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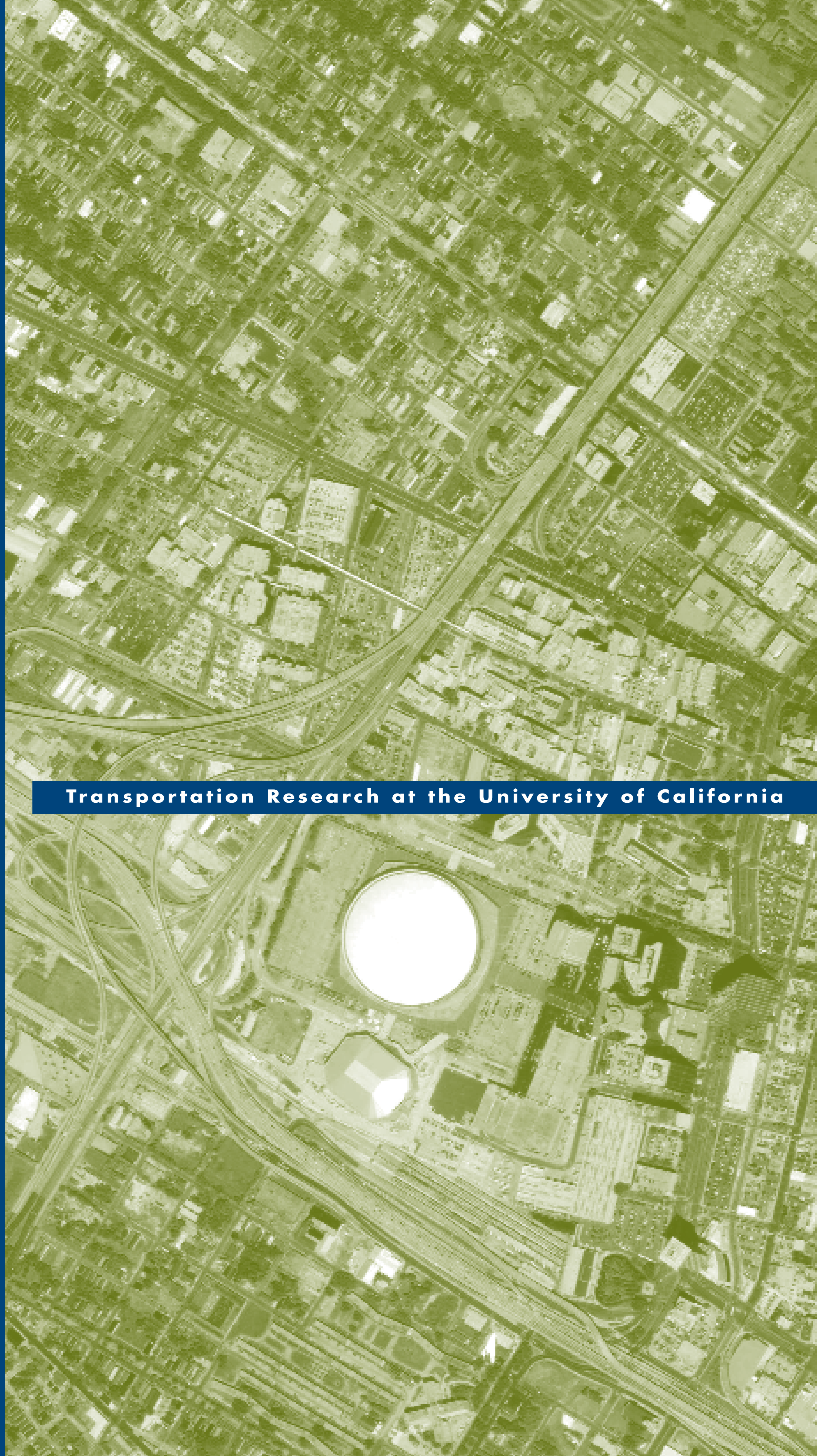

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Terrorist Attacks and Transport Systems

INCREASINGLY FREQUENT and deadly bombings of public transit systems have put transportation officials around the world on edge. Buses and trains in London, Madrid, Moscow, Paris, Tokyo, and dozens of other cities have been the unlucky sites for terrorist attacks in recent years. Such attacks, quite understandably, have prompted calls here in the US and overseas for increased efforts to make public transit systems safe from terrorists. Such calls assume, of course, that public transit systems, or transportation and infrastructure systems more broadly, are the focus of the problem and the appropriate venue for policymaking and action. The solution, we are told, is transit security. But are these recent bus and subway bombings a transportation problem, or something much broader?

Acts of terrorism intersect with transportation systems in three ways:

- When transportation is the *means* by which a terrorist attack is executed;
- When transportation is the *end*, or target, of a terrorist attack; or
- When the *crowds* that many transportation modes generate are the focus of a terrorist attack.

Examples of transportation as the *means* of a terrorist attack include the use of cars, buses, or trains to convey explosives, or when they are used as weapons—like on September 11th. Examples of transportation as the *end* of a terrorist attack include attacks on bridges or tunnels to disrupt transit, railroad, or highway operations, exact economic costs (but not necessarily human casualties), and attract attention; this describes the IRA bombing campaign against transit targets in England and Northern Ireland between the early-1970s and mid-1990s. In each of these cases, the unique characteristics of transportation (and other infrastructure) networks define many aspects of the attacks, emergency response, and system protection. As such, the logic of defining both the problem and proposed policy solutions in terms of transportation, or in this case public transit, is clear.

But when *crowds* are the target, which is increasingly the case in recent suicide bomb attacks, defining the problem and its solutions in terms of transportation may be a mistake. Airports, rail stations, and bus and ferry terminals all congregate large numbers of people in small, often enclosed spaces, making them attractive targets for terrorists. But such crowding is in no way unique to transportation stations and terminals. Skyscrapers, shopping malls, concerts, and sporting events likewise assemble large numbers of people in small spaces—as do major celebrations (like the 4th of July on the Mall in Washington, DC) and parades (like the Tournament of Roses on New Year's Day). Even if it were possible to completely close and secure public transit systems, there would remain a considerable number of potential venues for tragic and devastating attacks on large crowds of people. While public transit systems may currently be a favored venue of terrorists in search of crowds to attack, one cannot assume that securing or eliminating crowds on public transit would in any way end or even mitigate such attacks.

This is important because attempting to close and secure public transit systems "airline-style" would strike a devastating blow to an industry already buffeted by decades of competition with private vehicles. Public transit networks remain the lifeblood of the central parts of the oldest, largest US cities; these places, and movement in them, would change forever should open, accessible transit systems be "secured."

Public assembly is a defining characteristic of free and open civil societies, and the consequences of closing, securing, or eliminating large gatherings of people—on public transit systems, in shopping malls, or at parades—reach well beyond the transportation sector and into the very heart of civil society.

—Brian D. Taylor

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Building a Boulevard

BY ELIZABETH MACDONALD

Many communities in the United States are taking a second look at the freeways built through and around their downtowns during the 1950s and 1960s. They see them now as barriers to neighborhoods and waterfronts. Several cities have removed stretches of urban freeways or have buried them. The city of San Francisco has taken down two elevated freeways and replaced them with surface streets. One of these new streets, Octavia Boulevard, opened in September 2005 as a multiway boulevard.

Multiway boulevards don't get built very often in the United States, so when a new one emerges it is a notable event for the transportation and city planning professions. A multiway boulevard handles large amounts of relatively fast-moving through-traffic as well as slower local traffic within the same right-of-way but on separate but closely connected roadways. The street design is novel because it goes against prevailing standards, hence the question: how did Octavia Boulevard ever get built? The short answer is that it took a combination of committed and long-term citizen support, timely academic research, willingness on the part of public agencies to go against established norms, and a great deal of luck. The story of how Octavia Boulevard got built, and reflections on the final design, may be useful to professionals working in communities that are considering building a multiway boulevard.

Octavia Boulevard is a four-block-long multiway boulevard crowned by a new park, Hayes Green, at its northern end. As with all classic multiway boulevards, it has central travel lanes for relatively fast-moving through-traffic bordered by tree-lined medians with walking paths. It has narrow one-way access roadways on each side for slower traffic and parking, and finally, at the edges, tree-lined sidewalks. The medians, narrow access roadways, and sidewalks together create extended pedestrian realms, where movement is at a slow pace.

Although modest in length, Octavia Boulevard is the first true multiway boulevard built in the United States since about the 1920s, with the exception of the Esplanade in Chico, California, which became a multiway boulevard upon removal of a railroad right-of-way in the 1950s. Octavia Boulevard replaces the double-decker elevated Central Freeway that was damaged in the 1989 Loma Prieta earthquake. ,

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Oak

The Central Freeway

Built as part of San Francisco's elaborate 1950s-era Trafficways Plan, the Central Freeway was intended to connect through to the Golden Gate Bridge by way of Golden Gate Park. A citizen-led revolt in 1966 halted freeway construction throughout the city, but not before large sections had been constructed in Hayes Valley with devastating effects on the surrounding neighborhood. Put simply, the Central Freeway was not a nice place to live or do business near. But there it was for over thirty years, a short period as measured by the time-spans of freeways, a lifetime if you lived or worked in the neighborhood.

The 1989 earthquake did not topple the freeway but did severely damage it, raising the question of whether to retrofit or remove it. Amidst drawn-out and often heated community deliberations, a referendum to retrofit was put on the 1997 ballot, sponsored by residents potentially served by but not close to the freeway. It caught anti-freeway activists off-guard, and passed.

During the same time period but unrelated to the earthquake or the referendum, Allan Jacobs of the University of California, Berkeley published a book called *Great Streets*, which documented several classic multiway boulevards in Paris and Barcelona. Jacobs had been told by traffic engineers that such streets were dangerous because of their complex intersections with multiple roadways, but after spending time on them he began to question this assertion. People apparently adapted to the unusual street configuration, and traffic seemed to move easily and safely. Moreover, the streets were uniquely able to handle large volumes of through-traffic without imposing on the local environment. These observations led Jacobs, myself, and our colleague Yodan Rofé to undertake a two-year research project to test the safety of multiway boulevards and to understand their design qualities. Essentially, our research found that multiway boulevards are not more dangerous than normally configured streets carrying the same amount of traffic, if they are well designed.

Timing, as the saying goes, is everything. Hayes Valley citizen activists, tired beyond telling of the Central Freeway and conversant with *Great Streets* as well as the boulevards research, sponsored a measure that garnered enough support to be placed on the 1998 ballot, this time to replace the freeway with a surface multiway boulevard. It passed, overturning the previous ballot measure. The San Francisco County Transportation Authority, charged with implementing the boulevard, hired us to design it through our recently established firm Jacobs Macdonald: Cityworks.

Citizens protesting the Central Freeway in 1966 (left); it was demolished in 2003 (above). The new freeway ramp leading to Octavia Boulevard (right).

A Design Team

We knew that city staff would be unfamiliar with multiway boulevards and the design characteristics that make them work well and safely, and that close cooperation would be important. So we set up a process for working directly alongside city staff in the role of design leaders. It was important to have key city professionals at the table as the design progressed, for they were the people who would ultimately have to sign off on the design. The design team consisted of a planner from the Department of Parking and Traffic, two civil engineers and three landscape architects from the Department of Public Works, and three project managers from the Central Freeway Project office.

After introductory sessions aimed at bringing all participants up to date on the boulevard research and on examples of the world's best boulevards, weekly meetings worked out increasingly detailed design proposals and then discussed, challenged, redesigned, and designed them again. The urban designers and engineers on the project team, naturally inclined in different directions on design questions, worked out an understanding that anticipated future open community meetings. They agreed that if there were more than one possible design solution to a functional question, and if both solutions could be acceptable even though the designers strongly favored one and the engineers another, they would all sign off on whichever the community chose.

While the design progressed, presentations were made at regular intervals to an official Citizens Advisory Committee. The members were generally quite perceptive about what it would take to create a good boulevard and not just a traffic-moving corridor, and they were not afraid to take some gambles with the unknown. A major finding of the boulevards research had been "the elusiveness of wholeness," meaning that focusing in turn on every *potential* traffic conflict or *possible* bad-driver behavior and trying to solve each by adding greater lane widths, wider turn radii, greater tree setbacks, or more movement restrictions was a misapprehension of the complex manner in which good boulevards work. Most committee members came to understand this, and a saying emerged: "No one gets everything; everyone gets a lot."

Design Specifics

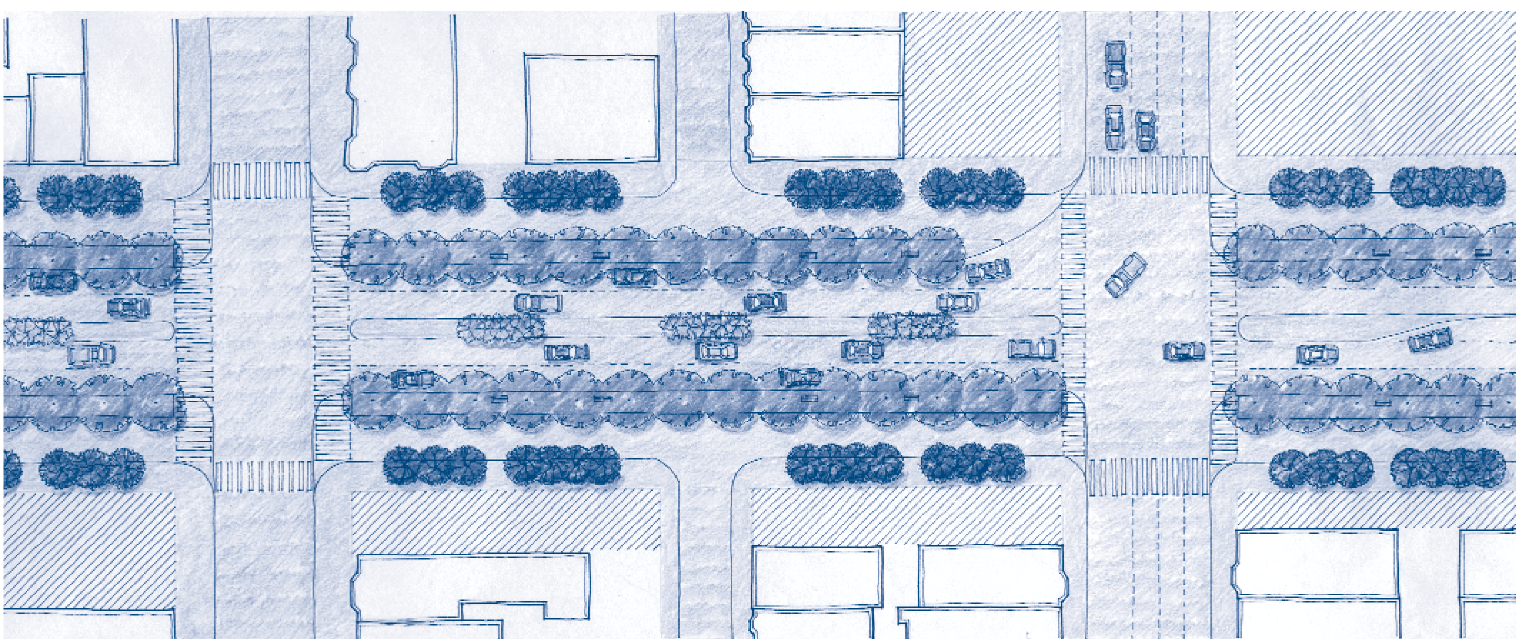
For the designers, a major consideration was to keep the boulevard as narrow as possible so that there would be room for new buildings along its eastern side, replacing structures torn down when the freeway was built. Having buildings facing onto the side access roadways was crucial for these spaces to make sense, whether the buildings were residential or commercial.

The widths of travel lanes arose as a major issue. The urban designers argued for narrow travel lanes, preferably ten feet or less, in order to minimize the overall roadway width as well as pedestrian crossing distance, whereas the engineers argued for eleven- and twelve-foot-wide lanes. To achieve a narrow overall boulevard, the travel lanes, parking lanes, and side medians all needed to be as narrow as possible. Applying a standard interpretation of fire engine access rules to the side roadways would have resulted in very wide lanes. To solve this problem, the design team proposed placing the median trees near the central roadway and giving the access roadway side of the median a mountable curb. Thus, in the event of an emergency, a fire engine could easily enter the access road by driving with one wheel on the median. This design approach was vetted with the fire department and they agreed to it. In the end, lane-width compromises were reached all around, and the central lanes ended up eleven feet wide, the access lanes ten feet wide, and the parking lanes eight feet wide.

Another major design question was how to end the boulevard after Fell Street, where through-traffic turns west towards the Panhandle, and how to integrate it into the surrounding grid of narrower streets. Early suggestions by Caltrans included a one-block diagonal street with staggered building frontage, but a rather simple urban design solution was quickly agreed on and immediately embraced by the whole design team and the community. Between Fell and Hayes streets, the boulevard's right-of-way would become a small neighborhood park, flanked by the access lanes.

This simple open space, dubbed Hayes Green, has proven enormously successful. Opened on World Environment Day in May 2005, it is constantly in use, particularly on weekends. For

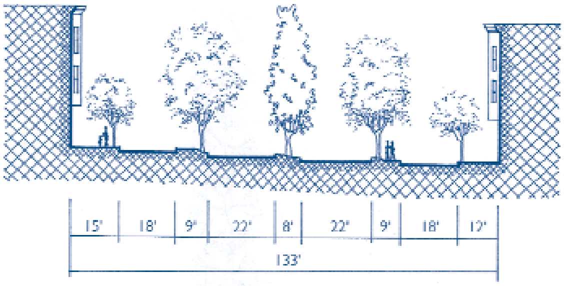
Plan of Octavia Boulevard

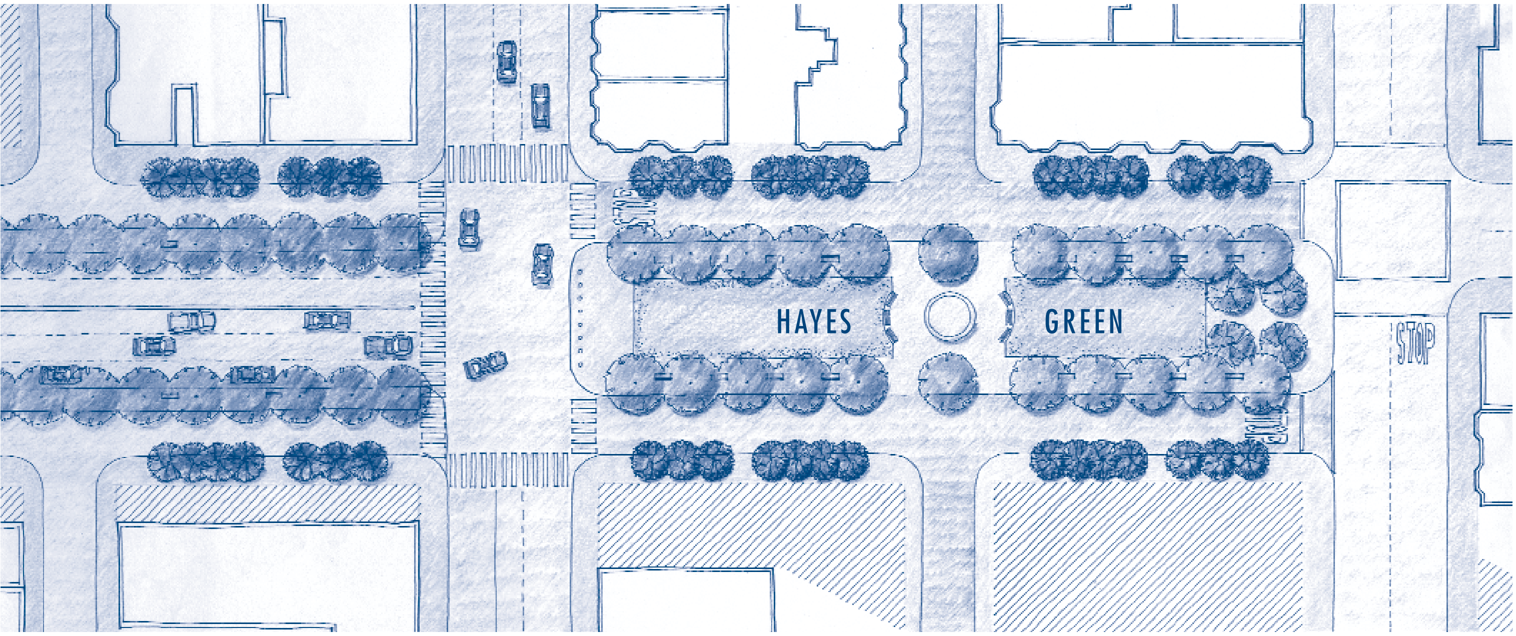


a designer, one can't do better than hear comments like: "There are mothers who now have a place to take their young kids, where they meet and get to know other mothers and kids that they never knew about." That, we suggest, makes for community.

Intersection issues were much debated, including how access roads would enter intersections, how intersections would be controlled, how close to intersections trees would be placed, and how wide to make the turning radii. Wanting to adhere as much as possible to existing street-design standards, the engineers on the team argued for returning the access roadways to the center prior to the intersections, holding trees back a considerable distance, and providing large turning radii. We argued for keeping the access roads straight so that they intersected independently with the cross-streets, for controlling the center roadway with signal lights and access roadways with stop signs, for carrying street trees all the way to the intersection, and for minimizing turning radii. Straight access roadways would allow local residents to stay among local, slow-moving traffic when driving.

Section of Octavia Boulevard





Community Input

A preliminary design offered three alternative intersection approaches at three community-wide evening meetings: side access roads going straight through at intersections; side access roads returning to the center before intersections; and side access roads returning to the center both before and after intersections. Community response was lively.

One significant issue that the design team had not addressed emerged from these meetings: whether or not there should be separate lanes for bicycles. Separate lanes would have been wonderful, but an extra ten feet of width would have reduced developable land along the eastern side, in some blocks to no space at all. With no buildings facing onto the boulevard, the access roadways would have been pointless. We looked to the experience along the Esplanade in Chico, where bicyclists use the local access roads jointly with automobiles, with no resulting problem. The San Francisco Bicycle Coalition accepted this solution, but required assurances that bicyclists would be able to continue straight through at intersections without having to move into the central lanes. Along with arguments that local traffic should not be forced to enter the through-traffic flow at intersections, this issue convinced the community to choose the design alternative with straight-through side roadways.

To help decision-makers and the community visualize what Octavia Boulevard would be like, Peter Bosselmann of the UC Berkeley Simulation Laboratory built a physical model and made a video simulation of driving along the boulevard. This proved very helpful, and the San Francisco Board of Supervisors approved the schematic design.

But, all was not done. In 1999, pro-freeway forces gathered enough signatures to compel a third referendum on retrofitting the freeway. Anti-freeway forces were by now better organized and were able to add a competing “Build Octavia Boulevard” measure to the ballot. San Francisco’s voters, presented with drawings of an already-designed multiway boulevard to compare to the still-standing freeway, voted for the boulevard.

It took the efforts of many people to get Octavia Boulevard built, but without a doubt local citizen activists really made the project happen. A group of concerned residents met continually, addressing problems and envisioning potential solutions even before the 1989 earthquake, and pushed for something better than they had. City bureaucrats were instrumental as well, particularly traffic professionals from the Departments of Parking and Traffic and Public Works. Each had to give a little and bend long-standing norms to help reach compromises. In the end, the Public Works Department prepared the construction drawings and saw Octavia Boulevard and Hayes Green through to completion.

Hayes Green looking north

Room for Improvement

Octavia Boulevard is not perfect. It contains compromises in design, construction, and regulation. Most apparent is that the local access roads are too wide—for a through-lane next to a parking lane, they were made eighteen feet wide, rather than 16.5 feet. A narrower space would have contributed more to traffic calming. Also, the surface of the local access roads was finished in asphalt, whereas it should be some material that marks them as part of a pedestrian realm, such as concrete like the sidewalks or cobbled pavers to match the medians. This was proposed during schematic design, but never made it into construction—and ought to be corrected. At Market Street, the entry into the eastern side access road should be narrower and less inviting to discourage through-traffic from entering it.

Operationally, there are intersection control confusions because conservative regulators were not willing to experiment or give people a chance to adapt. The side lanes ought to be controlled by stop signs and the central lanes by traffic signals. Concern over this unusual arrangement (which has been shown to work just fine on Chico's Esplanade) prompted the installation of flashing red lights at the access road intersections, which drivers have difficulty interpreting.

Finally, the transition from the freeway to the new boulevard is less than successful. What's left of the elevated freeway now touches down just south of Market Street. During the design process we were very concerned about making sure that this threshold clearly signaled to drivers that they were now on an urban street where different driving behavior was necessary. Although meetings were held with Caltrans engineers to find a solution for what the designers called "touch down" problems, some were never solved satisfactorily. Issues include too-wide ramp lane widths, turns allowed onto Market Street, and no appropriate signage or other cues to reduce vehicle speed, such as a roughened surface texture on the ramp.

Lessons from Octavia Boulevard for building future multi-way boulevards, we suspect, will emerge over time. Currently, the street is too newly arrived to say anything conclusive. Nonetheless, the process of coming to a final design suggests the following:

Research like that carried out on boulevards can be very effective in bringing about change—if focused on specific street types, directed to professionals, and presented clearly in narrative and graphic form so that citizens as well as urban design professionals can easily make sense of it.

The design *process* is important. The right people must be sitting around the table on a regular basis. Problems and constraints must be raised and solutions agreed to during schematic design, not after a design is prepared and presented. This includes design sign-off by all interested parties.

Too-wide side access roadways

Finally, citizen participation and advocacy may not be everything, but it is extremely important in terms of getting inherently conservative city governments and bureaucracies to consider and eventually implement an innovative street design. When one considers all that the citizens brought to the table—referenda, political activism, willingness to keep learning, advocating, and discussing over many years, unwillingness to give up, personal funds—one cannot escape the conclusion that their efforts are a main reason that Octavia Boulevard exists. u

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Must a Bridge Be Beautiful Too?

BY MATTHEW DRESDEN

"It's a Soviet-style bridge, and it's going to result in an aesthetic Chernobyl."

—Jeremiah Hallisey, Member of the California Transportation Commission, San Francisco resident, and Gray Davis appointee

"The skyway approach we are going to have is very open and clean, and for me personally what is special about the area is the bay. The design continues to open up the beautiful vistas of the bay."

—Sunne Wright McPeak, California Business, Housing and Transportation Secretary, Arnold Schwarzenegger appointee

In late 2004, California Governor Arnold Schwarzenegger announced that as part of statewide budget cuts, the design of the new eastern span of the San Francisco-Oakland Bay Bridge would be dramatically scaled back. At the time, estimates of the new span's cost had risen to $5.1 billion from an initial estimate of $1.3 billion. Instead of a single-tower "signature span," Schwarzenegger proposed a towerless concrete viaduct—a slightly raised road across the water that was compared (unfavorably) to a freeway onramp.

The span is being rebuilt because of longstanding concerns by Caltrans and state civil engineers about its seismic integrity. Part of the existing structure collapsed during the Loma Prieta earthquake in 1989, and since then the bridge has been considered unstable, although it has remained open because it is indispensable to Bay Area traffic flow.

The eastern span has long been a sore spot for East Bay civic leaders, who consider its charmlessness—especially as compared to the Golden Gate Bridge, or even the western span of the Bay Bridge—an aesthetic affront. Its new design, arrived at after considerable community input and debate in 1998, was widely praised as elegant and seen as correcting a longstanding geographic disability.

After protracted negotiations between Bay Area lawmakers and the governor, the signature span design was reinstated in 2005, but an important planning and policy question remains. What role should aesthetics play in the design and funding of such a massive civil engineering project? Is a good-looking bridge worth a higher price tag, and if so, who should pay for it?

Early American Toll Bridges

The first toll bridge in the United States was built across the Charles River in 1785, connecting Boston and Charlestown. The Massachusetts legislature granted a charter to the Charles River Bridge Company, a private corporation, under terms that required the company to fund and build the bridge, to collect and keep tolls for forty years, and then to turn the bridge over to the Commonwealth.

The Charles River Bridge contract seemed an easy call for the state legislature to make—they wanted a bridge, and the private company wanted a chance to make money. It was not obvious that toll bridges would make any money; the previous American experience with toll roads had been, in the words of economic historians Daniel Klein and John Majewski, "limited and lackluster." But the Charles River Bridge was on the same location as a financially successful ferry crossing, and it paid back its investors at a rate of thirty to forty percent annually. Its success inspired a boom in toll bridge construction—over the next thirteen years, some 59 toll bridge companies were chartered in the northeast alone.

The Aesthetics of Early Toll Bridges: The Covered Bridge

For early toll bridges, the impetus behind their construction was economic, both for the private financiers and for the governments granting charters. Largely absent from bridge financing were concerns about aesthetics. The development of covered wooden bridges in America illustrates this point nicely. The covered bridge, though not invented in America, reached its apogee here in the mid-nineteenth century, and is celebrated today as a beautiful, albeit obsolete reminder of early American design history, ,

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Opposite: Artist's rendition of the new Bay Bridge east span and a melding of function and form. The real story about how covered bridges came to be, however, is rather less romantic.

The first covered bridge in America, Philadelphia's privately financed 1805 Schuylkill Permanent Bridge, was not intended to be a covered bridge at all. Its original design called for an uncovered stone bridge, but the builders determined that tolls would never pay back the cost of the stone. The building material was changed to wood, with a cover added solely as a protective measure. According to a latter-day account of its construction, the cover "compelled ornament, and some elegance of design, lest it should disgrace the environs of a great City," and so the wooden covering was coated with imitation stone. This additional design feature did not exactly break the bank. In 1805 dollars, the total cost of the bridge was $300,000—at the time, the costliest private structure in American history. The cost of the ersatz stone coating was less than $50.

Covered bridges were soon built all around the Northeast, but the rationale underlying this fad was strictly economic: covered bridges were deemed to last three times as long as uncovered bridges. Although today the bridges draw travelers' interest as beautiful, charming objects, their aesthetic design derives from their function, in this case durability.

American Preeminence in Bridge Design

Throughout the nineteenth and twentieth century, the US cemented its position as the worldwide leader in building innovative bridges, as well as in the quantity of new bridges overall. The main reason for this trend was economic, although geography and culture played roles as well. Unlike the largely deforested European continent, the US was timber-rich and capital-poor in the 1800s, with many carpenters and few stonemasons. Early American bridge designers were thus able to experiment with and implement wooden truss designs to a degree that the Europeans simply were unable to match. Subsequently, with the increasing dominance of the American iron and steel industries, Americans began to construct metal bridges, employing innovative chain link and suspension designs. (Although American James Finley is credited with having built the first practical suspension bridge in 1796, the US did not begin to build suspension bridges in earnest until the mid-1800s, after European bridge builders had made several substantive improvements to Finley's basic design.)

During the nineteenth and twentieth centuries the US experienced two successive, extended frenzies of bridge building: first with the construction of the transcontinental railroad system, and then while building roads for ever-increasing numbers of automobiles. Up through the Great Depression, most toll bridges were privately financed. Since 1929, however, almost every new bridge in the US has been publicly financed.

In 1928, the American Institute of Steel Construction's annual Artistic Bridge Awards began to call attention to the value of beautiful bridges. Today dozens of local and national awards go to innovative or attractive American bridges. It's unclear to what extent these are self-congratulatory awards given by engineers to other engineers, but as noted American bridge engineer D. B. Steinman made clear in his 1952 article, "How Bridges Have Increased Man's Mobility," by the middle of the twentieth century the idea that bridges could and should be both functional and beautiful was firmly ensconced in the minds of bridge designers and the public.

The Golden Gate Bridge

The Golden Gate Bridge is perhaps the most famous bridge in the world today. It is featured on postcards, T-shirts, and inside snowglobes. It has been celebrated in poem and song. It has been the main plot device in a James Bond film. It has its own United States postage stamp. It has been called "matchless in its Art Deco splendor," a man-made object whose "soaring grace enhances the beauty of its natural setting," and "the largest work of art in history." And this is not simply the puffery of local boosters: the Golden Gate Bridge gift shop takes in nearly $3 million annually. But how did this all come to pass? Did the builders of the Golden Gate Bridge (or the citizens who paid for it) know what they were creating?

The Golden Gate Bridge's website would have you believe that a great deal of thought went into the design of the bridge. This is true, of course, but little of that thought was geared toward aesthetics. Geographer Brian Godfrey argues that both the Golden Gate and Bay Bridges were proposed for economic and logistical reasons: first, to relieve traffic at the ferries; second, as part of the civic competition with Los Angeles; third, in recognition of the burgeoning power of the automobile; and fourth, upon the realization that San Francisco's peninsular isolation was becoming increasingly less romantic and more inconvenient.

Most accounts have it that noted bridge engineer Joseph Strauss took on the construction of the Golden Gate Bridge as the greatest challenge of his career. His contemporaries considered spanning the treacherous Golden Gate to be either impossible or so difficult and expensive as to be practically impossible. Strauss' original plans for the Golden Gate Bridge called for a complicated hybrid cantilever-suspension bridge—a design that

has since been reviled as ill-conceived and ugly. Although his initial estimate of $17 million was appealing, the design was untested and it soon became clear that if built as planned, the bridge would cost significantly more and might not even be structurally sound. Strauss' alternative design, a less expensive, clean-lined suspension bridge—the design that ultimately came to be built—was the result of economic necessity rather than a quest for beauty. In other words, the Golden Gate Bridge was designed to be the cheapest, most simple bridge possible.

The Golden Gate Bridge was financed with a $35 million bond measure submitted in 1930 to voters in San Francisco, Marin, Sonoma, Napa, Mendocino, and Del Norte Counties. The bond would be paid off in forty years. The text of a pro-bond brochure, put out just prior to the election, indicates how much weight the bridge backers gave to the economic argument:

> The bridge will pay for itself out of tolls. These tolls will redeem the bond issue, pay all interest, pay for maintenance of the bridge and accumulate a vast profit—not less than $17,242,800, within the forty-year period.
>
> It is the consensus of opinion of all who have studied the subject that the construction of this span will increase property values not only in the territory tributary to the bridge, but throughout the entire metropolitan bay area....
>
> The Golden Gate Bridge is based on the most rational of all methods of taxation, namely, the user's tax.

Not one word of the brochure addressed the design or appearance of the bridge.

The 1930 campaign brochure promised that after the bonds were paid off, the Golden Gate Bridge would become free. In 1969, the bonds were almost paid off and the Golden Gate Bridge , District had nearly $23 million in reserves, but traffic on the bridge was close to capacity. At this point, the state legislature authorized the district to use its reserves to provide public transit for the San Francisco-Sonoma corridor. By 1972, the district provided both bus and ferry service across the Golden Gate.

According to Golden Gate Bridge, Highway, and Transportation District data, since 1972 the average daily bridge vehicle crossings have only risen from 94,344 to 106,456, with an additional 14,323 people now crossing via transit. However, it is also true that Marin County has been losing population, the number of Golden Gate Transit riders has been declining, and the bridge toll has increased to $5 per vehicle.

At the same time, the district has had a significant budget deficit for several years, and is considering such measures as raising the toll to $6 per car, charging pedestrians and bicyclists to cross the bridge, and eliminating free passage for carpools and low-emission vehicles. The primary reason for the shortfall has been attributed to the cost of capital improvements and increased insurance costs (in the wake of the 1989 earthquake and 9/11, respectively). But the district's financial statement reveals that if it were not funding public transit, the bridge would be making a profit.

The San Francisco-Oakland Bay Bridge

The San Francisco-Oakland Bay Bridge has long been the unglamorous sibling of the Golden Gate Bridge. Although its suspension bridge west span, from San Francisco to Yerba Buena Island, is considered "handsome, if conventional," the cantilevered east span, from Yerba Buena Island to Oakland, has been called "probably one of the ugliest bridges in the United States." The Bay Bridge was featured on a stamp, but only as the untitled background to a 1947 airmail issue. It is not a tourist destination, and does not have a gift shop. In 1939, San Francisco hosted a world's fair on Treasure Island, a man-made island in the middle of the Bay Bridge created from earth excavated during the bridge's construction. The name of the fair? The Golden Gate International Exposition.

From the beginning, the Bay Bridge project was significantly more ambitious than the Golden Gate Bridge. When completed, it was the longest, heaviest, deepest, and most expensive bridge ever built. It was considered an essential transportation link in the state economy, and as an official state project (unlike the self-financed Golden Gate) had little difficulty gaining funding. But pure functionality did not completely rule the day: the Bay Bridge's original design, a matched set of cantilevered

Construction of the Golden Gate Bridge

bridges, was unacceptable to influential San Francisco residents. A suspension bridge was also considered for both spans, but the geology of the bay rendered a suspension design on the eastern span considerably more expensive. Local historians note, however, that as long as San Franciscans' view of the cantilevered portion was blocked by Yerba Buena Island, city residents had no problem with such a design. And so the San Francisco half became a pleasing suspension bridge, while the Oakland half remained a graceless cantilevered span.

Did the people of Oakland believe they were getting an ugly bridge? It's instructive to note that the Bay Bridge was designed by California's State Highway Engineer, Charles H. Purcell, and that irrespective of any ostensible aesthetic shortcomings, the bridge was considered an engineering marvel. In fact, in 1956 it was named one of the seven engineering wonders of the world.

Considering Strauss's original design for the Golden Gate, it would be easy to ascribe the aesthetic differences between the two bridges to mere serendipity. But it also seems that the difference in engineers was crucial: Strauss designed bridges for a living, whereas Purcell designed highways. Although it would be fatuous to presume that either Strauss or Purcell were solely responsible for the design of their respective bridges, each one was ultimately responsible for its look.

Funding the Bay Bridge

The Bay Bridge cost $77.6 million, paid for by a series of government bonds. From the day it opened to vehicular traffic on November 12, 1936, it has been the workhorse of Bay Area transportation. This is no surprise; the ferry crossing it replaced transported over 46 million passengers annually. Currently, nearly 100 million total vehicle crossings are made on the Bay Bridge each year; by contrast, slightly less than 40 million vehicle crossings are made on the Golden Gate Bridge.

The Bay Bridge's tolls paid off its bond debt within twenty years. Since that time its net revenues have been controlled by the Metropolitan Transportation Commission (MTC), the Bay Area's regional transportation planning organization. Bay Bridge revenues funded its 1958 reconstruction (when the Key Route streetcar tracks were removed from the lower deck and all lanes were converted to vehicular travel), as well as construction of the San Mateo and Dumbarton Bridges. Since those projects were completed, the lion's share of net Bay Bridge toll proceeds have gone to public transit, including BART, San Francisco's MUNI bus and trolley system, and Alameda County's AC Transit bus system. ◆

San Francisco-Oakland Bay Bridge

After the 1989 Loma Prieta earthquake, which caused part of the Bay Bridge east span's upper deck to collapse, Caltrans inspected the entire bridge and determined that most of the east span was seismically unsound. Designated a "lifeline bridge" for its crucial role in everyday traffic flow as well as in emergency scenarios, the Bay Bridge jumped to the top of the state's list of structures needing seismic work.

A Caltrans study determined that although a retrofit was plausible for the east span, a more cost-effective solution would be to build an entirely new bridge. Bay Area politicians, seeing an opportunity to address the aesthetic injustice inflicted on the East Bay since 1936, leapt at the chance to design a new east span. This time, they vowed, Oakland would get its own world-class bridge.

First, Caltrans came up with a proposal for an elevated skyway that looked substantially like an extremely long freeway ramp. Not good enough, responded the MTC. After several years, numerous advisory committees, and a full-blown design competition, the MTC in 1998 opted for a higher, fancier skyway rising to a "signature span" on the west end. This signature span, so-called because of its bold, distinctive design, would be a self-anchored suspension bridge, with only one tower and cables wrapping entirely around the roadway. It would be the largest such bridge in the world and the first one in the United States. But it was this signature span, this chance for the Bay Bridge to step out of the Golden Gate's long shadow, that caused all the trouble.

Paying for the New Bay Bridge

The entire eastern span was originally budgeted at $1.3 billion. Currently, the signature span alone is estimated at $1.5 billion, with the entire eastern span at $6.3 billion. When the signature span's design was initially approved, it was vetted by a panel including engineering professors and Caltrans employees. Since then, it has been alternately attacked as a waste of money, unbuildable, and possibly even unsafe. The latter two arguments never gained much traction, but the former argument was at the heart of Schwarzenegger's objection.

Part of the problem was that the signature span was designed at the height of the Internet bubble, when the Bay Area was riding high economically and the state enjoyed a sizable budget surplus. It didn't help, though, that steel prices subsequently skyrocketed and that then-Governor Gray Davis had included a "Buy American Steel" provision in the bridge contract. It didn't help that terrorists attacked the country on 9/11, sending insurance and bonding costs to unforeseen heights. It didn't help that only one construction company bid on the signature span. It certainly didn't help that Caltrans underestimated costs, paid millions of dollars to outside consultants, and failed to communicate any of this to state legislators.

Meanwhile, the reason for building the new bridge in the first place—to make the Bay Bridge earthquake-safe—is no less pressing. According to the United States Geological Service, there is a 62 percent chance that a major earthquake will hit the Bay Area in the next three decades.

When Schwarzenegger rejected the sole bid for the signature span, he insisted that if Bay Area residents wanted anything but the plain skyway, they would have to pay for it themselves. According to his estimates, the original Caltrans proposal would save $300 to $400 million. Bay Area lawmakers contended that the governor's proposal would require a new set of plans and environmental reviews and might even cost more, and that in any event the state ought to pick up the tab as a seismic repair, because the Bay Bridge was part of the statewide transportation network and was state-owned to boot.

The debate soon reduced to finger-pointing: state officials accused Bay Area lawmakers of placing aesthetic concerns over safety, while Bay Area lawmakers accused state officials of placing financial concerns over safety and throwing in an ugly bridge as part of the bargain. In July 2005, the parties compromised: the state provided some extra money, but also turned control of the project over to the MTC, which would pay for the remainder (including any future cost overruns) by floating bonds and increasing tolls on Bay Area bridges. In February 2006, the suspension span contract went out to bid again.

New east span under construction beside the old east span

San Francisco-Oakland Bay Bridge original east span and Golden Gate Bridge (background) both during construction

Conclusion

The new Bay Bridge can only be thought of in the context of the Golden Gate Bridge, for without the Golden Gate there would be no signature span. But the Golden Gate Bridge, lauded today as an artistic triumph, was primarily a product of efficiency and minimalism, with a design borne largely of economic necessity. In this respect it stands as a proud inheritor of the tradition of American bridge-building, dating back to the first covered bridge: a public work whose beauty is intertwined with its functionality.

That is not to say that any bridge whose form results from economic and functional necessity will be hailed as a work of art. If the Bay Bridge had been built with two cantilevered spans, as originally planned, it would have been just as much a melding of form, function, and economy as the Golden Gate Bridge, yet arguably would have been even more loathsome. Perhaps the problem is a failure of imagination, but aesthetic beauty is, as ever, in the eye of the beholder. Bridge builders have always seen the Bay Bridge as a work of art. The rest of the Bay Area can't wait to get rid of it. It seems appropriate, then, that they will be paying for their chosen design by way of increased bridge tolls.

At any rate, Bay Area residents can no longer claim that the Bay Bridge never gets any attention. It featured prominently in the news for much of 2005. It even has its own movie making the rounds at film festivals: *The Bridge So Far,* a documentary chronicling the struggle to rebuild the east span. Construction on the east span is now slated to be complete in 2012. No matter how the signature span is received, the Bay Bridge will surely be back in the news at that time, to reclaim its title as the most expensive bridge ever built. u

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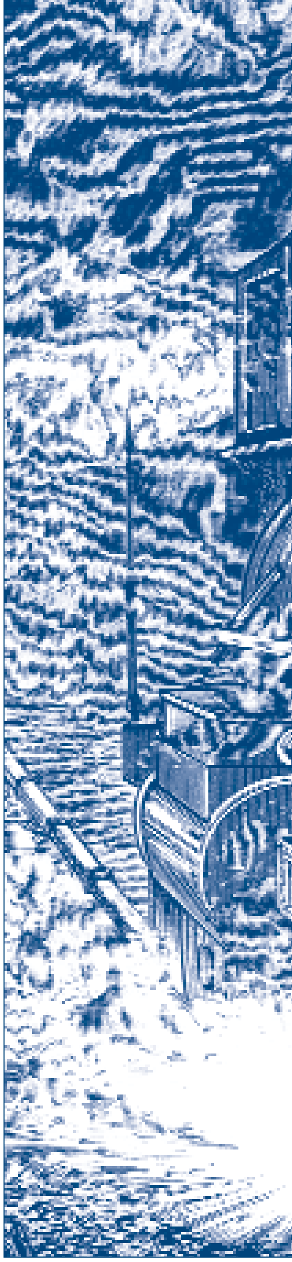
HOW PRIVATIZATION BECAME A TRAIN WRECK

BY ERIC MORRIS

September 15, 1830, saw the grand opening of the world's first steam intercity passenger railway. It also saw the first railway death, when William Huskisson, prominent Tory MP and railway supporter, misjudged the speed of an approaching locomotive and was run over. He was not to be the last British politician to wish he'd never had anything to do with the railways.

From 1994 to 1997, John Major's government conducted an audacious privatization of British Rail. The system was broken up into almost a hundred pieces and sold. Ten years later, disgust with the privatization and its aftermath cuts across British society. There are few stakeholders, from riders to drivers to railway executives to shareholders to regulators to politicians, who do not consider the experiment a dismal failure.



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The Push to Privatize

There are various theories as to why the Tories decided to break up BR. Those who ascribe baser motives to the government's actions focus on its allegedly Thatcherite, ideologically blinkered lust for privatization for privatization's sake. Other less reputable motives may have included a desire to trim the sails of organized labor or a philosophical antipathy toward rail (as it represents a "collectivist" form of transport as opposed to the "individualist" car).

The government maintained its hand was forced by the poor performance of BR and its rapacious need for subsidies. The Tories felt the railroad's monopoly status encouraged bureaucracy, low productivity, and an inattentiveness to customer needs. The government believed the antidote was markets and competition, which would promote efficiency and innovation. The Tories also claimed they wanted to create an "ownership society" and put the railways in the hands of the people. For his part, Major maintains he acted because BR was underfunded and needed to tap the markets for fresh capital.

There was considerable debate over the form privatization would take. The more cautious wanted to sell BR as one unit, break it into vertically integrated regions, or "sectorize" by dividing the business into intercity, regional, and freight companies. These plans were rejected on the grounds that they would not foster competition. Instead, the government decided to create multiple train operators who would be free to compete on any part of the network. In order to have a level playing field with ,

open access, it was decided to separate ownership of the track from ownership of the train operations.

The dismemberment of BR created a large and complex jumble of interlocking firms. The engines and rolling stock operations were divided among three separate companies known as ROSCOs that leased the trains to 25 passenger train operating companies (TOCs). Four freight companies were sold off, as were technological service units, the businesses that dealt with Royal Mail traffic, and European passenger services. Ownership of the track, stations, and other infrastructure was assigned to a newly formed company called Railtrack, which would subsist by charging access fees from the train operators. And in a move that was to have repercussions in the future, BR's engineering and maintenance divisions were broken up into thirteen separate companies that in turn contracted with Railtrack for their services. All of these pieces would now (theoretically) work together, not as part of a hierarchical command structure, but as a network of firms whose relationships would be governed by contracts and government regulation.

There seems to be near-universal agreement that privatization was rushed through with indecent haste. The Tories were an unpopular government with a tiny majority and believed they were going to lose the next election. Thus they raced to make privatization a fact that could not be erased by Labor.

The government feared it would have difficulty finding buyers. London's financial sector had never encountered a business like this, did not know how to value the assets, and was wary of risk. In addition, it feared that Labor would eventually renationalize. In a desperate effort to find buyers, the Tories were forced to "fatten up" the railway companies by raising subsidies. In addition, the companies were often sold at bargain-basement prices. When the true value of the pieces was recognized, those prescient enough to have gotten in on the ground floor often made vast profits.

But the most momentous decision was made with respect to the TOCs. Because potential bidders feared that competitors would descend on the most lucrative routes and skim the cream, a reluctant government was forced to abandon its goal of competition on the rails. Instead, local monopolies were awarded to train operators, undermining the very purpose for which privatization was undertaken. Even despite this concession, there were initially few bidders for the franchises.

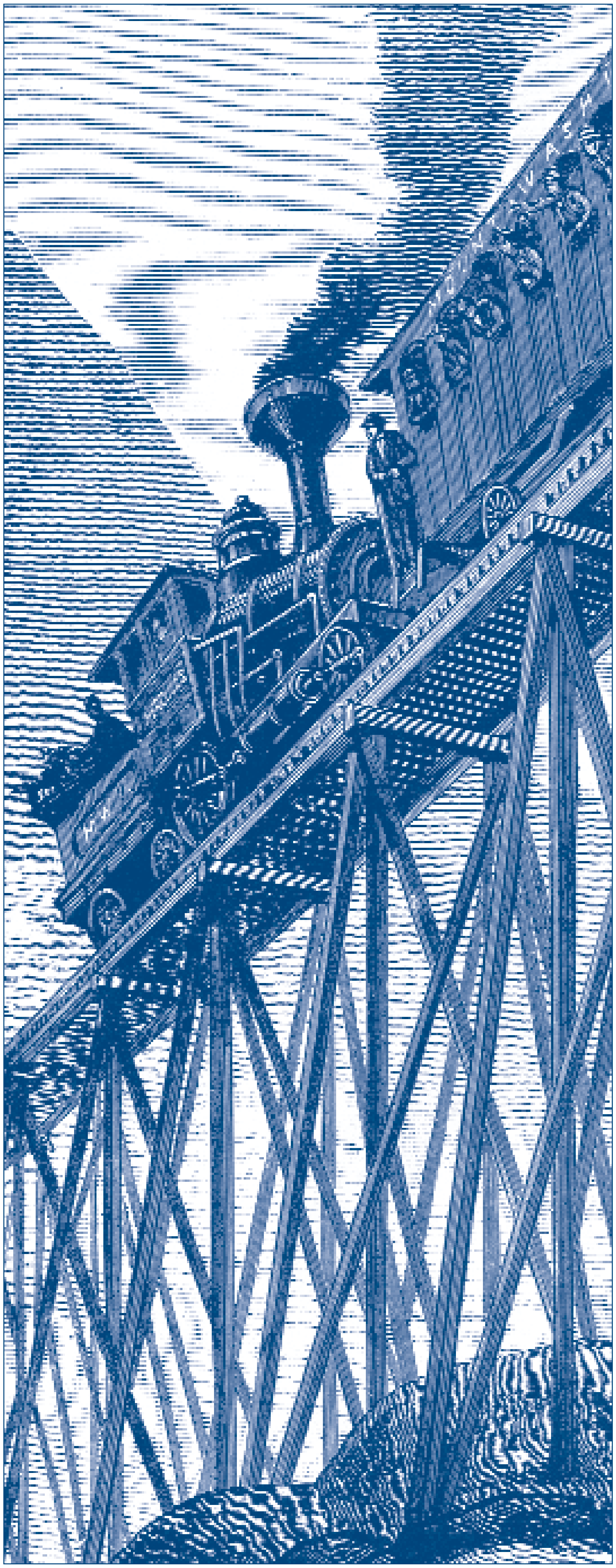
The Railtrack Debacle

The centerpiece of the system, Railtrack, was eventually offered in a public flotation in 1996. This presented the government with great difficulty. Railtrack was immense in scope (10,346 miles of track and signaling, 40,000 bridges and viaducts, 50 tunnels, 2,508 stations, 1500 signal boxes, 9000 level crossings, and 90 shops and depots). The complexity of its new, untested relationships with the other parts of the system were daunting (there were 224 separate legal agreements covering freight access alone). To overcome these obstacles and complete the sale, the government wrote off most of Railtrack's debt, set generous access fees, and offered the company at the ridiculously low share price of £3.90. The offer was seven times oversubscribed, and by 1998 Railtrack's share price was £17.68. This could be seen as a great giveaway, although given that Railtrack was forced into bankruptcy in 2001, it could be said that Railtrack's shareholders got the bad end of the deal (they eventually received around £2.50/share in compensation from the government).

Railtrack's fall was swift and total. Within just a few years, it became one of the most vilified companies in Britain. How did it plummet so far and so fast?

The early years were good ones for Railtrack, but it soon became a victim of its own success. Thanks in part to the booming economy, between 1996 and 2000 the railways experienced a thirty percent growth in usage. But trains and stations became dirty and overcrowded. There were nearly one million passenger complaints in Railtrack's first year of operation, more than ten times the level in 1983. The TOCs responded by increasing the number of trains, putting on a thousand extra services from 1997 to 1999. But this created its own problems—Railtrack calculated that for each extra one percent of service there was a 2.5 percent increase in delays. Railtrack pointed the finger for this at the operating companies. The train operators blamed Railtrack's failure to invest in new capacity.

But it was the issue of safety which above all others sank Railtrack. While there were only eight rail fatalities from 1990 to 1997, there were 38 deaths in the first three years under private management. Two bloody accidents brought Railtrack and the TOCs into disrepute, but damaging though these incidents were, it was a relatively minor third accident that more than any other factor destroyed Railtrack. On October 17, 2000, four were killed when a train derailed near the town of Hatfield due to a cracked rail that shattered into 300 pieces. This time the blame belonged squarely with Railtrack, which had known about the problem and failed to fix it. ,



Yet it was not the accident itself that destroyed Railtrack—it was the aftermath. Railtrack panicked. Speed limits of 20 mph were imposed at every site that showed evidence of cracking—1,286 of them. While the company's response may seem prudent, most observers agreed it was being far too cautious, as broken rails are fairly common and rarely cause fatalities. Railtrack's overreaction was undoubtedly caused by its poor understanding of engineering and its surprising lack of knowledge about the conditions of its assets (Railtrack had no catalog of what it owned).

The result of the speed limits was widespread chaos throughout the system, with massive delays, canceled services, and closed lines. Railtrack, already unpopular, sunk to new lows in the public's estimation.

The bedlam meant the end of Railtrack's financial health. Under the terms of its contracts with the TOCs, Railtrack was forced to pay compensation for the delays. In part due to these huge payments, Railtrack showed a post-Hatfield loss of £534 million compared to a profit of £360 million the previous year. Its stock price plummeted. Deeply in debt (to the tune of £3.3 billion) and with no prospect of raising funds on the capital markets, Railtrack had no choice but to return to the government, cap in hand. But patience had run out. On October 7, 2001, Transport Secretary Stephen Byers shocked the nation by putting the company into insolvency. Railtrack was eventually sold for £500 million to Network Rail, a newly formed private but nonprofit company.

The Problems of Privatization

What wrecked the privatized rail system? Those predisposed to doubt privatization in principle maintain that private gain has no place in what is essentially a public service. To them, privatization was the product of right-wing ideologues and the capital markets to whose tune they were dancing. The fact that Railtrack paid healthy dividends while protesting to the government that it lacked funds for investment and safety strikes many as the height of capitalist perfidy.

Advocates of privatization, however, can make a case that there was actually not enough capitalism involved. Both Railtrack and the TOCs were monopolies, shielded from market discipline. It could be maintained that the structure of the system never gave competition and markets a chance to operate.

The system's structure had other grave flaws. The atomization of BR created administrative chaos. When BR was dismantled, a unified, military-style command structure was replaced by a heinously complex web of contractual relationships between almost a hundred pieces of the old BR plus numerous subcontractors. Because of the uncertainty of the relationships, contracts attempted to account for all possible future situations with an elaborate system of payments and penalties. This led to an adversarial system in which the parties were frequently sniping at each other, pointing fingers, and demanding compensation.

Functions that cried out for integration were separated. First, although Railtrack owned the track, it did not own the maintenance companies. And the maintenance companies did not own the companies that actually did the repair work. Without an effective in-house engineering department, Railtrack was in no position to supervise the contractors. Thus, despite Railtrack's nominal control, the maintenance and repair companies actually called the shots.

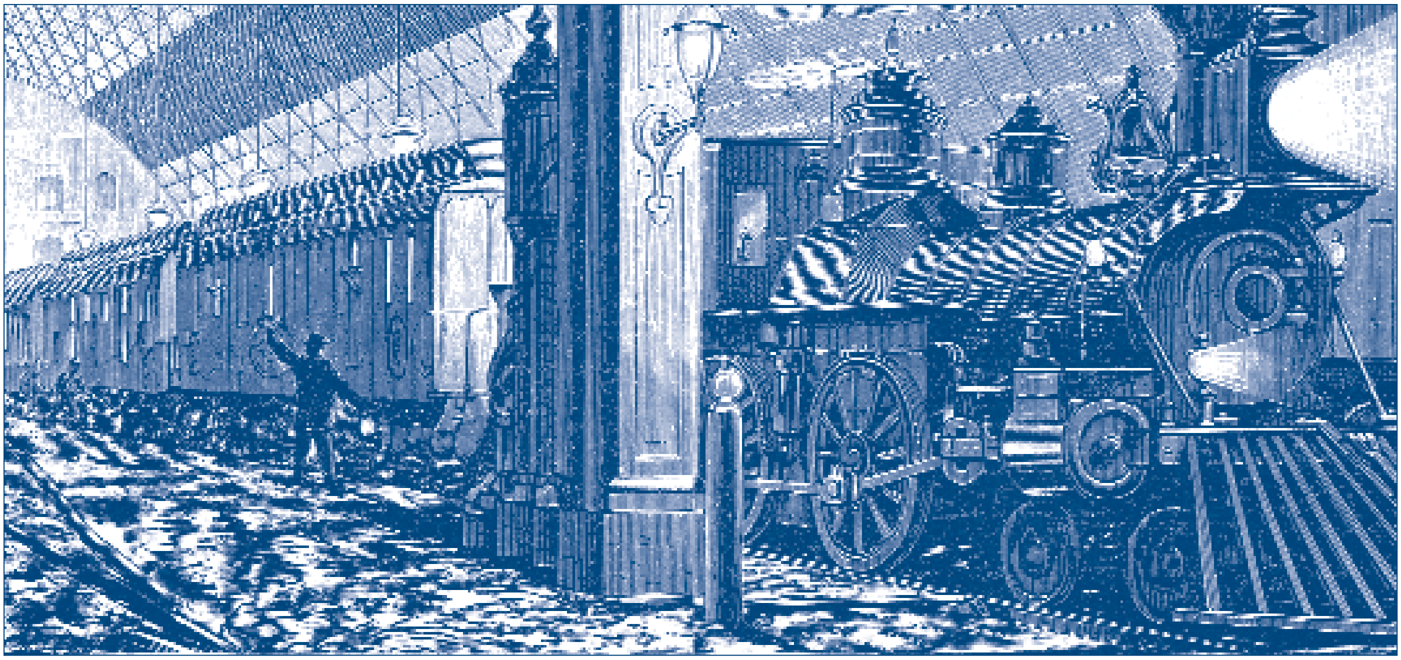
Another problem was caused by the separation of train operations from the track. Because Railtrack was required to compensate the TOCs for delays, the companies endlessly squabbled over who was to blame for them. The system for attributing fault was mind-numbingly complex and onerous, involving 1,900 checkpoints, 204 predefined delay causes, and 1,300 delay-attribution points. Railtrack employed fifty people just to account for delays in the Southern region alone. Bitter disputes and legal action ensued.

This leads to another explanation for the failure of Railtrack: perverse incentives. The TOCs had an incentive to increase service in response to the boom in traffic in the late 1990s. But since ninety percent of the access fees Railtrack charged to the TOCs were fixed, Railtrack had little interest in approving new train paths or adding additional capacity. Thus, to the consternation of the TOCs, investment in the system languished.

The problems were not limited to the private side of the equation. The role the government played in the (mis)management of the railways was considerable. A confused tangle of organizations with overlapping responsibilities oversaw the railways, including the Office of Passenger Rail Franchising, the Office of the Rail Regulator, Her Majesty's Railway Inspectorate, the British Railway Board, the Rail Passengers Council, and the Transport Secretary. Although these were supposed to complement each other, they produced duplication, paralysis, and turf battles.

Labor, which assumed power in 1997, fared little better. It took virtually all of its first term to pass any significant legislation. Eventually, Labor created yet another body, the Strategic Rail Authority, to tackle the ills of the industry. But this simply added one more layer of bureaucracy.

Plain old bad management also played a part in privatization's demise. Many of the people in important positions had



little or no experience with railways. Railtrack CEO Gerald Corbett and his successor Steven Marshall had been executives at a food and drink company prior to their association with Railtrack. Old railway hands felt their advice was ignored by newcomers who did not understand the business and had little interest in learning.

In the opinion of many, the culture of the railways, carefully nurtured under BR, was destroyed. Employees had to cope with the dismemberment of their beloved paternal organization. Widespread staff cuts bred a climate of fear and the need for many to work excessive hours. A new emphasis on cost-cutting frustrated employees, who felt the economies were irrationally conceived and operationally damaging. A great intangible—pride in their jobs and pride in the railway—deteriorated, and there was considerable nostalgia for the old organization and the sense of belonging it fostered.

Culture change, after all, was an explicit goal of privatization. In the view of privatization's supporters, the railways were a bastion of union militancy and poor public-sector work habits. Although there may be a degree of truth in this perception of the industry's ills, it cannot be denied that morale under the privatized regime suffered.

Railtrack alienated its employees, its investors, its passengers, its regulators, and just about everyone else. Its demise was thus greeted with considerable relief across Britain—it was, opined the *Economist*, like "putting down a very sick dog." But it is still worth asking: did anything go right?

In Privatization's Defense

First, it must be said there were mitigating circumstances. Many of the problems Railtrack faced were inherited. British Rail bequeathed an overbuilt system, yet for political reasons Railtrack and the TOCs were forced to continue providing service on money-losing lines. Second, the quality of the assets they inherited was often poor, as BR had been starved of capital. BR's response to rising demand had been to raise fares rather than invest or expand service. The plant was run down and lacked the most modern technology.

This raises the issue of safety. It is true that there were 42 deaths in the four years after privatization, compared with only eight in the early 1990s. But Railtrack's record was not terribly far out of line with the 75 deaths that took place in the 1980s. In fact, the total number of accidents and derailments was actually lower than it had been under BR.

Two of the major disasters were caused by drivers running through red signals, something arguably out of Railtrack's control. One could maintain that Railtrack should have installed advanced safety features which would have prevented those mishaps, but those features were clearly uneconomical. The Hatfield accident was more unequivocally the fault of Railtrack. Yet, ironically, the speed limits and the pandemonium they caused were not the result of a cavalier attitude toward safety but rather excessive concern for it.

Why did Railtrack impose such a draconian and probably unnecessary safety regimen? Perhaps the answer lies in the ,

state of the modern media. Twenty-four-hour news channels and sensationalist tabloids give greater coverage to the morbid details of train crashes than ever before. In truth, rail is a far safer mode than road travel (ten people die on Britain's roads every day), but only the rail disasters attract the public's intensive scrutiny. For this reason, Railtrack simply could not afford another crash.

Moreover, Railtrack faced the public's suspicion on account of its being a private company. Undoubtedly, in the eyes of many, these accidents (as well as the delays, dilapidation, and crowding) were the result of penny-pinching and greed run amok. The public was deeply skeptical about the very notion of a public service being run for private profit, and thus the tenor and volume of the criticism Railtrack faced were perhaps to an extent unwarranted.

There are some aspects in which the privatized railroad succeeded. From 1997 to 2002 the number of passengers increased by twenty percent and distance traveled by thirty percent. At least part of the credit should rest with the TOCs. First, they ran more trains, which BR was loath to do. This may be seen as a case of privatization delivering on the promise of more efficient and effective employment of the system's assets. Another success was improved marketing. In some respects, the rail system did indeed become more customer-friendly.

In addition, the privatization period was not without new investment, and there were cost savings and a slimmed-down labor force, although many (particularly in organized labor) consider this a black mark for Railtrack, not a badge of honor.

Fallout

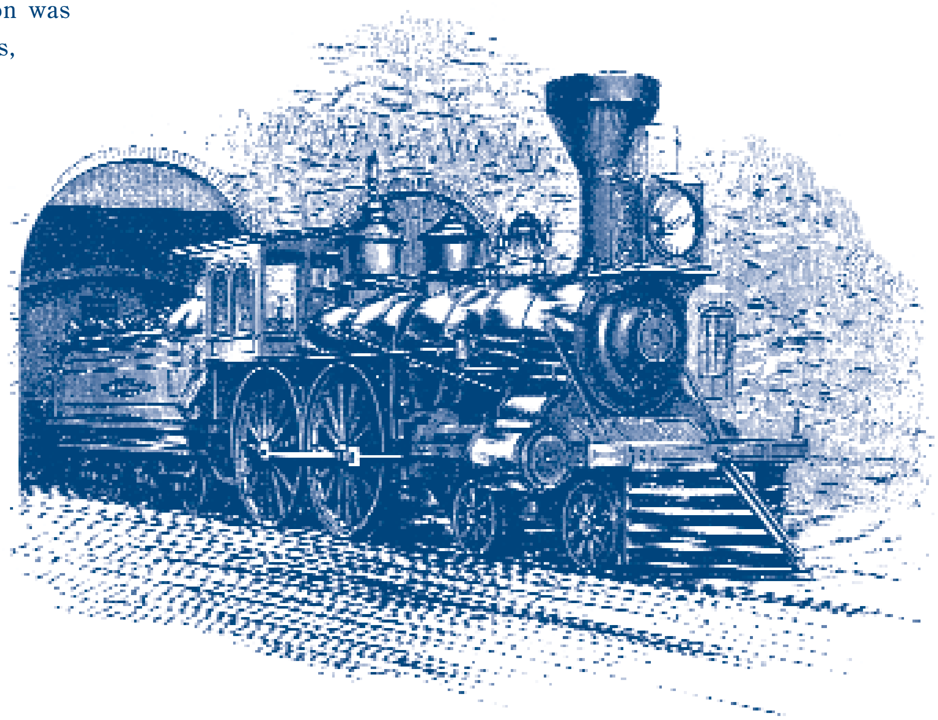
The final argument on privatization's behalf is the record of its successor. Network Rail is run by a not-for-profit corporation with an extremely unwieldy governance structure. Critics generally agree that it is merely a front for what is, in essence, renationalization. The prime advantage of the current system, at least as far as the government is concerned, seems to be that Network Rail's debts are kept off the public balance sheet. And given the levels those debts would reach, the government seems to have made a wise decision.

Disorganization reigned in the months after the transition. Delays rose and Railtrack staff deserted in droves. The system desperately needed private finance, but not surprisingly it proved difficult to raise capital. The Network Rail structure was hastily cobbled together with a speed that makes Railtrack seem the product of careful deliberation.

By 2002 passenger numbers and revenue were beginning to fall for the first time since privatization. Delays were worse than they had been under Railtrack. Almost one-third of the TOCs were in need of a bailout. At the same time, thanks to questionable management, Network Rail's already huge deficit continued to swell. To stem the tide of red ink, an unpopular across-the-board fare hike was instituted. Recently, the system has improved in terms of ridership, performance and reliability, but only at the cost of ever-rising subsidies (from £1.4 billion in the year before Hatfield to £4.6 billion per year today).

Thus a final point should be made in privatization's defense. The railways did not work particularly well before nationalization or under BR. Privatization was judged a failure, but by many measures, creeping renationalization has been worse. In sum, no administrative system has ever proven totally satisfactory. Perhaps the conflicting goals of profit maximization (or, as is more usually the case, loss minimization) and the provision of a social service are to a degree unreconcilable.

Over the last ten years, British politicians of both parties have not done the rail system any favors. Perhaps they are taking revenge on the railways for the death of poor William Huskisson. u



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Transit and Contracts: What's Best for Drivers?

BY SONGJU KIM AND MARTIN WACHS

THROUGHOUT ITS HISTORY, most public transit has been provided by private companies. During the second half of the twentieth century, however, things changed. Transit came gradually into public ownership as revenues from fares no longer covered costs and operators faced bankruptcy. Local, state, and federal subsidies kept transit afloat in most metropolitan areas. In reaction to steadily increasing subsidies and rising operating costs, many said transit services should be contracted out to private operators. Margaret Thatcher had made great strides toward privatizing transit in Britain, and there were calls for adopting similar strategies in the US. Proponents argued that private operation would be more efficient and less costly, while opponents said that private operators would save money simply by paying workers less than public operators and providing inferior benefits. Actual data were hard to come by, and both sides used dueling studies to prove opposite conclusions based on competing ideological commitments rather than actual data. It is still not completely clear whether privately operated transit service is more efficient than publicly run services.

Transit is labor intensive, and personnel costs for bus drivers, train operators, and mechanics account for nearly three-quarters of a transit operator's total costs. As the transit industry in the United States shifted from largely private to largely public ownership and operation there were dramatic increases in service costs and deficits. Between 1950 and 1980, the inflation-adjusted operating cost per revenue-hour of transit service rose 183 percent. Most of this increase was covered by public subsidies.

Proponents of transit contracting argue that wherever transit operations have been contracted out in the United States and Europe, the quality of service has improved and the cost to taxpayers has been reduced. Opponents believe that cost reductions are not true measures of improved efficiency, saying that most savings come from depressing wages, reducing workers' benefits, and imposing more demanding work rules—merely transferring costs by reducing the well-being of the transit workforce.

Today, about eighteen percent of all vehicle-hours of transit service in the US are provided by private companies working under contract to public transit agencies. A variety of published studies claim that contracting has resulted in cost savings ranging from ten to forty percent. In debating how much money contracting has saved, most analysts conclude that cost reductions are due to lower labor costs and lower levels of unionization in the private sector. However, it is difficult to find reliable information, and many studies of contracting have been ideologically charged or based on single case studies comparing costs over rather short periods of time.

Outline of Study

Our study investigated twelve bus agencies between 1995 and 2001. Five were operated by private contractors; seven were public agencies. Among the seven, four engaged in a mix of offerings, including some services operated directly and some contracted out to private operators. The remaining three were a "control group" of public operators providing similar services but using very few or no private contractors.

Over the years small local bus contractors have increasingly been acquired by a few large international private companies. All private operations in our study were provided by the three large international transit contractors that now dominate the market. Since the private companies refused requests to share data with us, we relied entirely on data they entered into the National Transit Database, a widely used source of information on transit operations throughout America. Interestingly, the drivers at four of the five private operations we studied were covered by union agreements. ,

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Measuring Drivers' Well-Being

Besides hourly wages, drivers' compensation packages include fringe benefits such as paid absences and restrictions on work assignments. Our study examined wages, benefits, paid absences, and extra payments due to work rules.

It usually takes more than one driver pay-hour to produce one hour of actual revenue service because contractual regulations require paying for time not necessarily spent driving. For example, drivers are also paid for time spent deadheading—driving vehicles to or from their routes without passengers. In addition, drivers are paid for absences such as holidays and paid vacations. Time spent on standby for assignments, on training, and for union activities is also paid for, and drivers earn extra pay for overtime. Additional costs associated with labor include health and disability insurance. These costs are shown graphically in the following chart:

FIGURE 1

Schematic diagram of driver compensation per hour

Earnings are composed of two components, with wages often accounting for a larger share than supplementary pay. In addition to earnings, the costs of labor include paid absences such as holidays and fringe benefits like retirement programs and health insurance.

Findings

Drivers for private contractors received lower wages and fewer benefits than drivers for public agencies.

Bus drivers for the five private operations included in this study received a base hourly rate of about $10 to $11 (in 2001 dollars), or about $6 to $8 per hour less than drivers working for comparable public agencies. Expressed as an annual difference, privately employed bus drivers earned between $9,600 and $12,000 less per year than drivers working for public agencies during the years we studied. Thus we estimated that wage rates for drivers with private contractors were about 38 percent below their counterparts in public agencies, and their annual earnings were 34 percent lower. Privately contracted drivers' benefits packages cost approximately $8,000 to $9,000 per year—which amounted to $11,800, or fifty percent, less per year than drivers working directly for public operators.

Contracting out appears to reduce transit drivers' benefits more than wages.

Between 1995 and 2001, the annual value of a privately contracted driver's fringe benefits fell by $1,600 in 2001 dollars, while her yearly wages increased by $2,100. Benefits made up more than 25 percent of a contracted driver's yearly pay, and 35 percent of a public agency driver's pay. This difference was due mostly to less paid leave among the private contractors. On average, drivers working at public agencies received three times more paid days off than did drivers for private contractors—about 52 versus 15 days off per year.

A privately contracted driver worked on average 100 to 200 more hours per year than a public driver.

Proponents of private contracting for transit service often argue that it saves resources because private operators have simpler work rules than public operators. They say that many of the high costs of public transit are due to archaic and demanding work rules, for example, requiring payments for overtime and for hours when drivers are not actually driving. We were thus quite surprised to find that while basic wages and fringe benefits were lower for the privately contracted workers, there were relatively higher payments due to work rules to workers at four out of five private operators. Overall, private contractors had generally lower operating costs per revenue vehicle hour (by $35) and relatively higher overall labor efficiency—in terms of service produced per dollar of cost—than their public counterparts, yet they showed higher costs imposed by drivers' work rules. This finding suggests that private contractors' cost savings are achieved ,

FIGURE 2

Hourly compensation of bus drivers, 1995 to 2001 (in 2001 Dollars)

Note: not to scale

through lower wages and less costly benefits packages rather than because they utilize their workforce more efficiently than public operators.

At first glance, it is perplexing that private contractors spend more due to drivers' work rules than do public operators, since private contractors would be expected to benefit from more flexible work rules. A probable explanation is that the lower-paid drivers for private contractors seek to make more money by making themselves available for overtime. In fact, we found that full-time drivers working for private contractors worked on average about 150 hours more annually than the national average among bus drivers.

Accident insurance and training generally cost more for private contractors than for public agencies.

Four of the five private operators in this study had much higher costs related to accidents than did their public counterparts. Higher driver turnover rates and reliance on less experienced drivers among the private contractors help explain the difference. High driver turnover is a chronic problem for all transit operators, but particularly for private contractors because they pay lower wages and offer fewer benefits. High driver turnover means less experienced drivers and higher accident rates. Employing fewer drivers means that each driver works more hours, and fatigue also causes higher accident rates.

Private operators also had higher costs for insurance, liability, unemployment compensation, and worker's compensation. These also can be caused by high turnover, frequent layoffs, and inexperienced or poorly trained drivers. Among other labor cost items, training and non-operating paid time were more costly to private bus operators. Privately contracted drivers spent one out of eleven scheduled work hours on such functions as training, accident reporting, and union duties. Higher spending on these items is a form of inefficiency, which must be balanced against increased efficiencies from lower wages and fewer fringe benefits.

Private contractors use fewer part-time workers.

It is widely believed that private contractors save money by using more part-time workers than do public agencies. Because the demand for transit rises in the morning and afternoon rush hours, many believe that private contractors can avoid the high costs of overtime by hiring part-time workers. We found, however, that the percentages of part-time employees at private operators are actually much lower than at public agencies—about two percent versus eleven percent of drivers and operation-related personnel. This may be because private operators pay lower wages and provide fewer paid absences.

Conclusions

Although our study was based on a small sample of transit operators, we examined trends over a five-year period, employed experimental and control groups, and used data that were carefully screened for precision. We found that transit services that were privately contracted out did achieve cost savings. But those cost savings came largely through lower wages and fewer benefits for transit workers rather than through other kinds of efficiencies, such as reductions in costs due to flexible work rules, hiring more part-timers, or lower insurance or accident costs.

It could well be true that contracting out to private operators in some metropolitan areas has also slowed increases in the costs of providing transit service by public agencies in other locations. Increased reliance on part-time workers and slower increases in the costs of wages and fringe benefits among public authorities are responses to the increased use of private contractors elsewhere. Unions representing public transit employees are fearful that demands for higher wages and fringe benefits will be met by louder calls for private contracting, so they are increasingly willing to accept more modest offers from management.

The mechanisms and consequences of private contracting are inherently complex. Local contexts differ and the terms of service contracts vary widely. More research is needed to clarify the kinds of relationships discussed in this paper, yet it is difficult to conduct rigorous research when private companies routinely refuse to share information. It is increasingly clear, however, that there are lower costs associated with contracted services. They appear to result from lower wages and fringe benefits more than from streamlined operations. Those who believe that "efficiency" means producing a given level of service at a lower cost will assert that the lower wages and fringe benefits *are* mechanisms for achieving greater efficiency among contractors than among public operators. However, those who consider efficiency to be more service at lower cost *without* lessening the welfare of transit employees will conclude that privatization lowers costs but does not necessarily enhance efficiency. u

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THE ACCESS ALMANAC

Floating Cars

BY DANIEL BALDWIN HESS

SURPLUS VEHICLES LEFT BEHIND in New Orleans by evacuees are a grim reminder of the excessive number of cars in the United States, where vehicle ownership rates are greater than in any other nation on earth. After Hurricane Katrina battered New Orleans on August 29, 2005, flood waters from Lake Pontchartrain and the intracoastal canals submerged an estimated 200,000 to 300,000 cars unused in the evacuation of the city. Near the 17th Street Canal, gushing water overturned cars and piled them one on top of another, and parked cars crashed through garage walls into neighboring back yards.

Before the hurricane struck, 27 percent of New Orleans households (much higher than the national average of 10.3 percent) did not have access to a private vehicle, but 30 percent owned two or more vehicles, and many of these households must have left one or more cars behind when they evacuated. Still other residents with cars chose not to evacuate, and both they and their cars were scattered throughout the city when the flood waters began to rise.

As the flood waters receded, the floating, water-soaked cars—originally parked in surface parking lots, parking structures, driveways, parking pads, garages, and at curbside—were deposited haphazardly across the landscape on streets, on roadway medians, and in front and backyards. Compacts, sedans, SUVs, minivans, taxicabs, ambu-

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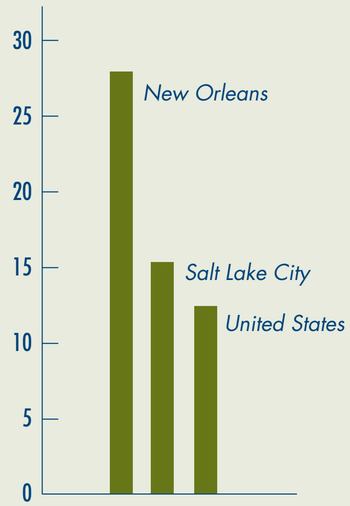
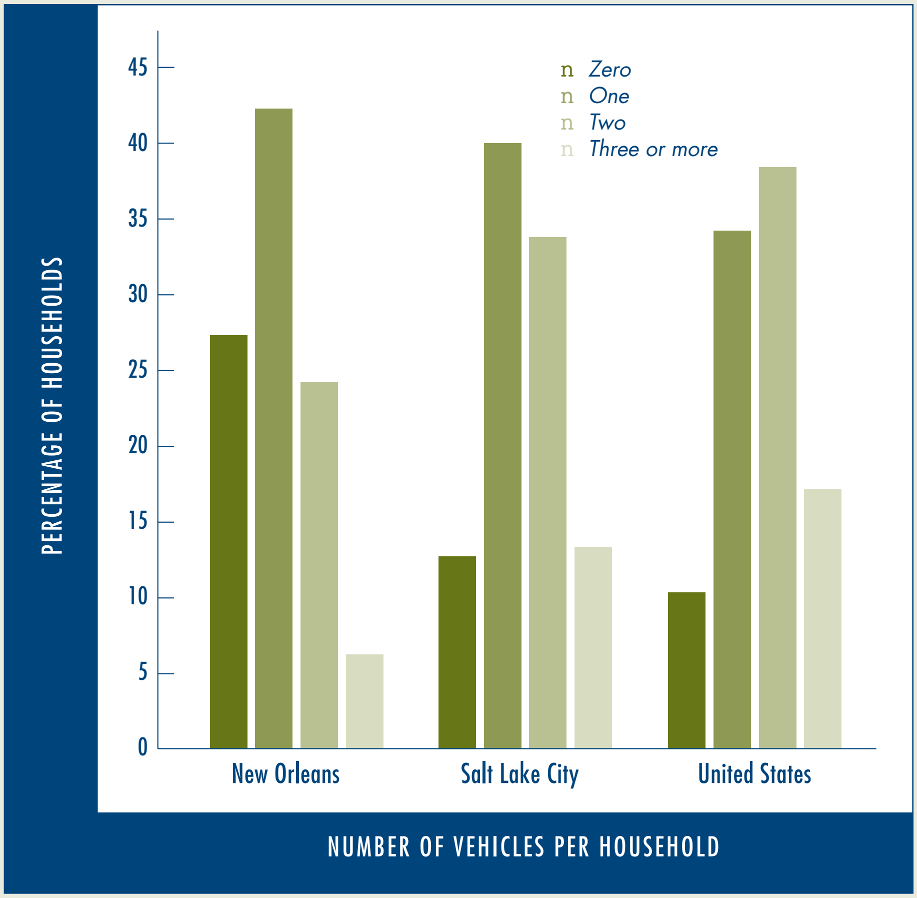


Percentage of individuals below poverty level



Source: 2000 US Census, Summary File 3

lances, jeeps, trucks, hearses, and limousines are scattered throughout New Orleans like a child's toy collection. These vehicles are corroding and growing mold, and most will never operate again.

City crews have been clearing streets of disabled vehicles for months. The first step was to tow abandoned cars from travel lanes so emergency vehicles could traverse city streets unimpeded. Many cars were initially towed to the roadside, to front lawns, or to the grassy medians in the city's elegant divided boulevards such as Napoleon Avenue and St. Charles Avenue. Now the cars are being towed to temporary lots, where vehicle numbers can be recorded by state police and insurance companies can assess damage. After that, most cars will be moved to scrap yards, which will certainly fill up quickly.

New Orleans is a city with high poverty rates and relatively low levels of automobile ownership. Imagine if a similar catastrophe struck the Salt Lake City metropolitan area, where average household automobile ownership is seventeen percent higher than in the New Orleans metropolitan area. New Orleans' landscape of destroyed cars provides a stark illustration of automobile dependency and excess. u

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