Rapid Transit: A Real Alternative to the Auto for the Bay Area?

Years before the automobile was widely accused of ecological villainy, residents of the San Francisco Bay Area voted to provide themselves an alternative. When the trains start running later this year, the 75-mile-long Bay Area Rapid Transit (BART) system will be the first new urban transport network in the United States since Philadelphia's was completed in 1907.

Unlike the old systems, BART must compete with the automobile in an area where the automobile is a well-established way of life. If BART's fast, quiet trains and new transit technology can lure Bay Area motorists off the highways, then rapid transit has a rosy future in the United States. And rail technology, virtually neglected since the heyday of the railroads, will advance further as aircraft, electronic, and other industries converge on the rapid transit market.

Forsaken for many years as the automobile gained popularity, rapid transit is now often prescribed for a host of urban ills. BART could reduce the Bay Area's air pollution and traffic congestion, provide inner-city ghetto residents access to new jobs, and slow down the sprawl of suburbs that threatens to devour most of the region's open space. But in spite of such possible advantages, it was not ecology or job access, but the potential profits from land development and the rejuvenation of downtown San Francisco that prompted a group of influential businessmen to provide the push necessary to bring a transit system to the Bay Area. And that was no easy task. Time and time again, the BART project came close to failure.

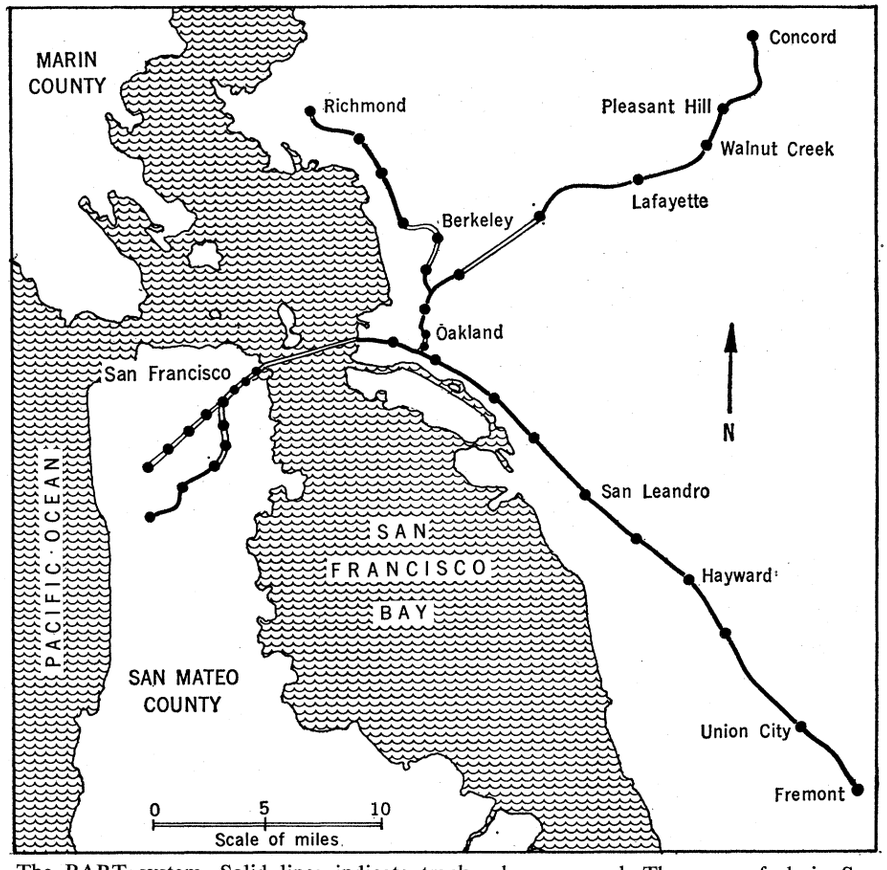
BART began with a commission appointed in 1951 by the California legislature to study the transportation needs of the Bay Area. At that time, San Francisco was well along in the process of decay common to many American cities. Fed by one of the most advanced freeway systems in the country, low-density suburbs were spreading out in all parts of the region. Moreover, retail business and some industries were moving to the suburbs, leaving fewer and fewer jobs for city residents.

The transport commission declared that for San Francisco such trends need not continue. Noting the city-shaping consequences of existing transportation systems, they argued that a transit system could be used to shape development patterns in the suburbs and inject new financial and cultural vitality into downtown San Francisco. To this end, the commission and its successor, the Bay Area Rapid Transit District, recommended that the region invest in a high-speed, rapid rail transit system.

Although the federal government has recently established the Urban Mass Transportation Administration within the Department of Transportation and allocated $10 billion for urban public transport over the next 10 years, BART was constructed with virtually no federal funds. In 1962, when the voters of three Bay Area counties (San Francisco, Alameda, and Contra Costa) approved BART, they accepted a $792 million bond obligation, the largest debt ever incurred at the local level. The only other major source of funds for BART was $133 million from bridge tolls that will pay for the tube under San Francisco Bay.

The planners of BART made decisions about the metropolitan area's future in addition to its transit needs. To serve the planners' purposes, the system had to run on rails. Several cities have experimented with transit systems that don't run on rails, such as bus lines with special right of way on the freeways. But the Bay Area planners rejected such ideas for a simple reason. As Larry Dahms, BART's director of planning, said in an interview with *Science*, "The thing about a bus line is that it can be moved. But a rail transit stop will be there day after day, and this allows for [real estate] development."

According to Dahms, the decision to build BART included a decision



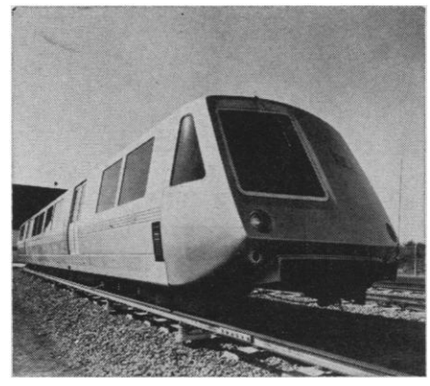
The BART system. Solid lines indicate tracks above ground. The upper fork in San Francisco is still in the planning stages.

that downtown San Francisco could accommodate more development. And already development has begun on a large scale. "Even without a single train running," declared a San Francisco Chamber of Commerce advertisement in *Fortune* magazine, "rapid transit has made an impact. BART has triggered a building boom in the billions of dollars."

Many San Francisco residents, however, despise the new buildings going up in their city as part of the boom. A group of ecology-minded citizens, led by dress manufacturer Alvin Duskin, have termed the new skyscrapers "the Manhattanization of San Francisco" (which is in no way intended as a compliment). Duskin took out an ad in San Francisco newspapers to warn that San Francisco would soon be "like New York or Chicago, where life has all the joys of the bottom of an elevator shaft—a crowded elevator shaft where everybody has guns." Indeed, one of the main contentions of the critics of BART has been that a transit system would lead to the overcrowding of San Francisco. And a good deal of pressure has been brought on San Francisco's Board of Supervisors to reject proposals for additional skyscrapers. Nevertheless, Duskin and his allies, as staunch environmentalists, favor BART. But economic factors make it unlikely that there will be rapid transit without increased development. That was the idea behind BART in the first place.

The Forty Thieves

Not surprisingly, some of BART's most enthusiastic boosters have been the merchants and businessmen of downtown San Francisco. For several years before the 1962 BART election, a group of civic leaders conducted a well-financed campaign to promote rapid transit. Variously known as the Blyth-Zellerbach Committee or "the 40 thieves," the group included the heads of such San Francisco–based corporate giants as the Bank of America and the Pacific Gas and Electric Company. Without their campaign, it is unlikely that Bay Area residents would have approved BART. To sell BART to the public, rapid transit propaganda emphasized that the system would relieve rush-hour traffic congestion and implied that it would incorporate space-age technologies. Curiously, in spite of the many possible advantages of the new transit system, BART is unlikely to relieve rush-hour congestion. And



A BART car.

the new technologies, while impressive, are evolutionary modifications rather than major innovations.

By the BART planners' own estimates, traffic on the Bay Bridge, the main traffic artery affected by BART, will return to its current level of congestion within 5 years of BART's completion. Other planners estimate that the congestion will return much sooner. BART planners project that some 60 percent of BART's patrons will transfer from existing forms of public transport and not from automobiles. In addition, many auto commuters probably voted for BART, not because they had any intention of using it, but because they hoped it would get the other fellow off the road. Actually, a high level of rush-hour congestion may be necessary to induce many commuters to leave their cars at home and ride BART to work.

As for the technology, BART planners never seriously considered any exotic new forms of transport. Limited funds and the continuing scrutiny of BART's future patrons would have prevented any radical experimentation. On the other hand, BART planners knew that some advances in transit technology would be necessary for their system to compete with the automobile. New technologies were also required to limit the system's manpower requirements. Over 80 percent of the costs of the deficit-ridden transit systems of the East Coast are wages. BART planners sought an automated transit line.

In order to obtain the new equipment they required, BART engineers undertook a research and development program financed by the district's own funds and supplemented by a 2-to-1 matching grant from the federal government. The program, unique in public works projects at the local level, allowed BART to contract with private firms for the R & D effort. BART's testing attracted several companies new to the transit industry, many of them enticed by BART's receptivity to new ideas. Competition among the firms anxious to get a foot in the door of the rapid transit market was stimulated to the point where several companies invested their own funds, often in amounts far exceeding BART's expenditures. Consequently, BART achieved its desired new equipment specifications while several firms obtained their first experience with what they perceive as a rapidly expanding market.

From the development program, BART evolved into a transit system strikingly different from the usual noisy, uncomfortable subway line. Constructed by Rohr Corporation, an aircraft firm, BART's passenger cars are designed to seat most, if not all, passengers in large padded chairs. The 70-foot-long cars have carpeted floors, wide aisles, recessed lighting, automatic air conditioning, and large, tinted windows. So much emphasis was put on a low noise level for the BART system that passengers inside the train should be virtually unaware of train noises.

Computer in Command

To keep the trains on schedule and to reduce the need for manpower, the BART system will be completely automated. A central computer will start, stop, and operate the trains, continually adjusting the speed and station stop time of each train on the line. Such controls should avoid the bunching up of trains that is common to most transit systems, thus moving the trains at an average speed of 50 miles per hour, including station stops. That is nearly twice as fast as any existing urban transit system. During peak periods, trains will run 90 seconds apart, with the interval lengthened to one-half hour late at night. An operator will ride each train, but he will only watch for trouble and serve to remind the passengers that some human element is involved in the system.

BART's automation extends even to ticket sales and collection. Fares on BART will range from 25 cents to about $1.50. Passengers will purchase plastic "credit cards" from machines at each station for any amount from 25 cents to $20. The passenger inserts the magnetically coded card into a slot at the gate when entering the system,

and the origin of his journey is recorded on the card. Upon leaving the train, the passenger again inserts the card, and the exact fare for the number of miles traveled is subtracted from the value of the card. If the cost of the journey exceeds the amount remaining on the card, a light appears telling the passenger to go to the "add fare machine." The complexities of this technology would seem to invite a massive amount of confusion as well as a multitude of schemes to beat the system. But BART officials claim they can get the bugs out and operate their system with a minimum of manpower.

The ease with which BART developed the new technologies required for the system contrasts sharply with the difficulties encountered in actually building the line. From its inception, BART faced the task of reconciling the often conflicting interests of the several communities it was to serve. At times, the task was nearly impossible.

Noticeably absent from the BART system are the populous regions to the north and south of San Francisco. Just prior to the 1962 bond election, San Mateo County (to the south) withdrew from the district. Fearing that rapid transit would retard suburban growth and development, several large property holders in San Mateo County brought the necessary pressure to bear on the county's Board of Supervisors. Without the tax base from the more populous San Mateo County, the district could not afford to extend the system to Marin County. Consequently, BART became a three-county system with the 1962 election.

San Mateo County could still join the BART system sometime in the future. Such an association might come about if BART decides to construct a line to San Francisco Airport, which is located in San Mateo County. The project is now in the planning stages.

After the 1962 election, BART planners began to determine the specifics of the system. That was no easy task. The location of virtually every segment of track, as well as the location and design of each station, led to a dispute between BART and a local community. Moreover, the voice of a given community was not always united behind a particular demand, as various interest groups vied for their own benefits.

As BART's Director, B. R. Stokes said in a recent speech, "Rapid transit systems are no immaculate conceptions

Fellowship Panel Protests Cutbacks

A group of psychologists that was called together by the National Academy of Sciences to recommend fellowship awards has staged a mini-revolt and is protesting the Nixon Administration's fellowship cutbacks and its "continuation of the war in Southeast Asia," which is blamed for inflicting "damaging consequences" on higher education. The group was rebuffed when it sought cooperation from the Academy and from the National Science Foundation (NSF), so the panel members are now, on their own, circulating a petition among colleagues on other Academy-appointed panels. The petition does not mention the Nixon Administration by name, but it protests policies that are being carried out by the incumbent Administration.

The mini-revolt broke out last month when the Academy, which has a contract to help select NSF fellowship winners, convened 11 different panels to recommend the winners from among some 9000 applicants for NSF graduate fellowships in 1971–72. About 150 scientists participated in the selection process, but one of the groups—Behavioral Sciences Panel A, dealing with psychology—became so upset over a sharp cutback in fellowship money that it decided to make a public protest.

K. Edward Renner, professor of psychology at the University of Illinois, told *Science* he and his fellow panelists became disturbed after hearing details about the cuts in NSF's graduate fellowship program. The total number of fellowships awarded dropped from 2582 last year to 1969 for 1971–72. The number of new awards was cut almost in half, while only 56 percent of the applications for renewal could be honored compared with more than 90 percent in previous years. Renner said he was particularly disturbed that "nobody objected or said anything." Instead, the scientists just "shuffled off silently" to their individual panel meetings to award what money there was.

Psychology Group Dissents

The psychology group, however, decided not to acquiesce silently in its assigned task. The group discussed various actions that might be taken, then decided to circulate a petition among all panelists with the idea that the Academy would forward the petition to President Nixon and to the news media. But the Academy balked, as did an NSF representative at the meeting. The dissidents were not even allowed to use 11 sheets of paper and the typewriters in the offices where they were working, and they were denied permission to circulate their petition.

Renner charges that the Academy and NSF were afraid of "political repercussions" that might jeopardize the fellowship program. But Wayne C. Hall, director of fellowships in the Academy's office of scientific personnel, said the Academy refused to help the dissidents on the basis of long-standing policy that it is not appropriate for a committee that is convened for a particular purpose—in this case the recommending of fellowship winners—to make sweeping pronouncements on other issues. "We encouraged them as individuals to do whatever they wanted, but not under the auspices of the Academy," Hall said. "We're disturbed, too, about cutbacks in funds for fellowships. And many of us, as individuals, are concerned about the Vietnam War. But we don't necessarily see a connection between the two."

Frustrated in their efforts to use the Academy as a podium, the psychology group is now mailing its petition to the members of the other ten panels. The petition has already been endorsed by 11 of the 12 members of the psychology panel (one refused to sign). Renner says it is too early to tell what the response will be from the others. At this writing he has received about ten endorsements and five refusals to endorse—the latter coming from people who either support the Vietnam War or else feel it is improper for fellowship panels to make such a protest. The Academy, meanwhile, has received perhaps half a dozen letters from panelists who say they refuse to endorse such a petition.

—PHILIP M. BOFFEY

or virgin births, with the populace wakening one morning to the glories of swift trains and spotless stations. They come about through endless public meetings on route and station locations, detailed engineering plans, dust, noise, confusion and the universal cry that rapid transit is wonderful, but not beneath my property."

And the problems extended to every detail of the transit system. In downtown San Francisco, for example, a group of merchants objected to BART's plans for a large and attractive staircase running into one of the main stations. The merchants feared that the stairs would become a gathering place for hippies and "other undesirables." Nevertheless, San Francisco's Board of Supervisors, after an impassioned debate, voted to keep the stairs.

Across the bay, in Berkeley, the main issue between BART and the community was whether the tracks would run above or below ground. BART planners had decided to build tracks on elevated structures everywhere in the system except downtown San Francisco and downtown Oakland. Overhead construction costs far less than subway lines. To avoid conjuring up images of the old Third Avenue El in New York, BART officials emphasized that their structures would enhance the beauty of the neighborhoods through which they passed and that the quiet trains would zip by virtually unnoticed by people on the street or in the houses below.

But a group of Berkeley residents, unmoved by promises of lovely, landscaped "linear parks," wanted no part of the elevated line. Organized into a "Committee to Bury the Tracks," they argued not only that the tracks would be unsightly, but that they would form a racial wall separating the black and white communities. After much discussion, BART agreed that the tracks in Berkeley could be buried if Berkeley would pay most of the difference in construction costs. Following a special election in Berkeley, the tracks went underground.

Besides the disputes with local communities, BART's arduous history includes difficulties ranging from a citizens' group demanding that bicycles be allowed on the trains to ships damaging the trans-bay tube with their anchors. But, by far the largest problem encountered by the project was its going broke when halfway complete.

Cost overruns characterized most huge construction projects of the 1960's, and BART was no exception. Time and time again, contractors' bids exceeded the planned costs, often because of last-minute changes to satisfy the demands of local communities. By mid-1967, BART officials admitted that the transit system would never run unless they obtained some $150 million in excess funds.

Even before that announcement, relations between BART and the residents of the Bay Area had been deteriorating: the inconveniences of construction seemed to drag on endlessly amid unending disputes. A series of articles in the San Francisco *Chronicle*, titled the "Transit Fantasy," had claimed that BART would do nothing that it was supposed to do. And few politicians expressed any enthusiasm over giving the transit system more money. But finally, in 1969, the California legislature voted an additional ½ percent sales tax in the three counties to be served by BART. And BART was assured the necessary funds.

Now that most of the disputes are settled and the project is nearing completion, BART is again generating more excitement than distrust among Bay Area residents. Limited service is scheduled to begin this fall between Hayward and Oakland. Barring any major difficulties, the entire system should be operating by late 1972.

BART and the Environment

Will BART improve the Bay Area's environment? In large measure, the answer lies with BART's future effects on land usage in the areas surrounding San Francisco. BART planners, in addition to their successful efforts to stimulate construction in downtown San Francisco, intend for their transit line to attract high-rise apartments and commercial buildings in the areas surrounding the transit stops in communities such as Berkeley and Walnut Creek. Such satellites of urban development, in regions that would have been low-density suburbs, could ease the demand for land usage in outlying areas and cut down on automobile traffic. This type of development encouraged by BART is just the opposite of that brought about by highway construction. With rapid transit, the development follows the transportation construction, whereas highways are usually constructed wherever anyone develops the land. But the two phenomena are not mutually exclusive. The Bay Area could end up with both high-density development encouraged by BART and sprawling suburbs fed by new highways. That would mean more people, cars, suburbs, and buildings.

The solution, at least according to the supporters of rapid transit, is to stop building new highways. But in California it might be easier to eclipse the sun. As BART's Dahms told *Science*, "Highway construction in this state has an inertia that would take 15 years to stop. As it now stands, a community can lay out $1 and get $2 worth of rapid transit; but for the same $1, it can get $10 worth of highways." Any schemes to change that situation must confront California's powerful highway lobby. In the last election, the highway lobby spent hundreds of thousands of dollars. Most of this money was donated secretly by oil companies to defeat a measure that would have diverted a portion of the state's gasoline taxes to rapid transit and pollution research.

San Francisco's peninsular location allows only limited access to the city, and for that reason rapid transit might be uniquely successful in the Bay Area. But the pro-highway forces in the state are attempting to change that. A new bridge, known as the Southern Crossing, is scheduled to be built just to the south of the San Francisco–Oakland Bay Bridge. And in spite of vigorous opposition from the Sierra Club and other conservation groups, the state legislature recently approved the project. Consequently, BART will face competition from even more automobile routes almost as soon as it is completed.

Like most major public works projects, BART raises nearly as many new problems as it is purported to solve. Nurtured more by vested interests than by a desire of Bay Area residents to find an alternative to the automobile, BART was built without a long-range commitment to shift the emphasis to public transportation in the Bay Area. Thus highway construction continues. And the region could end up with the harmful side effects of both mass transit and the automobile.

In the time since BART was first proposed, air pollution, noise, and traffic congestion have convinced all but a few that the automobile should be deemphasized in urban areas. Bay Area residents will soon have the first major alternative to the automobile of the 20th century. What is clearly needed now is a commitment to depend on BART for the Bay Area's transportation needs.—ROBERT J. BAZELL