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BART: Dig We Must

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Federal Reserve Bank of San Francisco
Monthly Review Reprint / January 1970

BART: Dig We Must

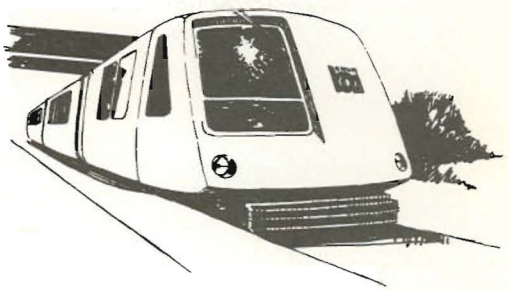
All American cities share a common transportation problem, but only within the last few decades has the problem approached a crisis stage. Few individuals today are immune to the headaches caused by highway congestion and the shortage of parking facilities, and few are unaware of the frustrations and inconvenience resulting from overcrowded, inefficient mass-transit systems. As population and auto usage increase, traffic congestion continues to worsen. The auto's appetite for land is seemingly insatiable, as there is always a demand for new highways and parking spaces. And, whereas the lack of adequate facilities threatens to negate the convenience and flexibility offered by the automobile, the continual construction of new facilities threatens to deny land to other essential uses.

The existing mass-transit systems are meanwhile beset with their own share of problems. The growth in the transit-dependent urban population strains existing facilities, while the even-more-rapid growth of suburban areas creates a demand for the expansion of urban transit services. But at the same time, the transit industry remains trapped in a spiral of increasing costs, declining patronage, and an almost perpetually unfilled need for more and better equipment and maintenance.

Auto spells congestion

Urban planners recognize, however, that a city's viability depends upon its potential to attract residents, shoppers, businesses, and workers sufficient to sustain a high level of economic activity. This potential depends, among other things, on the relative ease with which existing resources can be reached. Yet as it stands, traffic congestion and inadequate mass-transit facilities threaten to paralyze the major American cities and to stunt their growth as important centers of economic, social and cultural activity.

The problem, then, is to create an efficient transportation system which will satisfy a metropolitan area's growing need for peak-hour transportation services but will not endanger the other needs of the metropolis. Unless public officials are willing to allocate a great deal of valuable land to highways, bridges, and parking spaces, the trend towards increased auto usage by peak-hour commuters must be curtailed. The best alternative thus is to provide a metropolitan-wide mass-transit system that is capable of competing with the automobile in terms of speed, comfort, and convenience. A system of this type requires much less land usage, and it also relieves peak-hour traffic congestion on streets and highways by inducing many auto users to leave their cars at home.



With this in mind, Los Angeles, Chicago, Washington, Boston and other cities have all begun to look into the costs and benefits of rejuvenating and/or introducing mass-transit systems. But meanwhile, the San Francisco Bay Area Rapid Transit District — the subject of the present article — has already constructed the major portion of a seventy-five mile system and is now making plans to extend it.

Topography spells trouble

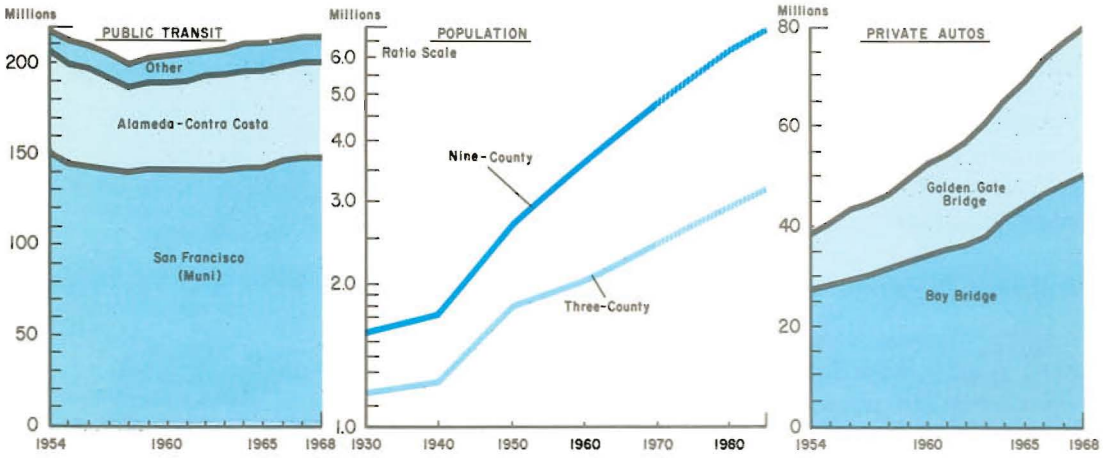
San Francisco is second only to New York in its reliance on mass transit; buses, cable cars, streetcars, trolley cars and commuter trains provide extensive local, interurban, and transbay service. However, the facilities are inadequate and consequently overcrowded, uncomfortable and often inconvenient. Heavy traffic snarls the streets, highways, and bridges during peak-hours, as thousands of motor vehicles pour into the central business district each day and pour out again each night. The topography of the area further aggravates the situation and necessarily narrows the range of feasible solutions. The Bay itself as well as the steep hills that rim the Bay — the very features that make the area so picturesque — create special problems for the transportation planners who would knit the area together.

An omnibus line in the early 1850's, and horsecar and steam-dummy lines later on, freed San Franciscans for the first time from the necessity of living near the center of town. The Market Street Railway, for example, opened up the foothills of the Twin Peaks area. Then, in 1873, Andrew S. Halladie introduced the famous cable car. With its ability to climb steeply graded hills, the cable car permitted settlement of heretofore isolated or sparsely populated sectors — in particular, Nob Hill and Telegraph Hill.

But while San Francisco was clinging to the horsecar and the cable car, the East Bay was opening its arms to the electric railway, so that by 1894 it could boast of almost 60 miles of electric and cable railways. The electric railway stimulated the dispersion of population from Oakland towards the north and southeast. Other railroads and highways, of necessity occupying the natural topographic corridors, were meanwhile servicing the communities of the San Francisco peninsula.

The system now building had its genesis in

Bay Area's population explosion demands new transport innovations, as bridges operate at capacity and public-transport usage stagnates



a proposal, made in 1900 by the San Francisco *Chronicle*, for an underground, high-capacity transit system to be centered around Market Street, the city's major thoroughfare. But for many decades, the expansion of the area's transit network depended upon the extension and enlargement of existing surface lines.

Early transit plans

In the West Bay, the San Francisco Municipal Railway (Muni) started operations in 1912 and, within the next forty years, established an extensive service of buses, streetcars, cable and trolley cars. In the process, the Muni system purchased and integrated two private transit companies and two cable car lines. In the East Bay, one F. "Borax" Smith succeeded in the early 1900's in purchasing all the existing streetcar routes and in establishing a major ferryboat system. (This system was preceded by a ferryboat system operated by the Southern Pacific Railway.) Although Smith eventually went bankrupt, his transit system was taken over in 1923 as the Key System Transit Company, and was eventually transformed (1960) into the Alameda-Contra Costa (AC) Transit District.

The Muni in San Francisco, the Key System in the East Bay, and the Southern Pacific railroad in the Peninsula all helped along the development of outlying residential areas. In San Francisco, for example, the opening of the Muni's Twin Peaks Tunnel in 1918 permitted a rapid increase in settlement west of the hilly barrier in the center of the city. Then, in the mid-1930's, the Greyhound Corporation entered this field by offering commuter bus service into Marin County to the north, San Mateo County to the south, and Alameda and Contra Costa counties to the east.

But with the advent of the automobile, the pace and direction of urban living changed radically, as was seen in the accelerated growth of peripheral and suburban areas throughout the Bay Area. And along with the increase in auto usage (and a consequent decline in railway patronage) went an increased demand for more and better streets and highways. El Camino Real, the trunk line down the Bay Plain, by 1915 had already been repaved into a two-lane highway from San Francisco to Santa Clara Valley, while the East Bay Highway from Oakland to San Jose was virtually completed at the same time. Then, during the following decade, engineers began work on a tunnel to connect Berkeley with Contra Costa County in the east, and others began work on the Skyline Boulevard to connect San Francisco with Santa Cruz County to the south.

The expansion of public-transit and (especially) private-auto traffic intensified the need for improved transport links across the various reaches of the Bay. Ferry systems had been transporting passengers and cargo since the 1850's, but passengers in later decades demanded bridges instead of more ferries. Railway bridges came first—at Dumbarton in the South Bay in 1910 and at Martinez-Benicia in the North Bay in 1929. Then came several bridges for automobiles—at Dumbarton and San Mateo in the south and Carquinez in the north. Finally, there were those two masterpieces of the bridgemaker's art — the San Francisco-Oakland Bay Bridge

(1936) and the Golden Gate Bridge, linking Marin County to San Francisco (1937).

The new bridges vastly stimulated auto traffic, but they also helped bring about the demise of the ferry system and a serious decline in the Key System's transbay patronage. Even so, the new bridges and highways did provide the Bay Area with a unified road network — something which the public-transit systems had not been able to achieve.

Coordinated transit plan

The need for a coordinated mass-transit system seemed self-evident to many authorities. San Francisco's City Engineer, M. M. O'Shaughnessy, as early as 1931 predicted that substantial traffic congestion would occur after the opening of the Golden Gate and Bay Bridges, and thus pushed for the development of a rapid-transit system that would help reduce the volume of auto traffic flowing into the city. But despite official backing, the public voted down a proposal for a streetcar subway in 1937. A unified transit system became only a glimmering prospect; indeed, an uninterrupted transit trip from, say, the Peninsula to Marin or the East Bay was a virtual impossibility.

Still, the obvious need for mass-transit planning culminated in 1951 with the creation of the Bay Area Rapid Transit Commission. After five years of extensive research, this group came up with a transit plan for the entire nine-county Bay Area. The Commission foresaw two alternative growth patterns for the Bay Area: one which entailed a dispersion of business activity into many small and uncoordinated districts, and a second which envisioned a well-defined hierarchy of high-density central business districts.

The first alternative — urban sprawl — would almost necessarily result if the community relied on motor vehicles for assuring the necessary circulation of goods and persons throughout the area. But the second alternative—a pattern of concentrated, strategically located central-business districts—would require the development of an extensive mass-transit system. In such a system, San Francisco and Oakland would form the major centers of economic activity, while other nuclei would be located at San Jose, Berkeley, San Mateo, Vallejo, Concord, Petaluma, and Hayward.

In the Commission's view, the central business districts of these various population centers would be connected by a network of freeways and, more importantly, by a $900-million, 123-mile rapid-transit system. Construction would be carried out in three stages: 1) Palo Alto (Santa Clara County) through San Mateo County to San Francisco, across the Golden Gate Bridge to Marin County, and across the Bay in a subaqueous tube to Alameda and Contra Costa Counties; 2) Palo Alto to Hayward and San Jose; and 3) extensions to Napa, Sonoma and Solano Counties and throughout the original six counties.

The Commission recognized the interdependence of rapid transit and other modes of transportation; in fact, it argued that an efficient, coordinated transportation system required the development of feeder service to rapid transit stations, the improvement of existing local transit services, and the building of additional freeways and bridges to fulfill future private transportation demands. But a rapid-transit system, in the Commission's view, was the basic essential, in view of the existence of overloaded freeways, crowded interurban buses, and congested downtown streets. Thus, as a result of the Commission's report, the Bay Area Rapid Transit District (BART) was created in 1957 to finance, construct and oversee the operation of a rapid-transit system to serve the five counties of San Francisco, Alameda, Contra Costa, Marin and San Mateo.

Proposed 1956

Rapid Transit in the Bay Area

Actual 1972

Difficulties and delays

BART has been beset with difficulties from the very outset, beginning with the withdrawal of Marin and San Mateo counties from the original plan. First of all, BART engineers concluded that the cost of a subaqueous tube to Marin would be prohibitive because of the depth of the ocean floor, and then the Golden Gate Bridge District refused to permit a lower deck on the span for BART trains. Next, San Mateo decided to withdraw because it felt that BART would do nothing more than duplicate the bus and rail services already existing in the county, and because the increased tax rate necessitated by BART membership would put the county in a disadvantageous position vis-a-vis Santa Clara County in attracting new industries.

By mid-1962, the District contained only three counties — a far cry from the nine-county plan of 1956 — the 123-mile system was down to 75 miles, and the total cost was up to about $1 billion. Moreover, BART had to make a number of route changes to take account of its shrunken configuration. In San Francisco, for example, it deleted the Geary Street line that would have been necessary to service Marin, and in its place substituted a Muni subway to service the southwestern portion of the city. But finally, after approval of a revised plan by the Boards of Supervisors in the three counties, the District submitted to the voters a $792-million general-obligation bond issue for basic construction work on the new system. Only a 60-percent majority was necessary for approval, in contrast to the usual two-thirds majority, but even at that, the issue barely passed, with a 61.2-percent yes vote (November 1962).

Law suits, route changes, design problems — all contributed to prolonged and expensive delays. In Contra Costa, a group of taxpayers challenged (unsuccessfully) the legality of the bond issue and the use of official funds to support the bond issue. In the West Portal area of San Francisco, local merchants fought for surface construction of the transit line in order to obtain easier access for their customers. Berkeley's city administration, on the other hand, fought for four years (1962-66) against BART's plan for a predominantly surface line in Berkeley. That particular issue was not decided until Berkeley voted to put up over 75 percent of the extra $24 million needed to provide underground construction of the entire route through the city.

Despite all the delays, the first ground was broken in 1964, with construction of the Diablo Test Track, a 4.5-mile segment of the old Sacramento Northern Railway between Walnut Creek and Concord. In February 1965, the first major construction contract was let for the tunnel through the Berkeley Hills between Berkeley and Orinda, and by April 1966, work on the transbay tube was underway.

To date, almost all of the design work is finished, roughly 90 percent of the right-of-way has been acquired, and more than 55 percent of the total system is completed. Much work still remains to be done, of course, and contracts still must be let for various parts of the system—for the Richmond-Concord line, for example, and for the stations at Fremont and Daly City. Even so, the first passenger service from Oakland to Hayward should begin next year, and the entire system should be in operation by mid-1972.

Modern-day design

BART, when completed, will be the first truly modern rapid-transit system in the country—even though it will utilize the standard type of transit vehicle, the bottom-supported type with metal wheels operating over steel rails. (According to BART engineers, no other alternative offered the same combination of safety, speed, capacity, operational efficiency, comfort, and quietness.)

But the Diablo Test Track, a symbol of the District's commitment to build the entire system from scratch, has been used to develop the most up-to-date types of track, power, train-control systems and noise-reduction techniques.

BART's electrically powered trains will have a top speed of 80 miles per hour, an average speed of 45 mph, and an acceleration/deceleration rate of 3 mph per second. The longest trip into downtown San Francisco (from Fremont) will take only 35 minutes. Each car (67'3" long, 10'5" wide) will accommodate 76 seated passengers, and BART's total carrying capacity will be 30,000 seated passengers per track per hour, a carrying capacity equivalent to 30 freeway lanes.

Station stops will be approximately 8 to 20 seconds, with trains running every 90 seconds during peak-hour service and, except for late at night, every 15 minutes during off-peak hours. The scheduling, speed and spacing of the trains will be automatically controlled by a central computer. But there will also be three fail-safe systems: 1) an emergency power system capable of maintaining the full system for two hours; 2) a duplicate computer system adjacent to the central control room; and 3) automatic controls at each station capable of operating independently of the central computer control.

BART will have 38 stations — 13 in San Francisco and 25 in the East Bay. (Four of the San Francisco stations — Van Ness, Church, Castro and West Portal — will be part of the Muni Rapid Line.) Suburban stations will be equipped not only with free parking facilities but also with special turn-off lanes for feeder buses and passengers.

Perhaps the most challenging engineering task in the entire project has been the construction of the $180-million, 3.6-mile trans-bay tube, which now lies from 75 to 130 feet below the surface of the Bay between San Francisco and Oakland. Altogether, 57 steel sections — 314 to 350 feet long, 24 feet high, and 48 feet wide — with two tunnel bores 17 feet in diameter and a central repair walkway, were laid end to end across the Bay. When the system is completed, passengers will be able to cross the Bay in BART trains in only 8 minutes' time.

Fare collection will be automated on the BART system. Passengers can choose between using a credit card or buying a cash value ticket to pay for their ride. Fares will average 2½ to 3 cents per mile, and a plan is being developed to allow for a transfer system between BART, Muni and AC Transit.

Modern-day costs

The cost of BART is no less spectacular than its design. But the District, under its original 1957 authorization, has a number of alternative means of financing: 1) incur bonded indebtedness in an amount not exceeding 15 percent of the assessed valuation of taxable property within the District; 2) levy and collect taxes to pay the principal and interest on bonds issued; 3) issue bond anticipation notes; 4) levy and collect taxes, not to exceed 5 cents per $100 assessed valuation of taxable property, for purposes other than payment of debt services; 5) issue revenue bonds and equipment-trust certificates for the purchase of equipment; and 6) issue special assessment bonds.

The District's 1962 report envisioned a total cost of $997 million for construction of the proposed 75-mile system. The $792-million general-obligation bond issue of 1962 made funds available for basic construction work, for acquisition of right-of-way, and for basic design. (Payment of principal and interest on the bonds would be based upon a District-wide property tax not to exceed 71 cents per $100 of assessed valuation.) In addition, financing of the $133-million trans-bay tube would be obtained from bridge rev-

enues and from revenue bonds of the California Toll Bridge Authority, while financing of $72 million of rolling stock would be based upon District sale of revenue bonds secured by future BART revenues. BART was also obligated to reimburse the California Toll Bridge Authority for the $61-million cost of tube approaches.

Within several years, however, the $997-million cost estimate seemed wildly optimistic, despite — or because of — the use of a 3-percent annual inflation allowance in the estimates. Delays due to the 1962 taxpayers suit, delays due to prolonged negotiations over station design and route location, and delays in cash disbursements all contributed to spiraling costs. In many instances, too, BART had to contend with bids well over the 1962 allotments, such as the $9-million excess on the transbay tube alone. Other increases came about because of additional engineering work, or because of unanticipated improvements in station finish, train control, and tube approaches.

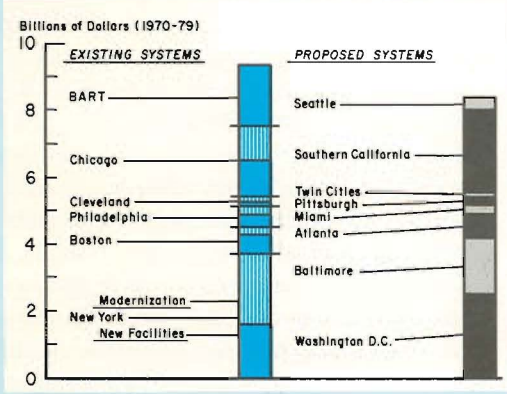
Despite cost reductions in some areas, BART by 1966 had overrun the 1962 estimates by more than 18 percent, and the situation continued to worsen in later years. Cost inflation, delays, design improvements and additional engineering services all added to the toll. Thus, by early 1969, the total cost for the package was estimated at $1,380 mil-

Needed: $20 Billion

The rapid-transit industry handed Congress a $20-billion shopping list last summer for the modernization of existing transit facilities and the construction of new systems. Over the next decade, industry spokesmen estimate their requirements this way: $8.0 billion for existing rail rapid-transit systems, $1.3 billion for existing commuter railroad systems, and $8.4 billion for new rapid-transit operations, plus another $2.5 billion for motor bus systems.

New York alone could utilize $3.7 billion for rapid transit over the period 1970-79, and Chicago could use another $2.1 billion. In both cases, roughly half the total is needed for modernizing existing plant, and half for building new facilities. San Francisco's BART could use perhaps $1.8 billion, and Boston, Philadelphia, and Cleveland are in for smaller amounts.

For constructing completely new systems, Los Angeles could use perhaps $2.5 billion, Washington $2.4 billion, and Baltimore $1.7 billion. If construction were completed on these systems and on smaller systems in Atlanta, Miami, Seattle, Pittsburgh, and Minneapolis, some $8.4 billion would be required.



Where's the money coming from? Industry spokesmen support the establishment of a Federal urban rapid-transit trust fund, using funds available from the existing auto excise tax. If that were done, public agencies and state-and-local governments could "move ahead now with the kind of assurance that state highway commissioners have enjoyed in developing the interstate highway program."

lion — $383 million above the 1962 estimate — and some critics wondered if even that would be enough to finish the entire system as planned.

Where is this $1,380 million coming from? The initial $792-million bond issue started the ball rolling. (The bonds have been marketed over a period of several years, and the net interest on the entire issue thus averages out to an unbelievably low — for these times — rate of 4.14 percent.) The initial $133 million from the California Toll Bridge Authority for the transbay tube has now risen to $180 million, and $118 million more has come from Federal grants for research-and-development and rolling stock. A maximum of another $150 million will come from the 0.5 percent sales tax now levied in the three-county District, $50 million will come from interest earned on funds held longer than expected because of project delays, and there will be other funds available from other sources.

Some critics are still not certain that $1,380 million will do the job. (To cite one minor but significant action, bids submitted recently for the finishing of the concrete shells of three subway stations in Berkeley and Oakland came in $2 million above the District's estimates.) The budgetary squeeze is accentuated by the unresolved debate over the Muni Rapid subway — the result of a lack of sufficient funds to finish the line as promised — and by the unanticipated expense of adding water fountains and facilities for the handicapped to each BART station. BART directors may be correct in stating that they will be able to finish the system with the available funds, but to do so may require the deletion of such "fringes" as more stations, landscaping, and good design.

Modern-day growth

With the cost of BART rising daily, Bay Area residents may wonder how BART will benefit the community — how BART will affect not only the area's peak-hour congestion problems but also the overall development of the communities serviced. Some answers can be gained from the analysis published in the 1967 report of the Northern California Transit Demonstration Project (NCTDP).

Despite a decline in patronage for the transit industry nationwide, both AC Transit and Muni have experienced increases in revenue patronage since 1960 — 11.3 percent and 4.4 percent, respectively. Moreover, according to the report's projections, three-county revenue patronage may increase 26 percent by 1975. Even in the face of the introduction of BART services, both Muni and AC should share in this increase because of their greater patronage from BART feeder services.

Population in the three-county area is projected to increase about 25 percent by 1975. Most of this growth may be concentrated in the suburban areas of Alameda and Contra Costa counties, implying a substantial demand in these areas for BART as well as extended AC Transit services. But San Francisco, although perhaps losing some population by 1975, should still provide over 52 percent of the three-county transit patronage in that year. San Francisco, after all, is the focus of most daily adult transit trips in the area; besides, it has always been a transit-dependent city, due primarily to its high population density (16,500 persons per square mile) and its hilly terrain.

But the report indicates that BART will make its main contribution in fighting auto congestion. Between 1960 and 1967, auto registrations in this area increased over 28 percent — somewhat more than population growth—with the number of persons per car declining steadily. Highway and bridge congestion during peak-hour travel thus progressively worsened, so that both the Bay and Golden Gate Bridges could expect unbearable congestion in future years unless alternatives were provided to auto travel.

But according to NCTDP estimates, roughly one-third of BART's patrons from the East Bay may be diverted from automobiles by 1975. "In terms of equivalent capacity, BART will be equal to another Bay Bridge in delivering East Bay citizens to downtown San Francisco each morning." If such results are actually realized, BART could put off the need for a new bridge to relieve Bay Bridge congestion, and it could also save San Francisco millions of dollars each year in terms of streets and parking spaces that would otherwise have to be provided.

Since BART does not service Marin or the southern Bay Area counties, it will not relieve their congestion problems or reduce the traffic flows from these areas into San Francisco and the East Bay. But the system may not always remain in its present form. Planners are already considering such possibilities as a San Francisco-Marin ferry system and augmented bus system, a comprehensive feeder network to BART stations, and of course, the eventual implementation of BART's original plan.

Already, some major signs of growth have appeared in tandem with the construction of the BART system. In San Francisco, over 400 stories of new office buildings are planned, under construction, or already operating in the vicinity of Market Street, near the BART stations; indeed, San Francisco accounts for 60 percent of new office-building permits issued in the nine-county Bay Area, as compared to 31 percent in pre-BART days. Oakland has initiated an urban-renewal project in the area of BART's 12th Street station, and will locate four new high-rise buildings and a college campus near the Lake Merritt station. Berkeley's inventory of rental space has jumped 30 percent; Union City's improved land value has risen 50 percent and its vacant land value has doubled; in Fremont, a whole new central business complex is developing, with land value in-

Europe vs. America

Many European cities are emerging as models of balanced transportation systems, on the basis of a distinctive European approach to transportation problems coupled with a long-standing dependence on mass transit. In Europe, as cities were rebuilt after World War II, both public transit and automobile traffic were taken into consideration. In America, by contrast, the emphasis on automobile transportation and auto-oriented facilities resulted in increasing highway congestion and decreasing use of public transportation systems.

Since the end of World War II, new rapid-transit systems have been opened in Stockholm, Oslo, Frankfurt, Cologne, Milan, Rotterdam, Lisbon, and Rome. Other new systems now under construction or in the planning stage include: Helsinki, Amsterdam, Brussels, Munich, Essen, Dortmund, Stuttgart, Hannover, Nuremburg, Dusseldorf, and Bremen. Highway construction has also been making strides to keep pace with the rapid growth of automobile ownership — from one car for every 50 persons two decades ago, to one for every 5 persons today.

European cities have generally utilized the familiar two-rail rapid transit as the most efficient system. American cities in contrast, have frequently tended to conduct costly studies in the search for technological breakthroughs. BART, for example, carried out a number of studies which eventually supported the claims of the standard two-rail system.

creasing accordingly. Quite obviously, BART is stimulating the development of those areas that will be reached by its transit lines.

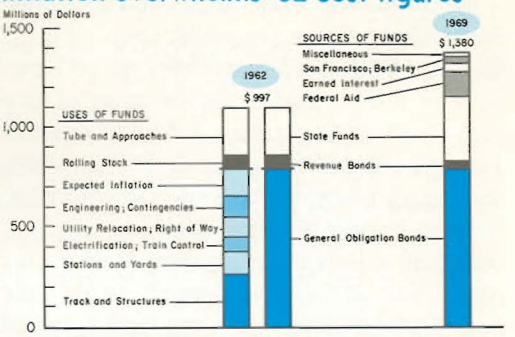
Pluses and minuses

BART's obvious growth potentialities have led many communities to consider ways of tieing into the system. San Mateo, in its transit plan, has discussed the possibility of rejoining the District, while Sacramento, California's state capital, has considered means of extending BART there. Oakland has already financed a $200,000 study to evaluate a BART line to the Oakland airport. More recently, a similar study has been authorized to determine the costs and benefits of a rapid-transit line to the San Francisco airport; several firms are submitting reports on the feasibility of a monorail system to the airport, but these plans tend to suffer from the fact that they envisage an independent line uncoordinated with BART.

BART's advocates, regionally and nationally, cite a long list of advantages that will accrue from the operation of this rapid-transit system. The list of pluses include: a delay in the need for the construction of more facilities for autos; stimulation to the growth of the areas serviced; increased mobility of the labor force in the three-county area; savings in travel time and in auto-insurance and maintenance costs; easier access to social, cultural, and recreational activities; and the provision of a high standard of public transportation at a low cost. And, unlike many transit systems, BART will have a large reserve capacity to fulfill future increases in demand for service.

But for every encomium BART has received, it has received several brickbats as well. A common complaint is that too much money has gone into a single mode of transportation, without sufficient analysis of alternative uses of available funds. Serious doubts exist, for instance, as to how effective BART

BART seeks new funds, as severe inflation overwhelms '62 cost figures



will actually be in relieving peak-hour highway and transit congestion. Furthermore, BART has been criticized for servicing primarily the suburban cities and the central business districts of the three counties. Thus, BART may stimulate a further rush to the suburbs and thereby accentuate the problems of the inner city. Others point to the negative effects of the high level of indebtedness caused by BART, which may render the public less willing to approve bond financing of equally important projects in future years.

Only time will test the validity of these various criticisms. All that is certain at this point is that BART's shortcomings, as well as its achievements, will be of considerable interest to metropolitan areas nationwide.

BART and the future

Perhaps one of the most vital needs of the Bay Area is a regional agency for transportation planning. As it stands now, responsibility for the planning and operation of various modes of transportation is highly fragmented and specialized. Despite this dispersion of responsibility, many agencies closely coordinate their operations; for instance, BART and the California Division of Highways have developed arrangements for joint use of rights-of-way, thus saving both agencies millions of dollars. However, the establishment of a single "umbrella" agency would allow for a much greater degree of overall coopera-

tion and integration of transportation facilities, present and future.

In 1968, the Bay Area Transportation Study Commission (in conjunction with the Bay Area Regional Organization Study Committee) recommended the creation of one such "umbrella" agency, a Metropolitan Transportation Authority, which would oversee the planning and operation of all transit systems, bridges, airports, seaports, ferry systems and freeways in the nine-county Bay Area. The MTA, as proposed, would take over BART's functions, along with those of the State Division of Bay Toll Crossings, the California Toll Bridge Authority, and the Golden Gate Bridge and Highway District. The proposed MTA at this point may be nothing more than a glimmer in a planner's eye, but some such move toward regional unification may be necessary to assure the continued growth and well-being of the Bay Area.

An effective transportation network requires not only a high level of coordination but also the provision of alternative means of transportation at varying costs, speeds, and degrees of comfort and convenience. BART is one step in that direction, and the extensive research now taking place in the field of transportation offers a variety of "next-steps." Transportation planners recognize that the usual solution of providing more and more of the same facilities is no longer an adequate solution: although the value of traditional means of transportation cannot be denied, the need to take advantage of recent technological advances in mass-transportation techniques is equally as important.

Perhaps, to much too great an extent, the San Francisco Bay has been ignored as a natural transportation corridor for daily travel purposes. Technologically advanced watercraft, such as the hydrofoil or air-cushion vehicles, may provide the type of high-capacity vehicles which will obviate the need for more and more trans-bay bridges. Meanwhile, some of the land vehicle systems developed in recent years may also provide alternative approaches to solving regional traffic problems. These systems include:

- PERC, an automatically controlled (2-person) personalized capsule running over city streets;
- GENIE, a small (10-person) bus routed by computers and servicing residential areas on call;
- StaRRcar, a small commuter vehicle capable of being operated individually on local streets or automatically at higher speeds on special guideways;
- Tunnel Train, a high-speed air-supported train that would travel in an enclosed tunnel; and
- Hovertrain, a similar vehicle that would glide along guide tracks.

Traffic today is outpacing street and highway construction. Existing transit facilities are outmoded and frustratingly overcrowded. Population is growing rapidly, spreading to the suburbs, and demanding faster, safer, and more convenient means of transportation. Simply providing more of the same facilities may not work; consequently, the San Francisco Bay Area has taken a broader approach and turned to rapid transit for relief.

The creation of BART has been a somewhat evolutionary process. The integration of design and performance standards, the problems of route location, and the desire to satisfy local community demands have necessitated a sometimes agonizingly slow process of development. Yet, within several years we can expect to see high-speed, high-capacity trains carrying passengers throughout the three-county area. BART may not solve all of the Bay Area's transportation difficulties, but it represents an ambitious step on the part of one of the nation's major metropolitan areas to solve a serious nationwide problem.

Patricia Alexander

Progress Report (Mid-'71)

Inevitable increases in costs (and in frustrations) have occurred with the approaching completion of the BART system. The system has had to face problems in the areas of routes, fares, equipment — and in one case, has encountered the problem of gopher damage to underground cables.

The opening date of the new system has been pushed back as a consequence of various production delays. Originally scheduled for the fall of 1971, service on the Oakland-Hayward segment of the system will not start until early 1972, at least in part because of difficulties encountered in producing a new-style fleet of transit cars. Also, the problem of integrating BART with other public-transit systems in the Bay Area has continued difficult, despite years of effort on the part of a transit liaison committee, helped along by an $800,000 Federal study grant.

More important, arguments have continued over the means of linking up the BART system with the Bay Area's airports serving San Francisco and Oakland. Most planners have agreed on the feasibility of links with the Oakland Airport, either through an extension of the BART line or through the provision of shuttle service. But providing service to the San Francisco airport promises to be somewhat more complicated.

Servicing the San Francisco airport involves the extension of BART lines outside the basic three-county system — San Francisco, Alameda, Contra Costa. To add service to the airport — located in San Mateo county — would require annexing San Mateo to the BART system, with the imposition of a $52-million buy-in cost and a property-tax levy on San Mateo home owners. BART's cost for a subway line and distribution services within the airport grounds would be about $286 million.

Finally, BART now seems likely to boost fares because of increasing estimates of operating and maintenance costs. The original system had planned a fare range of $.25 to $1.00, depending on the distance traveled, but present estimates call for a fare range of $.35 to $1.30. BART planners claim that this high range of fares has been necessitated by the legal requirement to dispense with the present property-tax levy as soon as possible — and thus by the need to rely solely on its (estimated) $35-million annual fare-box revenue to meet expenses.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