What Went Wrong

A paradox confronted Southern Pacific and Santa Fe managers at the end of the 1930s. Even as they implemented passenger improvement measures, which when examined individually seemed highly profitable, each company's passenger deficit stubbornly persisted. Either their efforts achieved much less than their apparent success, or the ICC definition of the passenger deficit bore little resemblance to reality.

During the 1950s and 60s many railroad critics argued the latter view. According to them, the ICC formula yielded an overly pessimistic picture of passenger train finances because it included allocated fixed expenses that critics thought would continue if the passenger trains were eliminated.¹ The economic historians George Hilton and John Due reached similar conclusions from their study of electric interurban railways. In studying the financial effect that passenger service abandonment had on electric interurban railway companies that continued to provide freight service, Hilton and Due found that the costs actually saved approximated the predicted cost savings based on out-of-pocket cost calculations.²

After studying the evolution of costing on the Southern Pacific in relation to recent cost analysis work, I come to different conclusions. I argue here that cost estimates based on the ICC formula approximated reality much more closely than did railroad out-of-pocket costing methods for mainline passenger services on heavily used railroads. Hilton's and Due's conclusions pertained to lightly used railways. Most of the cases in their sample had minimal capacity, and what freight and passenger service remained at the time of passenger abandonment used only a small fraction of the capacity. In such cases most allocated joint costs are fixed. In addition, Hilton and Due point out that in most cases management failed to properly maintain passenger service, which understated passenger costs.

These conditions prevailed to a far lesser extent for mainline passenger service. Mainlines of major railroads were built for much greater capacity than interurban lines, and passenger and freight trains used most of the ca-
pacity. Changes in the volume of either passenger or freight service changed the magnitude of joint expenses commonly thought of as being fixed. In this chapter I contend that the passenger deficit was real and persisted because management failed to consider the impact of individual trains on what were thought of as fixed costs. Consequently, individual trains earned smaller profits than management thought. In many cases, they earned deficits. Excessive tare weight per passenger primarily accounted for this problem. Traditional railroad accounting failed to show the cost consequences of the tare weight factor, which in reality became an ever greater liability as trains became faster and as fares fell. Because of such cost ignorance, managements wasted millions of dollars on investments in inappropriate streamlined train designs. They also upgraded hundreds of old battleshiplike cars with relatively luxurious and low density accommodations. The cars should have been junked. These factors explain much about the inability of U.S. railroad managers to operate their passenger service profitably in the days before airline competition.

Another factor contributed to the relatively poor financial performance of California passenger service. The primitive development of railroad infrastructure, particularly over the mountain passes that separated the various populated regions of the state, wasted passengers’ time, which depressed potential revenue. It also increased operating expenses.

Of the two explanations for the failure of California passenger service, the cost explanation is the more applicable to the general passenger train problem of the United States in the 1930s, and I will address it at some length. In his study of U.S. passenger train costing on behalf of the Harvard business school in the mid-1950s, Dwight Ladd identified Southern Pacific’s costing methods as the most advanced in an industry otherwise characterized by deplorably bad cost information. Southern Pacific passenger management had only recently adopted the methods, but the company’s Bureau of Transportation Research had developed them more than thirty years earlier. The evolution of these costing methods sheds light on inadequacies of passenger decision making before World War II, not only for the Southern Pacific but for the U.S. railroad industry as a whole.

When Congress returned railroads to private control in March 1920, Southern Pacific established a small office, the Bureau of Transportation Research, to prepare exhibits for court cases and regulatory hearings. Much of the bureau’s work centered on Section 4 cases. Section 4 was the chapter of the Interstate Commerce Act that prohibited long haul/short haul rate discrimination. Railroads could petition the commission for specific waivers to Section 4, but they had to demonstrate that they would not lose money by carrying new traffic attracted by lowered rates.
Section 4 cases figured importantly in railroad freight rate-making strategy. The industry typically requested that the ICC grant it blanket freight rate increases in order to improve its financial standing. High railroad freight rates then encouraged shippers to seek other forms of transportation. Only when a shipper or region succeeded in finding an alternative would a railroad then propose to selectively lower rates for that shipper or region. Doing so typically ran afoul of the long haul/short haul discrimination provision of the ICC, prompting the railroad to apply for a waiver. The practice of individual railroad companies seeking Section 4 waivers to regain traffic that competitors had taken away at the same time that they were requesting general rate increases created resentment in the business community against railroads. Reflecting such resentment, Congress placed increasing burdens on railroads to demonstrate that lowered rates were in fact compensatory. The Transportation Act of 1920 strengthened this requirement, prompting the railroads to place greater effort in cost finding.

Southern Pacific’s cost finding work progressed when the company was confronted with a unique opportunity for gaining traffic if a Section 4 waiver could be obtained. This case involved water-competitive freight traffic between California and Oregon. During the mid-1920s coastal steamers hauled about 60 percent of the freight moving between California and Oregon, in part because of the lengthy travel times and high cost of moving traffic over Southern Pacific’s sinuous and grade-ridden route between those points. Prior to the 1926 opening of a new, more competitive line, the railroad petitioned for a Section 4 waiver for lowered freight rates between San Francisco and Portland in order to capture more of the high-volume market from steamships. Its efforts ran afoul of its inability to demonstrate that costs were less than its proposed water-competitive rates.

Two interest groups objected to the proposed rate reductions: railroad shippers located at interior points and steamship operators. Both groups feared that the proposed rates were so low that the railroad would spend much more to carry the large volume of new traffic than it would get in revenue. Steamship operators viewed this as predatory pricing designed to drive them out of business. Shippers at interior points feared that they would be the ones who would have to pay for the railroad deficits. The fact that the western railroads at the time were petitioning the ICC for higher general freight rates convinced shippers at interior points that selected rate discounts to win competitive traffic did not pay. The Southern Pacific failed to win its case because it could not assuage such legitimate fears of shippers or the ICC.

Six years later the Southern Pacific again sought Section 4 relief in the California to Oregon market and won its case on the strength of progress
that one of its executive staffers made in cost analysis.\textsuperscript{6} Professor Clarence Day graduated in civil engineering from the University of California in 1905. For the following fifteen years he worked in Southern Pacific’s chief engineer’s office on the location of railroads and the economics of the operation of alternative routes. In 1920 he took a three-year leave of absence to become a professor of railway engineering at the Pei Yang University, Tiensien, China, where he taught railway engineering and the economics of railway engineering. Upon returning to Southern Pacific in 1923, he resumed his previous duties until promoted to office engineer in the general manager’s office in 1925. There he conducted his first operating cost analyses. He soon transferred to the company’s Bureau of Transportation Research, where he refined and continued his work.\textsuperscript{9}

Day advanced the costing work of the ICC’s M. O. Lorenz, who a decade earlier cast doubt on the traditional railroad economics paradigm holding that most costs are fixed. Day sought to determine with more precision than Lorenz had done how much each cost account went up or down when the railroad moved more or less freight. Using a statistical technique called regression analysis, combined with interviews with managers responsible for different areas of Southern Pacific costs on each division, he studied the relationship between traffic volume and the magnitude of each cost account on each division. Day’s use of regression analysis probably marked its first use in the railroad industry.\textsuperscript{10} Such methods led Day in 1937 to observe that as a rough rule of thumb, the variable expenses from operating an average length train were about 60 percent of the ICC fully allocated cost per train mile. To determine how much the operation of a new train added to the railroad’s annual operating costs, he used the 60 percent figure and added to it allowances for terminal expenses, depreciation, interest, and taxes.\textsuperscript{11}

Day also concluded that long, heavy trains cost much more to operate than short, light trains. For a train of average length, one could very roughly estimate the added operating expense of adding an extra car as 60 percent of the ICC fully allocated cost per car mile.\textsuperscript{12}

Day’s work almost resulted in the development of a general costing procedure that could have immensely helped management, but the railroad siege mentality prevented this work from coming to fruition. In 1935 the California legislature placed for-hire trucks under the jurisdiction of the California Railroad Commission.\textsuperscript{13} The legislation directed that truckers base their rates on the marginal or out-of-pocket costs of truck operations. Truckers agreed to this provision but demanded that a similar standard be applied to rail rates.

The commission acceded to their demands and launched a study of
railroad marginal costs. To direct the study, it hired Dr. Ford K. Edwards, formerly a transportation economist at the University of Southern California. The Edwards study zeroed in on refining the cost variability research that Day previously developed. In doing so, the study tied together what Edwards termed the best railroad cost variability work that then existed. In addition to Day’s work, this included that of the ICC’s M. O. Lorenz and Arthur White. White previously worked as the federal coordinator’s chief statistician and prior to 1933 was a colleague in the Southern Pacific executive office with Day. Edwards called White’s earlier cost analysis work with the federal coordinator’s office pathbreaking. Lorenz, White, and Day worked together on the Edwards study, with the full support of the Southern Pacific. The railroad’s Sacramento shops were made available for engineering experiments on cost variability.

Unfortunately, the study did not get beyond the stage of developing a general formula for finding the cost of operating different trains, a necessary first step in product costing. According to the Greyhound executive Cloyd Kimball, Southern Pacific killed the study. Kimball was in a position to know. He had been one of Edward’s students at the University of Southern California and after graduation went to work for California’s trucking industry. When Edwards went to the railroad commission, Kimball followed and participated in the study. According to Kimball, Southern Pacific came to fear the potential political repercussions of the study. At the time most railroad rates still bore no relation to the cost of providing the service. Southern Pacific feared that those shippers who were paying rates far above the cost of their service would exert political pressure to have their rates legislated downward once they discovered the truth. On the other hand, those shippers who were paying rates far below the cost of their service would exert political pressure to have their rates frozen in place. The cold light of truth would force the railroad into bankruptcy, according to this reasoning. Ladd found that as late as 1956 many American railroads resisted the development of accurate passenger train costs for fear that such information could be misused if it got into the wrong hands.

Had management applied Day’s work to passenger service in the 1920s and 1930s, it would have concluded that trains cost more to operate than it thought. In 1937, for example, the ICC fully allocated cost per passenger train mile on the Southern Pacific was $2.35. This number is the cost of Southern Pacific’s passenger operations in 1937 calculated by the ICC formula, divided by the annual passenger train miles in 1937. Day’s reasoning implied that if Southern Pacific ran a passenger train one additional mile, the company’s annual operating costs would increase by 60 percent of $2.35, or $1.41. Interest and taxes would add another 25 cents to this
figure, bringing it to $1.66. Terminals expenses would add still more. Day's reasoning also implied that if the company added one car to the train, which averaged 9.1 cars in 1937, the company's annual expenses would increase by 15 cents.

Later cost analyses show that even Day's estimates understated the impact of passenger train operations on the company's operating costs. In the mid-1950s John R. Meyer and a group of Harvard economists studied the passenger burden on behalf of the Aeronautical Research Foundation for the Association of American Railroads.\textsuperscript{20} Using regression analysis, they analyzed the variability of major railroad cost accounts with explanatory variables describing both freight and passenger traffic. Their work differed from Day's 1928 work, which the ICC still used in the 1950s, by making the tests for variability before rather than after separating each account into freight and passenger related costs according to ICC formulas. By doing so, they avoided the controversy surrounding the formulas.

According to ICC hearing examiner Howard Hosmer, the Meyer et al. study offered an independent check on the ICC passenger costing formula, and it showed that the ICC formula understated the passenger burden.\textsuperscript{21} Later works by scholars such as Theodore Keeler, Ann Friedlaender, and Richard Spady used refined methods but came to generally the same conclusions as did Meyer and his group. Friedlaender and Spady, for example, received intuitively plausible results, including indications that freight loss and damage costs rose when passenger service was discontinued, presumably because railroads cut back too much on maintenance or became too sloppy in their operations. In spite of such external economies of passenger operations, the results show that for roads such as the Santa Fe in 1968, running a passenger train one extra mile added more to the company's annual operating costs than indicated by the ICC fully allocated cost per train mile. These researchers' works also generally corroborated Lorenz's findings of roughly seventy years earlier.\textsuperscript{22}

This body of work suggests that once traffic has built up to rather minimal mainline densities, a total of about six or seven mainline freights a day, still more traffic requires longer and more trains, producing greater motive power and car maintenance costs and more wear and tear on existing facilities. At the same time, it requires more yard and terminal facilities, more passing sidings, and more shops. All of these additional facilities and equipment must be operated and maintained. Costs from such sources rise about as fast as traffic, such that whether six or twenty trains a day are operated, unit costs are about the same.

Moreover, the process is reversible. At any given time large railroads have facilities in need of replacement. At times of traffic reduction, replace-
ment can be foregone. Yards, sidings, second tracks, roundhouses, and shops also can be operated and maintained at reduced capacity. Some such facilities and rolling stock can be mothballed altogether, thereby almost completely eliminating their ongoing expenses, or they can be abandoned. Even some debt interest can be reduced. A sizable part of debt is for rolling stock, which can be sold or returned to the lender. The ability of a railroad to reduce operating expenses and adjust a supposedly fixed plant in the face of traffic reduction is far greater than is commonly thought, as the Great Depression showed.

The work from Lorenz through Meyer and his colleagues suggests that passenger trains operating on freight mainlines fit into this characterization with an important difference: passenger trains added to costs more than freight trains of equivalent weight. Thus, fluctuations in the volume of passenger service in the context of an already moderate traffic volume had significant impacts on the corporate bottom line. According to this work, passenger operations cost the Southern Pacific in 1937 at least $2.35 per train mile to operate a train nine cars long, and $0.26 for every additional car.23

Unfortunately, railroad methods for estimating the direct or out-of-pocket costs of passenger trains captured only a small part of the linkages between added services and added activities on the railroad caused by those services. This condition prevailed even on the Southern Pacific, where Day developed his more advanced cost finding techniques. As described in chapter 3, Southern Pacific accounting forms of the early 1920s, for example, showed the out-of-pocket cost of running passenger trains at between only $0.30 and $0.50 per train mile, while the average cost based on the ICC method was about $2.50 per train mile.

By the 1920s and through the mid-1930s, Southern Pacific and Santa Fe managements revised their estimates of out-of-pocket costs upward to about $1.00 a train mile for steam trains. Both managements estimated costs similarly. In addition to crew wages and fuel expenses, they included allowances for maintenance of way, and for locomotive and car maintenance expenses. Neither allowed for depreciation or interest on rolling stock, though one study did include a special category for ice-activated air conditioning that contained operating costs, depreciation, and interest. The Santa Fe prepared its estimates from division accounts, using solely related passenger expenses from most accounts divided by the number of passenger train miles in the division to obtain an average cost per mile. For locomotive repairs, it used allocated passenger costs. For maintenance of way and structures, it used one-third of fully allocated passenger expenses, following the then accepted assumption that one-third of maintenance of way and
structure expenses varied with the amount of traffic over the line. These calculations produced an out-of-pocket cost per train mile. The Southern Pacific used similar methods with just a couple of exceptions. It allowed for lower cost of motor car fuel and maintenance, while the Santa Fe did not. The Southern Pacific discontinuance applications also noted that the passenger trains imposed delay costs upon freight traffic, but it made no attempt to quantify those costs. By the mid-1930s the conception that both Southern Pacific and Santa Fe management had of the marginal cost of running a passenger train one mile—about $1.00—was more than double the figure of the early 1920s, but it was still less than half the ICC fully allocated passenger cost per train mile. The latter more accurately reflected the true out-of-pocket expenses of operating mainline passenger trains on railroads with both heavy freight and passenger traffic.

An exchange during the Santa Fe Case between Southern Pacific vice president of passenger traffic Felix S. McGinnis and Santa Fe counsel Allan Matthew illustrates the state of Southern Pacific passenger train costing in 1937. Matthew asked McGinnis, “You do not keep figures of net revenues from handling passenger trains, do you?” McGinnis replied, “We do not figure them, except in one instance, that happens to be the streamliner, the City of San Francisco, and we can figure a net revenue for that train.” Pacific Greyhound counsel Earl Bagby pursued this line of questioning when he asked McGinnis, “Well, as to the steam trains under the accounting procedure established by the I.C.C. and with their allocations, do you not have a bookkeeping account that indicates net revenue from passenger train operations?” McGinnis understood Bagby to mean the net for individual trains. He replied, “It probably could be obtained, but we do not have it.”

This type of questioning continued until Southern Pacific counsel objected that McGinnis was not a cost witness. Clarence Day was placed on the stand for that purpose. In cross examining Day, Matthew discovered that Day conducted special cost studies for specific freight rate cases but to that time had not performed any cost analysis of Southern Pacific passenger service.

Interest in new.streamliners spurred the development of more complete passenger train costing in the mid-1930s. In the Santa Fe Case the Southern Pacific requested that the Santa Fe provide an economic analysis of the proposed streamlined train. Santa Fe’s valuation engineer, Joseph Weidel, argued that the company would earn a healthy return on its streamliner investment, even under moderate usage. The method Weidel used for estimating operating expenses represented an advancement over earlier methods and reflected a new idea that longer and heavier trains cost more to
operate. Engineering consultants had prepared operating cost analyses for three-unit Zephyrs then being used by the Chicago, Burlington & Quincy. While the train Weidel proposed for the Santa Fe was not like the Zephyr, he based his estimates on the Zephyr's costs with appropriate modifications. Weidel's proposed train would be composed of a diesel locomotive and six detachable cars generally similar to those in the new Abraham Lincoln running between Chicago and St. Louis, except made out of stainless steel. The Budd Company had already built a prototype car. His proposed train was calculated to be 3.46 times heavier than the three-unit Zephyr. Weidel reasoned that crew costs for his train would be the same as those for the Zephyr, except that he added expenses for a locomotive fireman, which he thought the unions would demand, and an extra brakeman required by California's full crew law. He estimated that remaining operating and maintenance expenses would be 3.46 times greater than those for the Zephyr, because he reasoned such costs varied by weight. To the result, he added depreciation, interest, and taxes, arriving at a $0.97 figure. 28

Southern Pacific's skepticism of these projections revealed that it still made no analysis of its own passenger rolling stock investments. In early 1937 Day took the stand to dispute Weidel's economic analysis for Santa Fe's proposed streamliner by arguing that it was too low. Under cross examination, he revealed that neither he nor anyone else in Southern Pacific's management performed cost analysis for Southern Pacific's Daylights. 29 Moreover, the Southern Pacific made no estimate of the load factor of the proposed train, nor of the extent to which traffic would be diverted from other trains. 30

However, Southern Pacific was taking the first steps in cost analysis that would later enable the company to perform estimates on the return on investment of proposed rolling stock. The accounting department began issuing monthly statements for at least those trains for which the company had made large investments in rolling stock. As McGinnis stated, the company in 1937 was compiling net revenue statistics for the City of San Francisco, which was a lightweight diesel streamliner that the Southern Pacific operated jointly with the Union Pacific and Chicago & Northwestern since 1936. As the company invested in additional streamliners, it began to monitor their financial performance as well, recording both expenses and revenues. For example, the accounting department showed that the thirteen-car Daylight cost $2.77 per train mile to operate for the first seven months of 1938, while it grossed $5.37 per train mile. 31 The cost figure is not too much below the 1937 fully allocated cost of $3.35 per train mile for a thirteen-car train.

In the light of what is now known about the behavior of railroad costs,
Southern Pacific's evolution of passenger cost analysis shows that until the time of the *Daylight* management significantly underestimated the cost implications of its passenger decisions. As a consequence, management failed to improve rail passenger productivity as much as it might have. Its management of load factors (the proportion of saleable space sold) provides a striking example of such failure.

Although the Pullman Company kept records on how many passengers occupied its sleeping cars, railroads did not monitor the load factor of their coaches in the mid-1930s. Day revealed this fact when he testified that the federal coordinator's special study of occupancy of coaches on specific trains constituted the first instance of the gathering of this information in the railroad industry. He believed the information was accurate and valuable, and in 1936 he collected additional information that was comparable to the 1933 data. This information showed that the coach load factors of most leading trains failed to reach 30 percent in 1933. The *Daylight*, Southern Pacific's most heavily traveled coach train, had a load factor of only 34 percent. Despite substantial growth of passengers using the train, the *Daylight*'s load factor still averaged about 34 percent in 1936 because managers added cars to the train to accommodate the added passengers.

The Southern Pacific's negligence in this area typified that of most railroads. Day testified that he had attempted to obtain load factor information from both the Santa Fe and the Chicago, Burlington & Quincy, but had received written replies from both roads that they compiled no such statistics. Railroads in the East neglected this aspect of passenger management, too. Raymond D. Swenek, general superintendent in the operating department of the Pennsylvania Railroad, the nation's largest passenger carrier, managed the capacity of his system's passenger trains. He described how statistics of passenger miles and coach car miles published by the Interstate Commerce Commission were useless for computing coach load factors. However, he saw no need to collect load factor information himself. He had not even bothered to look at the federal coordinator's occupancy figures for his trains because he erroneously thought they were the same as those published by the Interstate Commerce Commission. Witnesses for the New York Central, the nation's other major passenger carrier, testified similarly in the same hearing.

The railroads' casual attitude toward managing load factors contrasts vividly with the urgency with which Pacific Greyhound Lines managed this statistic. To Pacific Greyhound Lines, as to airlines today, profits or losses depended on how high managers kept the load factor. In 1936 Pacific Greyhound Lines maintained an average load factor of 60 percent on all of its buses competing with the *Daylight*, while it maintained a systemwide load
factor of more than 50 percent. Had the Southern Pacific done as well, it likely would not have had a passenger deficit.

Designs of the new streamliners also reflected railroad managements' nonchalance about load factors. When Pacific Greyhound Lines invested in a new bus design, it bought not only a more comfortable and attractive vehicle, but also a more efficient vehicle that carried more passengers per unit of weight. For all of this it paid hardly more than for the old buses that it replaced. When the railroads invested in streamliners, they generally bought trains less efficient in terms of tare weight per seat than the old trains they replaced. This, too, contributed to the passenger deficit. A typical nine-car pre-streamlined coach train of the mid-1930s, including a baggage and a dining car, weighed about 2.1 tons per seat. Generally weighing less than one ton per seat, the first generation streamliners greatly improved on this while offering spacious reclining seats, attractive meal and lounge service, and air conditioning. They represented a great step forward, returning passenger trains to the tare weight efficiency of the wooden trains of the 1910 era while offering incomparably more comfortable accommodations and greater speed in the process. However, the second generation streamliners ordered by the Santa Fe and the Southern Pacific improved on amenities by eliminating the breakthroughs in efficiency of the first generation streamliners. The Santa Fe's *Golden Gates* weighed about 2.5 tons per seat, while the *Daylight* weighed about 2.3 tons. They also cost three times more to buy than the old trains they replaced.

Such high tare weights, purchased at high cost, adversely affected passenger profitability. As the cost analyses since the 1950s show, not so much the length but the weight of a passenger train contributed to its operating costs. A train weighing twice what another train weighed per seat cost almost twice as much to move a passenger one mile, if they both had the same load factor. Railroad negligence in using the investment in streamliners to reduce tare weight therefore contributed to unnecessarily high operating costs.

That the *Daylight* earned substantial profits fails to detract from the argument. If management had invested in more efficient equipment, the *Daylight* could have netted more, and management could have converted other services that were unprofitable into profitable ones. Figure 6.1 shows how. The figure shows the April 1938 gross revenues for major trains on the Southern Pacific system. Costs are not shown, but we can roughly estimate them. From what we now know about the way costs behaved, the ICC fully allocated cost per train mile was a reasonable proxy for how much the Southern Pacific spent to run an average train one mile. In 1938 this figure was about $2.30 for a nine-car train. We reasonably can assume that most
mainline trains were of average length or longer and therefore cost $2.30 or more per mile to operate. Comparing this number to the revenues in figure 6.1, we see that most Southern Pacific mainline trains lost money. This need not have been. Had management carried the same number of passengers and items of mail, express, and baggage in shorter trains weighing substantially less, it could have reduced the operating costs of many trains to below revenues.

In a sense, then, railroad management wasted some of the investment it placed in streamliners by ordering equipment that failed to reach its productivity potential. Southern Pacific management compounded this lost opportunity by placing some of its expensive new trains in markets of insufficient size to make them pay, or by emphasizing the wrong attributes to stimulate new traffic. The Texas streamliners illustrate the first point. They grossed only about $1.50 per train mile, and while this figure probably exceeded considerably the revenues of the trains they replaced, in the opinion of Southern Pacific’s management it failed to cover costs. Before World War II Dallas and Houston each contained about 300,000 people, populations not large enough to support competitive rail service.38

The Lark, the crack overnight train between Los Angeles and San Francisco, illustrates the second point. While its gross revenue was much higher than that of the Texas service, the revenue failed to improve after the company invested heavily to equip the train with ultra-luxurious streamlined cars in 1941. Several factors contributed to the lack of earnings response to the investment. First, the investment bought luxury but not shorter travel time. This emphasis was mistaken. The public responded enthusiastically to earlier streamliners in large part because the new trains saved considerable amounts of time for each passenger. In contrast the Lark continued on its leisurely twelve-hour schedule. Second, competition from Southern Pacific’s faster daytime trains as well as airlines ate into the Lark’s demand. In 1933 the approximately 10,000 passengers riding in five-seat planes between Los Angeles and San Francisco constituted about 5 percent of the public mode market, but by 1937 airlines provided much greater capacity and comfort. Eight daily United Airlines flights flew nonstop between the two cities in two hours, while another three stopped at Bakersfield and Fresno en route. Capacities ranged from ten passengers for older model planes to twenty-one passengers for the new DC-3s. Many schedules ran in sections, particularly on weekends, indicating heavy passenger loads.39 Because air competition intensified during the next four years and drew most heavily from the Pullman market, it is not surprising that inauguration of ultra-luxury equipment on the Lark between March and July 1941 failed to increase its revenues significantly.40 Southern Pacific’s transcontinental
Pullman revenues also suddenly turned down in 1940, again most likely because of increasing air competition.\textsuperscript{41} Investments in luxury equipment to compete with air service could earn no return.

While the Southern Pacific invested heavily in streamliners for some unpromising markets, it ignored its heavy Oakland to Sacramento market, where higher speed streamliners could have earned profits. Through the rejuvenation of its Los Angeles to San Diego service, the Santa Fe showed what could be done with this type of market. After carrying about 75,000 passengers per year in 1933, the Santa Fe through low fares and much higher speeds increased this number to about 500,000 passengers per year in 1941. The streamliners grossed $2.30 per train mile, and because they used diesel rather than steam power probably cost less than $2.30 to operate.\textsuperscript{42} They could have netted considerably more had they been designed with lower tare weights. In contrast, traffic in Southern Pacific's neglected Oakland to Sacramento market declined from around 300,000 passengers per year in 1933 to about 200,000 in 1939.\textsuperscript{43}

How Southern Pacific's passenger strategies affected the passenger operating ratio is analyzed in table 22. Dividing passenger expenses by passenger revenues in a given year yields the operating ratio. Table 22 shows the trend in expenses and revenues from 1927 through 1941 for the years for which data could be found. It does this by examining two statistics. One shows the resources that the Southern Pacific spent to move a passenger car one mile. These are costs per car mile, adjusted for changes in the price of fuel, materials, and labor. The other statistic shows revenues that the car mile grossed, again adjusted for changing price levels. Division of the adjusted cost per car mile by the adjusted revenue per car mile shows the resources that the railroad spent to earn a dollar in revenue. This is the same as the passenger operating ratio and corresponds to the Southern Pacific passenger operating ratios shown in table 23.

Table 22 reveals that from 1927 through 1941 the Southern Pacific improved its efficiency in moving a passenger car one mile—by almost as much as did Pacific Greyhound Lines through 1935 (see chapter 4). There are two likely causes for the improved efficiency. The moderate drop in the cost per car mile between 1933 and 1935 no doubt resulted from better use of resources as expanding passenger traffic took advantage of a greatly underutilized physical plant. The improvement between 1938 and 1939 probably reflects the severe economy measures that the company began enacting in 1938 as well as the expanded operation of streamliners and more efficient steam locomotives. Streamliner cars weighed fifty to fifty-five tons, compared to seventy to eighty tons for standard coaches.

The reason that Southern Pacific's passenger operating ratio remained
above 100, while Pacific Greyhound earned substantial profits, derives from
the revenue per car mile part of the ratio. As passenger fares fell Pacific
Greyhound kept up the revenue per bus mile by loading more passengers
into each bus. In contrast, while the Southern Pacific improved the pro-
ductivity of moving a passenger car one mile, it failed to keep up the
gross revenue that each car mile brought in, as shown in table 22. In the
mid-1930s, as passengers returned to trains, Southern Pacific management
added cars to trains, rather than enticing passengers to fill up the seventy
to ninety seats typical of standard cars of the period. In the latter part of
the decade it invested in streamliners with only forty-five to fifty-five seats
in each car, and it rebuilt the interiors of standard cars to the same ca-
capacity. These investment policies increased rather than decreased the tare
weight per seat and made the trains uneconomical, even when passengers
(who paid very low fares) filled most of the seats. In short, the railroad
failed in comparison to Pacific Greyhound Lines because of its inability or
unwillingness to manage load factors and tare weights.

The failure of both the Southern Pacific and the Santa Fe to signifi-
cantly improve their intra-California mainlines also contributed to unsuccess-
ful passenger results. Routes over mountain passes connecting both Los
Angeles and San Francisco to the San Joaquin Valley possessed two sig-
nificant shortcomings, which neither railroad addressed. First, with miles
of unrelenting tight curves, the old lines forced passenger trains to run at
speeds as slow as 20 miles an hour. And the trains ran at the slow speeds
miles out of their way: about fifty wasted miles in the case of the route
out of Los Angeles, and about fifteen wasted miles in the route out of San
Francisco. Passenger trains using these routes required hours more to reach
destinations than what the auto-conscious public had become accustomed
to. This penalty depressed gross earnings. The old, circuitous lines also
cost more to operate than shorter, straighter lines would have cost.

The possibilities of what could have been achieved with improved
alignments are illustrated by the results of the only significant realignment
that actually occurred. The building of Shasta Dam in the late 1930s ne-
cessitated the relocation of Southern Pacific’s mainline to Oregon for about
thirty-seven miles north of Redding. The old line still followed the original
1884 sinuous alignment along the bottom of the Sacramento River Canyon.
To bypass this line, the California state engineer in 1925 located a new
thirty-two-mile railroad to the east of the canyon. Under a state contract the
Southern Pacific refined the new alignment in 1935, and the U.S. Bureau
of Reclamation began constructing the line in the late 1930s. Completed
in 1942 at a cost of $17.5 million, the new line eliminated 5,100 degrees
do of curvature (a reduction of 72 percent) in its thirty-two miles and short-
ened the route by five miles. It allowed speeds for passenger trains up to 60 miles an hour, in contrast to 20 mile an hour restrictions on many of the curves of the old line. Although the new line was relatively short, its fewer and gentler curves and reduced route permitted passenger trains to save a substantial thirty-three minutes between Redding and Delta.44

The Shasta Dam line relocation represented a new type of mountain railroad that contrasted as vividly with the old type of railroad as the new mountain highways of the 1930s contrasted with the 1910-era highway alignments they replaced. Unfortunately, the California Highway Commission generally had no jurisdiction over railroads, and neither the Southern Pacific nor the Santa Fe replaced any of their antiquated railroad alignments.

Improvements to the mountain routes on the main rail corridors in California, similar in nature to the Shasta Dam line relocation, would have made a difference. Such improvements constructed along the 1922 Santa Fe survey between Los Angeles and Bakersfield and from the San Joaquin Valley over Altamont Pass into the Bay Area not only would have speeded up trains, they would have shortened the route between the Bay Area and Los Angeles by fifty to sixty miles as well. The combination of a shorter route and faster speeds would have cut several hours from the schedules of California’s passenger trains linking the Bay Area and Los Angeles.

Given the enthusiastic passenger response to the modestly shortened running times of the streamliners, as shown in figure 5.3 of the previous chapter, investments in modern mountain crossings would have increased passenger traffic dramatically within California. If the trains using the new alignments would have been economical high-speed streamliners, such as those of the first generation, the heavy passenger volumes also would have been profitable.45

The fundamental problem bedeviling Southern Pacific and Santa Fe passenger service at the end of the 1930s was the failure of their major heavily used trains to earn substantial profits. Managements increased the gross revenue per train mile that each train generated by making the trains longer, which also made them more costly to operate. Typically, the gross revenue that each car mile earned fell short of the cost of moving the car mile, because management placed too few passengers into each car. Tare weights were much too high.

At the same time, both railroads failed to invest in potentially profitable improvements on their routes linking California’s major cities. As a consequence, passenger revenues did not reach the magnitudes that they could have, while passenger operating expenses remained higher than they had to. Compounding this problem, the Southern Pacific placed some of its costly streamliners on routes with little traffic potential while it neglected one of its most heavily traveled routes. Desire for prestige rather than profits
motivated the company's investment decisions, and the traveling public sometimes suffered as a consequence.

Such decisions and consequences were rooted in the historic relations between railroads and the society that they served in California. Chapter 7 reexamines this relationship and summarizes its impact on California's rail and bus managements.