



Current Trends and Future Challenges in the Freight Railroad Industry

Balancing Private Industry Interests and the Public Welfare

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EXECUTIVE SUMMARY

Deregulation has put the freight railroad industry on a more secure financial footing. In general, the transformation of the rail industry since the Staggers Rail Act of 1980 has been viewed by stakeholders at many levels as overwhelmingly positive. Perhaps most important to note is that deregulation has allowed the rail industry to fully realize the benefits of operating as a private business – cutting costs, boosting productivity, eliminating unprofitable lines, and gaining a higher degree of business autonomy. One consequence of this reduction in physical capacity is that often only one railroad company’s lines run on a particular route, resulting in monopolistic pricing practices.

Pivotal to our nation’s evolving transportation sector is the delicate balance between private industry interests (i.e., profitability and sustainability) and the public benefit (i.e., safety and fair freight rates). What does it mean when numerous reports project a growing demand for freight transportation in the coming decades? What does it mean that the rail industry has only recently yielded a higher return on investment than its cost of capital? What does it mean that federal funding mechanisms to maintain and improve the rail freight industry lack a cohesive national strategy?

All these questions and several others combine to form a pressing issue that demands a collaborative response from the rail industry, freight shippers, federal and state policymakers, and the public. Whether the future of the rail industry is more or less regulated is a policy decision that will yield far-reaching consequences for our nation’s future economic viability. The transformation of the industry since 1980 has resulted in down-sizing, consolidating, and a focus on profitable lines and operational strategies. Indeed, the significant capital investments required to satisfy projected demand increases will test an industry that operates with relatively inflexible capacity and substantial capital expenses.

REPORT OVERVIEW

This report engages in a detailed examination of the railroad industry and Class I railroad companies, in particular, relative to demand, capacity, productivity, and safety. We begin by providing an overview of the industry’s economic impact and a brief historical overview of the industry’s development. Chapter 1 concludes with a sketch of the industry’s operating environment today with a special focus on the challenges to meeting safety performance goals and sustaining economic health. Chapter 2 outlines the industry’s improved position since economic deregulation, especially as it relates to infrastructure investment and safety performance. Chapter 3 follows with an evaluation of the current operating environment as it relates to demand, capacity, and productivity. In light of demand forecasts, we assess the implications of these projections on the industry’s principal stakeholders – shippers, government, shareholders, employees, and the public. Chapter 4 profiles four safety improvement initiatives: Positive Train Control, Confidential Close Call Reporting System, Crew Resource Management, and the Federal Railroad Administration’s Highway-Rail Grade Crossings Program. These safety improvement initiatives are implemented to varying degrees in the industry today, and based on an analysis of the costs, benefits, and challenges to full implementation, we conclude with recommendations for future action relative to each. Chapter 5 concludes the report with public policy recommendations designed to ensure the health, safety, and economic vitality of the industry, its employees and customers, and the public. Based on assessments of the industry’s current performance and predictions of future challenges, the following recommendations have been formulated with an understanding of the tenuous relationship among the industry’s stakeholders and of the interconnectedness of freight transportation demand, operating capacity, productivity, and safety.

RECOMMENDATIONS OVERVIEW

POSITIVE TRAIN CONTROL

- Class I railroads should continue to pursue PTC projects and work toward full implementation on busy corridors, especially those with both freight and passenger rail.
- The FRA should continue to pursue PTC but should stop short of mandating a specific PTC technology for Class I railroads.
- The FRA should create an index to prioritize track lines that stand to benefit the most from PTC.

CONFIDENTIAL CLOSE CALL REPORTING SYSTEM

- The Bureau of Transportation Statistics should develop a sustainable, comprehensive database system that aggregates safety data from the multiple databases maintained by rail carriers, regulatory agencies, and independent organizations.
- The FRA should publish “lessons learned” from the demonstration project on a quarterly basis to document trends in safety vulnerabilities and the manner in which the rail carrier has worked to remedy those risks.
- The FRA should create a task force charged with documenting potential dispute resolution problems.
- The FRA and relevant rail carriers should complement quantitative analysis with qualitative research that explores how perceptions of program effectiveness, perceptions of employee-employer relations, and employee job satisfaction are associated with safety incident trends.

CREW RESOURCE MANAGEMENT

- The core elements of CRM training including technical proficiency, situational awareness, communication, teamwork, and assertiveness should be incorporated into the current curriculum of standard employee training procedures.

HIGHWAY-RAIL GRADE CROSSINGS PROGRAM

- The FRA should consider funding programs and alternatives that improve the safety of private highway-rail grade crossings.
- The FRA should standardize the closure indices maintained by each state Department of Transportation.
- The FRA should permit Class I railroad carriers to use program funding for maintenance of safety improvements established with earlier program funding.
- The FRA should allow for a higher percentage of funds to be used for sight-distance improvements, crossing closures or consolidations, and/or complete grade separations.

INDUSTRY-WIDE RECOMMENDATIONS OVERVIEW

- Increase funding to the FRA for oversight and inspection resources with the purpose of increasing the agency's capacity to effectively fulfill its regulatory responsibilities.
- Develop a systematic method for evaluating the FRA's various safety improvement programs to prioritize resource allocation and ultimately determine programmatic impact.
- Make infrastructure condition and congestion data maintained by Class I railroad companies confidentially available to the FRA with the purpose of better targeting safety oversight initiatives.
- Enforce the mandatory reporting requirements of the FRA and develop a graduated scale of civil penalties for repeat violators of reporting requirements.
- Standardize public-private partnership (PPP) cost-benefit methodology to more accurately assess the costs and benefits to public and private entities.
- Extend the infrastructure investment tax credit to Class I railroads to encourage public and private investment in rail capacity expansion.
- Develop and implement a National Freight Transportation Strategy to focus the efforts of all industry stakeholders and clearly outline the federal government's role in industry development.
- Refine and implement a National Investment Strategy that establishes a framework for federal investments with the purpose of developing a targeted, risk-management approach to capital investments.
- Establish a National Safety & Capacity Advisory Board as part of the National Freight Transportation Strategy to monitor implementation of the strategy as well as make recommendations regarding Class I improvements in the areas of safety, capacity, and productivity.

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List of Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
AAR	Association of American Railroads
BLE	Brotherhood of Locomotive Engineers
BLE-T	Brotherhood of Locomotive Engineers and Trainmen
BNSF	BNSF Railway
BTS	Bureau of Transportation Statistics
C³RS	Confidential Close Call Reporting System
CIRAS	Confidential Incident Reporting and Analysis System
CN/GTW	Canadian National/Grand Trunk Western Railroad
COFC	Container on Flat Car
CP	Canadian Pacific Railway
CRM	Crew Resource Management
CSX	CSX Transportation
CTC	Centralized Traffic Control
CURE	Consumers United for Rail Equity
DOT	Department of Transportation
EIA	Energy Information Agency
ETMS	Electronic Train Management System
FELA	Federal Employers' Liability Act
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
GAO	Government Accountability Office
ICC	Interstate Commerce Commission
ISTEA	Intermodal Surface Transportation Efficiency Act
KCS	Kansas City Southern Railway
MGT	Million Gross Ton-Miles
NTSB	National Transportation Safety Board
NS	Norfolk Southern
OCCA	Office of Compliance and Consumer Assistance
OEEAA	Office of Economics, Environmental Analysis and Administration
OIG	Office of Inspector General
PPP	Public Private Partnership
PPA	PTC Preventable Accident
PTC	Positive Train Control
RAC	Railway Association of Canada
RSAC	Railroad Safety Advisory Committee
RTM	Revenue Ton Miles
STB	Surface Transportation Board
TERP	Texas Emissions Reductions Program
TEU	Twenty Foot Equivalent

TIR	Track Image Recorder
TRB	Transportation Research Board
TTI	Texas Transportation Institute
TWC	Track Warrant Control
UP	Union Pacific Railroad
UPS	United Parcel Service
U.S. DOT	United States Department of Transportation
UTU	United Transportation Union
VMT	Vehicle Miles of Travel

CHAPTER 1

INTRODUCTION & INDUSTRY OVERVIEW

The freight rail industry has been a vital component of the American economy since its origins in the mid-19th century. Throughout its history, the industry has produced varying levels of economic benefit to both shareholders and the general public. Following a series of high-profile bankruptcies in the 1970s and on the heels of aviation and trucking deregulation, a legislative effort to salvage the economic vitality of the freight rail industry came in the form of the Staggers Act of 1980. The legislation was intended to create the conditions for “a safe and efficient rail system.”¹ Since deregulation, the industry has undergone a positive transformation in terms of profitability, productivity, and safety. Railroad carriers embraced the benefits of operating as a private business – cutting costs, boosting productivity, eliminating unprofitable lines, and gaining a higher degree of business autonomy. This report provides a descriptive examination of the freight rail industry today, its primary stakeholders, and key trends including freight rail demand, operating capacity, productivity, and safety performance. A comprehensive examination of these trends reveals that they are invariably correlated. Given projections for vastly increased freight transportation demand, the pressure to improve capacity and productivity has tested an industry traditionally slow to change. The following chapter previews the industry’s contemporary economic contributions, outlines the historical evolution of the industry, and concludes with an overview of industry stakeholders and the environment in which these stakeholders interact.

A PREVIEW OF THE ECONOMIC CONTRIBUTIONS OF THE INDUSTRY

This report is limited to an analysis of Class I railroad companies, which are defined by the Surface Transportation Board (STB) as companies earning adjusted annual operating revenues of \$319 million annually.² Since the Interstate Commerce Commission (ICC) first categorized railroad companies by earned revenues, the number of Class I railroad companies has fluctuated from

a high of 132 companies in 1939 to a low of 7 companies today. Class I railroad companies and the 140,490-mile railroad network on which they operate comprise a critical component of the nation’s transportation system.³ In terms of goods movement, the railroad industry moves 40 percent of the nation’s freight, measured in revenue ton-miles annually, which is more than any other mode of transportation (excluding gas pipelines). As shown in Table 1, today Class I railroad companies transport an estimated \$310.9 billion worth of freight,⁴ and in 2006 they earned a net income of \$6.5 billion.⁵

U.S. AND CANADIAN CLASS I RAILROAD COMPANIES

BNSF Railway (BNSF)
Canadian National/Grand Trunk Western R.R. (CN/GTW)
CSX Transportation (CSX)
Kansas City Southern Ry. (KCS)
Norfolk Southern R.R. (NS)
Canadian Pacific/Soo Line R.R. (CP/SOO)
Union Pacific R.R. (UP)

¹ Staggers Rail Act of 1980, Pub. L. 96-448, 14 October 1980, 94 Stat. 1895.

² United States, Internal Revenue Service, Railroad Industry Overview - October 2007 (Washington: GPO) 2007.

³ In 2006, Class I railroads operated on 94,801 miles of the total railroad network; Association of American Railroads. Class I Railroad Statistics, 15 Jan. 2008 <<http://www.aar.org/PubCommon/Documents/AboutTheIndustry/Statistics.pdf>>.

⁴ United States, Bureau of Transportation Statistics, “Appendix A - Modal Profiles,” National Transportation Statistics 2007, 3 Nov. 2007 <http://www.bts.gov/publications/national_transportation_statistics/2007>.

⁵ Association of American Railroads, Class I Railroad Statistics 15 Jan. 2008. <<http://www.aar.org>>. Path: RR Industry Info; Statistics.

Table 1
An Overview of Class I Railroad Companies

Financial		Inventory		Performance	
Class I operating revenues (in billions) ⁶	Monetary value of freight activity (in billions) ⁷	Number of freight cars ⁸	Number of employees ⁹	Ton-miles of freight traveled (in billions) ¹⁰	Average length-of-haul (in miles) ¹¹
\$52.2	\$310.9	473,773	166,214	\$1,772	905.6

Beyond the direct monetary benefit to railroad companies, a healthy railroad industry benefits the general public in the form of lower consumer good prices. To the extent that railroad companies have a multi-dimensional impact on the public welfare, local, state, and federal government entities play a significant role in ensuring the industry operates efficiently and safely. In October 2006, the Government Accountability Office (GAO) released a report on the freight rail industry that addressed how this private industry was performing in deregulation.¹² The report, which recommended issues of declining market competition and capacity be addressed, outlined how the public benefits from a healthy railroad industry. Table 2 has been modified from that report. However idealistic, these potential public benefits are seemingly distant in light of recent industry trends. Rising shipping rates, traffic congestion, and marginal gains in safety have characterized the industry most recently. In comparison to the trucking industry, the railroad industry has received relatively little public funding support, despite the fact that the costs of maintaining and improving the industry's extensive infrastructure are significant.

Overall, Class I railroads have spent a larger percent of their revenue on capital expenditures and maintenance since 1980 than any other manufacturing industry in the United States.¹³ Today, the industry and its shareholders underinvest in infrastructure for several reasons. First, railroad companies have traditionally struggled to yield return on investments that outweigh the cost of capital. Capital improvements are inherently incremental and expensive. Due to interoperability requirements, technologically upgrading the industry requires a comprehensive and significantly collaborative effort. This underinvestment has begun to manifest in a deteriorating rail system. Based on the *Report Card for America's Infrastructure* issued by the American Society of Civil Engineering in 2005, the nation's rail system was rated below average.¹⁴ As numerous government and industry evaluations of the industry report, the pace at which demand exceeds the industry's capacity to efficiently and safely operate poses significant challenges in the 21st century.

⁶ Association of American Railroads, 15 Jan. 2008.

⁷ Figure is from 2002; United States, Bureau of Transportation Statistics, 2007.

⁸ United States, Bureau of Transportation Statistics, 2007.

⁹ United States, Surface Transportation Board, "Employment Data," *Class I Railroad Annual Report 2008a*, 10 Mar. 2008 <<http://www.stb.dot.gov>>. Path: Industry Data; Economic Data; Financial & Statistical Reports; Class I Railroad Annual Report.

¹⁰ Association of American Railroads, 15 Jan. 2008.

¹¹ Association of American Railroads, 15 Jan. 2008.

¹² United States, General Accountability Office, *Freight Railroads: Industry Health Has Improved, but Concerns about Competition and Capacity Should Be Addressed (GAO-07-94)* (Washington: GPO) 2006: 58.

¹³ Association of American Railroads, *America's Freight Capacity Challenge* n.d., 9 Apr 2008 <<http://www.aar.org>>. Path: Infrastructure Tax Incentive.

¹⁴ American Society of Civil Engineers, "2005 Grades," *Report Card for America's Infrastructure 2005*, 10 Nov. 2008 <<http://www.asce.org/reportcard/2005/page.cfm?id=103>>.

Table 2
Potential Public Benefits of an Efficient and Responsive Railroad Industry

Economic	<ul style="list-style-type: none"> • Lowers the end price of consumer goods by becoming more efficient • Improves international economic position through gains in efficiency • Provides an economic boost to employees and increases the tax base • Improves the economy for local, state, and federal governments
Transportation System	<ul style="list-style-type: none"> • Allows each mode of transportation to carry the optimal quantity of goods • Strengthens connections among freight transportation modes • Improves system performance now and in the future
Mobility/Congestion	<ul style="list-style-type: none"> • Lessens freight movement on highways as freight is diverted from road to rail • Decreases congestion in America's cities as fewer trucks are on the road and rail-vehicle interactions are effectively minimized • Minimizes highway deterioration by carrying freight that would otherwise be transported by truck
Environmental	<ul style="list-style-type: none"> • Reduces harmful emissions relative to trucking as rail consumes one-fourth to one-third less fuel • Reduces emissions by absorbing a portion of freight demand that would otherwise be transported by the trucking industry
Safety and Security	<ul style="list-style-type: none"> • Decreases frequency and severity of rail-car and rail-human interactions • Lessens the vulnerability to terrorist attack, assuming the infrastructure is maintained and improved through technological advancements • Functions as a reliable and far-reaching mode of transportation in times of national security or weather crises

Source: GAO (2006)

THE HISTORICAL EVOLUTION OF THE FREIGHT RAILROAD INDUSTRY

Railroad historian Maury Klein (1990) delineates the evolution of the railroad industry into three periods: (1) the transition from competition to regulation (1860-1920), (2) cartelization and new competition from other transportation modes, (1920-1958), and (3) industry restructuring and deregulation (1958-present).

The idea of developing an American railroad system was first documented in 1812 by Colonel John Stevens in his book *Documents Tending to Prove the Superior Advantages of Railways and Steam Carriages over Canal Navigation*. Stevens, fully cognizant of British improvements in steam powered rail operations, outlined the shortcomings of the canal system of the United States. Stevens' predictions of a railroad system that moves freight "with a velocity of 100 miles an hour"¹⁵ would start to become a reality in 1830 when the first functioning railroad system was built. While these early railroads were dangerous and unpredictable, they nonetheless revolutionized the speed and cost of transportation. What would have taken 50 days to transport in 1817 could be transported by rail

in 8 days by 1850.¹⁶ As the speed of travel and goods movement increased dramatically throughout the mid-nineteenth century, the overall quality of life in America improved. Many of the companies blossoming out of the railroad construction boom (e.g., Mohawk & Hudson, Camden & Amboy, Baltimore & Ohio) were built to serve local needs and/or compete against other railroad companies. From 1830 to 1860, the nation was divided into nine operating regions, and six different track gauge measurements (the distance between the rails) were in use.¹⁷

By the 1860s, rail line construction had stagnated with the onset of the American Civil War. In response to the lag in new construction, President Lincoln authorized construction of a transcontinental railroad when he signed the Pacific Railway Act in 1862. Aside from the obvious economic benefits, the transcontinental rail line was also conceived of as a national security measure – better equipping the nation to rapidly transport military troops and materials in times of war. By 1869, the Union Pacific and Central Pacific Railroads joined lines in Promontory Summit, Utah, to complete the nation's first transcontinental railroad. This event was a major accomplishment for the expanding American economy. As demand for long-haul traffic increased and railroad companies recognized the economic value of allowing through-traffic, the 4 feet, 8.5 inch track gauge became the standard track gauge. By the 1880s and with industry-wide recognition of the value of cooperation, the standardization of bridge heights and braking systems allowed companies to use adjoining tracks and effectively expand operations.

The Pacific Railway Act (1862) was designed to "aid in the construction of a...telegraph line from the Missouri River to the Pacific Ocean and to secure to the government the use of the same for postal, military, and other purposes."

The degree to which railroad companies relied on financial institutions for credit in financing the early expansion of rail system was unique at the time. Railroad companies, like other capital-intensive firms,

¹⁵ John Stevens, *Documents tending to prove the superior advantages of the rail-ways and steam-carriages over canal navigation* (New York: T. and J. Swords) 1812.

¹⁶ Ruth Schwartz Cowan, *A Social History of American Technology* (New York: Oxford University Press) 1997: 114-15.

¹⁷ Douglas J. Puffert, "The Standardization of Track Gauge on North American Railways, 1830-1890," *The Journal of Economic History* 60(2000): 933.

faced significant barriers to market entry. The substantial amount of capital required for infrastructure construction and maintenance meant convincing Wall Street of future profitability, and competitive advantage was paramount. Constructing new rail lines depended on the industry's ability to draw credit from America's largest financial institutions. Of course, drawing credit to finance capital-intensive projects was not a new concept in industrialized America; however, the number of credit lines issued to railroad companies in their formative years was unprecedented. The first American holding company, the Pennsylvania Company, was a direct result of railway expansion.¹⁸

Paradoxically, railroad companies' significant and positive contribution to American economic development was also marked by anti-competitive and monopolistic behavior. As more railroad companies were created, competing lines began operating in close proximity to one another and competition increased rapidly. This phase of American railroad development led to several corporate buyouts and rail line mergers, and as a result, shippers were forced to choose amidst a dwindling number of railroad companies. These developments were indicative of a larger dilemma: Railroad companies could be either a powerful monopoly, or an insolvent, yet essential, component of the rapidly growing American economy. Before the first government rate regulation in 1887, isolated railroad companies were free to act as monopolists – strategically choosing customers and offering services at inflated prices.

Anti-Competitive Practices - Rate Pools

Before the creation of the ICC, railroad companies would often form traffic associations to charge equivalent rates and evenly distribute business among competing rail lines. These pools allowed railroads to charge rates closer to what would have been charged under monopolistic conditions. Railroad companies were also negatively affected by rate pools, as they were vulnerable to cheating by members seeking to get more business.

The anti-competitive activities undertaken by the railroads elicited strong reactions from shippers, government officials, and the general public. Overall dissatisfaction with service and prices led consumers to seek a way to force railroads to operate in a fashion that maximized social welfare, even if it came at the expense of profits. To combat monopolistic behavior and promote fair rates among all shippers, government entities at all levels intervened. State governments, in particular, adopted stringent regulation standards. In Wisconsin, for example, progressive politics culminated in 1905 with the establishment of the Wisconsin Railroad Commission. Together, affected shippers and railroad companies led efforts against more restrictive state regulations – citing the existing rate structure as critical to maintaining the industry's livelihood.¹⁹

The Interstate Commerce Commission (ICC), established in 1887, was the first federal regulatory agency. Railroad companies' unchecked economic power was dealt subsequent blows in 1890 and 1914 with the passage of the Sherman and Clayton Anti-Trust Acts – both of which were especially salient to an industry that increasingly operated as a natural monopoly. However, in its first 20 years, the ICC and other federal statutes did little to curb anticompetitive practices by the railroad industry. In the midst of a well-organized and powerful industry, the ICC was little more than a statistical agency throughout the early 1900s.²⁰ It was not until the Hepburn Act of 1906 that the agency was granted substantive enforcement authority.

Competing explanations for the first railroad regulatory policies are as varied as they are numerous. Historians cite a range of interest groups as responsible for regulation including: the Granger movement

¹⁸ L. H. Jenks, "Railroads as an economic force in American development," *The Journal of Economic History* 4(1944): 10.

¹⁹ Stanley Caine, "Why Railroads Supported Regulation: The Case of Wisconsin, 1905-1910," *The Business History Review* 44(1970): 177.

²⁰ Albro Martin, "The Troubled Subject of Railroad Regulation in the Gilded Age—A Reappraisal," *The Journal of American History* 61(1974): 339-340.

led by Midwestern farmers in the late 19th century,²¹ eastern producers in New York City,²² and merchants and shippers along the Mississippi River.²³ Edward Purcell offers a useful macro-level analysis of early railroad regulation as he explains that “it was neither, ‘the people,’ nor ‘the farmer,’ nor even ‘the businessmen’ who were responsible for the government regulation of the railroads. Rather it was many diverse economic groups in combination throughout the nation which felt threatened by the new national economy and sought to protect their interest through the federal government.”²⁴ In any case, the early part of the twentieth-century bore a shift in attitudes as the principles of regulation were more widely accepted and railroad companies came to grips with a public sentiment that increasingly valued government intervention.²⁵

Anti Competitive Practices - Rebates

Prior to regulation, anti-competitive behavior like routing traffic over preferred rail lines was sometimes rewarded in the form of a rebate. The anti Standard Oil crusader Ida Tarbell cited one case where a shipper was charged 40 cents to ship a barrel of oil over a particular railroad to Cleveland, and at the end of the month, received 15 cents per barrel back (Tarbell 1904).

The web of local and state regulations increasingly complicated the industry operating environment, and railroad companies looked to the federal government for clarification and support. Historian Gabriel Kolko contends that railroad companies supported federal regulation during the early part of the twentieth-century as a way to escape “cumbersome” and unpredictable state-level restrictions. The industry became “the most important single advocate of federal regulation.”²⁶ This unexpected consensus among reformers and the rail industry should not suggest the rail industry supported regulation.

Indeed, historians note that any industry support of government regulation was “purely opportunistic.”²⁷ The industry saw benefits in using a federal regulatory body to buffer rogue politicians that sought increasingly stringent standards.

The federal government gradually increased its regulatory power over the industry throughout the early twentieth-century. By the New Deal era of the 1930s, a generational preference for government policies of “coordination and control” resulted in an ironclad federal government presence in the industry’s day-to-day operations.²⁸ At the same time, the growth of the trucking and aviation industries significantly contributed to the railroad industry’s declining market power after 1920. The web of economic regulations and bureaucratic procedures required to complete strategic financial mergers in the face of economic crises explains at least partially the financial collapse of Penn Central in 1970 and the Rock Island Railroad in 1975. As policies to restore industry health topped legislative agendas, national opinion regarding the government’s role in the free market gradually shifted. Scholar Thomas McCraw writes that “the attack on regulation had become a staple of the broad re-evaluation of American institutions that began in the 1950s and reached maturity in the 1960s.”²⁹ Following the economic deregulation of the aviation and trucking industries, the political will to finalize industry deregulation had effectively peaked. In 1980, the federal government passed the Staggers Rail Act.

²¹ Solon Buck, The Granger Movement: A Study of Agricultural Organizations and Its Political, Economic, and Social Manifestations 1870-1880 (Lincoln: University of Nebraska Press) 1913.

²² Gerald Nash, “Origins of the Interstate Commerce Act of 1887,” Pennsylvania History 24.3(1957).

²³ Lee Benson, Merchants, Farmers and Railroads: Rail-Regulation and New York Politics, 1850-1887 (Cambridge: Harvard University Press) 1955.

²⁴ Edward Purcell, Jr., “Ideas and Interests: Businessmen and the Interstate Commerce Act,” Journal of American History 54.3(1967): 578.

²⁵ Caine, 179.

²⁶ Gabriel Kolko, Railroads and Regulation 1877-1916 (Princeton: Princeton University Press) 1965: 59.

²⁷ Caine, 188.

²⁸ Maury Klein, “Competition and Regulation: The Railroad Model,” Business History Review 64(1990): 323.

²⁹ T. McCraw, “Regulation in America: A Review Article,” The Business History Review 49(1975): 164.

A CONTEXTUAL OVERVIEW – REGULATING A DEREGULATED INDUSTRY

Economic deregulation following the Staggers Rail Act of 1980 did not completely remove the federal government’s influence and power in shaping the economic health of the railroad industry. From the industry’s formative years to the height of its economic power, the federal government has attempted to find its place in the delicate balance of

business-government relations – fluctuating from prescriptive regulatory policies to control the effects of limited competition to more collaborative negotiated rule-making processes. Today, the federal government maintains a broad regulatory presence in what might be described as policing the industry at arm’s length. The following provides a brief sketch of the federal regulatory environment today and the individual agencies that function to ensure the industry’s economic security and safety.

<u>FEDERAL REGULATORY AGENCIES</u>
FEDERAL RAILROAD ADMINISTRATION (FRA) NATIONAL TRANSPORTATION SAFETY BOARD (NTSB) SURFACE TRANSPORTATION BOARD (STB)

Table 3
An Overview of Select Federal Regulatory Agencies

Agency (Year Est.)	Parent Organization	Purpose	Annual Budget ³⁰
FRA (1966)	U.S. DOT	To promulgate and enforce rail safety regulations; administer railroad assistance programs; conduct research and development in support of improved railroad safety and national rail transportation policy; provide for the rehabilitation of Northeast Corridor rail passenger service; and consolidate government support of rail transportation activities.	\$1.1 billion
NTSB (1967)	Independent	To determine the probable cause of transportation accidents and promote transportation safety by issuing recommendations aimed at preventing future accidents, conducting safety studies, and evaluating other government agencies’ safety programs.	\$79 million
STB (1995)	Independent ³¹	To resolve railroad rate and service disputes and review proposed railroad mergers.	\$26.3 million

³⁰ All figures are based on FY2008 budget figures.

³¹ Although the agency makes decisions independently, it is affiliated with the U.S. Department of Transportation for administrative purposes.

FEDERAL RAILROAD ADMINISTRATION

The Federal Railroad Administration (FRA) was established by the Department of Transportation Act of 1966. The FRA is one of 10 agencies within the U.S. Department of Transportation that regulates aspects of intermodal transportation. The agency's stated purpose is to:

"Promulgate and enforce rail safety regulations; administer railroad assistance programs; conduct research and development in support of improved railroad safety and national rail transportation policy; provide for the rehabilitation of Northeast Corridor rail passenger service; and consolidate government support of rail transportation activities."³²

Of particular relevance to this report is the agency's Office of Safety. The Office of Safety employs approximately 415 federal investigators who specialize in five main safety disciplines: track, signal, and train control, motive power and equipment, operating practices, hazardous materials, and highway-rail grade crossing safety.³³ In much the same way as the FRA regulates the rail industry, modal safety administrations exist for aviation (Federal Aviation Administration), trucking (Federal Motor Carrier Safety Administration), and hazardous materials transport (Pipeline and Hazardous Materials Administration). Relative to the other modal safety administrations, however, the FRA maintains a limited presence in monitoring industry operations – inspecting an estimated 0.2 percent of total operations each year.³⁴ As rising levels of demand challenge the rail industry to maintain its competitiveness, the manner in which the federal government enforces safety regulations has been reassessed.

External assessments of the FRA and particularly of the agency's Railroad Safety Program rate the agency as "moderately effective" in reducing rail related accidents.³⁵ A common criticism found in external evaluations of the FRA and other federal transportation regulatory agencies is that regulatory policies are largely devoid of any guiding strategy.³⁶ In 2006, the U.S. Department of Transportation (U.S. DOT) drafted a "living document" to provide a more focused vision for the freight transportation system entitled the *Framework for National Freight Policy*. The agency was deliberate in noting that the "vast array of inter-connected public and private sector institutions and organizations"³⁷ that comprise the freight transportation industry means a national, as opposed to a federal, freight policy is needed.

The unique capacity challenges facing the rail industry make collaboration and coordination among labor, industry, and government imperative. To this end, the FRA created the Railroad Safety Advisory Committee (RSAC) in 1996 to provide consensus recommendations on a range of regulatory issues.³⁸ RSAC is made up of the major stakeholders in the railroad industry and its members include the Association of American Railroads, the United

RSAC has identified three primary safety recommendations: (1) eliminate as many grade-crossings as possible, (2) reduce nitrogen oxide emissions, and (3) expand implementation of positive train control systems.

³² United States, Federal Railroad Administration, "About the FRA," [Federal Railroad Administration](http://www.fra.dot.gov) 2008, 10 Nov. 2007 <<http://www.fra.dot.gov>>.

³³ United States, Federal Railroad Administration, "Safety," [Federal Railroad Administration](http://www.fra.dot.gov) 2008, 10 Nov. 2007 <<http://www.fra.dot.gov/us/content/3>>.

³⁴ United States, Government Accountability Office, [The Federal Railroad Administration is Better Targeting Safety Risks, but Needs to Assess Results to Determine the Impact of Its Efforts \(GAO-07-841T\)](#) (Washington: GPO) 2007: 3.

³⁵ United States, Office of Management and Budget, [Railroad Safety Program Assessment](#) 2008, 10 Mar. 2008 <<http://www.expectmore.gov>>. Keyword: Railroad Safety Program.

³⁶ United States, Government Accountability Office, [Freight Transportation: National Policy and Strategies Can Help Improve Freight Mobility \(GAO-08-287\)](#) (Washington: GPO) 2008: 4.

³⁷ US Department of Transportation, [Framework for a National Freight Policy](#), 2006. 20 Jan. 2008 <http://ostpxweb.dot.gov/freight_policy_framework.html>.

³⁸ United States, Federal Railroad Administration, "About RSAC," [Safety: Railroad Safety Advisory Committee](#) 2008a, 10 March 2008 <<http://rsac.fra.dot.gov/about.php>>.

Transportation Union, National Railroad Construction and Maintenance Association, the National Transportation Safety Board, and many others.³⁹ RSAC's primary goal is "to develop new regulatory standards, through a collaborative process, with all segments of the rail community working together to fashion mutually satisfactory solutions on safety regulatory issues."⁴⁰ The novelty of RSAC is that it brings to the table many of the industry's principal stakeholders and allows them to collaboratively develop solutions – a practice that instills industry ownership in regulatory policies.

NATIONAL TRANSPORTATION SAFETY BOARD

The National Transportation Safety Board (NTSB) is an independent agency charged with investigating transportation accidents and promoting transportation safety. Originally established as an agency within the U.S. Department of Transportation (U.S. DOT) in 1967, the agency has since been separated from the U.S. DOT in an effort to ensure the independence necessary for proper oversight. The primary responsibilities of the agency relevant to this report are to investigate transportation accidents, conduct safety studies, and evaluate the effectiveness of other government agencies' programs for preventing accidents. In fulfilling its mission, the agency formulates safety recommendations for the appropriate government agency or organization.⁴¹ These recommendations are the "focal point" of NTSB's work in fulfilling its mission of improving the safety of the nation's transportation system. As of 2006, the agency has issued more than 12,500 safety improvement recommendations to more than 2,200 recipients.⁴²

The NTSB Railroad Division is responsible for all rail-related investigations and studies. With a small staff and limited resources, the division does not investigate all rail-related accidents; instead, the division has established accident investigation criteria to determine which accidents bear the most significance for railroad safety. In 2006, NTSB issued 26 recommendations to the railroad industry and "closed" 7 railroad recommendations after the recommendations were either implemented or alternatively addressed.⁴³

The NTSB's *Most Wanted: Railroad Safety Improvements* publication recommends two initiatives for the rail industry: implement positive train control systems and reduce accidents and incidents caused by human fatigue.

While the agency has no direct regulatory authority, it plays a significant role in improving transportation safety. More than 82 percent of its recommendations have been adopted by regulatory agencies and/or industry since its inception.⁴⁴ A key contribution of the agency is its annually updated *Most Wanted: Railroad Safety Improvements* publication that lists top safety recommendations. Each recommendation receives a color-coded ranking according to the timeliness with which the improvement is being addressed. Most recently, the railroad industry has received the "most wanted" recommendation to "implement positive train control systems."⁴⁵ In 2008, progress on this front was color-coded "yellow" – meaning NTSB judges the FRA as "progressing slowly" but having an "acceptable response." In contrast,

³⁹ United States, Federal Railroad Administration, "RSAC Members," Safety: Railroad Safety Advisory Committee 2008b, 10 March 2008 <<http://rsac.fra.dot.gov/organizations/>>.

⁴⁰ United States, Federal Railroad Administration, 2008a.

⁴¹ United States, National Transportation Safety Board, "History and Mission," About NTSB 2008, National Transportation Safety Board, 20 Feb. 2008 <http://www.nts.gov/Abt_NTSB/history.htm>.

⁴² United States, National Transportation Safety Board, NTSB 2007 and 2006 Performance and Accountability Report (SPC-07-03), (Washington: GPO) 2007: 9.

⁴³ United States, National Transportation Safety Board, 2007: 33.

⁴⁴ United States, National Transportation Safety Board, 2007: 9.

⁴⁵ According to the NTSB "Most Wanted" list (2008), implementing positive train control systems will "prevent train collisions and overspeed accidents by requiring automatic control systems to override mistakes by human operators."

the second rail-related recommendation – to reduce accidents and incidents caused by human fatigue – is rated as “green” (i.e., being addressed in a timely manner).⁴⁶

SURFACE TRANSPORTATION BOARD

The Surface Transportation Board (STB) is an independent agency administered by the U.S. DOT. It was established in 1995 to replace the Interstate Commerce Commission. The STB is a federal economic regulatory agency, and its principal function is to resolve railroad rate and service disputes and to approve/disapprove potential railroad mergers. The STB also retains the authority to regulate railroad routes as part of the agency’s oversight of abandonment and trackage rights petitions. The agency is led by a three-member board and is divided into five offices. Of particular importance are the Office of Economics, Environmental Analysis and Administration (OEEAA) and the Office of Compliance and Consumer Assistance (OCCA). OEEAA conducts economic, environmental and engineering analyses that are used to inform STB rulings.⁴⁷ OCCA works to ensure railroad companies comply with STB decisions and regulations.⁴⁸ The office also maintains the Rail Consumer Assistance Program, which serves as an alternate forum for consumer complaints outside the formal filing process.

A principal function of the STB is to mediate rate disputes between shippers and railroad companies. For example, a shipper that believes a railroad company is setting shipping rates in excess of the true cost of transportation may challenge the rate through the STB. The process of filing disputes with the STB is underutilized, however, presumably because the process is expensive and time-consuming.⁴⁹ According to the rate schedule in Section 1002 of Chapter 49 of the Federal Transportation Code, it costs \$10,600 to file a claim that a rate is excessive based on the Stand Alone Cost Methodology.⁵⁰ This cost is in addition to any additional legal or research costs associated with filing the complaint.

The STB also wields regulatory authority in the event of a transportation crisis. If rail traffic conditions have an adverse effect on shippers, are harming the economy of a particular region, or preventing a railroad from transporting goods in a manner that serves the public, an emergency may be declared. As written in Section 1034.1 of Chapter 49 of the Federal Transportation Code, the STB can address the emergency by issuing orders that: (1) direct the handling, routing, and movement of the traffic of a rail carrier and its distribution over its own or other railroad lines; (2) require joint or common use of railroad facilities; (3) prescribe temporary through routes; or (4) give directions for (a) preference or priority in transportation, (b) embargoes, or (c) movement of traffic under permits. STB orders expire after 30 days unless action is taken to extend them.⁵¹ The STB cannot extend an order for more than 270 days after it was initially issued, however. The service “meltdown” after the Union Pacific/Southern Pacific merger in 1997 illustrates the agency’s regulatory power.⁵² The STB issued orders to manage traffic through the Houston area, allowed some shippers to break their contractual agreements with Union Pacific, and ordered Union Pacific to submit progress reports about their efforts to improve service.⁵³

⁴⁶ United States, National Transportation Safety Board, Most Wanted Transportation Safety Improvements, 2008b, 10 Jan. 2008 <http://www.nts.gov/Recs/mostwanted/rail_issues.htm>.

⁴⁷ United States, Surface Transportation Board, “About the STB > Office: OEEA” Surface Transportation Board 9 April 2008 <http://www.stb.dot.gov/stb/about/office_oeaad.html>.

⁴⁸ United States, Surface Transportation Board, 9 April 2008.

⁴⁹ Government Accountability Office, Freight Railroads: Updated Information on Rates and Other Industry Trends (GAO-08-218T), (Washington: GPO) 2007: 13-14.

⁵⁰ “Title 49: Transportation, Section 1002.2 Filing Fees” Electronic Code of Federal Regulations 7 April 2008 (Washington: GPO) <<http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=088674bf3cc1bfdee3c6fd5f9dc86c52&rgn=div8&view=text&node=49:8.1.1.1.4.0.1.2&idno=49>>.

⁵¹ “Title 49: Transportation, Section 1034.1” Electronic Code of Federal Regulations 7 April 2008 (Washington: GPO) <<http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=bfe47e062fd3dd144a740e61e6f6ffdb&rgn=div5&view=text&node=49:8.1.1.1.21&idno=49>>.

⁵² Fred Frailley, “Union Pacific’s Texas Traffic Jam: How a Railroad Turned, Merger into Meltdown,” Trains Magazine Jan 1998: 26-33.

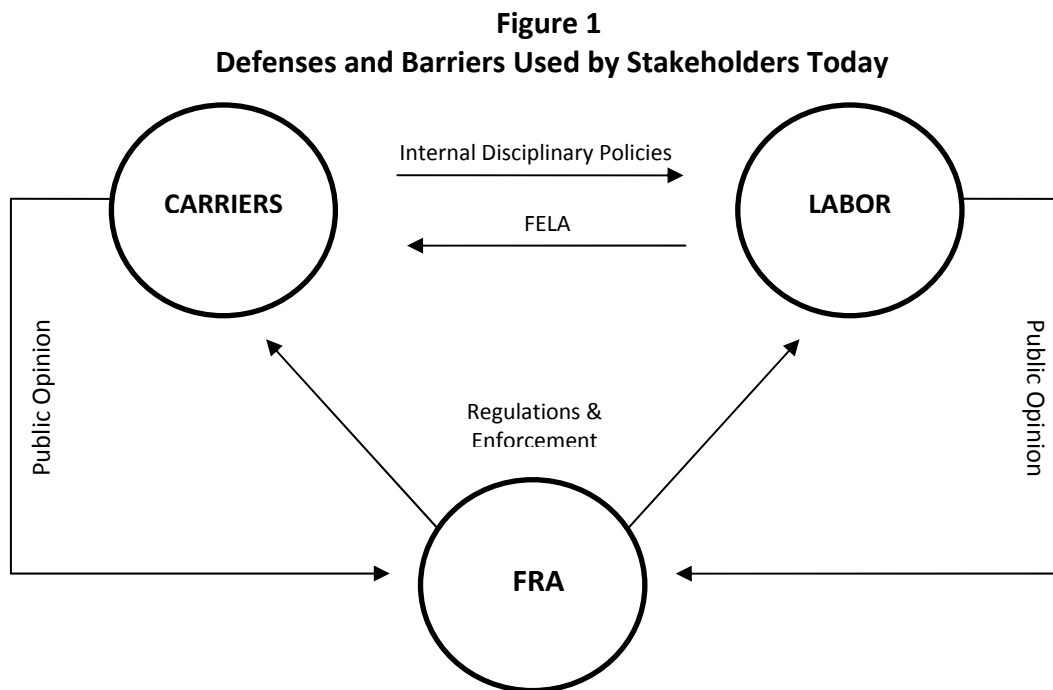
⁵³ United States, Surface Transportation Board, STB Service Order 1518 Joint Petition for Service Order (Washington: GPO) 1998.

CHARACTERIZING THE INDUSTRY TODAY

The concept of workman's compensation originated in the railroad industry, which was particularly dangerous in its earliest years. Injured workers struggled to get compensation, and Congress intervened in 1908 with passage of the Federal Employers' Liability Act (FELA) (GAO/RCED-96-199, 2).

The development of the railroad industry is marked by a long history of adversarial relations. Today, it is widely recognized as having a blame-based culture, in which accidents are followed by a series of defensive maneuvers and punitive actions. Characterization of the contextual factors that shape the relationships among rail carriers, federal regulators, and labor must be prefaced with an acknowledgement that this environment is complicated by politics, technological innovation, the pursuit of economic self-interests, and an uncertain perception of future challenges.

Each stakeholder depends on various defenses to protect against legal liability and fulfill respective roles and responsibilities. The federal government's primary responsibility is to act in the public interest and regulate the industry in a way that promotes the economic and security interests of the nation's freight transportation sector. To this end, the actions of the FRA are at least partially shaped by public opinion. To protect against legal liability following a safety incident, rail carriers depend on internal disciplinary and operating policies and labor depends on the Federal Employers' Liability Act (FELA), which is explained in greater detail below. The following figure, adapted from a presentation by Michael Coplen of the FRA,⁵⁴ illustrates the various defense mechanisms each stakeholder uses to protect against legal liability.



Source: Michael Coplen, FRA (2008)

⁵⁴ Michael Coplen, Personal Interview, FRA Risk Reduction Program: Current Status, Federal Railroad Administration Headquarters, 1200 New Jersey Avenue SE, Washington DC. 8 Jan. 2008.

A workshop convened by the FRA in 2003 to discuss how the industry might collaboratively address safety vulnerabilities documented some of the negative perceptions stakeholders have of one another. A sample of comments illustrates these adversarial relations (see Appendix A). The FRA is viewed with suspicion by industry and labor, who have suggested regulators are short-sighted in their rigid, militaristic approach to regulatory enforcement and compliance. The industry has a similarly unfavorable reputation – perceived as an inefficient bureaucracy intent on increasing shareholder wealth and exploiting competitive advantages at the expense of safety. From labor’s perspective the industry has a reputation for valuing profits over safety, which is a strain on labor relations.

The invariably dangerous nature of the railroad operating environment means that accidents and injuries are likely. Most employees in other industries are covered under no-fault workmen’s compensation, in which all injured employees receive compensation regardless of fault. In contrast, the railroad industry operates under FELA, a fault-based compensation system for on-the-job accidents. FELA is regarded by labor as “one of the strongest protections transportation workers have to ensure workplace safety and to counter carrier efforts to put profits ahead of safety.”⁵⁵ The rail industry does not view FELA with similar favor. The system is often cited as unreasonably litigious and a principal explanation for the blame-based culture in which the industry operates today.⁵⁶

Numerous reforms to FELA have been proposed over the years, including switching to a no-fault system or capping benefits. No recommendations for reform have gathered the political momentum for change, however. A 1996 study by the GAO offered no recommendations for reform due to the uncertainty of how a reformed system would impact the industry.⁵⁷ One reason for this uncertainty is the unpredictable nature of employee injuries. If a large number of employees are injured, for example, railroad carriers could spend more under a no-fault system due to lost wages. Conversely, a no-fault system would eliminate the costly administrative fees associated with investigations and litigation. From labor’s perspective, a no-fault system offers potentially fewer benefits than FELA. Complicating this debate is the fact that any changes to FELA must be pursued through Congress, a partisan endeavor that adds to the already complicated industry environment.

Despite the industry’s contentious reputation and complicated operating environment, collaborative initiatives (e.g., RSAC) indicate that, at a minimum, industry and regulatory agencies have recognized benefit in partnership. The FRA, in particular, has advocated partnership as the best way to identify and address safety-related issues.⁵⁸ This shift toward collaboration has been criticized, however. In 2004, allegations that the FRA was improperly relaxing enforcement of safety regulations prompted an investigation by the Office of Inspector General (OIG). While the allegations were found to be without merit, the investigation

From May 2003 to December 2004, Class I railroads failed to report 21 percent of the most serious collisions at grade crossings in a timely fashion, thereby reducing the chances of a federal investigation. These unreported accidents involved 116 deaths (US DOT-OIG CC-2005-060 2005).

⁵⁵ United Transportation Union, “Supreme Court ruling strengthens FELA,” Jan. 2007. 13 March 2008. <http://www.utu.org/worksite/detail_news.cfm?ArticleID=32727>.

⁵⁶ United States, Government Accountability Office, Federal Employers’ Liability Act: Issues Associated With Changing How Railroad Work-Related Injuries Are Compensated (GAO/RCED-96-199), (Washington: GPO) 1996: 2.

⁵⁷ United States, Government Accountability Office, 1996: 6.

⁵⁸ Programs like the FRA’s Risk Reduction Program reflect this desire to move away from traditional methods of safety improvement through stricter enforcement. The program is “an FRA-led industry-wide initiative to reduce accidents and injuries, and build strong safety cultures, by developing innovative methods, processes, and technologies to identify and correct individual and systemic contributing factors using ‘upstream’ predictive data” (Coplen 2008).

led OIG to recommend the FRA be more systematic in recognizing when a traditional approach (i.e., enforcement through monetary fines and citations) is more appropriate.⁵⁹

With a relatively small number of investigators, the FRA often depends on the industry to report accidents for investigation. In an attempt to be more “proactive” and “aggressive” in targeting safety vulnerabilities, the FRA introduced the *National Rail Safety Action Plan* in 2005 to: (1) target the most frequent, highest risk causes of train accidents, (2) focus FRA oversight and inspection resources more precisely, and (3) accelerate research efforts that have the potential to mitigate the largest risks.⁶⁰ The same year, the FRA implemented the *National Inspection Plan* in an effort to more efficiently deploy investigation and enforcement resources.

The railroad industry has also made recent attempts to improve safety accident investigations. By the end of 2008, more than 90 percent of Union Pacific locomotives will be fitted with Track Image Recorders (TIRs).⁶¹ These small cameras are mounted inside locomotives to record images from the train crew’s perspective. While the industry touts the technological upgrade as evidence of its commitment to safety, digitally recording the track, crossings, and signals is also an accountability mechanism, in that the railroad industry can more readily assign blame to drivers and/or labor.

The role of public opinion in influencing industry operations merits special attention. Some of the most significant safety improvement initiatives have come on the heels of major railroad accidents that raised the awareness of the general public and motivated people to action. Mandatory, random drug testing of railroad employees is a direct result of one such incident. In 1987, a collision between an Amtrak passenger train and three Conrail freight locomotives injured 175 people and left 16 people dead. The investigation revealed two of the Conrail employees tested positive for marijuana use. Consequently Congress authorized drug testing for all “safety-sensitive” positions in agencies within the U.S. DOT.⁶²

Class I railroad companies purchase between \$750 million and \$1 billion in excess liability limits to insure themselves against catastrophic toxic spills (Roberts 2008).

More recently, heightened national security threats have led many cities to demand the rail industry reroute hazardous materials (Hazmat). In 2005, Washington DC attempted to ban Hazmat within 2 miles of the Capitol, as the area faces a “disproportionate terrorist risk.”⁶³ Several other cities considered similar mandatory Hazmat bans (e.g., Baltimore, Boston, Buffalo, Cleveland, Chicago, Las Vegas, Memphis, Philadelphia, and Pittsburgh).⁶⁴ CSX, the primary rail carrier operating through Washington DC, promptly appealed the ban and won the right to transport Hazmat through the District. CSX argued that the federal

government, as opposed to states or localities, has the sole authority to regulate interstate commerce and the ban would unreasonably interfere with interstate commerce. The vulnerability of the industry with regard to Hazmat remains a contentious issue that illustrates competing interests and the tension between economic and safety security.

⁵⁹ Kenneth Mead, United States, Office of Inspector General, Memorandum: ACTION: Review of allegations that FRA Deputy Administrator attempted to relax safety enforcement against Union Pacific (Washington: GPO) 2004.

⁶⁰ United States, Federal Railroad Administration, National Rail Safety Action Plan Progress Report 2005-2007 (Washington: GPO, 2007).

⁶¹ Union Pacific, “Nearly 90 Percent of Union Pacific’s Road Locomotives to Have Cameras by End of 2008,” 28 Jan 2008, Union Pacific. 10 March 2008 <http://www.uprr.com/newsinfo/releases/safety/2008/0128_tir.shtml>.

⁶² Michael Dresser, “Responders, Residents Recall Deadly Maryland Train Crash,” The Baltimore Sun (Maryland), January 5, 2007.

⁶³ Washington Post, “D.C. 1, Toxic Waste 1,” Washington Post, 21 April 2005, Natl. ed.

⁶⁴ Association of American Railroads, “Mandatory Hazmat Rerouting,” Rail Hazmat/Rerouting: Hazmat Transportation Overview 2007, 20 March 2008 <http://www.aar.org/rail_safety/HazmatRerouting.pdf>.

The risk associated with Hazmat transport has not gone unnoticed by railroad companies, who have responded by calling for safer alternatives to toxic chemicals. With “common carrier obligations” that require railroad companies to serve customers willing to pay for transportation services, railroad companies have increasingly purchased high-dollar liability insurance to financially secure their interests. From chlorine used to purify drinking water to anhydrous ammonia used for agricultural fertilizer, hazardous materials are a necessary component of everyday life. The risk of Hazmat spills is one that affects all stakeholders. Indeed, this issue is representative of the types of challenges the freight rail industry faces in the 21st century.

Rising demand, tightening capacity, and diminishing gains in productivity and safety all characterize the industry today. The preceding chapter described the industry’s economic contributions, historical developments, and unique operating environment. In deregulation, the industry has essentially undergone a renaissance. With legislation to re-regulate the industry proposed as recently as 2007, (H.R. 2125 titled the “Railroad Competition and Service Improvement Act”), understanding the impact of deregulation is imperative. The following chapter more precisely outlines how the industry has changed since deregulation in 1980.

Chemical companies are a key customer for the rail industry, which transports an estimated 1.7 million carloads of Hazmat annually (AAR 2007).

CHAPTER 2

DEREGULATION & THE RAILROAD INDUSTRY TODAY

OVERVIEW: STAGGERS RAIL ACT OF 1980

On October 14, 1980, President Jimmy Carter deregulated the railroad industry when he signed the Staggers Rail Act of 1980 (hereafter referred to as Staggers). In President Carter's words, deregulation was "crucial to promote more competition, to improve productivity, and to hold down inflation." President Carter added that "for the first time, railroads and shippers can contract for terms of service, as is the case in other industries."⁶⁵ At the time of President Carter's statement, the rail industry was suffering from bankruptcy, meager profits, and deteriorating infrastructure conditions. Government regulatory standards, which had changed relatively little since original development in the late 1800s, had become considerably outdated and failed to account for the competitive challenges posed by alternate forms of transportation like trucking.⁶⁶ In essence, railroads had become a slowly dying industry, failing to generate revenues to cover the cost of capital. This chapter provides an overview of Staggers and the resulting capacity, financial, and performance changes.

Prior to deregulation, the industry was in need of flexibility with respect to rate setting to remain competitive with other modes of transportation. The FRA explains that "as a consequence [of this inflexibility], nine carriers were bankrupt, the industry had low return on investment, [was] unable to raise capital, and faced a steady decline in market share."⁶⁷ In fact, the FRA found that in the 30 years preceding deregulation, the market share of the rail industry had decreased by approximately 33 percent.⁶⁸ Railroad carriers' return on investment was dismal, making capital repairs and improvements difficult for the industry to pursue. The negligence manifested in a poorly maintained infrastructure and numerous rail accidents. By the late 1970s, "more than 47,000 rail miles had to be operated at reduced speeds because of dangerous track conditions... [and] the rail industry's return on investment averaged just less than 2 percent."⁶⁹ Since deregulation, the accident rate has declined 68 percent.⁷⁰

The Staggers Rail Act of 1980 reduced the federal government's economic regulatory power in freight rail operations and instead allowed the market to drive industry practices.

There is general consensus that deregulating the rail industry facilitated service quality improvement, declining shipping costs leading to improved profit margins, and falling rail costs and employment.⁷¹ Table 4, replicated from research by MacDonald and Cavalluzzo (1996),⁷² highlights some key operational improvements since deregulation.

⁶⁵ John T. Woolley and Gerhard Peters, "Staggers Rail Act of 1980: Remarks on Signing S. 1946 Into Law." 14 Oct 1980, [The American Presidency Project](http://www.presidency.ucsb.edu/ws/index.php?pid=45283), 2 Apr 2008 <<http://www.presidency.ucsb.edu/ws/index.php?pid=45283>>.

⁶⁶ Association of American Railroads, "The Impact of the Staggers Act of 1980." Feb 2008. Association of American Railroads, 31 Mar 2008, <<http://www.aar.org/>>: 1.

⁶⁷ United States, Federal Railroad Association, ""Impact of the Staggers Rail Act of 1980", N.D. " [Freight Railroading; Freight Rail Issue Briefs](http://www.fra.dot.gov/downloads/policy/staggers_rail_act_impact.pdf), Federal Railroad Association, 31 Mar 2008 <http://www.fra.dot.gov/downloads/policy/staggers_rail_act_impact.pdf>: 1.

⁶⁸ United States, Federal Railroad Association, ""Impact of the Staggers Rail Act of 1980", N.D.: 1.

⁶⁹ Association of American Railroads, Feb 2008: 1.

⁷⁰ United States, Federal Railroad Association, "Impact of the Staggers Rail Act of 1980", N.D.: 1.

⁷¹ James MacDonald and Linda Cavalluzzo, and "Railroad Deregulation: Pricing Reforms, Shipper Responses, and the Effect on Labor." [Industrial and Labor Relations Review](#) 50(1996): 81.

⁷² MacDonald and Cavalluzzo, 85.

Table 4
The Railroad Industry Before and After Staggers

Characteristic	1970	1975	1980	1985	1990
Miles of Road	206,265	191,520	164,822	145,764	119,758
Employment	566,282	487,789	458,332	302,199	216,424
Ton-miles per Employee (millions)	1.4	1.6	2.1	2.9	4.8
Ton-miles per Mile of Road (millions)	3.7	3.9	5.6	6	8.6
Real Revenue per Ton-mile (cents 1982 dollars)	3.38	3.46	3.31	2.76	2.01
Real Labor Expense per Ton-mile	1.79	1.67	1.44	1.09	0.63
Trailer On Flat Car/Container On Flat Car Loadings (millions)	2,363	2,238	3,059	4,590	6,207
Average Length of Haul (miles)	515	540	616	665	726
Mean Freight Car Cycle (days)	24.1	27.4	28.1	26.6	20.7

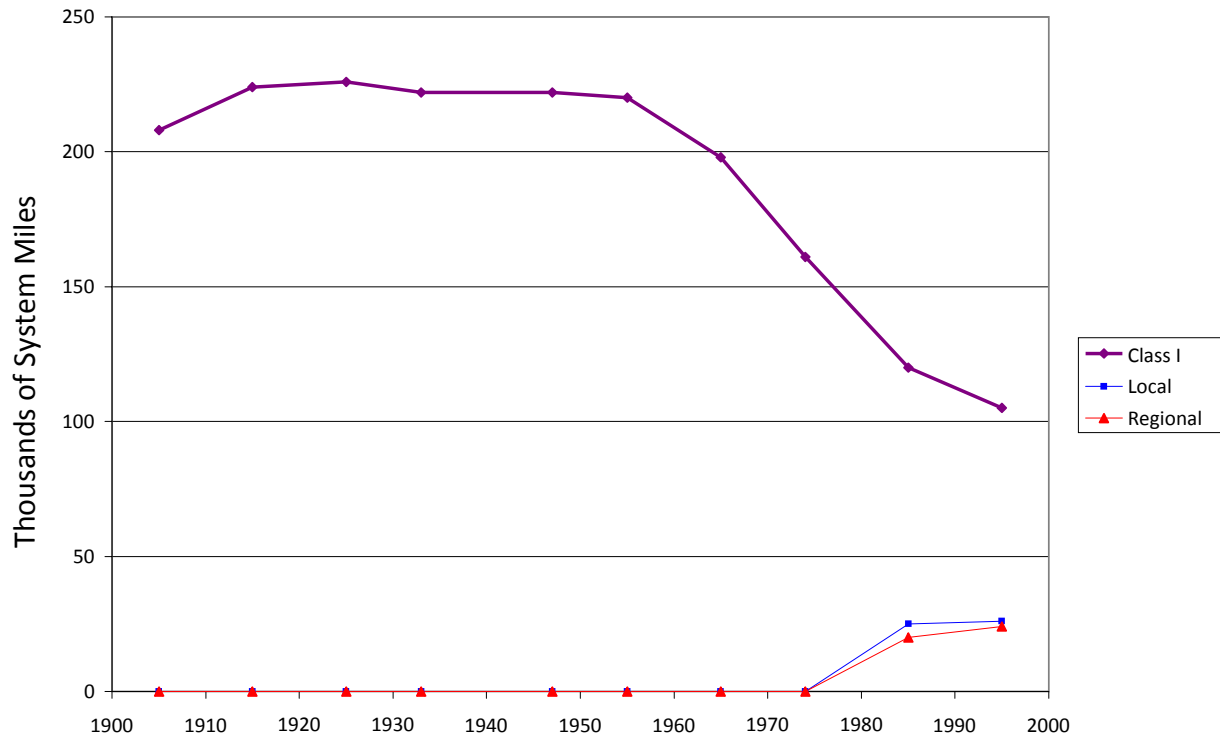
Source: MacDonald and Cavalluzzo (1996)

EFFECTS OF DEREGULATION: A LOOK OVER TIME

CAPITAL

The transformation of the rail industry since Staggers has been widely viewed as positive, as the transition to a market-based approach has allowed railroad carriers more flexibility in operating decisions.⁷³ As it pertains to the number of track miles, the rail industry has since shed much of the capacity it was required to maintain under regulation. Prior to 1980, railroad carriers were prohibited from abandoning low-density routes regardless of profitability.⁷⁴ In 1976, most major corridors across the country had excess capacity. For example, the five routes in the Houston-Dallas-Ft. Worth corridor had a capacity of 157 million gross ton-miles (MGT) but only carried 81 MGT annually. Staggers led to a dramatic decline in railroad capacity as the rules governing line abandonment were loosened. Figure 2 from the American Association of State Highway and Transportation Officials (AASHTO) illustrates the total track miles in the United States since 1900⁷⁵.

Figure 2
Miles of Railroad Track in the United States



Source: AASHTO (2003)

⁷³ Association of American Railroads, Feb 2008: 3.

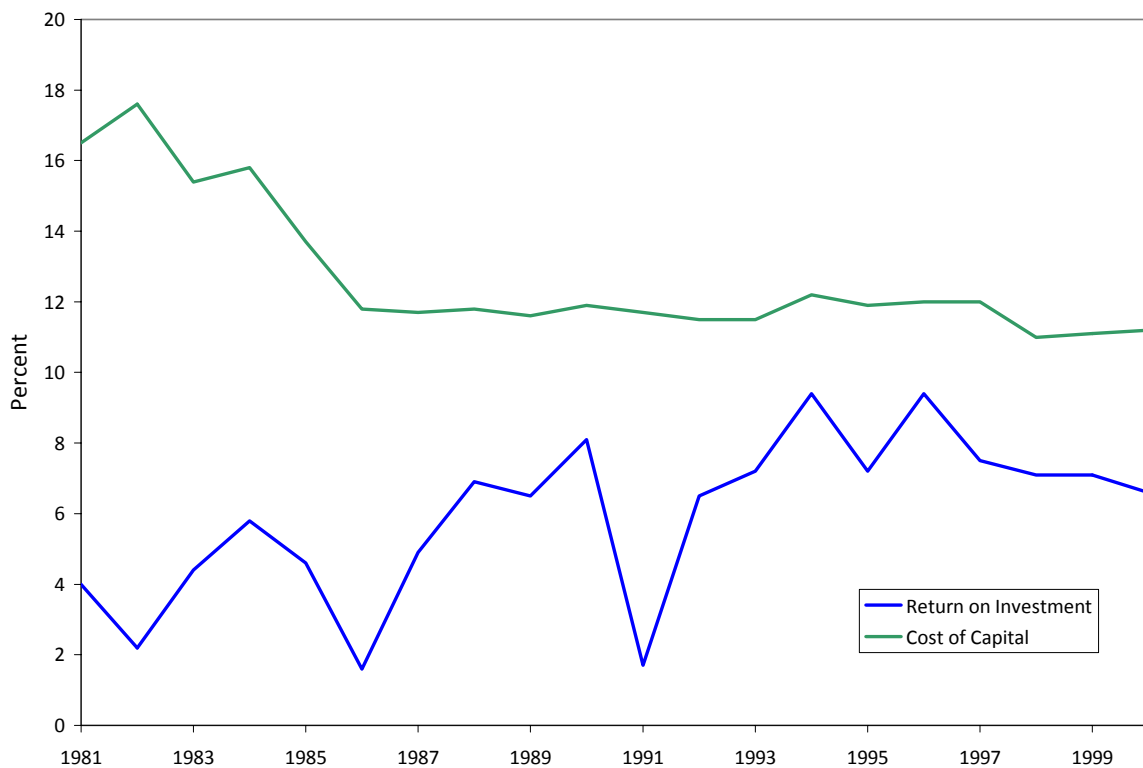
⁷⁴ United States. Department of Transportation, Preliminary Standards, Classification, and Designation of Lines of Class 1 Railroads in the United States. (Washington: DOT) 1976: A2-12.

⁷⁵ American Association of State Highway and Transportation Officials, 36.

INFRASTRUCTURE INVESTMENT POST-STAGGERS

Railroad carriers' decision to shed what was initially thought to be excess capacity has hampered their ability to carry additional traffic. The high cost of capital has effectively made replacing abandoned infrastructure difficult. As a result, railroad carriers have financed only the most essential projects. Unlike other manufacturing industries in the United States that spend an average 3.67 percent on capital, the railroad industry spends an average 18 percent of its revenues on capital expenses.⁷⁶ The rail industry's increased profitability since Staggers has enabled railroad carriers to better meet infrastructure investment needs. However, with little fiscal support from the public sector relative to the trucking industry, railroad carriers have struggled to meet the cost of capital. The FRA notes that "between 1980 and 2002, the railroads have expended \$364 billion in capital improvements and maintenance of track and equipment."⁷⁷ According to the Association of American Railroads (AAR), Class I railroads spent nearly 40 cents per revenue dollar, or \$400 billion, on capital expenditures and maintenance from 1980 to 2006. Despite the significant proportion of revenues railroad carriers spend on infrastructure, they are nonetheless criticized for underinvestment. According to the Transportation Research Board (TRB), the underinvestment is presumably due to "the perceived rate of return on research and development expenditures and the financial ability to risk scarce investment dollars on uncertain outcomes."⁷⁸

Figure 3
Investing in the Rail Industry



Source: AASHTO (2003)

⁷⁶ American Association of State Highway and Transportation Officials, Transportation-Invest in America: Freight Rail Bottom Line Report (Washington: 2003): 35.

⁷⁷ United States, Federal Railroad Association, "Impact of the Staggers Rail Act of 1980" N.D.: 1.

⁷⁸ United States, Transportation Research Board, 17.

Staggers freed railroads from most of the price constraints they operated under since the 1920s. In effect, railroad carriers have benefited to varying degrees. The average return on investment was just 2 percent in the 1970s but has since risen from 4.4 percent in the 1980s, to 7 percent in the 1990s, to 7.4 percent from 2000 to 2006.⁷⁹ Despite this, the rail industry’s cost of capital continues to outpace its return on investment. The graph in Figure 3 illustrates the cost of capital and return on investment in the railroad industry post-deregulation.

Table 5
Industry Return on Investment

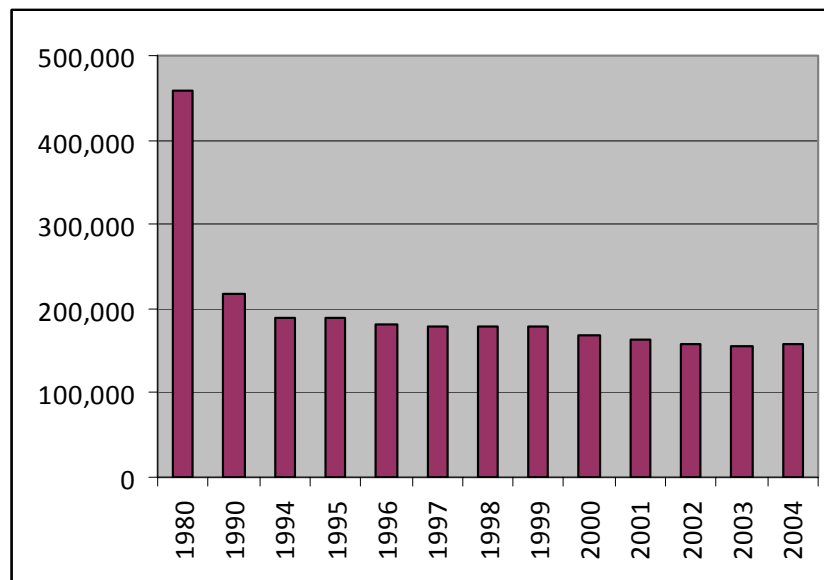
1970s	2.0%
1980s	4.4%
1990s	7.0%
2000+	7.4%

Source: AAR 2008, 3

LABOR

Changes in pricing and abandonment restrictions also influenced the type of service demanded and the corresponding derived demand for labor. Relative labor earnings, for example, rose sharply in the first 5 years following deregulation. Following the initial boom, however, real earnings stagnated and then deteriorated.⁸⁰ In terms of the industry’s labor force, technological change has been a primary driver of the drastic reduction in employment. As Figure 4 shows, more than 300,000 jobs have been eliminated since deregulation in 1980. Today, the industry’s employs an estimated 166,214 people.⁸¹

Figure 4
Total Railroad Industry Employment



Source: AASHTO (2003)

⁷⁹ Association of American Railroads, Feb 2008: 3.

⁸⁰ MacDonald and Cavalluzzo, 81.

⁸¹ United States, Surface Transportation Board, “Employment Data,” *Class I Railroad Annual Report 2008a*, 10 Mar. 2008 <<http://www.stb.dot.gov>>. Path: Industry Data; Economic Data; Financial & Statistical Reports; Class I Railroad Annual Report.

PRODUCTIVITY

As Table 6 indicates, productivity has increased significantly since Staggers. Calculating the extent productivity has improved since industry deregulation and the effects of specific innovations on productivity, however, have been difficult to precisely evaluate. Wilson contends that rail productivity growth slowed by the late 1980s.⁸² On the other hand, Bitzan and Keeler cite research that indicates “productivity growth accelerated between 1991 and 1995 compared with previous recent years.”⁸³ More recent productivity gains by Class I railroads have at least been on par with gains in the 1980s.⁸⁴

In terms of labor, fuel, and equipment, productivity has improved since 1980. Between 1978 and 2004, labor productivity increased from 1.8 million to 10.5 million revenue ton-miles per employee; fuel productivity increased from 216.4 to 408.5 revenue ton-miles per gallon; productivity per locomotive increased 250 percent, and productivity per freight car increased by 450 percent.⁸⁵ Reducing the industry’s labor force was particularly influential in terms of productivity. Today, railroad carriers move more freight with fewer employees and locomotives, thereby reducing the cost of shipping per ton-mile and increasing productivity. The increase in revenue ton-miles per constant dollar of operating expense offers another perspective on productivity improvement. Based on this criterion, productivity has increased 180 percent from 1980 to 2004.⁸⁶ Figure 5 illustrates the industry’s increasing productivity following deregulation, with more detailed graphs presented in Appendix B.

Table 6
Railroad Productivity

	1978	2004
Labor Productivity (million RTM/employee)	1.8	10.5
Fuel Productivity (RTM/gallon)	216.4	408.5
Equipment Productivity (RTM/locomotive)	1.08	2.54
Equipment Productivity (RTM/freight car)	0.9	4.59

Source: TRB (2007)

⁸² Wesley W. Wilson, “Cost Savings and Productivity in the Railroad Industry,” *Journal of Regulatory Economics* 11 (1997): 37-8.

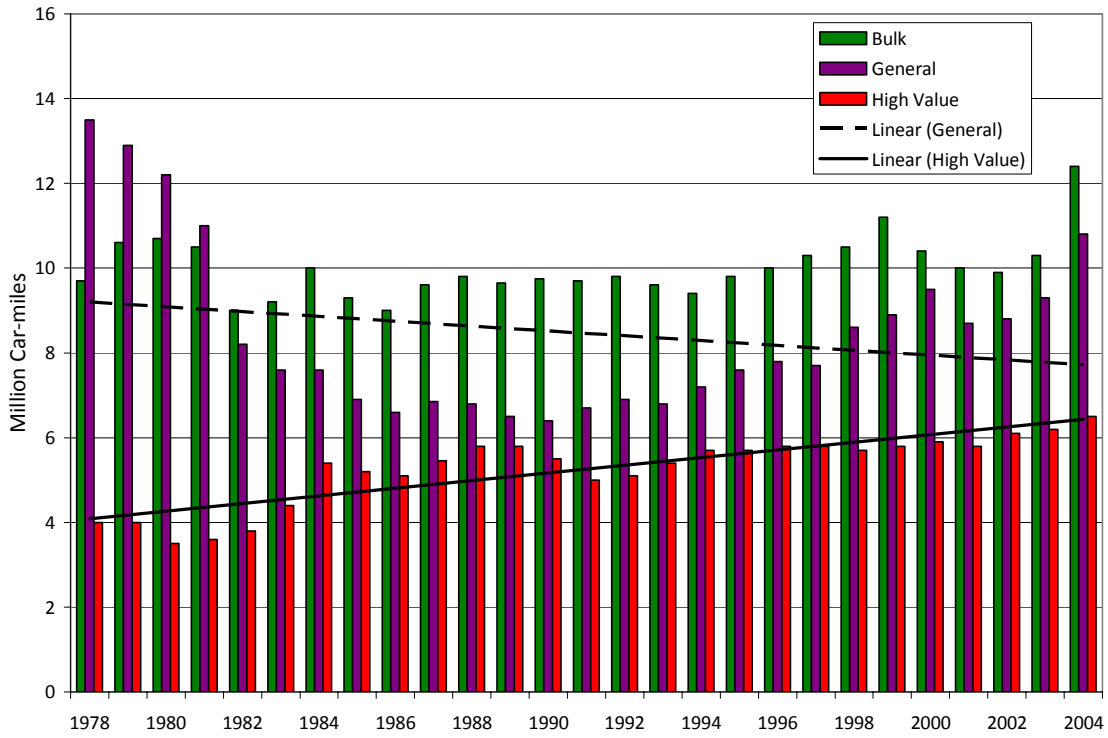
⁸³ John Bitzan and Theodore E. Keeler. “Productivity Growth and Some of Its Determinants in the Deregulated U.S. Railroad Industry.” *Southern Economic Journal*, 70.2 (2003): 235.

⁸⁴ Bitzan and Keeler, 235.

⁸⁵ United States, Transportation Research Board, *Research to Enhance Rail Network Performance* Washington D.C.: TRB, 2007, 65-6.

⁸⁶ United States, Transportation Research Board, 66.

Figure 5
Railroad Productivity Following Deregulation



Source: TRB (2007)

SHIPPING RATES POST-STAGGERS

Prior to Staggers prices were generally uniform regardless of the commodity or distance traveled. Staggers allowed railroad carriers the freedom to set rates at a level that reflects the true cost of transportation. Shippers have reaped benefits from deregulation in the form of lower rates.⁸⁷ As a whole, shippers have seen real rates drop more than 20 percent since deregulation.⁸⁸ By some estimates, shippers saved nearly \$28 billion per year (in 1996 dollars) as a result of changes in rates that took place between 1982 and 1996.⁸⁹ Not all shippers have benefited equally from deregulation, however. For example, shippers with long-hauls or heavy products saw an initial increase in shipping rates, though eventually rates decreased. Short-haul and light commodity shippers initially saw reduced prices but the effect leveled off over time. As a result, long-haul shippers have benefited more than other shippers.⁹⁰

FROM PRICE TAKER TO PRICE MAKER

Railroad carriers today have significantly increased their market power since deregulation and become more profitable. Rising demand and deregulation have granted railroad carriers the flexibility to prioritize service to high profit-margin commodities.⁹¹ Essentially, the days of railroad carriers being a price taker have ended. Railroad carriers exercise their market power through pricing policies that often discriminate against low-margin commodities and captive shippers. For example, railroads not only raise nominal rates to shippers, they also add fuel surcharges. Passing the rising cost of diesel fuel to shippers reduces the industry's exposure to fluctuating fuel costs. All railroad carriers are experiencing record traffic levels across their systems and demand for transportation services has been strong. At the same time, however, shippers are finding their ability to turn to trucks or other alternatives increasingly limited. Equipment utilization and system efficiency has improved with the focus on high-revenue commodities. The trend, however, has negatively impacted shippers with low traffic volumes or low-value commodities that are priced out of the system to free capacity for high-revenue commodities. Captive shippers face rising rates because they have no alternatives to rail freight service.

Captive shippers face rising rates because they have no alternatives to rail freight service.

The Laramie River Station, a coal-burning power plant located near Wyoming's Powder River Basin, offers one example of the difficulties faced by captive shippers. Two decades ago the station negotiated a contract with Burlington Northern to transport coal from the Powder River Basin to the power plant 200 miles away. After the original contract expired in 2004, BNSF executives argued the previous agreement disproportionately benefited the Laramie River Station. Given the increasing traffic along the route, which transports an estimated 8 million tons of coal annually, BNSF doubled rates in the new contract. The station is only served by BNSF and does not have access to another railroad. After negotiations stalled, the plant decided to take the expensive step of protesting BNSF's rates through the STB.⁹²

⁸⁷ United States, Federal Railroad Association, ""Impact of the Staggers Rail Act of 1980." N.D.: 1.

⁸⁸ Winston, 8.

⁸⁹ Scott Dennis, "Changes in Railroad Rates Since the Staggers Act." Transportation Research Part E: Logistics and Transportation Review 37.1 (2001): 55.

⁹⁰ Wesley Wilson, "Market-Specific Effects of Deregulation." Journal of Industrial Economics 1(1994): 19.

⁹¹ Gregory Bereskin, Regulation, Deregulation, and Reregulation in the Surface Transportation Industry. Transportation Research Board Committee on Freight Transport Regulation (2000): 4.

⁹² Duane L. Richards, "Coal Captives," EnergyBiz Magazine Mar./Apr. 2005: 14-15, 25 Mar 2008 <www.energycentral.com>.

INDUSTRY SAFETY PERFORMANCE IMPROVEMENTS POST-STAGGERS

The industry's safety record prior to deregulation was dismal, as train accidents and fatalities reached record highs by the late 1970s. In the years since deregulation, a renewed industry-wide focus on eliminating train accidents has resulted in improved safety performance by nearly all measures, as shown in Table 7. In aggregate, total train accidents and incidents have decreased from 90,653 in 1978 to 12,741 in 2007.^{93,94} From 1980 to 1990, the train accident rate declined by 71 percent, the grade-crossing collision rate declined by 77 percent, and the employee casualty rate declined by 81 percent. In 2007, all three measures continued to decline from 1990 levels by 31 percent, 63 percent, and 72 percent, respectively.⁹⁵ While the positive shift in safety performance is undisputed, accidents and incidents caused by human error, and employee fatigue specifically, remain a significant problem. According to the FRA, 38 percent of all railroad accidents between 2000 and 2005 were caused by human factors.⁹⁶ Like many safety measures, recent years have been marked by marginal improvements in reducing these types of accidents.⁹⁷

Table 7
Railroad Safety Statistics Since Staggers

	1980	1990	2007
Total Accidents/Incidents	55,194	21,305	647
Train Accidents Per Million Train Miles	12.3	5.2	3.3
Train Accident Deaths Per Million Train Miles	23	10	--
Train Accident Injuries Per Million Train Miles	322	184	5
Collisions	983	268	12
Derailments	5,352	1,716	141
Trespasser deaths (not at grade-crossing)	341	362	21
Trespasser injuries (not at grade-crossing)	347	413	12
Total Highway-Rail Incidents	8,725	4,432	176
Highway-Rail Incidents: Deaths	670	534	21
Highway-Rail Incidents: Injuries	3,437	1,943	61
Total Employee On-Duty Deaths	80	31	16
Employee On-Duty Injuries	38,015	13,349	233
Hazardous Material Releases	95	30	6
Cars Carrying Hazardous Materials	3,218	2,525	503
Cars Releasing Hazardous Materials	140	61	12
Hazmat Cars Damaged/Derailed	729	491	69

Source: FRA Office of Safety Analysis, *Ten-Year Accident/Incident Overview* (<http://safetydata.fra.dot.gov>)

⁹³ United States, Federal Railroad Administration, "Accident/Incident Overview: January-December 1978." Office of Safety Analysis. 18 Jan. 2008 <<http://safetydata.fra.dot.gov/officeofsafety>>.

⁹⁴ United States, Federal Railroad Administration, "Accident/Incident Overview: January-December 2007." Office of Safety Analysis. 18 Jan. 2008 <<http://safetydata.fra.dot.gov/officeofsafety>>.

⁹⁵ Association of American Railroads, "Railroads: The Safe Way to Move," *Railroad Industry Info: Background Papers*. March 2008. 22 Nov. 2007 <http://www.aar.org/GetFile.asp?File_ID=161.>: 1.

⁹⁶ United States, Federal Railroad Administration, "Federal Railroad Administration Action Plan for Addressing Critical Railroad Safety Issues". May 2005. Federal Railroad Administration, 30 Mar 2008 <http://www.fra.dot.gov/downloads/safety/action_plan_final_051605.pdf>: 3.

⁹⁷ United States, Federal Railroad Administration, *Railroad Safety Statistics 2005 Annual Report* (Washington: GPO) 2006a: 6.

COMPARING SAFETY PERFORMANCE IN THE TRUCKING AND RAILROAD INDUSTRY

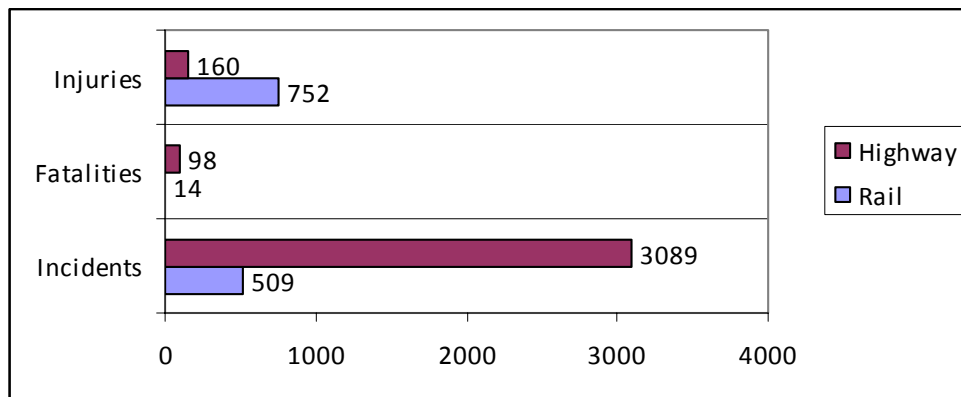
Relative to other modes of transportation, the railroad industry remains relatively safer in terms of both employee fatalities and hazardous materials transportation. As can be seen in the following table, in 2006, the railroad industry had 517 fewer employee on-duty fatalities in comparison to the trucking industry. As it pertains to Hazmat transportation, data from the Hazardous Materials Information System indicates that the railroad industry experiences relatively fewer incidents, fatalities, injuries, and damages due to Hazmat.⁹⁸

Table 8
Comparing the Truck and Rail Industry: Employee Fatalities

	1992	2000	2006
Trucking Industry	699	852	537
Railroad Industry	27	21	19

Source: Bureau of Labor Statistics, *Census of Fatal Occupational Injuries (CFOI)*⁹⁹

Figure 6
Comparing the Truck and Rail Industry from 1997-2006:
Hazardous Materials Transport



Source: PHWA, *Hazardous Materials Information System*, <http://hazmat.dot.gov>

The reduction in derailments, train accidents, human factors-caused accidents, and accidents with a Hazmat release was pronounced immediately after Staggers, but has been considerably less significant since 1990. Even those areas where safety has consistently improved are beginning to see stagnating rates of improvement. In fact, the total number of train accidents gradually increased throughout the 1990s – fluctuating from 2,504 accidents in 1994 to 3,373 accidents in 2004.¹⁰⁰ This statistic paints an

⁹⁸ United States, Department of Transportation, “Hazardous Materials Incidents by Mode and Incident Year,” *Hazardous Material Information System*, 2008. 3 March 2008 <http://hazmat.dot.gov/pubs/inc/data/tenyr_accd.pdf>.

⁹⁹ United States, Bureau of Labor Statistics, “Census of Fatal Occupational Injuries 1992-2002,” (Washington: GPO) 2002; United States, Bureau of Labor Statistics, “Census of Fatal Occupational Injuries 2006,” (Washington: GPO) 2006.

¹⁰⁰ United States, Federal Railroad Administration, 2006a, 6.

incomplete picture of industry safety performance, however. Railroad carriers point to the declining rates in train accidents per million train-miles, which is a function of the significant increase in train-miles traveled since the 1990s. In any case, the cost of the damage from accidents has continued to escalate even as the total number of all rail-related accidents and incidents has decreased.¹⁰¹

This chapter provided a descriptive analysis of the industry since deregulation in 1980. The overall impact of deregulation on industry economic and safety performance has been widely viewed as positive. The industry's ability to shed unprofitable routes and reduce its labor force resulted in improved productivity in terms of labor, fuel, and equipment. Shippers also benefited from deregulation in the form of lower freight rates. While the industry has significantly improved its safety performance since 1980, stagnating rates of improvement merit attention. As the following chapter outlines in greater detail, forecasts for increased demand and current levels of capacity and productivity will affect the industry's ability to sustain and/or improve safety performance and economic vitality.

¹⁰¹ United States, Federal Railroad Administration, 2006a, 6.

CHAPTER 3

TRENDS IN DEMAND, CAPACITY, AND PRODUCTIVITY

This chapter provides an overview and analysis of key trends in the railroad industry. The following outlines various forecasts for freight transportation demand, defines and analyzes current freight rail capacity, and discusses how railroad productivity has evolved since deregulation in 1980.

FREIGHT TRANSPORTATION DEMAND

The demand for freight transportation overall and rail transportation, in particular, is expected to dramatically increase over the next 30 years. According to a 2006 GAO report, “Recent forecasts predict that the demand for freight and freight rail transportation will grow significantly in the future.”¹⁰² The distribution of the increased demand across transportation modes is uncertain; although the trucking industry is expected to absorb a bulk of the increase, the rail industry is also expected to see upwards of a 67 percent increase in rail freight tonnage demand. The railroad industry is already a key part of the American economy, and it will play a major role in meeting the increase in demand for freight transportation.

While railroads carry an impressive 40 percent of the nation’s freight today, the industry’s share of the freight transportation market is expected to grow. Organizations such as the Federal Highway Administration (FHWA) and American Association of State Highway and Transportation Officials (AASHTO) agree that future freight rail demand will increase drastically over the next few decades – a prediction that will invariably impact operating capacity, productivity, and profitability. Demand projections calculated by each of these agencies are included in Table 9.

Table 9
Forecasts for Future Demand

Federal Highway Administration	Import-export freight shipments will increase from 1,657 million tons in 2002 to 3,509 million tons by 2035.
	Domestic freight shipments of all modes and weights will increase from 17,670 million tons in 2002 to 33,668 million tons in 2035.
American Association of State Highway and Transportation Officials	Even with normal economic growth, rail freight tonnage will grow 67 percent by 2020.
	Domestic rail freight demand will increase by 57 percent and import-export tonnage will grow by 99 percent by 2020.

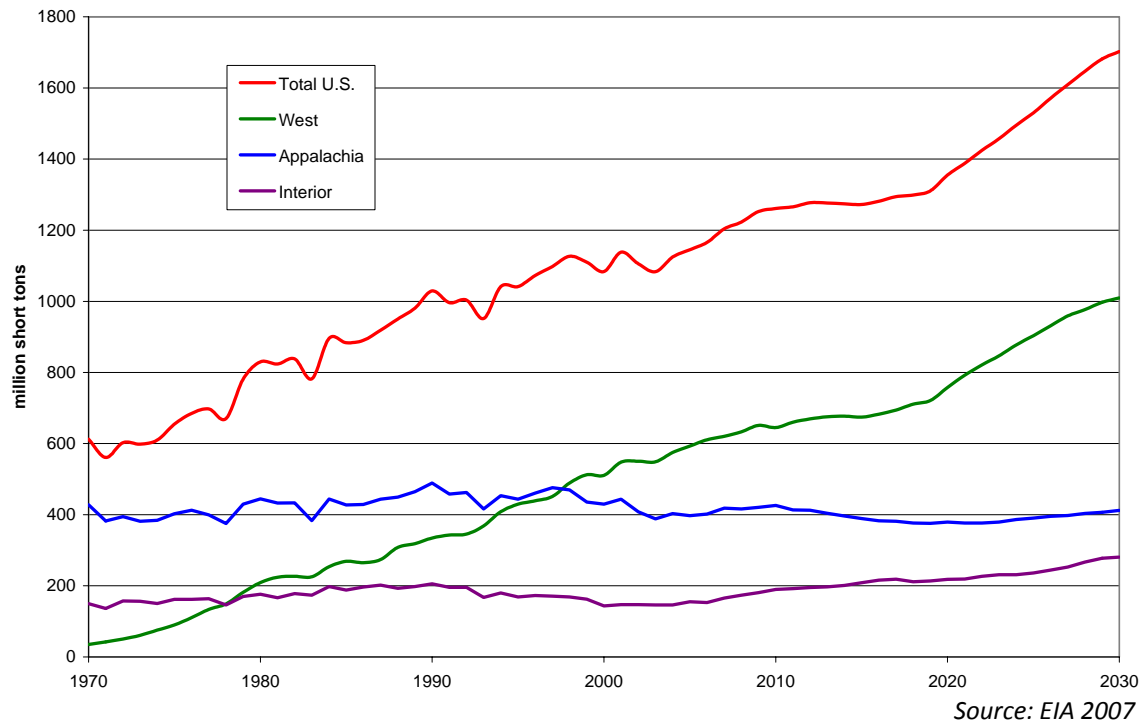
¹⁰² United States, Government Accountability Office, 2006: 53.

FACTORS DRIVING FREIGHT TRANSPORTATION DEMAND

COAL

Coal transportation is a primary driver of increased rail freight demand. According to AASHTO's *Freight Rail Bottom Line Report*, coal currently comprises 41 percent of the total tonnage in the railroad industry and this share is expected to increase.¹⁰³ The Energy Information Agency (EIA), a component of the Department of Energy, predicts the production of western coal will nearly double by 2030. Much of this growth is expected to come from the Powder River Basin.¹⁰⁴ Figure 7, constructed using data from the EIA, illustrates this trend. Given the gross tonnage of coal transported by the industry today, any increase in coal demand will further strain rail capacity without proportional expansion.

Figure 7
Coal Production by Region, Projected to 2030



The EIA predicts much of the demand increase in the eastern United States will be met by coal imported from west of the Mississippi River. The EIA attributes the demand increase to coal-fired power plants in the east, which are projected to increase by 39 percent by 2030.¹⁰⁵ The railroad industry will bear the brunt of this increased demand, with coal traffic increasing on routes to power plants in places like the southeast. This is in addition to growing demand for coal along routes that already have robust coal traffic throughout the west. One implication of this increase in demand is that it will create an opportunity for railroad carriers to selectively choose which traffic to prioritize based on profit margins. Specifically, railroad rates may reflect the growing pricing power of rail carriers. Many power plants are captive shippers, and as their coal consumption grows, they face market pressures to keep transportation costs

¹⁰³ American Association of State Highway and Transportation Officials, 18.

¹⁰⁴ United States, Energy Information Administration, "EIA- Annual Energy Outlook 2007 with projections to 2030 – Coal Forecast" *Energy Information Administration*, February 2007. (Washington: GPO) 12 December 2007.

¹⁰⁵ United States, Energy Information Administration.

down. Groups that are supported by coal consumers like Consumers United for Rail Equity (CURE) favor policies that make it easier for captive shippers to challenge the rates they are charged.¹⁰⁶

INTERMODAL

Intermodal freight transportation, which is defined as the transfer of goods from one transportation mode to another (i.e., ship-to-truck, truck-to-train, etc.) in loaded equipped containers, is predicted to significantly impact the industry in the coming decades. According to AASHTO, intermodal transportation comprises 18 percent of annual revenues for Norfolk Southern, CSX, and Union Pacific Railroads. The FHWA predicts that intermodal freight shipments will more than double – from 1,292 million tons in 2002 to 2,598 million tons in 2035 in order to meet predicted demand.¹⁰⁷ Loaded ocean containers are of particular significance, as this is the primary method of importing consumer goods into the United States from Asia. As can be seen in Table 10, the Port of Long Beach alone handled 5.3 million Twenty Foot Equivalent Units (TEU) in 2006.¹⁰⁸ The following table shows the volume of inbound loaded containers over the last 10 years.

Table 10
Container Trade in Twenty Foot Equivalent Units (TEU)

Year	Loaded Inbound	Loaded Outbound	Total
2007	3,704,593	1,574,241	5,278,834
2006	3,719,680	1,290,843	5,010,523
2005	3,346,054	1,221,419	4,567,473
2004	2,987,980	1,007,913	3,995,893
2003	2,409,577	904,539	3,314,116
2002	2,452,490	855,202	3,307,692
2001	2,420,687	952,845	3,373,532
2000	2,456,188	1,044,353	3,500,541
1999	2,317,050	989,221	3,306,271
1998	2,096,901	973,647	3,070,548

Source: Port of Long Beach, www.polb.com

FREIGHT TRANSPORTATION CAPACITY

Railroad capacity can be conceptualized in different ways and goes beyond simply miles of track. Capacity is generally defined as “the potential or suitability for storing, holding or accommodating” and “the maximum amount or number that can be contained or accommodated.”¹⁰⁹ For the railroad industry, capacity is the volume of freight that can be shipped over the rail network in a given time period. Capacity

¹⁰⁶ Consumers United for Rail Equity, “The Issue- Unfair Federal Policies.” 2008 <http://www.railcure.org/issue_unfair.htm> 9 April 2008.

¹⁰⁷ United States. Federal Highway Administration. Freight Facts and Figures 2006. (Washington: GPO) 2006: 9.

¹⁰⁸ Port of Long Beach, “Port of Long Beach- Yearly TEU’s”. 9 April 2008 <http://www.polb.com/economics/stats/yearly_teus.asp>.

¹⁰⁹ Merriam Webster, “Capacity,” Dictionary and Thesaurus- Merriam-Webster Online, 2007, 26 March 2008, <<http://www.merriam-webster.com/dictionary/capacity>>.

can be measured as the average speed of trains on a railroad, the number of cars that a yard can classify per 24 hours, or ton-miles of freight that a particular route can accommodate. Factors that influence capacity include train control systems (signals), rolling stock, service patterns, and track structure. However, because there are many different ways to measure capacity, it can be difficult to precisely determine optimal levels of operating capacity for rail carriers, shippers, and the general public.

Railroad companies are particularly attuned to the intersection between increasing demand and capacity and the subsequent financial impact. BNSF, for example, uses several measures of capacity in their system planning to calculate the number of conflicting movements on a line, the total running time, and the density of traffic along particular routes.¹¹⁰ These measures are used to determine when and where capital improvements are made. If a railroad lacks sufficient capacity, service can suffer as trains are slowed down at chokepoints and delivery times become unreliable.

From an economic perspective, expanding capacity can be a double-edged sword. Adding capacity will allow a railroad to carry more freight over a given line, enabling it to capture a greater market share in a corridor or add new services that make it more competitive. In the 1990s, the Atchison, Topeka, and Santa Fe Railway (the predecessor to BNSF) attracted new business from industry giants like J.B. Hunt and United Parcel Service (UPS) as a result of its ability to provide quality service and sufficient capacity. Overinvestment in expanding operations can have negative implications, however, as this can force railroads to lower rates in an effort to utilize excess track. Railroad companies seek a capacity “sweet spot,” with sufficient capacity to attract new business, but not enough to require lowering rates. Striking the optimal balance between capacity and demand translates to long-term profitability and sustainable market power.

Case Study: Investing in Railroads

Recent investment by big-money investors like Warren Buffett is evidence of changing attitudes about industry profitability. In March 2008, Buffett’s firm, Berkshire Hathaway, held about 20 percent of BNSF Railway’s stock and he disclosed plans to acquire at least a quarter of the stock. One reason railroad investment has become a sound decision is the high barriers to market entry. Railroads are capital intensive and adding physical capacity is a slow and expensive process. In essence, Class I railroad companies have become increasingly isolated from competition – allowing the few companies to set higher prices for high-demand services (Tracy 2008).

Shippers are affected by changes in rail capacity as it relates to the impact on shipping rates. Moreover, the quality of the service shippers receive is impacted by the capacity of the railroad line that serves them. Shippers served by a railroad company with sufficient capacity are less likely to experience service delivery delays. Shippers also value their connection to the overall rail network. A joint study by Booz Allen Hamilton and Traffic World found that a majority of rail customers perceived a shortage of rail capacity. As an indication of foregone profits due to capacity shortage, 42 percent of respondents said they would use rail transportation more frequently if capacity problems did not exist.¹¹¹

FACTORS IN FREIGHT TRANSPORTATION CAPACITY

There are four key factors that influence capacity both across the railroad network and along particular routes including track, terminals, train control systems, and equipment. Each of the factors is discussed below.

COMPONENTS OF CAPACITY

- TRACK
- TERMINALS
- TRAIN CONTROL SYSTEMS
- EQUIPMENT

¹¹⁰ Gary Agnew, Personal Interview (17 October 2007).

¹¹¹ Booz Allen Hamilton, “Study Reveals Shippers’ Ongoing Concerns about North American Freight Railroad Capacity,” Insights & Ideas, 5 October 2007 <<http://www.boozallen.com/publications/article/38850372>>.

TRACK

The quantity and quality of track used by a railroad is critical in determining the capacity of that route. The number of tracks on a line is closely related to the number of trains the line can carry - a double track line can carry more trains than a single track line, all other things being equal. The actual track structure (rail, ties, and ballast) is also important in understanding the capacity of a particular line. The quality of the track structure affects the weight of the equipment that can be used on a line and the speed that trains can travel. Lines with light rail, for example, can only handle lighter cars at lower speeds. The number of routes in a particular corridor also affects capacity. This especially true in the western part of the United States, where there are few main routes. A service disruption on a major route can strain service on an entire railroad or across an entire region.

TERMINAL FACILITIES

Railroad terminals are frequently operational bottlenecks. Terminals can handle bulk commodities such as grain, containers, or general traffic. Terminals must be able to accept inbound traffic and process outbound loads during each operational period for a railroad to remain fluid. A usual constraint to terminal operations is a shortage of tracks available for inbound loads waiting to be processed. Other factors such as physical proximity to the market served and terminal design can affect a terminal's operational efficiency. Congestion at key terminals can sink the operations of an entire railroad. In 1997, Union Pacific's major service disruptions were attributed to operational changes in Houston.¹¹² Englewood Yard in Houston became flooded with cars, which dramatically reduced UP's freight-carrying capacity and required the STB to remedy the crisis through regulatory action.¹¹³

TRAIN CONTROL SYSTEMS

The capacity of a particular line is also affected by the type of train control equipment used. Railroad dispatchers use train control systems to coordinate and control the movement of trains and rail cars. These systems originated as simple staff systems that used a physical object to grant a train crew the authority to move. Today, these systems have evolved to electronic control systems using wayside signals such as Centralized Traffic Control (CTC). In contrast to automated CTC systems, many lines are controlled with systems like Track Warrant Control (TWC) that depend on crew adherence to operating rules and radio contact with train dispatchers. All other factors held constant, a single track with CTC will be able to handle more trains than a single track line with TWC; however, CTC costs approximately \$140,000 per mile to install and the total cost to replace this equipment on all existing signaled track would exceed \$9 billion.¹¹⁴

EQUIPMENT

Availability of equipment or rolling stock, particularly cars, is another key factor in capacity. The availability of freight cars is a critical element of capacity, which depends on factors such as the type of load, seasonal traffic patterns, and the kinds of service a car is able to handle. In agricultural and chemical industries with seasonal surges, car shortages are possible, which can force customers to halt their operations for lack of raw materials. If a customer faces serious or persistent car supply issues, they may cease using rail service altogether. This problem was indicated in a Booz Allen Hamilton survey.¹¹⁵ Locomotives are also important in determining capacity. Railroads that lack reliable motive power face higher costs as trains remain in terminals or stopped along major routes requiring additional crews.

The Washington Grain Train program offers one example of the benefits of additional capacity through equipment availability. Farmers in eastern Washington were having difficulty in obtaining grain cars for

¹¹² Frailey, 1998, 26-33.

¹¹³ United States, Surface Transportation Board, STB Service Order 1518 Joint Petition for Service Order (STB Service Order 1518-28922 EB), 17 February 1998 (Washington: STB, 1998): 2.

¹¹⁴ Zeta Tech, "The Business Benefits of PTC: Presentation of Results." 2004. Zeta Tech. 24 Mar 2008

<http://www.transportation.northwestern.edu/programs/sandhouse/sources/presentations/resor_PTC_041304.pdf>: 5.

¹¹⁵ Booz Allen Hamilton, 2007.

the short haul to Seattle and Tacoma. Unable to move their grain, shippers faced financial uncertainty and few alternatives. The state stepped in and designed the Grain Train program to ensure that the farmers had cars available for shipments to Washington ports. The state did this by purchasing used covered hopper cars for the service. In addition to the benefits of keeping smaller farmers in business, the Washington DOT slows the wear-and-tear on its highway system as grain loads are shifted from the road to the rails.¹¹⁶

THE NEED FOR MORE CAPACITY

While freight rail capacity is a complex subject, the need for more freight transportation capacity is clear. An AAR-commissioned study by Cambridge Systematics estimated that over the next 28 years, \$148 billion dollars must be invested in additional capacity. Without this investment, an estimated 30 percent of the nation's rail system will be over capacity by 2035.¹¹⁷ The trucking industry faces similar capacity development constraints. AASHTO reports that many state highway departments face long-term funding shortfalls, making continued highway expansion less likely. This means that the rail industry must absorb demand the highway system cannot accommodate. AASHTO noted that if all traffic currently shipped by rail went by truck instead, it would add 92 billion truck vehicle miles of travel (VMT) and cost an additional \$64 billion over the next 20 years.¹¹⁸ If current rail capacity remains constant, 31 billion VMT will be added to the highways at a total cost to society in excess of \$800 billion over the next 20 years. In their report, AASHTO presented an "aggressive scenario" for capacity investment that would allow railroads to increase their share of total tonnage by 1 percent and move 600 million tons of freight off of the highways, costing \$205-225 billion dollars over the next 20 years. The savings to society calculated by AASHTO under this plan could exceed \$1 trillion.¹¹⁹ Faced with rising demand for rail freight transportation and an overall tightening of domestic capacity, railroads have ample incentive to increase capacity.

The Investment Tax Credit

Railroad companies have long argued that capacity expansion projects would increase if the cost of investment was lowered through a tax credit system. In response to tightening capacity and increasing demand, Congress introduced the Freight Rail Infrastructure Capacity Expansion Act of 2007 to provide a 25 percent tax credit for any investment in new track, intermodal facilities, and/or other capacity-expansion projects. Railroads are unique in that they operate on infrastructure they build and maintain. A Cambridge Systematics study determined \$135 million of investment would be necessary in the railroad system to meet anticipated economic growth, but railroads would only be able to contribute \$95 million. Rail executives state the remainder will need to come from other sources, including the proposed infrastructure investment tax credit program.

BARRIERS TO INCREASING CAPACITY

Increasing capacity is not a simple process. It can be costly and slow, which makes it difficult for railroads to adjust quickly to changes in demand for freight transportation. An example of a typical capacity project on many railroads is adding an additional siding on a single track route. According to Norfolk Southern executive James McClellan, such a siding can cost in excess of \$10 million.¹²⁰ Because capacity expansion

¹¹⁶ Washington State Department of Transportation, Washington Grain Train, 2008. 10 Mar. 2008 <<http://www.wsdot.wa.gov>>. Keyword: Washington Grain Train.

¹¹⁷ Cambridge Systematics, National Rail Freight Infrastructure Capacity and Investment Study, Prepared for the AAR. (Washington: Cambridge Systematics, 2007) 5-6.

¹¹⁸ American Association of State Highway and Transportation Officials, 1.

¹¹⁹ American Association of State Highway and Transportation Officials, 3.

¹²⁰ James McClellan, "Railroad Capacity Issues," TRB Rail Workshop- Workshop on Research to Enhance Rail Network Performance, Washington. 6 April 2006.

projects are costly, railroads are highly selective in pursuing capital improvements. Cost is not the only factor railroads consider. For example, there are a limited number of suppliers of rolling stock. As a result, cars and locomotives must be ordered well in advance. Additionally, there are environmental and quality of life factors that must be considered that often slow down the construction of additional infrastructure. Local residents may be opposed to additional traffic on a nearby rail line if it increases levels of noise and vibration, and environmental rules may prohibit construction in the most advantageous locations. In effect, rail carriers spend considerable time planning major improvements to the fixed physical plant.

One response to the capacity crunch has been the use of public funds to finance capacity improvements through public-private partnerships (PPPs). The principal goal of PPPs is to increase capacity in a particular corridor by adding infrastructure. By reducing a railroad company's cost of capital, public sector financing effectively increases the likelihood of capital investments and capacity expansion. The Alameda Corridor in Los Angeles is a well-known PPP that combined several rail lines into one, grade-separated route. Other PPPs are being considered in Virginia and Chicago. Despite the popularity of PPPs, the trend has been hampered by the difficulty of achieving an equitable division of costs and benefits between the public and private sector. The lack of a standardized methodology and perhaps more significantly, the difficulty of putting a price on intangible benefits have been key barriers to pursuing PPPs.

FREIGHT TRANSPORTATION PRODUCTIVITY

Productivity measures are calculated to determine the level of output obtained from various inputs. Labor and capital are the two primary inputs of productivity. Labor-related inputs include crew size and work rules restricting individual duties. Capital-related inputs include more powerful locomotives, end-of-train devices, communication technologies, and train control technology. Outputs include the tons of freight moved and revenues obtained for each train movement. To measure productivity, railroads maintain and monitor statistics such as crew starts, revenue ton-miles, train miles, and number of trip cycles cars make carrying a load. Each measure reflects the utilization of resources and resulting outputs. Beginning in January 1999, North American freight railroads began voluntarily reporting performance data to the AAR. The data, which is updated on a weekly basis, covers three measures: cars on line, train speed, and terminal dwell time. A list of common productivity measures is included in Table 11.

PROBLEMS WITH MEASURES OF PRODUCTIVITY

Researchers have noted that one difficulty in defining productivity within the rail industry has been diverse methodologies and determinants used to calculate productivity measures. Because the nature of inputs and outputs differs across firms, productivity measures may not be comparable from one rail carrier to another. Oum, Waters, and Yu surveyed the methodologies frequently used to determine productivity in rail efficiency studies and concluded that there are several drawbacks to these current methodologies, including diverse inputs and outputs, unavailability or misinterpretation of data, and lack of standardization in measurement.¹²¹ In addition to the lack of standardization in measuring productivity, the authors suggest that efforts to increase the quality of productivity measurement methodologies must include more data, specifically longitudinal data, as this may reduce the disparity in measurement and allow for the explanation of these observable differences.¹²² The three common measures used by AAR represent an effort to provide some standardized data. The railroads use a common methodology when submitting their data, which allows for rough comparison.¹²³ However, perfect comparisons remain difficult because there are multiple factors that comprise productivity.

¹²¹ Tae Oum, W.G. Waters II, and Chunyan Yu, "A Survey of Productivity and Efficiency Measurement in Rail Transport." *Journal of Transport Economics and Policy* 33(1999): 34-35.

¹²² Oum, Waters, and Yu, 34-35.

¹²³ Association of American Railroads, 2005.

**Table 11
Productivity Measures**

<i>Crew Starts</i>	Number of crews called to work in a given period. It can be compared to ton-miles or train miles to measure the average crew output.
<i>Cars on Line</i>	Average daily on-line inventory of freight cars. Excessive cars can slow operations.
<i>Average Train Speed</i>	Time needed for line-haul movement between terminals. This is calculated by dividing train-miles by total hours operated (excluding yard and local trains, passenger trains, maintenance of way trains, and terminal time).
<i>Terminal Dwell</i>	Average time a car resides in a terminal as measured in hours. According to AAR, the measurement “begins with a customer release, received interchange, or train arrival event and ends with a customer placement (actual or constructive), delivered or offered in interchange, or train departure event.” Long terminal dwell means cars are not getting to their destinations quickly. ¹²⁴
<i>Revenue Ton-Miles</i>	Number of miles a ton of revenue freight travels. This measure can be used along with route mileage data to determine the average length of haul and/or the type of commodity hauled.
<i>Car Utilization</i>	Number of trips a loaded car makes over a given time period. Cars that are idle or being transported empty negatively impacts efficiency.

CHANGES IN CAPITAL INPUTS

COMMUNICATION AND TRAIN CONTROL SYSTEMS

The adoption of radio-based dispatching systems like TWC in unsignaled or “dark” territory has been a key capital improvement in the last 30 years. In the past, operations in unsignaled territory were controlled according to timetables and train queues – a process heavily dependent on labor. Advanced technologies have allowed train dispatching to become centralized, as communication with trains can now be done

¹²⁴ Association of American Railroads, “General Definitions for Measurements,” Railroad Performance Measurements, 2005, 20 February 2008 < <http://www.railroadpm.org/Definitions.aspx>>.

remotely from hundreds or even thousands of miles away. This allowed railroads to close almost all of their stations and eliminate the jobs of the station agents. More recent developments in train control systems like Positive Train Control (PTC) and Electronic Train Management Systems (ETMS) have made it possible to leverage existing capacity. These technological advances have allowed “route maximization, line balancing, and renewed pricing competitiveness on bulk deliveries” and have all led to significant gains in productivity.¹²⁵ These systems can increase crew productivity by allowing for better scheduling of train movements, thereby reducing the trains’ idle time. Equipment utilization and fuel consumption has also improved with the more efficient scheduling offered by PTC or ETMS systems.

MORE EFFICIENT ROLLING STOCK

Railroad rolling stock continues to become more efficient and drive improvements in productivity. Double-stacked railroad cars have, in particular, improved the efficiency of shipping containers. The use of aluminum in coal car construction and the introduction of higher-capacity cars of all types have facilitated increased utilization, higher revenue ton-miles, and increased fuel efficiency. The efficiency and power of locomotives have also improved since 1980, when the EMD SD40-2 locomotive was popular. It used a 16-cylinder engine to generate 3,000 horsepower and was a refinement of a 1966 design. New locomotives from General Electric use 12 cylinders to generate 4,400 horsepower. The new locomotive also comes with emissions control equipment and alternating current traction motors, which allows locomotives to haul heavier loads.

Case Study: Texas Emissions Reduction Plan

The State of Texas operates a program called the Texas Emissions Reduction Plan (TERP) that gives financial incentives for companies willing to replace older diesel engines with more environmentally-friendly engines.

Union Pacific has taken advantage of the program to purchase 98 modern “Gen-Set” locomotives for service in Texas. These locomotives use several smaller engine generator sets rather than one large engine and generator and produce fewer emissions than older engines.

CHANGES IN LABOR INPUTS

REDUCED CREW SIZE

Perhaps one of the more significant developments in increasing productivity has been the elimination of train cabooses. Since deregulation and into the 1990s, eliminating train cabooses has significantly and positively affected productivity.^{126,127} The practice also reduced the number of crew members required to operate the train – a concept railroad industry shareholders have traditionally favored. In translating the savings from operating without cabooses and related crew members, Bitzan and Keeler argue that relative to the industry in 1983, the cost savings for Class I railroads in 1997 was somewhere in the range of \$40 million to \$1.4 billion.¹²⁸ To further illustrate the impact of eliminating cabooses and related crew members, BSNF Railway may serve as a case study, as it failed to reduce costs at the rate of other Class I

The End of the Line for the Caboose

Cabooses brought up the end of freight trains across the country and served as additional crew space for years. However new technology, such as hotbox detectors and End of Train devices removed the need for cabooses and coupled with reductions in the crew per train, railroads began to remove cabooses from their trains. The last state to require a caboose on the end of every freight train was Virginia which repealed the relevant law in 1988.

¹²⁵ Steven McIntyre and Todd J. Stein, “Railroads: Following Buffett’s Latest Move,” *The Texas Hedge Report*, September 2007: 6.

¹²⁶ Bitzan and Keeler, 232.

¹²⁷ Carl D Martland, “Productivity and prices in the U.S. rail industry: Experience from 1965 to 1995 and prospects for the future,” *Journal of the Transportation Research Forum* 38(1999): 12-25.

¹²⁸ Bitzan and Keeler, 245.

railroad companies. According to Bitzan and Keeler, one reason is that 4.24 percent of BNSF trains continued to operate with cabooses, a relatively high number compared to other railroads. For BNSF operations in Montana, specifically, the company was restricted by the state's "full-crew" laws, which "forced the operation of cabooses on many freight trains later than in any other state."¹²⁹ This point is indicative of the unintended consequences of command-and-control legislation. While written for the protection of labor, the legislation effectively prevented BNSF from fully adapting to new operating conditions and realizing associated cost savings.

BARRIERS TO MORE PRODUCTIVITY IMPROVEMENTS

Although productivity has been consistently increasing since deregulation in 1980, further increases in productivity may prove challenging. Specifically, reducing crew size is a contentious issue among labor and management. Railroad carriers prefer reducing crew sizes to one. Many operational jobs are done by a single crew member and a remote-control locomotive. However, regulatory agencies are hesitant to support operating trains with a single crewmember, as the complexity and inherent risk of railroad operations is thought to be better served by multiple-member crews. Railroad efforts to reduce employees in other areas also face stiff opposition from labor unions upset with potential job losses.

There are also challenges to incorporating new technologies to improve productivity. Systems like PTC, for example, are cost prohibitive to install and maintain, especially in a capital-constrained industry. Advanced train control systems also present interoperability concerns because technological improvements must occur concurrently among Class I railroads. Incompatible versions of advanced train control systems on different railroads could make the equipment of one railroad far less useful when on the tracks of another. Unless the rail industry makes major changes to interchange practices, the adoption of more than incremental new technology on rolling stock will continue to be a slow process.

¹²⁹ Bitzan and Keeler, 247.

CHAPTER 4

CURRENT RAILROAD SAFETY INITIATIVES

Throughout this post-Staggers investigation of the railroad industry, several key safety initiatives have proven their viability in improving safety along America's railways. The following four programs – Positive Train Control, Confidential Close Call Reporting System, Crew Resource Management, and the Federal Railroad Administration's Highway-Rail Grade Crossings Program – have all been implemented with varying degrees of success. This chapter provides an overview of these initiatives and recommendations for future safety performance improvements.

POSITIVE TRAIN CONTROL

Positive Train Control (PTC) is defined by the FRA as "technology that is capable of preventing train-to-train collisions, overspeed derailments, and casualties or injuries to roadway workers."¹³⁰ It is being implemented by the railroads for both safety and productivity improvements. PTC is on the National Transportation Safety Board's list of *Most Wanted Transportation Safety Improvements* and has been since the inception of the list in 1990. The NTSB believes PTC will help compensate for human errors and prevent train collisions, thereby saving the railroads money and time lost.¹³¹ For instance, the FRA, the AAR, and rail labor all agree that between 1988 and 1993 PTC could have prevented 116 accidents and saved \$70 million in property damage.¹³² In another example, in 2005 two Canadian National (CN) freight trains collided head-on in Anding, Mississippi, killing all four crewmembers on board and spilling diesel fuel that burned for 15 hours. In total, the collision caused \$9.5 million in property damage and \$616,800 in clearing and environmental cleanup costs. The NTSB believes that a PTC system would have prevented that collision.¹³³

**Between 1988 and 1993,
use of PTC could have
prevented 116 accidents
and saved \$70 million in
property damage.**

The railroad industry and regulators also argue that the increased costs of PTC can be offset by increases in productivity. With these safety features installed, railroad carriers believe that many trains can go to one-person crews, saving them labor costs. Estimates vary as to the amount of these savings, which are disputed by labor unions.¹³⁴ However, PTC is expensive to implement and the cost-benefit analysis requires further discussion. The fact that many firms are pursuing PTC pilot programs means that many different implications of it can be explored.

Other train-mounted electronic control systems similar to PTC have been actively pursued by the railroad industry since 1983 when Burlington Northern developed its Advanced Railroad Electronic System. At the same time, both the AAR and the Railway Association of Canada (RAC) pursued Advanced Train Control Systems. Both systems provided an electronic platform to execute business and safety applications; however, in 1993 both groups stopped supporting these systems.

¹³⁰ United States, Federal Railroad Administration. "Positive Train Control Overview." Federal Railroad Administration. 2007a. U.S. Department of Transportation. 24 Mar 2008 < <http://www.fra.dot.gov/us/content/1264>>.

¹³¹ United States, National Transportation Safety Board. 2008b.

¹³² United States, Federal Railroad Administration, Office of Safety, Railroad Communications and Train Control: Report to Congress. GPO, (1994): 56.

¹³³ United States, National Transportation Safety Board, Collision of Two CN Freight Trains, 10 July 2005 (Washington: GPO 2005).

¹³⁴ Railway Age Staff, "One-person crews? No, say UTU, BLET," Railway Age. February 2006: 9.

In 1994 the FRA sent a report to Congress entitled *Railroad Communications and Train Control* that first used the term “positive train control.” The report examined both signal control and communication-based PTC systems. The cost of investment ranged from \$843 million to \$1.5 billion for communication-based systems and up to \$2 billion for signal-based systems with annual operating costs estimated to be approximately \$200 million. However, the calculated safety benefits totaled just over \$100 million. Therefore, the report concluded that PTC could not be justified on a safety basis alone.¹³⁵ No analysis was made of possible business benefits such as fuel savings, better utilization of track and equipment, reduced wear, or better scheduling and service. One argument for not doing the analysis was that benefits would not be seen equally by each railroad. Calculating average benefits across the industry is not useful for each company’s decision of whether or not to invest.¹³⁶ The report concluded by encouraging railroads to continue to look at the business case for PTC and consider implementing it on their rail lines.¹³⁷ In 1997 the Railroad Safety Advisory Committee (RSAC) decided to look into PTC further and established a working group to address the technology.¹³⁸ This committee again agreed that the high costs of PTC could not be justified on a safety basis alone but disagreed on non-safety benefits of PTC such as increased productivity and capacity.¹³⁹

Today, nine different railroads, including four Class I railroads, are implementing eleven different PTC projects. Railroads currently testing systems include BNSF Railway, Amtrak, and the Alaska Railroad.

In 2004 the FRA issued a report investigating the non-safety benefits of PTC. For this report, the FRA contracted with Zeta-Tech Associates, Inc., which performs technical and economic analysis of the railroad industry, to examine the business benefits. The results of the Zeta-Tech study found many non-safety benefits of PTC. However, many assumptions went into that study with which some stakeholders do not agree. For instance, the AAR disagrees that PTC will provide greater rail traffic velocity and reliability.¹⁴⁰ Despite these objections, the FRA felt

comfortable enough with PTC that in 2005 it issued a rule titled “Performance Standards for Processor-Based Signal and Train Control Systems” which supported the introduction of new technology to accomplish PTC functions. With this rule clarifying the specifics of PTC, railroad companies are presently implementing pilot projects to determine if PTC is cost-effective. Currently nine different railroads, including four Class I companies, are implementing eleven different PTC projects.¹⁴¹

The short and long-term costs of PTC are one of the contested aspects of the program. In their study Zeta Tech examined two different implementations of a PTC system. PTC A is a much simpler system, involving an overlay of the new technology onto existing systems, while PTC B is a stand-alone “vital system,” which allows for the safe failure of electronic components in the system.¹⁴² The term “vital system” indicates that the electronic components will control the system, but if they fail mechanical systems will remain and can control the train so that safety is not compromised. In addition, the specifics of the systems analyzed by the RSAC and Zeta Tech are not the same, further complicating cost estimates. The estimated costs of these various PTC systems are listed in Table 12.¹⁴³

¹³⁵ United States, Federal Railroad Administration, 1994, 64-65.

¹³⁶ United States, Federal Railroad Administration, 1994, 61.

¹³⁷ United States, Federal Railroad Administration, 1994, 66.

¹³⁸ United States, National Transportation Safety Board. 2008b.

¹³⁹ United States, Federal Railroad Administration, Benefits and Costs of Positive Train Control: Report in Response to Request of Appropriations Committees, (Washington: GPO) 2004: 2.

¹⁴⁰ United States, Federal Railroad Administration, 2004, 25-26.

¹⁴¹ United States, Federal Railroad Administration. 2007a.

¹⁴² Zeta Tech, 13-4.

¹⁴³ FRA (2004): 22-23.

Table 12
PTC Cost Estimates

	RSAC Calculations (in millions) 1999 dollars		Zeta-Tech Calculations (in millions) 2003 dollars			
			PTC A		PTC B	
	Low	High	Low	High	Low	High
System development and central office cost	85	235	100	500	100	500
Initial acquisition costs	600	4000	1200	2200	2000	3700

Supporters of the PTC program include the NTSB and the FRA. The railroad industry, however, has been hesitant to fully support PTC, believing that economic benefits do not currently justify the costs of system-wide implementation. Additionally, the perceived threat PTC systems pose in the form of reduced crew sizes explains why labor unions are not supportive of full implementation.

PTC could have positive impacts on safety for both the public and for railroad workers. Reducing the number of train collisions and derailments and lowering the chance of Hazmat spills benefits all stakeholders. Also, the Intermodal Transportation and Inventory Cost model predicts that due to increased service reliability and decreased transit time, PTC will divert between 1.937 and 3.723 billion VMT from highway to rail by 2010, creating a safety benefit for the highway system, the environment, and the general public.¹⁴⁴ However, projections suggest that the overall impact of PTC Preventable Accidents (PPA) is small compared to its costs.¹⁴⁵

Zeta-Tech contends that PTC will benefit shippers by allowing shipments to be delivered more rapidly and with greater reliability.

PTC's impacts on expanding railroad capacity are still unclear. According to Zeta-Tech, PTC will increase capacity because of the utilization of "dynamic headways" (moving block separations). With this system the shorter and lighter, mostly passenger, trains can have a smaller headway than larger, heavier trains so more trains can pass through a given area.¹⁴⁶ However, the AAR argues that PTC will actually reduce capacity as a result of the conservative braking algorithms used in the system, slowing trains down. Also, while it agrees that reduced headway could have some benefits, it argues they would only be seen in multi-track territory.¹⁴⁷

There is also debate on the impact of PTC on productivity. One complication is that many of the benefits will not be realized without full implementation. For example, long-haul shippers are currently seeing only the total travel time, not improved speed on one corridor. Since long-haul shippers see relatively little benefit, it is difficult for them to support railroads investing in PTC instead of lowering shipping costs.¹⁴⁸ A benefit of PTC is that dispatchers will know precisely where all trains are located on the rail network at any given time. This will allow for better pacing of trains so there will be less acceleration and deceleration and thus lower fuel consumption. However, some railroads argue that these same benefits can be obtained without PTC at a lower cost.¹⁴⁹ There is also debate about the productivity gains to

¹⁴⁴ United States, Federal Railroad Administration, 2004, 20-21.

¹⁴⁵ United States, Federal Railroad Administration, 2004, 19.

¹⁴⁶ United States, Federal Railroad Administration, 2004, 15.

¹⁴⁷ United States, Federal Railroad Administration, 2004, 15-16.

¹⁴⁸ United States, Federal Railroad Administration, 2004, 8.

¹⁴⁹ United States, Federal Railroad Administration, 2004, 12.

shippers. Zeta-Tech argues that PTC will benefit shippers by allowing shipments to be delivered more rapidly and with greater reliability.¹⁵⁰ Both the AAR and the Brotherhood of Locomotive Engineers and Trainmen (BLE-T) disagree with this assumption and argue that there will not be a benefit to shippers.¹⁵¹

It is realistic for this program to continue on the current incremental pace. It will be expensive to implement PTC across the entire rail network, and substantial benefits will need to be demonstrated before it becomes realistic to install the technology on all rail lines. This incremental pace also allows for innovation within the industry. Currently railroads are looking at PTC and other technologies that might yield the same benefits at a lower cost. As better technologies are discovered, they are implemented on more locomotives so that interoperability can be achieved. This method also allows each rail company to find technologies that will work best with its own equipment and operating systems.

Most likely, PTC will be implemented on high traffic lines where the benefits of shorter headways will have the greatest impact. The biggest concern is prioritizing the lines on which PTC will be beneficial. The program will be sustainable as long as the benefits of installing it on a particular section of track outweigh the costs. For this reason, it is unlikely that PTC will be installed on every mile of track in the United States, as areas with low traffic volumes will not see high benefits from the program. Areas that will most likely implement PTC

are high traffic corridors, especially lines with both passenger and freight rail. Eventually, program success will be measured in fewer train collisions and derailments, decreased fuel costs, and more freight shipped by the railroads. With careful implementation PTC can improve the productivity and economic viability of the rail industry as well as make the general public and train crews safer.

Due to its high cost, it is unlikely PTC will be installed on every route in the United States. Areas with low traffic volume, in particular, will not generate sufficient returns on investment necessary for PTC.

RECOMMENDATIONS FOR PTC

To expand the usefulness of PTC in the future, we recommend:

- *The Class I railroads continue to pursue PTC projects and work toward full implementation on busy corridors, especially those with both freight and passenger rail.* Implementing PTC is expensive and it is unlikely the benefits of installing PTC on all tracks will outweigh those costs. However, on tracks with both freight and passenger rail, the potential of a collision and the costs associated with collisions are high. Accidents involving passenger rail, especially those with oil or hazardous materials spills, also garner a lot of bad publicity for railroads. In addition to directly affecting profits this lessens both shippers' and the public's trust in the industry. This could lead to the loss of freight volume as shippers go to other freight modes.
- *The FRA continue to pursue PTC but should stop short of mandating a specific PTC technology that the Class I railroads should use.* With all of the pilot projects going on, the technology is quickly changing and it is unclear which technologies will prevail. The industry should not be locked into a particular technology, allowing innovation if something better is discovered.
- *An index to grade lines of track on the potential benefits of PTC should be created by the FRA.* For example, those lines of track with both high-speed passenger trains and freight trains would receive a high rating while those with only a low volume of freight traffic would receive a low rating. On tracks with a high index, the FRA should encourage collaboration between railroad companies so that they can share the costs as well as the benefits.

¹⁵⁰ United States, Federal Railroad Administration, 2004, 17.

¹⁵¹ United States, Federal Railroad Administration, 2004, 27 & 34.

CONFIDENTIAL CLOSE CALL REPORTING SYSTEM

The Confidential Close Call Reporting System (C³RS) is a safety improvement initiative designed to identify systematic risks in railroad operations by collecting information from employees when a “near miss” incident occurs. Specifically, an employee files a report via phone or mail with a third-party agency that subsequently removes all identifying information and provides a redacted report to the appropriate rail carrier. As defined by the FRA, a close call is “an opportunity to improve safety practices in a situation or incident that has a potential for more serious consequences.”¹⁵² In this way, rail carriers can analyze close call data to identify and remedy safety vulnerabilities. C³RS reflects a desire to change the blame-based culture that distinguishes the manner in which data is currently collected and evaluated by the FRA with regard to railroad safety operations. While safety is the primary goal of the program, secondary goals include improving trust, communication, and collaboration among all stakeholders. Collectively, stakeholders generally agree that analyzing data from close calls and sharing those “lessons learned” will contribute to the industry’s goal of eliminating safety risks.

The development of C³RS reflects a desire to change the blame-based culture that distinguishes the manner in which data is currently collected.

Since deregulation in 1980, the industry’s safety record has significantly improved. From 1980 to today, train accidents have declined 64 percent and employee injuries have declined 79 percent. These statistics are a positive indication of progress in meeting safety goals. Over the last decade, however, the FRA notes a declining number of reportable accidents, making it increasingly difficult “to detect emerging trends related to unsafe events and conditions.”¹⁵³ The fact that safety trends have generally reached a plateau since the mid-1990s indicates the need for more aggressive strategies to target vulnerabilities. Against the backdrop of increasing freight rail demand that will no doubt put a strain on employees and an aging rail infrastructure, C³RS represents an opportunity to improve the operating culture of the industry, reduce risk, and generally enhance operations.

Recent operating accidents have refocused the industry’s efforts to better assess risk since the passage of the Staggers Act. In 1996, a passenger rail collision and derailment near Silver Spring, Maryland, killed 11 and injured 26. Estimated damages from the accident exceeded \$7.5 million.¹⁵⁴ The accident, which was partially attributed to sunlight reflection that made the signal difficult to see, followed documentation of several related employee complaints. The preceding year, a survey of two labor organizations [Brotherhood of Locomotive Engineers (BLE) and United Transportation Union (UTU)] solicited a total of 95 complaints from employees describing unusual signal occurrences, several of which related to sunlight.¹⁵⁵ This accident illustrates the dangers of ignoring information that can help identify where vulnerabilities exist. More recently, a Norfolk Southern freight train rear-ended another train in January 2006. The incident resulted in three injuries and an estimated \$5.2 million in damages. NTSB determined the probable cause of the accident to be crew members’ misinterpretations of an operating signal, which was further attributed to inadequate crew training. Many of the train accidents in the last 10 years have cost the industry significant sums of money and eroded the industry’s credibility. In sum, there are both safety and economic reasons to support the program.

¹⁵² Volpe National Transportation Systems Center, Proceedings of the Human Factors Workshop: Improving Railroad Safety Through Understanding Close Calls, April 23-24, 2003, (US Department of Transportation, 2003) <<http://www.fra.dot.gov/downloads/Research/ord0403.pdf>>: 1.

¹⁵³ Volpe National Transportation Systems Center, 1.

¹⁵⁴ United States, National Transportation Safety Board. “Collision and Derailment of Maryland Rail Commuter MARC Train 286 and National Railroad Passenger Corporation AMTRAK Train 29 Near Silver Spring, MD February 16, 1996,” (NTSB Report No. RAR-97-02) (Washington: GPO) 1997.

¹⁵⁵ United States, Federal Railroad Administration, Model Memorandum of Understanding for Participating Stakeholders In C³RS (Confidential Close Call Reporting System) Demonstration Project, March 2005, 22 February 2008 <<http://www.closecallsrail.org>>.

The industry-wide shift in focus toward better data collection and management was supported in legislation when reporting requirements were changed to reflect the FRA's "overall goal of hazard elimination and risk reduction" in 1997.¹⁵⁶ C³RS, a product of this shift toward better risk reduction through data management, is distinct from existing reporting systems in two ways. First, the program is participatory in its development and implementation, which ideally contributes to a sense of ownership, credibility, and program legitimacy. Indeed, mutual benefits exist in a well-designed and widely supported confidential reporting system. Employees have the confidence to report without fear of punishment. The industry saves money in the long-term by averting minor incidents that, when aggregated, cost significant sums of money, and the FRA benefits in allowing the industry to essentially regulate itself. Second, by using a neutral, third-party data collection agency, the program has effectively circumvented some of the legal barriers associated with collecting potentially damaging information from employees. The U.S. Bureau of Transportation Statistics (BTS) serves as the data repository because of its legally stipulated ability to assure confidentiality and protect individually identifiable information.

Through a balance of employee empowerment and industry accountability, the system represents efforts to eliminate accidents and injuries in an industry constrained by complicated legal and regulatory statutes such as the Federal Employers' Liability Act (FELA). Similar systems are implemented in other capital-intensive industries like aviation and nuclear energy. Since the rail industry operates in the shadow of its own rules and disciplinary policies, FELA, and numerous FRA regulations, gathering information from employees about close calls is a delicate process. Accidents that occur in the industry are followed by punitive measures necessitated by the compliance- and enforcement-focus. This is likely the reason data collection is currently driven by a need to discredit one party or another in assessing blame – effectively constraining the ability to determine the root cause of any given incident. Root cause analysis is predicated on the belief that problems are best addressed by understanding the often multiple underlying factors contributing to an incident.¹⁵⁷

Both the Union Pacific Railroad and the Canadian Pacific have agreed to participate in the Close Call pilot program.

As with any major initiative, the costs and benefits of the program must be evaluated. Currently, C³RS is being implemented in pilot projects to assess the feasibility of widespread industry use. The program has three primary cost components: design and implementation, processing, and evaluation. Original estimates for the program's total cost averaged \$500,000 per year; in 2007, however, the total cost for the pilot program reached approximately \$2.5 million.¹⁵⁸

According to FRA officials, the largest share of funding is currently spent on processing incoming calls. On average, a single call takes 6 hours to process from the initial intake to the final evaluation. Officials estimate this processing time will decline as the program matures. While it is still too early to provide concrete evidence as to the monetary benefits of the program, Great Britain's confidential reporting system, CIRAS, offers some indication of the program's benefits. CIRAS has enjoyed widespread support. From 2005 to 2006, the system received 20 percent more calls and issued several industry reports documenting emerging trends in safety vulnerabilities identified through data analysis.¹⁵⁹

The implication of C³RS on the safety record of the industry is perhaps the most explicit. However, the benefits of the program, which was first implemented as a pilot project in February 2007, will not likely be realized in the short term, as building trust in a blame-based culture is invariably an incremental process.

¹⁵⁶ United States, Federal Railroad Administration, Railroad Safety Statistics: 2005 Annual Report (Washington: GPO) 2006a: 3.

¹⁵⁷ To understand the difference between reactive and precursor data, one might consider an accident a chain of events. Currently, data is collected about incidents occurring at the end of the chain – after the accident has occurred. Accidents are preceded, however, by any number of preventable events, and it is this root information on which effective problem solving depends.

¹⁵⁸ Tom Raslear, Personal interview (2008).

¹⁵⁹ Confidential Incident Reporting and Analysis System (CIRAS), Annual Report 2006/7, <<http://www.ciras.org.uk>>.

The program, according to the FRA, is founded on the belief that “central to the success of [improving safety goals] is the ability to understand the nature of rail-related accidents and to analyze trends in railroad safety.”¹⁶⁰ The program is designed to more effectively create a “learning culture” through which the industry will reduce risk, identify systematic problems, and generally improve operations; however, the program rationale extends beyond a simple safety focus. A safer operating environment means that more business can be conducted in less time with fewer resources. Arguably, C³RS will have a positive effect on the capacity and productivity of the industry, albeit indirectly.

A workshop hosted by the FRA in 2003 brought railroad industry stakeholders together to understand the benefits of close call programs and determine how implementing the scheme would require changes in the American railroad industry. All participants agreed that “an organized approach to sharing information about close calls will be useful, and the right thing to do.”¹⁶¹ Participants concluded that in addition to the formidable challenge of changing the current culture in the industry, the need for data confidentiality, more resources, and changes to the current regulatory requirements that complicate the dispute resolution process are all barriers to realizing the full benefits of a close call system.¹⁶² Current federal regulations require the employer to “decertify” the employee for certain rule violations, which is a disincentive for employees to report close calls.¹⁶³ As mentioned by stakeholders in the preliminary development stages of the program, the dispute resolution process must be clarified.

One of the major issues facing this program has been developing a measure to evaluate its success. Since initial implementation of the pilot program in February 2007, C³RS has yielded positive indications of success in several aspects. According to FRA officials, the average 1.5 calls per day can be credited to the buy-in process allowing labor and management to develop a program of its own design. Local operations receiving redacted reports from BTS have begun to identify trends in safety vulnerabilities and have identified previously unknown risks. Moreover, the corrective actions taken by the rail carrier in response to these discoveries are showing a “positive impact.”¹⁶⁴ However, the program has revealed weaknesses too. Confidentiality remains a primary concern, as stakeholders must determine the most appropriate method for sharing “lessons learned” among all parties. In cases where disciplinary action may be required, further clarification is needed in conducting the dispute resolution process. Moreover, FRA officials note that tailoring C³RS for individual railroad operations is a time-consuming process that can be frustrating to participants eager to move forward with the program.

Indeed, the program’s success depends on the industry’s consistent support, employees’ confidence in using the program, and dissemination of useful information discovered throughout the process. The long-term success of the program finally depends on the industry’s proactive response and consistent support. All stakeholders, rail carriers in particular, must be willing to invest time, money, and support. In summary, a system that maintains confidentiality and serves as a reliable data intake point for employees will ultimately enable the industry to identify and remedy safety risks as well as contribute positively to the economic vitality of the freight rail industry.

In the end, C³RS is a promising initiative that could have positive implications for industry safety and productivity. The program has the potential to lead to a safer railroad operating environment for employees, a more innovative and adaptive working culture, and a generally more attractive industry to customers, employees, and investors. In the long term, success depends on the industry’s ability to augment the rule-based environment in a way that allows rail carriers to learn from one another. This program represents another opportunity to move the industry forward collectively and for the mutual benefit of all stakeholders.

¹⁶⁰ United States, Federal Railroad Administration, 2006a, 1.

¹⁶¹ Volpe National Transportation Systems Center, 41.

¹⁶² Volpe National Transportation Systems Center, xi.

¹⁶³ Volpe National Transportation Systems Center, 36.

¹⁶⁴ Tom Raslear. Personal interview (2008).

RECOMMENDATIONS FOR CLOSE CALL

C³RS initial successes in its pilot phase have given many in the public and private sectors reasons to hope that the program will continue to produce safety improvements for years to come. To make this program successful in the future, we recommend:

- *The BTS develop a sustainable, comprehensive database system that aggregates safety data from the multiple data sources maintained by rail carriers, regulatory agencies, and independent organizations, in accordance with the NTSB recommendation issued in 2002.* The primary purpose of the system is to identify information gaps and establish data quality standards. This recommendation is based on the assumption that collecting, processing, analyzing, and disseminating data is fundamental to identifying when, where, and how the railroad industry can maintain and improve its safety record. See Appendix C for previous database-related recommendations and current industry databases.
- *The industry publish “Lessons learned” from the demonstration project on a quarterly basis to document trends in safety vulnerabilities and the manner in which the rail carrier has worked to remedy those risks.* Currently, the United Kingdom’s version of C³RS publishes a bi-monthly newsletter to inform all parties working in the rail industry of the types of reports received as well as how the industry is working to address the reported safety vulnerabilities. Given the similarities between the U.K. and the United States reporting systems, we can assume that the United States freight rail industry would similarly benefit from disseminating these “lessons learned” to all stakeholders.
- *A task force be created that is charged with documenting potential dispute resolution problems.* In addition to legal representatives, the task force should include representatives from labor, management, and FRA. The task force should review relevant documents from the FRA and participating rail carriers to identify potential conflicts arising from simultaneously enforcing existing rules and regulations and implementing C³RS. This task force may be situated within RSAC as a working group.
- *Quantitative analysis should be complemented with qualitative research that explores how perceptions of program effectiveness, perceptions of employee-employer relations, and employee job satisfaction are associated with safety incident trends.* Given the widely documented schism in relations and relatively little communication among labor, management, and regulators, this recommendation is intended to illuminate when and why certain safety improvement initiatives fail/succeed. A systematic qualitative analysis of perceptions of C³RS, in particular, will be helpful in understanding the contextual factors that facilitate/impede programmatic success.

CREW RESOURCE MANAGEMENT

Crew Resource Management (CRM), a human factors training program, began in the airline industry during the 1980s to reduce the occurrence of human error accidents. Although mechanical causes for airline accidents were on a decline, accidents caused by human factors remained constant. After the implementation of CRM in aviation, the industry experienced a significant decrease in such accidents, in part because of the contributions of CRM.¹⁶⁵

In response to a 1998 train accident in Butler, Indiana, found to be caused by “a lack of coordination, communication, and teamwork” among crew members, the NTSB recommended CRM training for the rail

¹⁶⁵ United States, Federal Railroad Administration, "Rail Crew Resource Management (CRM): The Business Case for CRM Training in the Railroad Industry," *Federal Railroad Administration*, 2006c, 24 Mar 2008
<<http://www.fra.dot.gov/downloads/Research/ord0721.pdf>>: 8.

industry because of the similarity of the above-mentioned human factor issues to those experienced in other industries.¹⁶⁶ The NTSB acknowledged the potential of such a CRM program to reduce human factor rail accidents, which currently account for approximately 38 percent of all train accidents.¹⁶⁷

Case Study: Crew Fatigue Turns Deadly

A loud crash woke the residents of Macdona, Texas, early in the morning of Monday, June 28, 2004. A UP freight train had collided with a BNSF Railway train. The collision resulted in a derailment and the release of liquefied chlorine gas when one of the cars was breached.

The UP conductor and two nearby residents were killed as a result of chlorine gas inhalation. The UP engineer, 23 civilians, and 6 emergency responders also had to be treated for respiratory problems from the chemical release. Track and signal equipment destruction as well as vehicle damage totaled \$5.7 million, and environmental cleanup costs of \$150,000.

The accident investigation focused on train crew fatigue and the risks associated with transporting hazardous materials following existing procedures. The NTSB recommended using scientific principles to develop work schedules for crew members to reduce the effects of fatigue and to use the Macdona collision as a case study in future fatigue awareness training (NTSB 2004).

In the FRA's report on CRM in 2006, rail CRM is defined as training that "...typically consists of an on-going training and monitoring process through which personnel are trained to approach their activities from a team perspective rather than from an individual perspective. The team concept allows more efficient use of the available assets to prevent errors or lessen the severity of errors once they occur."¹⁶⁸ The rationale for CRM according to the NTSB is chiefly safety. The hope is to increase not only the safety of the work environment but also the safety of the public, as the training addresses issues such as fatigue and communication that may affect members of the general population who come in contact with the railroad employees. CRM is included in this study of new approaches to improving safety, productivity and capacity of the rail industry because of its emphasis on employees; specifically the train crew members, yard workers, maintenance crews, and dispatchers who stand at the forefront of daily operations. This program stresses training for signals, communication, awareness and management of fatigue, and the importance of performance assessments for crew members.

The Texas Transportation Institute (TTI) has emphasized in their CRM course manual that CRM is not a short-term fix for a long-term problem; it is, however, an all-encompassing approach to improve safety operations of crew members including human factors training, awareness of crew member's behaviors and attitudes, and working together to perform all tasks safely.¹⁶⁹ The main elements of CRM training are technical proficiency, situational awareness, communication, teamwork, and assertiveness.¹⁷⁰ Technical proficiency includes being familiar with procedures and equipment and incorporating skill into performance. This includes an individual assessment as well as an evaluation of other crew members. Situational awareness focuses on the significance of external (equipment and surrounding crew members) and personal (fatigue) factors that affect performance. Communication and assertiveness include an overview of the methods of communication including written information, radio, hand signals, and the significance of asking questions, safely implementing new technology such as cell phones and remote controls,¹⁷¹ and how to properly conduct conversations without losing control of emotions.¹⁷² Teamwork emphasizes the importance of group responsibility, decision-making as a team, and conflict resolution.¹⁷³

¹⁶⁶ United States, Federal Railroad Administration, 2006c, 3.

¹⁶⁷ United States, Federal Railroad Administration, May 2005, 3.

¹⁶⁸ United States, Federal Railroad Administration, 2006c, 3.

¹⁶⁹ Texas Transportation Institute, Rail Crew Resource Management Pilot Course: Participant's Manual," 2005: 6.

¹⁷⁰ Texas Transportation Institute, 10.

¹⁷¹ Texas Transportation Institute, 20.

¹⁷² Texas Transportation Institute, 24.

¹⁷³ Texas Transportation Institute, 23.

Currently, CRM training has begun to be implemented by most Class I railroads. Videos were used by the AAR as a means of CRM training but were later updated by the FRA in their pilot CRM program with BNSF and Kansas City Southern (KCS) to include scenario-based training, and the application of these principles in the railroad environment.¹⁷⁴ At first, evaluation of rail CRM practices proved to be difficult, as it was not feasible to calculate success in numbers of accidents prevented due to CRM training. The industry also experienced several situations in which they had heard that “CRM saves” helped to avoid an accident, but these are anecdotal and currently there are no records kept of these occurrences.¹⁷⁵ To quantify the costs and benefits of CRM training in the rail industry, the FRA reported the methods of a TTI study that chose to utilize a statistical model called “utility analysis” to calculate results. Utility analysis is defined as a “...series of statistical procedures used to evaluate the dollar gains accrued from the implementation or use of personnel interventions and systems over their associated costs.”¹⁷⁶ When this model was applied to the railroad industry, the potential costs avoided were estimated to be an annual net benefit that ranged anywhere from \$4 million to \$33 million for the entire railroad industry, or between \$600,000 and \$6 million for any typical Class I railroad. The analysis took into account factors such as accident-related cost savings, number of persons trained, estimated effectiveness of the CRM training program, per trainee cost of accidents, and per trainee cost of training programs.¹⁷⁷

The FRA indicated in their report on the pilot CRM program that, in general, it was successful in reducing accidents caused by human factors and that CRM practices also reduce fatigue among rail crew members.¹⁷⁸ Although constructed specifically for safety measures, the report states that CRM may also result in “more efficient and less costly operations,” attributed to appropriate use of capacity and satisfactory levels of productivity, and an overall cost reduction because of less frequent staff injuries, hazardous spills, and vehicle collisions.¹⁷⁹

CRM practices have the potential for a large positive impact but they are not currently required by the FRA.¹⁸⁰ Although there are not many opponents of CRM and the benefits of the program (specifically in the realm of safety) have been partially realized, the FRA states it must be used widely and its scope must be broadened to include management’s role in order for the program to be more effective.¹⁸¹ The evaluation of CRM success, however, appears to only be an estimate and difficult to quantify due to problems inherent in measuring accidents prevented by training. It is likely that CRM practices will need to be used by all Class I railroads for a number of years before an evaluation of CRM practices can be conducted.

In order to expand the program, the FRA has recommended that both those in the railroad industry and the FRA be trained as facilitators for CRM training.¹⁸² They argue that the knowledge and credibility of these combined efforts may increase the effectiveness of the program and is necessary if CRM is to be used throughout the entire industry.

It is possible that rail CRM could experience the success seen in other industries such as airline crews, medical staff, offshore oil rig crews, and many other high-risk careers. It is because of the success of these other industries that the rail industry believes in the potential of CRM to provide an increasingly safer environment for railroad employees and the public.

¹⁷⁴ United States, Federal Railroad Administration, 2006c, 4.

¹⁷⁵ United States, Federal Railroad Administration, 2006c, 9.

¹⁷⁶ United States, Federal Railroad Administration, 2006c, 1.

¹⁷⁷ United States, Federal Railroad Administration, 2006c, 2.

¹⁷⁸ United States, Federal Railroad Administration, “Rail Crew Resource Management (CRM): Pilot Rail CRM Training Development and Implementation,” Federal Railroad Administration, 2007b, 24 Mar 2008 <<http://www.fra.dot.gov/downloads/Research/ord0703-1.pdf>>: 37.

¹⁷⁹ United States, Federal Railroad Administration, 2006c, 3.

¹⁸⁰ United States, Federal Railroad Administration, 2007b, 36.

¹⁸¹ United States, Federal Railroad Administration, 2007b, 37.

¹⁸² United States, Federal Railroad Administration, 2007b, 37.

RECOMMENDATIONS FOR CRM

The CRM concept, though not extensively used in the railroad industry, has shown a great deal of success in other industries. In order for the full potential for CRM to manifest itself in the railroad industry we recommend:

- *The core elements of CRM training: technical proficiency, situational awareness, communication, teamwork, and assertiveness should be incorporated into the current curriculum of employee training.*¹⁸³ There are many safety benefits to CRM. However, requiring separate training adds additional costs, creating unnecessary duplication of effort to what railroads are currently doing.

HIGHWAY-RAIL GRADE CROSSINGS PROGRAM

The FHWA Highway-Rail Grade Crossings program, also known as the Section 130 program, has been a successful safety initiative launched by the federal government to decrease fatalities at the nation's more than 181,000 public railroad grade crossings.¹⁸⁴ Over the past 34 years the Section 130 program has become primarily a financing mechanism for state and local governments to improve the safety of their most dangerous highway-rail intersections.

The safety improvements utilized by the state and local governments with the Section 130 funds have included installing cross-buck, yield, and other passive warning signs; pavement markings leading up to and away from active and passive crossings to better inform pedestrians and drivers of oncoming tracks; "installing active warning lights and gate arms; upgrading active warning devices which have included track circuit improvements and interconnections with highway traffic signs; installing lights at or near crossings to better illuminate the area; improvements to paved surfaces leading up to crossings;" and simple landscaping improvements like clearing brush to better increase sight distances.¹⁸⁵

Case Study: Section 130 in the Courts

The Section 130 program intended to improve safety at railroad-highway intersections has been subject to judicial scrutiny. In 2001, Norman Goodman sought legal damages from Union Pacific and the Kansas DOT after his vehicle was struck by a train at a railroad grade crossing. He alleged that Union Pacific was negligent in its responsibility of maintaining the crossing, and that KDOT was negligent because they were required to comply with 23 U.S.C. § 130(d) (2000), which provides Section 130 funding. Based on their obligation under the law, Goodman alleged KDOT should have been held accountable since they failed to install adequate warning devices. He argued that KDOT took on that duty by reviewing the crossing and slating it for improvements. The trial court found that although KDOT had been given the right to survey crossings under Section 130, the regulation did not require it to make improvements (Norman Goodman v. State of Kansas DOT 2005).

The most expensive portion of the program has been the removal of at-grade crossings, either through closure or separation. Grade closures occur when the railroads and state/local departments of transportation (DOTs) determine that it is feasible to close down a railroad crossing completely and thereby reduce the possibility for vehicle/train collisions in that area. Grade separations occur when rail lines are either built above or below existing roads, thereby allowing unimpeded movement of locomotives as well as pedestrian and vehicular traffic. The FHWA and the FRA have seen that despite the adoption of many of the safety improvements listed above, the biggest need has been in the area of public education. As a result, many state and local DOTs have used their Section 130 funds to partner with

¹⁸³ Texas Transportation Institute, 10.

¹⁸⁴ United States, Federal Highway Administration, "Railroad-Highway Grade Crossing Handbook," [Federal Highway Administration](http://safety.fhwa.dot.gov/xings/07010/sec01.htm#b), 2007, 24 Mar 2008 <<http://safety.fhwa.dot.gov/xings/07010/sec01.htm#b>>.

¹⁸⁵ United States, Federal Railroad Administration, [Highway-Rail Crossing Program](http://www.fra.dot.gov/us/content/86), 19 Dec. 2006, 24 Mar 2008 <<http://www.fra.dot.gov/us/content/86>>.

Operation Lifesaver.¹⁸⁶ Operation Lifesaver is a public information group whose main goal is educating the citizenry about the dangers of railroad operations and the need for citizens to respect the power, speed, and lethality of railroad operations.

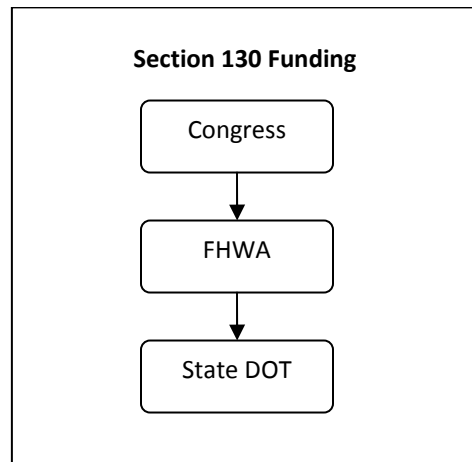
To receive the funding, the FHWA requires that all DOTs compile an index of their state's most dangerous highway-rail grade crossings. According to the FHWA, each state's index must catalogue the number of train/vehicle incidents, the potential safety reductions which could result from using Section 130 funds in numbers and/or severity of crashes, the cost of safety projects and the resources available, an onsite inspection of the public grade crossings, and other criteria as defined by the individual states.

Unlike PTC, C³RS, and CRM, the federal government's grade crossing safety initiatives are not new. Beginning in the 1920s the nation's railroads launched massive grade separation programs aimed at allowing for unimpeded operations, as well as decreasing the number of deaths at or near railroad crossings.¹⁸⁷ Seeing that the railroads could not make many of the safety improvements because of a lack of resources, the federal government began providing aid to improve railroad safety by 1935.¹⁸⁸ However, with the onset of World War II, federal and private funding for railroad safety programs fell to the wayside because of wartime concerns and never resumed after the war's end. Because of the lack of private or federal funds for safety improvements, by the 1960s the numbers of fatalities at or near grade crossings began to increase.

As a result of the increase in fatalities, the public began clamoring for more federal government involvement in improving highway-rail grade safety. In response to the demand for more government action, the Interstate Commerce Commission investigated grade crossing safety and concluded that, "Since the Congress has the authority to promulgate any necessary legislation along this line [highway-rail safety] it is recommended that it give serious study and consideration to enactment of legislation with a view to having the public including the principal users, assume the entire cost of rail-highway grade crossing improvements or allocating the costs equitably between those benefited by the improvements."¹⁸⁹ By 1973, Congress passed the Highway Safety Act, thereby creating the Section 130 program.

The Section 130 program financing mechanism is surprisingly simple when compared to many other federal financing systems. Based on U.S. DOT data, 50 percent of the funds are given to each state based on a ratio of the number of public crossings to the number of public crossings in the entire United States.¹⁹⁰ These funds ensure that each state is given public money in direct proportion to the number of public crossings. The other 50 percent of the funds are given based on a state's land area, population, and number of miles of track.¹⁹¹ These funds ensure that states with a high number of public crossings do not overshadow states with large populations which may have a high number of fatalities solely based on probability of train/pedestrian interactions. This mechanism stood in place unchanged until 1991 with the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA), which mandated that all states would not receive Section 130 funds less than what they received for that year.¹⁹² ISTEA has effectively

Figure 8
Section 130 Funding Flow Chart



¹⁸⁶ United States, Federal Highway Administration, 2007.

¹⁸⁷ United States, Federal Highway Administration, 2007.

¹⁸⁸ United States, Federal Highway Administration, 2007.

¹⁸⁹ United States, Federal Highway Administration, 2007.

¹⁹⁰ United States, Federal Highway Administration, 2007.

¹⁹¹ United States, Federal Highway Administration, 2007.

¹⁹² United States, Federal Highway Administration, 2007.

guaranteed each state a high level of certainty as to the amount of funding it will receive annually, thereby allowing state DOTs to better establish long-term safety improvement programs.

As with any federally financed program, Section 130 funds come with stipulations as to how states can use the funds. Title 23, Section 130, of the United States code stipulates that at least 50 percent of the funds allocated to the states *must* be spent on what the FHWA classifies as “protective devices.”¹⁹³ These protective devices are defined as “the installation of standard signs and pavement markings; the installation or replacement of active warning devices; upgrading active warning devices, including track circuit improvements and interconnections with highway traffic signals; crossing illumination; crossing surface improvements; and general site improvements.”¹⁹⁴ The other 50 percent of the funds can be used for public education campaigns, sight-distance improvements, crossing closures, crossing consolidations, and grade separations.

The Section 130 program has saved more than 9,000 lives and prevented nearly 40,000 injuries and produced a benefit to cost ratio of 17 to 1.

Interestingly, the federal government has committed to pay only 90 percent of the total funds needed for grade separations, by far the most expensive per unit Section 130 project allowed.¹⁹⁵ The other 10 percent of the project’s funds are provided by either state/local DOTs, railroad companies, or a combination of the two. However, “signing; pavement markings; active warning devices; the elimination of hazards; and crossing closures,” much cheaper projects than grade separations, are paid for in full by the federal government.¹⁹⁶

The level of funding for the Section 130 program has proven to be consistent since 1973, despite changing presidential administrations and constantly shifting partisan priorities in Congress. From 1987 to the present, the level of funding for the Section 130 program has been at record highs, with funds ranging from \$144 to \$155 million per year.¹⁹⁷ Since the inception of the Section 130 program, almost \$4 billion has been provided to state DOTs for grade safety improvements.¹⁹⁸

Besides the high level of consistent funding from Congress, the success of the Section 130 program has been due in part to the buy-in of the program by many key stakeholders. The key stakeholders in the Section 130 program have been the U.S. Congress, FHWA, FRA, state DOTs, the railroad companies, and the American people. The U.S. Congress has been and will continue to be one of the biggest stakeholders in this program because it has the power of the purse to finance or cut any federal program it deems appropriate. Since the public clamor and ICC’s declaration for public funding for grade-crossing safety in the 1960s, Congress has been very loyal in funding the Section 130 program. In return, Congress has demanded and received impressive highway-rail grade safety improvements despite the increases in railroad productivity and vehicle miles traveled. According to the FRA, the Section 130 program has saved more than 9,000 lives and prevented nearly 40,000 injuries and produced a benefit to cost ratio of 17 to 1.¹⁹⁹

The FHWA is another major stakeholder in the success of this program. The FHWA has acted as the conduit through which the nearly 4 billion Section 130 dollars have passed to the states, local

¹⁹³ United States, Federal Railroad Administration, 19 Dec. 2006.

¹⁹⁴ United States, Federal Railroad Administration, 19 Dec. 2006.

¹⁹⁵ United States, Federal Railroad Administration, 19 Dec. 2006.

¹⁹⁶ United States, Federal Railroad Administration, 19 Dec. 2006.

¹⁹⁷ United States, Federal Railroad Administration, 19 Dec. 2006.

¹⁹⁸ United States, Federal Railroad Administration, 19 Dec. 2006.

¹⁹⁹ Jolene M. Molitoris, “Statement of Federal Railroad Administrator to Senate Subcommittee on Surface Transportation and Merchant Marine Committee on Commerce, Science, and Transportation” (105th Cong. 2nd Sess. 25 Feb. 1998) 24 Mar 2008 <<http://testimony.ost.dot.gov/test/pasttest/98test/molo1.htm>>.

governments, and railroad companies since 1974. Without the FHWA's buy-in, the program would lack a coherent mechanism to evaluate state safety programs and proposals. The FHWA also acts as the Section 130 watchdog to make sure state and local DOTs are using the funds appropriately. Without its vital role, the Section 130 program would come to a drastic halt.

State and local DOTs are also major stakeholders in the program. Under the Section 130 program, state DOTs act as the lead agencies in identifying unsafe highway-grade crossings to be closed in their states and implementing safety programs designed to reduce the danger at those crossings. It is from these DOTs that the federal funds flow either to the state or local DOTs for implementation. For many state and local DOTs, the actual work of bringing to life the safety programs is done by third-party contractors and not the actual DOT. As a result of the large and consistent federal government payouts from the program, many construction contractors have developed a huge stake in ensuring the long-term viability of the Section 130 program.

The railroad companies are another major stakeholder in this program. Since the Staggers Act of 1980, the railroad companies have been operating in a highly competitive economic environment where only the strongest and most efficient companies can survive. As a result of market forces, the push from company executives and stockholders has been to maximize profits wherever possible. Unfortunately for the American people, maximizing profits oftentimes means cutting programs designed to improve grade-crossing safety (e.g., lighting crossings, grade separations, and grade closures). With the passage of the Highway Safety Act, the railroads were given an advantage in financing major safety grade-crossing improvements. With every grade closure, consolidation, or separation, the likelihood of a train/vehicle collision decreases, thereby ensuring increased productivity for the railroads. The safety improvements also help to reduce the risk of having to pay litigation costs in case a citizen takes the railroad to court.

Finally, the American people have an enormous stake in a successful Section 130 program: their personal safety. Thus far the program has shown impressive results throughout the nation in improving safety. The State of Missouri in particular has made robust highway-rail grade crossing safety improvements for its citizens. Since 1976, the first year Missouri received Section 130 funds, vehicle/train collisions have been reduced by 81 percent, fatalities at crossings have dropped by 76 percent, and injuries have plummeted by 83 percent.²⁰⁰ In return for these and other similar safety improvements across the nation, the American people have provided their support and tax dollars to the program. Without the safety improvements made by Section 130 and without the popular support of this program, the program would cease to exist.

RECOMMENDATIONS FOR HIGHWAY-RAIL GRADE CROSSINGS PROGRAM

Although the Section 130 program has saved thousands of lives since its creation, there are many issues that should be addressed to improve the program. In order to improve the overall safety highway-rail grade crossings through the Section 130 program we recommend:

- *The FRA should examine ways to provide funding for safety improvements at private highway-rail grade crossings. According to the *Railroad-Highway Grade Crossing Handbook*, there are 97,306 private grade crossings in the United States which make up 54 percent of all the highway-rail grade crossings.²⁰¹ Of these, a large percentage is in rural areas where track signage is sparse to nonexistent. These undersigned crossings have been dangerous for too long and should be provided funding in any future Section 130 program. The countryside, however, does not have a monopoly on dangerous private crossings. In industrial centers where carriers routinely drop off bulky and hazardous loads on private properties, many grade-crossing improvements could be made. While federal money cannot simply be given to private individuals, it is in the public's best*

²⁰⁰ Missouri Department of Transportation, *Missouri Highway/Rail Crossing Safety Program*, 2008, 24 Mar 2008 <<http://www.modot.org/othertransportation/rail/programs.htm>>.

²⁰¹ United States, Federal Highway Administration, 2007.

interest to ensure that accidents do not occur at private crossings and disrupt goods movement across the country. Possible funding schemes include matching grants and loans.

- *The FHWA should standardize the closure indices maintained by each state DOT.* Currently, the FHWA gives state DOTs a broad list of criteria needed to qualify for Section 130 funding and leaves the interpretation of those criteria up to the states. As a result, nearly every state has developed their own specific indices and specific criteria for selecting safety improvement sites. With hundreds of millions of dollars of Section 130 money riding on the outcomes of these indices, a more standardized approach needs to be implemented.
- *Congress should provide funding to maintain the safety improvements created by earlier Section 130 spending.* Under the current system, Section 130 will pay for specific safety improvements to highway-rail grade crossings but will not pay for the long-term maintenance and upkeep of those improvements. Instead, the entire cost of replacement and maintenance is left to the railroads and state/local DOTs. This aspect of the program is, in effect, encouraging DOTs and railroads to neglect their grade crossings in the hope that they get flagged as potentially dangerous in the future and eligible for additional Section 130 monies. In order to ensure that past Section 130 funds continue to be properly used and to encourage continued safety at crossings, the program should include language to provide funds for past project maintenance.
- *The FHWA should allow for a higher percentage of funds to be used for sight-distance improvements, crossing closures or consolidations, or complete grade separations.* Under the current system, Section 130 only allows up to 50 percent of a state's funds to be used for said projects and allows up to 100 percent of a state's funds to be used for protective devices, which are by far cheaper per project than closures and separations. Also, the program only covers 90 percent of the cost of grade separations, which are by far the most expensive per project of all the allowable safety improvements under Section 130. Given the immediate and permanent positive benefits on highway-rail grade crossing safety and railroad productivity as a result of grade separations and closures, more money should be allotted to these projects under any future Section 130 programs.

Our investigation of PTC, C³RS, CRM, and the Section 130 program has highlighted the pros and cons of these already/potentially successful railroad safety initiatives. In order for these programs to maximize the amount that they help improve safety conditions on America's rails, we feel that our recommendations should be taken into consideration by the appropriate government and private sector organizations. In addition to these safety recommendations, there are a number of other industry-wide points of guidance this investigating body will make in the following chapter.

CHAPTER 5

LOOKING TO THE FUTURE

“Safety is great for business.”²⁰² This simple contention from FRA Administrator Joseph Boardman speaks to the mutual benefits of ensuring a safe and efficient freight rail industry. Statistical evidence leaves no room to doubt that the railroad industry is safer today than it was in 1980. Human fatigue, crew communications, data reporting, and grade crossing safety are examples of the many safety issues the industry and government regulatory agencies have worked to address. As we argued in the opening pages of this report, capacity, productivity, and safety are interrelated concepts. Improving the capacity of the industry through PTC systems, for example, has obvious advantages in terms of safety, as electronically managing freight car movement reduces the potential for human error. The industry’s commitment to safety will be tested over the next decades as demand increases and gains in productivity, safety, and capacity reach levels of diminishing returns. Given that a finite amount of resources are available to the industry and government, policy decisions must be driven by data, not politics. Implementation of the following recommendations will aid the industry in its continued progress and give support to regulatory agencies in fulfilling its responsibility to the public.

INCREASE FUNDING TO FRA FOR OVERSIGHT AND INSPECTION

The FRA’s limited regulatory presence in the rail industry is a function of both limited resources and the growing emphasis on industry collaboration. With current funding levels and fewer than 500 FRA inspectors, the agency lacks the capacity to effectively and comprehensively fulfill its regulatory responsibilities. In fact, the agency inspects a mere 0.2 percent of the railroad network annually. The belief that railroad carriers reap economic benefits from maintaining a safe operating environment and will thus regulate themselves in part justifies such a limited regulatory presence. Nonetheless, the stagnating safety improvement trends and future demand and capacity challenges call for a refocused regulatory effort. Congress should increase FRA funding to expand its inspector workforce in light of these concerns.

EVALUATE FRA SAFETY PROGRAM PERFORMANCE TO ASSESS IMPACT

In order for the FRA to be more effective, it must develop a systematic and quantifiable method for evaluating its various safety improvement programs. GAO report 07-841 found that while the FRA has been doing a good job of implementing its safety programs to address the nation’s rail safety concerns, it has not done an adequate job of evaluating the performance of these programs. Additionally, Expectmore.gov recently found that while the FRA has made great strides in addressing many rail safety issues, “significant train accidents continue to occur, and the train accident rate has not shown substantive improvement in recent years.”²⁰³ In light of this reality and the financial and manpower constraints faced by the FRA, a program to evaluate the FRA’s safety program performances will allow for the allocation of scarce resources in the most appropriate manner in order to decrease railroad safety threats.

INCREASE AVAILABILITY OF INFRASTRUCTURE CONDITION AND CONGESTION DATA

The ability of the FRA to improve the safety of the freight rail industry is dependent upon the availability of accurate, reliable, and comprehensive data. Currently, rail carriers only selectively

²⁰² Joseph H. Boardman, “Statement of Federal Railroad Administration to House Subcommittee on Railroads, Pipelines, and Hazardous Materials; Committee on Transportation and Infrastructure” (110th Cong. 2nd Sess. 5 Mar. 2008) 24 Mar. 2008 <<http://testimony.ost.dot.gov/test/boardman1.htm>>.

²⁰³ United States, Office of Management and Budget, *Program Assessment: Railroad Safety Program* (2003) 24 Mar 2008 <<http://www.whitehouse.gov/omb/expectmore/summary/10001127.2003.html>>.

share infrastructure condition and congestion data with the FRA - citing security and liability concerns as justification for withholding information.²⁰⁴ To address this concern, we recommend the FRA take advantage of existing data management systems within the Bureau of Transportation Statistics (BTS). BTS is an appropriate intermediary between rail carriers and the FRA because of its capacity to collect and analyze statistical information as well as its legally stipulated ability to ensure confidentiality. To facilitate this process, we recommend Class I rail carriers be required to provide infrastructure condition and congestion data to BTS that directly relate to the safety and security of the freight rail system. This information will be used exclusively and confidentially by the FRA to better target its safety oversight resources. This system for determining and reporting information that directly relates to safety and security should be developed by the FRA.

ENFORCE MANDATORY REPORTING REQUIREMENTS

Railroad carriers are required by law to report certain accidents and injuries to the FRA.²⁰⁵ Failure to comply with these federal reporting requirements hinders the FRA's ability to address safety vulnerabilities. Between 1999 and 2004, 12 railroads failed to report 139 collisions to the FRA within the appropriate time frame, and some grade-crossing collisions were reported nearly 3 years late.²⁰⁶ Although the FRA has the authority to issue violations and assess civil penalties for those railroad carriers failing to comply with reporting standards, an audit issued on May 3, 2007, from the DOT Office of Inspector General found that the FRA failed to consistently penalize railroad carriers for noncompliance. For the 139 instances of noncompliance between 1999 and 2004, the FRA issued 57 violations to 8 of the 12 railroads and chose to not penalize railroad carriers for the remaining 82 noncompliance cases. The risk of incurring financial losses for noncompliance is a fundamental accountability mechanism that must be consistently enforced by the FRA for every reporting violation.²⁰⁷ We recommend the FRA be consistent in issuing civil penalties for each failure to comply with reporting requirements. In accordance with the DOT Office of Inspector General, we also recommend the FRA develop a graduated scale of civil penalties for repeat violators of reporting requirements.

STANDARDIZE PUBLIC-PRIVATE PARTNERSHIP COST-BENEFIT METHODOLOGY

Because railroad companies and government alike are facing fiscal constraints, there has been an industry-wide emphasis on public private partnerships (PPPs) to improve railroad capacity and productivity. PPPs are theoretically designed to maximize utility and minimize costs for both parties. The negotiation process is nonetheless imbued with difficulty, as accurately calculating the costs and benefits to public and private entities lacks a standardized methodology. Without standardization, little is known about the degree to which each entity benefits at the other's expense. With the number of PPPs expected to increase, we recommend the Volpe National Transportation Systems Center develop a standardized cost-benefit methodology for PPPs with funding from the U.S. DOT.

EXTEND INFRASTRUCTURE INVESTMENT TAX CREDIT TO CLASS I RAILROADS

Capital and maintenance expenditures totaled \$400 billion from 1980 to 2006. This illustrates that expansion and maintenance of freight rail line capacity is a costly endeavor. To encourage

²⁰⁴ United States, General Accountability Office, *Railroad Bridges and Tunnels: Federal Role in Providing Safety Oversight and Freight Infrastructure Investment Could be Better Targeted* (GAO-07-770) (Washington: GPO) Aug. 2007.

²⁰⁵ Reportable accidents and incidents are classified as those that exceed \$7,700 in damages. In addition, all grade-crossing collisions must be reported within 30 days of the end of the month during which incident occurred. "Serious" grade-crossing incidents must be reported to the National Response Center within two hours of the incident occurring

United States, Office of Inspector General, *FRA Can Improve Highway-Rail Grade Crossing Safety by Ensuring Compliance with Accident Reporting Requirements and Addressing Sight Obstructions* (MH-2007-044) (Washington: GPO) 3 May 2007: 5.

²⁰⁶ United States, Office of Inspector General, *FRA Can Improve Highway-Rail Grade Crossing Safety by Ensuring Compliance with Accident Reporting Requirements and Addressing Sight Obstructions* (MH-2007-044) (Washington: GPO) 3 May 2007: 5.

²⁰⁷ United States, Office of Inspector General, 3 May 2007, 7.

further investment in rail capacity expansion, we recommend that legislation like the Freight Rail Infrastructure Capacity Expansion Act of 2007 (H.R. 2116) be enacted to extend the infrastructure investment tax credit to Class I railroads. The tax credit program was implemented in short line railroads in 2004, and since, their capital investment has increased providing additional support for the potential benefit of the tax credit incentive in Class I railroads.²⁰⁸ The proposal includes a 25 percent federal investment tax credit for any and all project funds used to expand rail capacity and is open to any taxpayer who wishes to invest in increasing rail capacity and as a result, may increase financing from the private sector.²⁰⁹ Overall, this program is meant to reduce the disparities in capital investment in the highway system, which utilizes public facilities to transport goods, and the railroad network, which operates on a network the industry almost exclusively constructs and maintains.

DEVELOP AND IMPLEMENT NATIONAL FREIGHT TRANSPORTATION STRATEGY

The development of a National Freight Transportation Strategy will provide methods to improve mobility and clearly outline stakeholder roles. The U.S. DOT has in recent years reacted to specific bottlenecks in the system, but currently a national strategy does not exist to provide guidelines of how to address the future needs of moving more domestic and international freight.²¹⁰ This approach differs from previous strategies because of its focus on both private and public involvement. The *Draft Framework for a National Freight Policy* outlines how freight transportation is dependent on both private and public participation, but guidelines regarding what this participation should look like in practice are lacking. Because the framework is a work in progress, it must remain flexible to changes in the environment. We support the GAO recommendation that suggests the U.S. DOT consult with Congress and all industry stakeholders to create a strategy outlining the federal government's role in freight transportation.²¹¹ The strategy should incorporate all stakeholders and identify existing and potential funding sources to maintain a rail network capable of meeting future needs. Overall, the proposed strategy is meant to focus the efforts of all stakeholders while outlining federal government involvement.

REFINE AND IMPLEMENT NATIONAL INVESTMENT STRATEGY

Public investment figures prominently in the freight rail industry. As the integrity of the freight rail infrastructure continues to deteriorate, the need for a targeted and risk-management approach to investments becomes imperative. Moreover, the fiscal constraints of government require targeted investment to leverage resources for maximum benefit. As DOT Transportation Secretary Mary Peters noted in October 2007, allocating public funds must be driven by "safety first, economics second, and politics not at all."²¹² The *Framework for National Freight Policy* has been cited as an important first step in targeting public and private investment for maximum impact. However, the framework lacks clearly defined criteria for guiding investment decisions.²¹³ In reference to public investments at the federal, state, and local level, we argue the U.S. DOT should develop a systematic, risk-assessment methodology to guide federal spending on safety and capacity improvements.

ESTABLISH NATIONAL SAFETY & CAPACITY ADVISORY BOARD

A National Safety and Capacity Advisory Board should be developed as part of the National Freight Transportation Strategy to monitor the implementation process of the strategy as well as

²⁰⁸ Railroad-Shipper Transportation Advisory Council, [Railroad Investment Tax Credit: Position Paper](#) (Washington: GPO) Jan. 2007: 2.

²⁰⁹ Railroad-Shipper Transportation Advisory Council, Jan. 2007, 2.

²¹⁰ United States, Government Accountability Office, 2008: 8.

²¹¹ United States, General Accountability Office, Jan. 2008, 43-4.

²¹² Mary E. Peters, "Statement of Secretary of Transportation to Senate Committee on Environment and Public Works," (110th Cong. 1st Sess. 20 Sep. 2007) 24 Mar. 2008 < <http://testimony.ost.dot.gov/test/pasttest/07test/peters7.htm>>.

²¹³ United States, General Accountability Office, [Railroad Bridges and Tunnels: Federal Role in Providing Safety Oversight and Freight Infrastructure Investment Could be Better Targeted \(GAO-07-770\)](#) (Washington: GPO) Aug. 2007: 5.

make recommendations regarding Class I improvements in the areas of safety, capacity, and productivity. The primary task of this advisory board is to look ahead in order to identify problems on the horizon so that they may be addressed before they affect mobility. A secondary responsibility will be educating policymakers to increase awareness of the effects of their decisions and how they fit into the overall national strategy. This board will fall under the Department of Transportation for administrative purposes and its members will be composed from those stakeholder groups involved in creating the strategy, including railroad carriers and regulators.

This board will have the authority to provide monetary incentives in the form of grants and tax credits to individual rail carriers implementing recommended actions for safety and capacity improvements. The Advisory Board will be responsible for reporting to Congress and providing performance measurement data on the programs and the initiatives it chooses to fund. All program grants and incentives must have performance measures in place to demonstrate fiscal responsibility and adherence to the overarching goals and respective recommendations to align with the national strategy.

In addition to the recommendations proposed in chapter 4 with regard to safety improvement initiatives (Positive Train Control Systems, Confidential Close Call Reporting System, Crew Resource Management, and the Highway-Rail Grade Crossing Program), the aforementioned recommendations have been formulated based on assessments of the industry's current performance and predictions of future challenges. The railroad industry's prominent role in the United States transportation sector and in global trade is not likely to diminish. Government regulation and other artificial attempts to manipulate the economic and safety performance of the industry have had varying degrees of success. As illustrated in our review of the effects of economic deregulation in 1980, the Staggers Rail Act is regarded as a positive turning point in industry performance. This holds true for both economic and safety performance.

Demand for freight transportation will continue to grow in the coming decades. How freight will be distributed among rail, trucking, aviation, and barge is difficult to predict. Nonetheless, the adaptation of each of these transportation modes will be influenced by both market forces and government regulation. In the end, railroad carriers have an obligation to act in the best interests of shareholders. It is misguided to believe this principle of private sector behavior invariably conflicts with safety and customer service. However, when the industry sacrifices safety for profits or takes unfair advantage of its market power, government has the responsibility to act in the public interest and to formulate evidence-based policies. We conclude with the assertion that implementation of this report's proposed recommendations will contribute to the tenuous and complicated process of striking a balance between the market forces that drive industry behavior and government intervention designed to ensure the safety, security, and economic vitality of the nation's freight rail industry.

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Appendix A: Stakeholder Perceptions

A workshop convened by the FRA in 2003 to discuss how the industry might collaboratively address safety vulnerabilities documented some of the adversarial perceptions stakeholders have of one another. A sample of comments illustrates these adversarial relations.²¹⁴

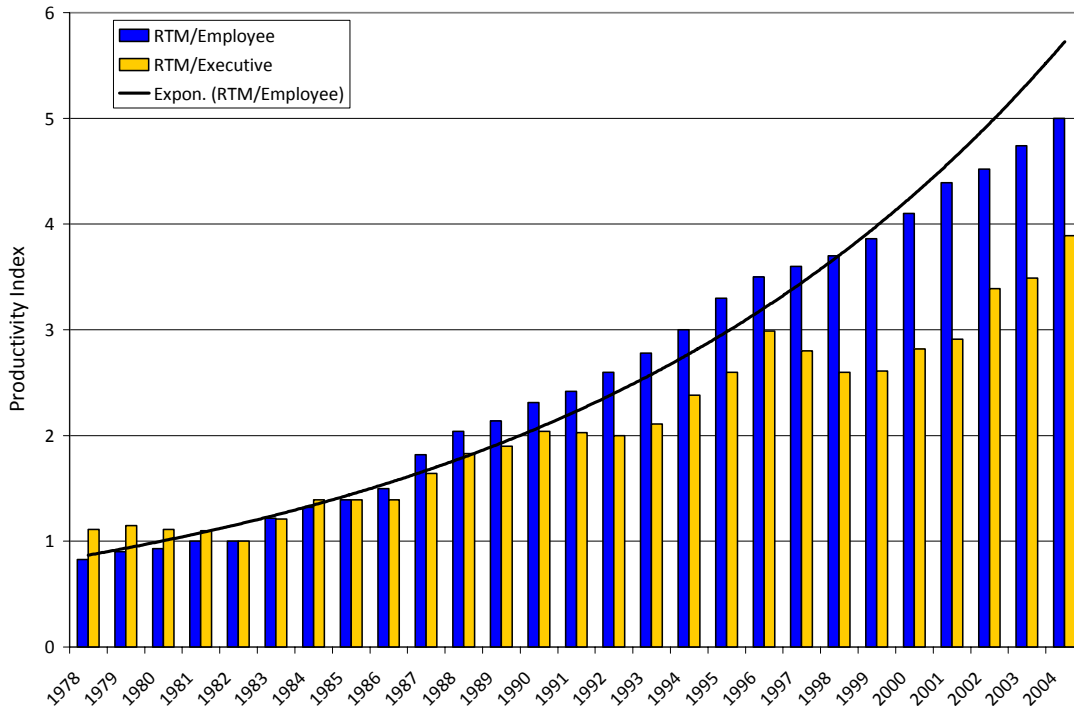
Figure A:1
Stakeholder Perception Matrix

Stakeholder	FRA	Industry	Labor
FRA view of:	—	Railroads don't want anyone in their business. There is a history of inaction and long line of failed programs.	It is hard to move from an adversarial stance of a "them versus us" culture and a long-term "code of silence."
Industry view of:	Most transportation people don't trust the FRA.	—	Employees think everything is to be blamed on working conditions.
Labor view of:	There is a fear of regulation and increased audits. There is a perceived self-interest of regulators by unions.	Humans will err, but industry thinks everything is a human factor. Industry says, "it's the employee's fault."	—

²¹⁴ Volpe National Transportation Systems Center, Proceedings of the Human Factors Workshop: Improving Railroad Safety Through Understanding Close Calls, April 23-24, 2003, (US Department of Transportation, 2003), <<http://www.fra.dot.gov/downloads/Research/ord0403.pdf>>: 47.

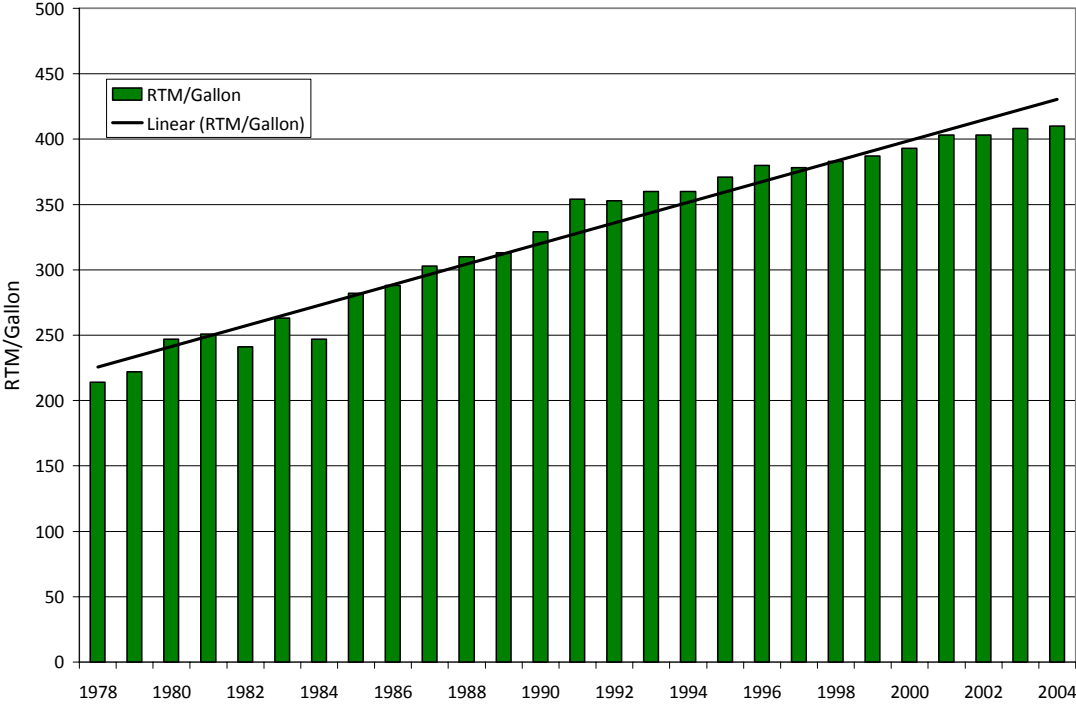
Appendix B: Productivity Figures

Figure B:1
Labor Productivity Post-Staggers Measured in Revenue Ton-Mile per Employee



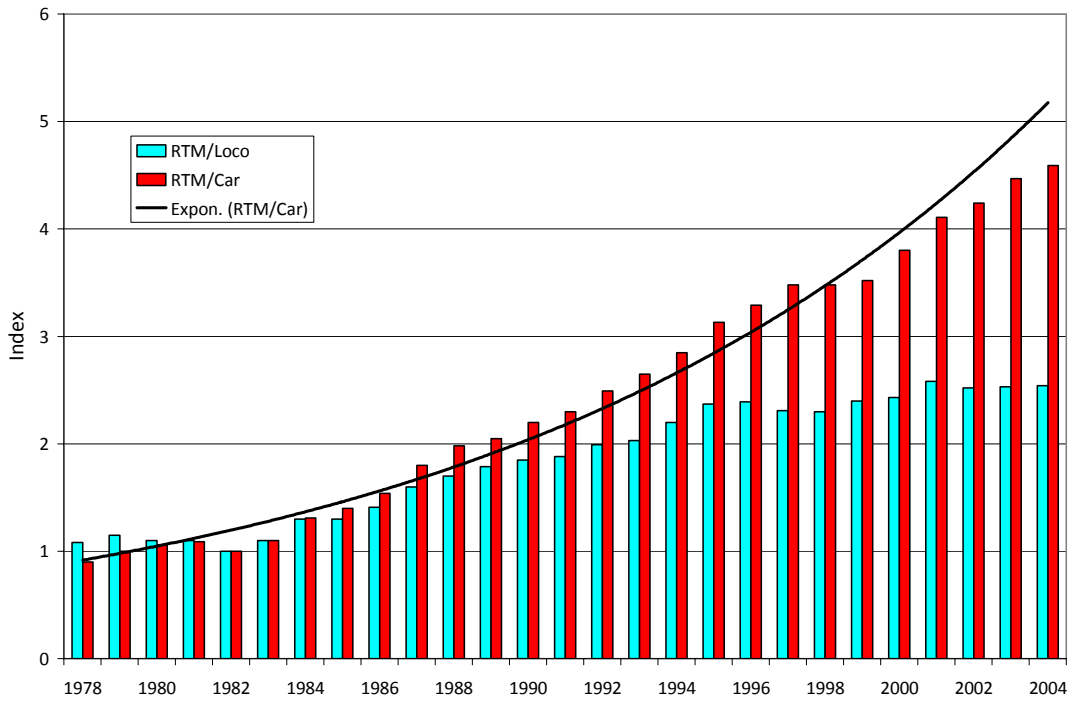
Source: TRB (2007)

Figure B:2
Fuel Productivity Post-Staggers



Source: TRB (2007)

Figure B:3
Equipment Productivity Post-Staggers



Source: TRB (2007)

Appendix C: Database Recommendations

The railroad industry is repeatedly issued data-related recommendations. From January 1968 to October 2001, 27 data-related recommendations have been issued to the railroad industry.²¹⁵

**Table C:1
Previous Database-Related Recommendations**

Recommendation category	Number of recommendations
Develop new database	9
Modify existing database	7
Improve data accuracy, currency, or completeness	7
Improve event identification and reporting	2
Improve data analysis or dissemination	6
<i>Total data-related recommendations</i>	27

²¹⁵ United States, National Transportation Safety Board, Safety Report: Transportation Safety Databases (NTSB/SR-02/02), (Washington: GPO) 2002: 17.

**Table C:2
Current Industry Databases**

Database name or description	Sponsoring organization
Rail Equipment Accident/Incident Report (RAIR) Database	Federal Railroad Administration
Highway–Rail Grade Crossing Incident Report (GXIR) Database	Federal Railroad Administration
Railroad Injury and Illness Summary Database	Federal Railroad Administration
Grade Crossing Inventory Database	Federal Railroad Administration
FRA Test Center	Federal Railroad Administration
Confidential Close Call Reporting System	Federal Railroad Administration
Hours-of Duty Records	Railroad carriers
Operator Near-Miss Databases for Highway-Rail Crossings	Railroad carriers
Trailer On Flat Car/Containers On Flat Car Reporting System	American Association of Railroads
AAR-Railroad Progress Institute Accident Data	American Association of Railroads
Hazardous Material Incident Reporting System	Pipeline and Hazardous Materials Safety Administration