetual danger of accidents or injury requires the coordination of the actions of many people. These standing work rules were set up as general guidelines for whatever situations might occur. They also protected the employees from arbitrary managerial decisions that might jeopardize their welfare and safety.[3]

There is little question that these work rules have served valuable and necessary functions during their existence. However, in light of more recent technological developments, the rules have become restrictive and need to be amended. The increased productivity made possible by the innovations has been reduced by the rigid rules. The technological innovations of the past quarter century are too numerous to fully explain. The most significant for the operating workers has been the replacement of the steam engine by the diesel model. The diesel locomotive was first used in yard service during the 1920's. Its implementation was slow, but, by the 60's, diesels were hauling over 97% of total ton-miles of freight. The diesel engine's advantages over its predecessors are many; it has greater tractive power and can move a train more efficiently at low speeds.

Two important consequences of the diesel locomotive's introduction have been hindered by work rule agreements of the operating unions. Diesel engines are powered by a liquid fuel instead of steam. Therefore, they no longer require the use of a fireman to stoke the engine. The locomotive's service needs are also at a minimum; the steam powered engines had to be serviced about every 100 miles. Divisions were set up to mirror the limits of its operating capacity. Many of these divisions have not been altered to take the greater capacity of the new engines into consideration. Their continuance limits the intended effectiveness of the new technology.

II-A: Firemen's Issue

The introduction of the diesel locomotive meant the demise of the need for a fireman to fuel the engine, and his position might have been abolished. On the contrary, the National Diesel Firemen's Agreement of 1937, providing for the assignment of firemen on all diesel electric locomotives, was signed. Today, over 97% of the freight is pulled by diesels, and the cost of the unnecessary firemen is too great for the carriers to accept. They have tried

Railroad Work Rules and New Technology: Train and Engine Service Employees

*by Philip S. Kemp, Jr.**

for nearly two decades to settle the problem and remove all those unwarranted employees. One must decide whether there are any functions that they continue to perform that are vital. Train operations are dangerous, and accidents are not uncommon. The unions, in the interest of the safety of their members, try to force the usage of extra personnel to prevent any mishaps. The principle of safety must be remembered along with the issues of efficiency and equity.

According to the Presidential Railroad Commission of 1962[4], the duties of a fireman in a diesel cab are mainly limited to three functions: 1). left hand lookout, 2). mechanical duties of making periodic checks and repairs of the diesel equipment, and 3). relief of the engineer. The Commission discovered that over 90% of the fireman's time was spent in the lookout function, for which he is not always required. In freight service, there is usually a head brakeman stationed in the cab who performs the same duty. In yard service, the slower speeds and improved performance of other workers could also eliminate the need for a fireman. Only in passenger service, since only two people ride in the cab, would firemen still be necessary.

The Commission also discovered that the fireman is not essential in terms of the other two duties. "Dead man controls" on the foot pedals can be installed to stop the train whenever the engineer is struck by a sudden illness. The small percentage of time spent in checking the engine units or making the few repairs possible while the train is in motion also do not warrant the presence of a fireman for efficient operations. After more than five years of disagreement on the part of labor and management leaders, Arbitration Board 282 was formed to settle the question of which firemen positions could be eliminated. Operating under the twin principles of equity and efficiency, the Board announced that up to 90% of the freight and yard positions could be eliminated. The 10% margin was to maintain the level of safety on those runs made under difficult conditions.

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Those firemen who were laid off (over 18000 positions were eliminated under the Arbitration Award)[5] were to be protected by the carriers under the provisions discussed below. The Award might be fair from an efficient or even equitable perspective, but one must look at the results from the standpoint of safety. The leaders of the Brotherhood of Locomotive Firemen and Enginemen (BLFE) claimed that the fireman's presence in the cab protects the health of the rest of the train crew. To judge the validity of their statement, I have calculated accident and casualty reports for the industry for the last 15 years. A train accident is defined by the Interstate Commerce Commission (ICC) as any accident causing damage to railroad property of $750 exclusive of the cost of clearing the wreck. Rates per million man-hours and per million locomotive train miles are both included as a capitulation to an ever-raging debate. The union economists feel that man-hours is a better measure because of the hazardous nature of yard service for which there are few miles of operation but many hours of labor exposed to unknown dangers.

As can be seen from Table II-2, the distinction does not really matter. Over the last 15 years, the number of train accidents has increased steadily, a 125% increase. The accident rate per million man-hours of train service has risen from 10.3 to 31.8. On the other hand, the number of casualties has decreased, but the mere number of casualties is not sufficient to judge the issue, because the figures do not reflect the decline in train miles or hours worked. The casualty rates have been remarkably stable over the period. One cannot tell what the calculations represent in terms of the safe handling of trains without firemen, for they are not classified according to causes, nor can one tell whether a fireman was present in the cab. Considering that the carriers have been unable to spend as much as in earlier years on track maintenance, the increase in the accident rates may not be a valid reason for the need of a fireman. Increased maintenance expenditures might lower the figure. The steady casualty rate indicates that the harm to train service employees has not increased

	Millions of train miles	Millions of man-hours train and engine service
1961	930	405
1962	944	408
1963	945	410
1964	992	403
1965	930	375
1966	941	382
1967	895	364
1968	876	363
1969	864	361
1970	839	359
1971	784	338
1972	781	336
1973	831	344
1974	834	336

Source of basic data: ICC statements M-400 and A-300.

I have taken the number of straight time hours worked plus the number of overtime hours to get the number of hours worked.

Also the number of man-hours per year are only reported for Class I railroads. Since the number of train and engine service employees on Class I lines is approximately 92% of the total employees in the industry within that category, the number of man-hours for all the carriers has been increased in accordance with that percentage relationship.

TABLE II-1

TRAIN ACCIDENTS AND CASUALTIES PER YEAR

	Train Accidents	Accident rate/million man-hour train and engine service	Accident rate/million train-miles
1961	4152	10.2	4.4
1962	4380	10.7	4.6
1963	4824	11.7	5.1
1964	5320	13.7	5.4
1965	5967	15.9	6.4
1966	6793	17.8	7.2
1967	7294	20.0	8.2
1968	8028	22.1	9.3
1969	8543	23.7	9.9
1970	8095	22.6	9.6
1971	7304	21.6	9.3
1972	7532	22.4	9.6
1973	9698	28.2	11.7
1974	10694	31.8	12.8

	Casualties-Train operation[a]	Casualty rate/million man-hour train and engine service	Casualty rate/million train-miles
1961	10416	25.7	11.2
1962	10188	24.9	10.8
1963	10608	25.8	11.2
1964	10960	27.2	11.0
1965	10553	28.1	11.3
1966	10227	26.8	10.9
1967	10050	27.6	11.2
1968	10207	28.1	11.6
1969	9996	27.7	11.6
1970	9311	25.9	11.1
1971	8026	23.7	10.2
1972	7332	21.8	9.4
1973	7924	23.0	9.3
1974	8859	26.4	10.0

Source of basic data: ICC statement M-400 and U.S. Congress, Senate Committee on Commerce, Railroad Work Rules. Disputes. Hearings. Mr. Winfield Homer's testimony pp. 181-206.

a. Only casualities in train accidents and train service accidents.

TABLE II-2

with the loss of so many firemen. The BLFE's argument does not seem realistic.

II-B: Interdivisional Runs

The restrictions against interdivisional runs still present in the work rules are counterproductive with diesel technology. The divisions still in existence were drawn up to mirror the 100 mile operating capacity of a steam engine. The division points and operating divisions define the extent of an employee's seniority district. Many rules were enacted to limit the road crews to their seniority districts, forcing the stopping of the train at every division point to change cabooses for the trainmen and engine crews.

The introduction of the faster diesel locomotive makes the old division points inefficient. One Santa Fe through freight run from Chicago to Richmond, Calif., a distance of 2498 miles, changed engine crews 19 times. The maximum time on duty was 5 hours and 25 minutes, while the minimum was 2 hours and 10 minutes.[6] All these crews were paid for a full 8 hour day, an inefficiency, as will be discussed below. Other large costs were incurred for the arbitrary delay payments for the workers and the high fixed costs of operating so many terminals.

The greatest inefficiency of the frequent crew changes comes from the reduced movement of the traffic. The utilization of the railroad is less desirable to shippers when the freight must be stopped so often. Competing modes can move the cargo more rapidly, because they are not forced to change crews. As mentioned earlier, the carriers have lost much traffic to their competition, especially the motor carriers. One cannot estimate the monetary cost of the effect of these restrictive rules, but it cannot be insignificant. Nineteen changes in a 2500 mile run are too many.

The efficient solution to the issue of interdivisional runs in the minds of the railroad managers would be the unilateral authority to decide on the proper deployment of crews for long runs. They would like the power to consolidate the number of seniority districts and reduce the size of the operating sector's labor force. The union leaders cannot agree to such a solution, for it would mean the discharge of many loyal members. Through collective bargaining, solutions acceptable on both efficient and equitable grounds might be arranged. Until then, the quality of service continues to decline, and the industry's revenues suffer.

III RESTRICTIVE ISSUES IN NEED OF CORRECTION

The counterproductive work rules account for much of the inefficiency in today's rail operations. Estimates of the financial losses range from $500 Million to $1 Billion/year.[7] The carriers have been forced to install new technology to alleviate the large labor costs. The managers have substituted large amounts of capital inputs and reduced the size of the labor force. The difficulties with the work rules are compounded by the new diesel technology and other innovations. Crew consist rules blow up the cost of operating trains. As a result, with the diesel, the carriers operate fewer, but longer, trains. The lower frequency of transit produces a deterioration in the speed and reliability of delivery and lowers the utilization of freight cars.[8] The longer length increases the probability of damage or delay. Automatic hump yards were designed to help improve the distribution of freight cars and limit yard delays as well as reduce the need for costly yard employees. However, freight car utilization is still low; the average car moved only 57.4 miles per day in 1974.

Several important work rules should be rectified to help solve the dilemma. The quality of rail service has declined, as shippers can no longer rely upon the frequent fast shipments of the past. They have turned to alternate modes of transportation, to the railroads' financial apprehension. The rate of return has been low throughout the post-war period. The return was only 8.44% in 1947 and the same in 1974. Productivity figures are not reliable for the industry, for the conventional estimates only measure labor productivity. The industry's total employment has declined 61% from 1351863 to 525177 since 1947. During that same period, the drop in train and engine service employment itself was from 290020 to 160566, or 45%. The smaller labor force helps maintain labor productivity at a high rate of 5-6% increase per year. Total factor productivity, including both capital and material inputs as well as labor, is estimated to be much less, only a 1-2% increase,[9] lower than the figures for the overall economy. The calculations might be better without the large substitution of costly capital inputs for the inefficient labor force and the resulting high capital/labor ratio.

III-A: Compensation Problems

The complicated system of compensation for the operating employees has not taken into consideration the introduction of the diesel technology. The

diesel engine greatly increased the speed of each run, thereby shortening the time of each trip. For many decades the workers have been paid under the so-called "dual" basis of pay. Employees are paid on both a mileage and an hourly basis. All formulae are similar to the following one for freight service employees:

a). In all classes of road service, except passenger service, 100 miles or less (straightaway or turnaround) shall constitute a day's work; miles in excess of 100 will be paid for at the mileage rates provided, according to class of engine or other power used.

b). On runs of 100 miles or less, overtime will be given at the expiration of 8 hours; on runs of over 100 miles, overtime will begin when the time on duty exceeds the miles run divided by 12½. Overtime shall be paid for on the minute basis, at an hourly rate of 3/16 of the daily rate, according to class of engine or other power used.[10]

The costs to the carriers result from the 100 miles in 8 hours guaranteed wage. These numbers were originally based upon the operations of a steam engine. It could normally run 100 miles in 8 hours. Today the diesel powered trains can make the trip in much less the time. The accepted work week in the U.S. is 40 hours, but the operating employees of the railroad industry work less, from 32-38 hours for the average worker in 1974.[11] The standard basic day should be altered to take into account the higher speeds of the diesel. The speed basis for overtime payments might be raised to 20 miles/hour by increasing the basic day to 160 miles.[12] With these changes, the carriers would save on their operating sector's labor costs.

The compensation scale of the operating employees should also be more equitable for the workers in the different classifications. The operating employees receive more in yearly compensation on the average than does the average railroad employee. Certain groups are faring less well because of the type of service they work in. Engineers and conductors are rightfully paid more than the others, since they need greater skills to perform their tasks. However, among the different service categories, there are inequities. The passenger service workers receive more than do the freight service employees. Yard and local freight workers are also forced to work more hours each week. These freight employees must make more stops and cannot take as much advantage of the diesel's increased speed. They get less overtime, for their trips are shorter in length.[13]

The methods of compensation should be modified to take these many inconsistencies into consideration. A system based more upon the number of hours worked might be more equitable, but the efficiency of operations might decline, as the men would find it to their advantage to slow the trip down. The mileage basis of pay is a form of incentive system for road personnel, but the system is inequitable for the yard workers. They are paid only on an hourly basis.

III-B: Seniority and Job Protection

The increased wage bill for the industry, and the resulting fall in railroad employment, leads one to the discussion of the seniority and job protection practices of the industry. Many elaborate work rules covering layoffs, recalls, promotions, and job assignments have been part of the labor agreements for nearly a century. Once hired, a man finds his name on a seniority roster, usually covering a single operating division for transportation workers.

The layoff practices of the industry have led to great inefficiencies. The work rules state that workers are to be laid off in the reverse order of their hiring. The older men, or actually those with the most seniority, are safest from layoffs. However, men are recalled in the order of their seniority, not the length of their unemployment. Because those men first laid off are not often rehired, these practices have led to a labor force older than that of the overall economy. The median age of the railroad labor force has gotten progressively older since World War II, from 40.3 to 45-46 in 1973. The median age is even older for some operating classifications—53 for the engineers and conductors in 1973.

The seniority system must be improved to increase employee efficiency. Not only are there not enough skilled young workers to take over the train operations in the immediate future when the older engineers retire (25% of the labor force in 1973 was older than 64), but it has also been shown that many older workers are less efficient than young ones. Dan H. Mater conducted a study in 1941[14] and found that not only age but seniority had a detrimental effect on the efficiency of the employees. With advancement tied to seniority rules, workers often do not reach the level of highly skilled occupations, the engineers and conductors, until they have passed the most efficient plateau of their working career. Highly

productive young workers have felt stifled by the snail's pace of promotion, based upon length of service, not ability.

The effects of seniority procedures should be important considerations for the job protection plans. The model for railroad protection agreements has been the Washington Agreement of May 1936. The agreement was designed to cover only those redundant workers affected by the merger of carriers. Its usage has been extended in the recent decades to cover all adversely affected employees, whatever the reason for their dismissal, especially those workers discharged because of technological innovation, such as the firemen, made redundant by diesel powered cabs.

Arbitration Award 282[15] included numerous provisions for different groups of workers. They differ according to the worker's seniority rights. Those with little seniority are guaranteed severance pay, while some more senior workers may be transferred to new jobs. The carriers are required to give the adversely affected men compensation allowances equal to the differences between the wages of the old jobs and those of any new lower-paying positions.

The equity of the Award came up in the 1966 Senate Committee Hearings. The employee witnesses told many tales of the harsh effects of the Award. Men were forced to take noncomparable jobs with low pay, and the carriers did not make up the difference in wages as required by the law. Others were compelled to work long and unduly hard runs with many hours of overtime, because the large number of layoffs had produced a shortage of firemen; the list of grievances is endless.[16]

The overriding concern with these inequities should be their extent. The total number of harshly affected workers has not been very large when compared with the size of the labor force dismissed or transferred by Award 282 (by late 1965, 15700 diesel firemen had been removed). Yet, the concerns of the injured should not be overlooked. The government should supervise the administration of any job protection programs. Not a single worker should suffer any hardship greater than the law states. In return, the labor leaders should work with the carriers to correct the seniority principles to improve the efficiency of the industry labor force. Productivity would then increase.

IV POSSIBLE SOLUTIONS TO THE WORK RULE DILEMMA

Technological improvements in the railroad industry will no doubt continue in the future. New developments will take place to further complicate the problems of the work rules. A solution must be found that is both equitable for the workers as well as efficient for the management. Several solutions are possible. One novel approach is that taken by the Florida East Coast Railway Company (FEC). Over a decade ago, the FEC workers went out on strike. After negotiations failed, the FEC management drew up its own agreement. They assumed unilateral power in the decisions of hires, layoffs, recalls, and the other practices affected by seniority.[17] The important rules amended with regard to the new diesel technology for the operating employees are those of the crew consist and the basis of pay. No longer are the train and engine service workers paid under the "dual basis" of mileage and hours worked. Instead they work 8 hour shifts, with overtime payments of time and ½ for any additional hours. The FEC also pays lower hourly wages (for example, $4.29/hour versus $6.10 for the Boston and Maine yard trainmen). The mandatory retirement age was lowered to 65 by July 1968. In that way, more efficient young workers can be hired and trained.

The effects of the new agreement on the FEC's operations can be seen from Table IV-1. The line is a small one—only 500 miles of track—but it is doing well financially; revenues were $47 million in 1974. The annual wages/worker are much lower than they are for the industry. In 1974 the FEC annual wage was only $9990, while it was $14225 for the entire railroad industry. The operating ratio has also been lower for the past few years. The increased profits of the period have been used to augment the maintenance expenses (Table IV-2). These improvements have led to better service, which attracts more shippers.

The solution of the FEC has proven efficient, but one must also consider the issue of equity. Has the unilateral power of the FEC management proven to be equitable for the workers themselves? The question is hard to answer, for their plight has not received much publicity. One can see that they face inequities when compared to workers on other lines, since their average annual compensation has been much lower since the 1964 agreement. Also, senior qualified workers are forced to take posted runs for which no bids are received. Employees are compelled by the carrier to take any assigned work, even if it is not their normal duty. The extent of these and other inequities and the number of workers affected are still unknown, but

FINANCIAL RECORD OF THE FLORIDA EAST COAST RAILWAY CO.

	1961	1962	1963	1964	1965	1966	1967
operating ratio	.813	.820	.839	.708	.724	.778	.811
number of employees	2211	2129	597	856	972	915	856
average annual wage/ employee	6345	6370	8148	7372	7332	7844	7784
	1968	**1969**	**1970**	**1971**	**1972**	**1973**	**1974**
operating ratio	.824	.737	.814	.734	.590	.580	.644
number of employees	862	816	952	974	992	1071	1208
average annual wage/ employee	7749	8967	8688	9885	9352	9998	9990

TABLE IV-1

OPERATING RATIOS
(operating expenses/operating revenues)

	FEC	US
1969	.7369	.7918
1970	.8141	.8058
1971	.7337	.7924
1972	.5899	.7872
1973	.5800	.7821
5 Year Average	.6909	.7919

MAINTENANCE OF WAY+ STRUCTURE RATIOS
(maintenance of way expenses/ operating revenues)

	FEC	US
1969	.2713	.1313
1970	.3351	.1345
1971	.3296	.1429
1972	.1790	.1432
1973	.2037	.1380
5 Year Average	.2637	.1380

Source of data and information: Annual Report of the Florida East Coast Railway Co., and Thornton, W.L., "How to Deal with the Railroad Crisis," p. 2.

TABLE IV-2

it's my belief that the interests of the workers might be better served if the carrier had not taken complete one-sided power.

Governmental controls might better serve the interests of the employees, but there are many powerful signals that nationalized railroads might prove to be less efficient. The foreign experience with nationalization has been far from impressive. The operating ratios have been much worse than the private U.S. rail carriers. Often the ratio is greater than 1.00, and the line must be subsidized heavily from the government budget. The foreign lines have also been found to be less efficient with regards to their labor force. The U.S. rail system, with all the inefficiencies mentioned above, employs only 2.7 employees/mile of track. The nationalized railroads use much more labor: 20.7 Englishmen, 12.9 Frenchmen, 22.1 Germans, and 19 Italians per mile of track.[18] The chance of increased employment and the large wage bill for a nationalized system has worried a lot of observers. They feel that there must be some other efficient and equitable solution.

V CONCLUSION AND FORECAST FOR THE FUTURE

The best apparent remedy for the restrictive and counterproductive work rules still present in the labor agreements of the railroad industry will be the continued use of collective bargaining between the top labor and management leaders. Both sides should review the problems caused by the introduction of advanced technology and then try to settle upon a workable solution, remembering the twin principles of efficiency and equity. Progress has been made in the past, but it has come at a slow pace, followed by much controversy. Days and months of negotiation have been wasted, due to the irreconcilable differences between the two parties. The final solution of the fireman's issue was not made until 1972, over a decade after the bargaining began.

The two parties should work with government supervision to achieve a proper settlement to the restrictive rules. The government's involvement would insure that neither side might circumvent the meaning of any agreements. Arbitration Award 282 was often honored in the breach. Efficiency and equity could then be maintained. Although not directly of interest to this discussion, the recent St. Louis Project of the Missouri Pacific (MoPac) is a prime example of the cooperation pos-

sible among labor, management, and the government. The project was designed to increase the efficiency and quality of service of the MoPac yards in St. Louis. The unions agreed to suspend several counterproductive rules, as the government guaranteed the lost compensation to the workers. The results have been encouraging: the average time spent in the yards by a freight car was reduced by 4.4 hours in the 6 months between March and October of 1975.[19] It should improve in the future.

The two sides must discontinue the use of restrictive work rules. They were designed for a period of a different and less productive technology. Their existence today is a burden too great for the proper functioning of the industry. Their modification is a necessary requirement for the survival of the private railroad carriers in the United States.

Without a peaceful settlement of the troubles, the post-war dilemma will only continue. New technology will be implemented to offset the rising wage costs. This perpetual substitution of capital for labor will not alleviate the low rate of return; instead the environment will get even more hazardous for the railroads. There will be no earnings to invest in the maintenance of equipment and the road bed; the number of delays or breakdowns will increase exponentially. Service will decline even further, leading to the loss of more traffic to the competitive modes.

The unions must realize that the steady decline in railroad employment of the past 30 years will continue, unless they work to amend the work rules of their many agreements. Their refusal to cooperate will only aggravate the problem. When they understand that their assistance in modifying the contracts to insure the most productive operations of the new technology can be used to their advantage, then progress will be made. By working with the carriers on the remedies, the labor unions can produce not just an efficient solution for the industry but also an equitable one for its employees. Modification of the restrictive work rules will be to their best long term interests. Employment could be stabilized at some realistic level.

Both sides could benefit from the end of the onerous work rules, but they must put together a concerted effort. Unilateral recommendations will not be sufficient. Progress has been made for such a collaboration, but there is room for much more.

FOOTNOTES

1 Volume of U.S. intercity freight traffic:

	railroad	truck	rivers + canals
1944	68.6%	5.4%	1.4%
1973	38.4%	22.9%	10.4%

2 Rate of return on net worth of Class I railroads was 69th out of 70 industries. See **Improving Railroad Productivity**, page 91.

3 Ibid., page 214.

4 US Presidential Railroad Commission—appointed by President Eisenhower to look into the work rules disputes and make nonbinding recommendations.

5 Levinson, et. al., **Collective Bargaining and Technological Change in American Transportation**, page 202.

6 Report of the Presidential Railroad Commission, page 295.

7 **Improving Railroad Productivity**, op. cit., page 218.

8 The average freight car cycle time has increased from 16.6 days in 1947 to 25.5 days in 1971. (**Improving Railroad Productivity**, op. cit., p. 290).

9 See **Improving Railroad Productivity**, op. cit., Chapter II.

10 **Report of the Presidential Railroad Commission**, page 149.

11. Calculations based upon ICC statement A-300. I divided the number of hours worked by the number of employees.

12 **Report of the Presidential Railroad Commission**, page 186.

13 **Appendix, Vol. 2, Report of the Presidential Railroad Commission.** In 1960, the average miles/trip of local freight engineers was 98, while the average for passenger engineers was 145. The average hours on duty was also longer—10.2 hours to 4.0.

14 See Mater, Dan H., **The Railroad Seniority System**, esp. "Effect of Seniority upon Employee Efficiency."

15 See US Senate Committee on Commerce Work Rules Disputes. Hearings of 1966, pp 998-1000 for text of the Award.

16 Ibid., pp 34-35; statement of H. E. Gilbert, President of the Brotherhood of Locomotive Firemen and Engineers.

17 Special thanks to Mr. Jim Mason of the Boston + Maine Railroad for a look at his unpublished comparison of the B+M work rules vs. the new FEC agreement.

18 Thornton, W. L., "How to Deal with the Railroad Crisis," page 3.

19 See **Cooperative Program of Experiments Involving Changes in Railroad Operations**, the 1975 Progress Report of the St. Louis Project for the complete description.

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