

McKinney Avenue Transit Authority Experience

FRANK A. SCHULTZ III AND JOHN B. MCCALL

Dallas' McKinney Avenue Transit Authority (MATA) was an early participant in the growing renaissance of vintage trolley systems in the United States. With a majority of its construction funding—and all of its operating subsidy—sourced in the private sector, MATA is perhaps singular in its public/private relationship. For more than 2 years, four vintage trolley cars have been maintained and operated over nearly 3 mi of reclaimed city trolley trackage by a largely volunteer labor force. This experience has application to present or planned vintage trolley and light rail operations. Promoted by commercial property owners adjacent to its route, MATA secured endorsements from city and state governments, as well as a federal construction grant, and began operation on a daily schedule in July 1989. The start-up process of construction, maintenance, personnel management, and initial operation revealed both unique opportunities and special problems that are associated with realization of an operating vintage trolley system. Farebox revenues have been influenced by both seasonal factors and economic trends that have not been sufficient to cover system costs. Hindsight reveals that MATA's initial route plan fell short of an important traffic generator that would have significantly improved system results. During 1991, a 2-year federal operating grant to supplement declining private-sector subsidy and reduced revenues was indefinitely forestalled. Failure to fully comply with Federal grant regulations, positions taken by employees of Dallas Area Rapid Transit (DART), as well as the intrinsic nature of MATA's operation created this result. As a result, in fall 1991, MATA eliminated all but one part-time paid employee, reduced its operating schedule to evenings and weekends, and began to cope with the problems created by deferred maintenance.

Major cities, by nature, are intensely competitive for both convention and tourist business. Innovative attractions, things for people to do and to see—properly promoted—can be a deciding factor for success in this competition. A well-planned and executed vintage trolley (VT) operation can be a key part of a city's attraction. A successful city government will attract millions of dollars each year to the local economy. These dollars will be respent approximately twice locally. Local taxes upon this activity alone can arguably justify city subsidy to VT. VT management must compete effectively for these funds before city government, as well as before private-sector firms that benefit from conventions and tourism.

Most civic leaders have little initial appreciation of the benefits that a properly placed and efficiently operated VT can bring to a city economy. The impact upon convention and tourist business aside, VT can also stimulate local activity in redeveloped or historic areas and its route can help "focus"

additional development. VT can introduce citizens to an alternative to private automobile, city bus, traffic congestion, and air pollution. And VT can also suggest the possibilities of light rail transit (LRT). If operated on regular, publicized schedules, VT will also serve as local transit.

Dallas' McKinney Avenue Transit Authority (MATA) is a joint public/private-sector venture. The first 2 years' operation were funded by a combination of farebox earnings and private-sector sources. MATA's survival has required that fundamentals be addressed; failure to produce reasonable results from any one of these fundamentals will place the entire operation in doubt. VT in North America, today, is a concept attracting interest among cities and within the LRT community. MATA's experience is applicable to extant and proposed organizations within the rapidly growing VT sector of public transport.

THE BEGINNING

Organization and Planning for Political Approval

In 1981 a Dallas area along McKinney Avenue, characterized by restaurants and specialty shops, was being redeveloped. The effort included excavation and renovation of the brick street paving. Removal of the asphalt revealed a double-track streetcar line that appeared to be in generally sound condition. A local businessman, with restaurant interests along this route, decided that trolley service on that portion of McKinney Avenue would enhance both the ambiance and commercial success of the redevelopment project. His observation that, "Wouldn't it be nice to have some old streetcars running down our street?" drew local media attention. After screening vintage Dallas trolley movies (supplied by a local VT enthusiast), the businessman organized MATA as a nonprofit corporation—Section 501 (c)(3) of the Internal Revenue Code—to build and operate the line. Two local trolley enthusiasts joined the board to oversee technical aspects of the project.

The businessman funded a professional feasibility study that supported the concept. He arranged pro bono public relations and advertising services, conducted fund-raising events, secured local business funding pledges, achieved city support, and applied successfully for two UMTA construction grants. MATA's early initiatives addressed mainly political hurdles. The businessman headed a small team that promoted MATA steadily before Dallas' city government for several years. This major effort finally produced the city's official endorsement and passage, in the Texas Senate, of a bill that limited the liability of city-contracted private transport firms to that of

F.A. Schultz III, McKinney Avenue Transit Authority, 3202 Urban Avenue, Dallas, Tex. 75227. J.B. McCall, The University of Texas at Arlington, P.O. Box 19479, Arlington, Tex. 76019.

the city itself. Once these hurdles were cleared, MATA began to develop a physical plant.

A Public/Private Partnership

MATA's \$5.5 million construction costs were divided between \$3 million in private-sector grants and \$2.5 million from UMTA (now the Federal Transit Administration). City government spent about \$200,000 for signs, pavement marking, and the relocation and modification of traffic signals. The businessman bought, and donated to MATA, a 1906-vintage Brill-built car from Portugal. Private grants to MATA funded the purchase of a large Model W-2 car from Melbourne, Australia. One of MATA's board members donated a restored Stone and Webster car body (on Melbourne trucks purchased with MATA funds). The same man also purchased, restored, and leased an ex-Dallas single-truck Birney car to MATA. The businessman bought, and leased to MATA for \$1 per year, a warehouse to be converted to a car barn. During this conversion, other private space was loaned to MATA for initial restoration work on the rolling stock.

Operating agreements were negotiated with the city, paid and volunteer personnel were selected and trained, and the 2.8-mi route construction was finished. With media coverage, a parade, and a crowd of about 30,000, MATA began daily service on July 22, 1989. From that date, through the summer of 1991, MATA produced a daily ridership load factor that was approximately double that of the surrounding public bus system (5.13 passengers per car-mile, versus approximately 2.60).

PLANNING THE SYSTEM

Route Constraints and Characteristics

MATA was conceived and developed primarily to stimulate lower McKinney Avenue restaurant and specialty shop business, as well as to enhance the historical ambiance of the surrounding turn-of-the-century neighborhood just north of Dallas' central business district (CBD). The idea was to both provide a magnet for convention and tourist activity and to attract a regular lunchtime trade from downtown. Hindsight revealed that the initial feasibility study greatly overstated traffic potential on the route. The same study also considerably underestimated both the construction and operating requirements.

Even though there was some discussion, during the planning process, that the 2.8-mi route was "Phase 1" of some undefined larger project, the founders had no real vision of a more extensive operation outside the vicinity of their own property holdings. Active consideration of route extension began after more than a year in operation, when both the pattern of public comment and problematic load factors began to be acknowledged by top management. Unfortunately the UMTA construction grants, generally available through the middle 1980s boom, were no longer an option by 1990. Downward economic trends foreclosed additional private-sector grants or city supplements for the same purpose.

The resulting 2.8-track-mile route used the revived double-track lines down McKinney Avenue with short segments of new construction at each end. At the north end, new track construction connected the McKinney Line with the new car barn and looped around an adjacent block for returning cars. At the downtown south end, new single track was constructed that turns, from double-tracked McKinney Avenue, onto St. Paul Street for a 0.5-mi stretch that terminates at Ross Avenue on the northern edge of the CBD. The Ross Avenue terminus requires a multiblock walk for any CBD lunchtime traffic. This terminus also stops six blocks short of a major, well-developed restaurant, specialty shop, and restored warehouse attraction named The West End. MATA's lack of access to, and visibility within, this area was, in retrospect, a major planning mistake. Extension to The West End would have created an extensive, attractive, magnet for Dallas convention and tourist traffic.

MATA could have accessed The West End by either six blocks of new street trackage from its Ross Avenue terminus or by soon-to-be abandoned freight railway trackage. This latter route would pass a third developed leisure area (The Quadrangle) and traverse a large parcel of undeveloped commercial real estate. It would also allow some express running through a greenbelt area. Together, both route expansion options would allow MATA to loop its route with double track. Without these West End connections, the route—as built—concentrates nearly all MATA's traffic generators on that half of the route that is remote from both the CBD and The West End. Well-developed parking facilities at The West End would also minimize the lack of such facilities along MATA's as-built route.

Rolling Stock Planning

From the beginning, MATA's founders had a keen sense of trolley heritage and identified transport of the public in carefully restored vintage cars as a major objective. In retrospect, choice of old cars over replicas was the correct approach. The traditions of MATA's steel car body designs, one of which is nearly 90 years old, have proven to be extremely reliable. It was the attraction of the genuine article that drew the large, skilled volunteer restorative force that did much of the work on the project. Even if the labor had been purchased, a restored car would still have been less expensive than an estimated \$450,000 reproduction car. With the volunteer force, the cost of restoring a double-truck car was approximately \$185,000. Additionally, MATA has tied its promotion and marketing to "genuine antique streetcars."

When planning a route, the equipment must be considered, particularly when planning curves and special work, given VT truck wheelbase and car overhang. The decreasing availability of VT cars dictates that the track geometry conform to the cars and not the opposite. MATA was under a design handicap in that special work and some curves were salvaged from the original system long-buried under the pavement. This resulted in the route being designed around available preexisting trackwork. Additionally, some of the newly constructed curves failed to take into account the wide variation in truck wheelbases (5 ft 6 in. to 8 ft). As a consequence, some of the cars (particularly the single-truck cars) bind up or are tech-

nically derailed on some of the curves. Car overhang must be carefully considered on sharp curves when locating poles. Degree of truck swivel must be adequate for the sharpest curve. Failure to consider route and equipment as an integrated system is an error. Design routine in LRT becomes the exception in VT.

Personnel

In addition to the two trolley enthusiasts who joined the board at the onset, there were several interested people in the Dallas area who brought some technical depth and mechanical expertise. Likewise, a larger group of more casual enthusiasts expressed strong interest in donating their time. MATA's planning, therefore, visualized a labor force drawn mainly from volunteers.

Ridership and Promotion

Although the initial feasibility report's ridership estimate was overoptimistic, MATA's novice management accepted these projections. Little formal discussion was held about the necessity to "buy" riders with a carefully thought-out, ongoing promotion campaign. Lacking a place on the initial budget, early promotion was informal and virtually nonexistent. Charter possibilities, likewise, were not considered to be an appreciable source of revenue in the initial planning.

Deficit Financing Options

During the planning process, UMTA funds were thought available and the then-strong local economy suggested that supplemental private grants could also be secured. No advance planning was done to have other sources (such as emergency city funding) in place should initial funding sources prove inadequate or evaporate. When negative economic trends in the real estate and oil sectors later eliminated large private pledges, this planning omission had severe consequences.

Board of Directors

The board of directors was assigned the functions of securing private grants, developing public grant proposals, and maintaining liaison with government at all levels. The chairman was to be the initiator in these functions.

NEAR-TERM RESULTS

Costs, Revenues, and Output

In 1990 MATA recovered 46 percent of its costs at the farebox; not bad for transit but inadequate for an independent VT. These costs included debt service to the bank line-of-credit that was secured by private-sector sources. Inclusion of other revenues—individual donations, membership dues, and merchandise sales—expanded cost recovery to 85 per-

cent. Farebox recovery, for the first half of 1991—as this paper is drafted—increased to 48 percent because of a fare increase and vigorous cost reductions. Through the end of 1991, no public subsidy of MATA's operating expenses has been received. Supplemental private guarantees of the bank credit line, and other private grants, have covered the deficit. Adult tickets are \$1.50 and children under 12 ride for \$1, round trip. Charter business has accounted for nearly 30 percent of MATA's revenues and, during some weeks, has exceeded the regular farebox revenues. Charter rates are based on a 2-hr minimum, priced from \$150 to \$400, with \$100 for each incremental hour purchased.

MATA's 1990 passenger load factor was nearly double that of the area public bus system that surrounds it. MATA carried 236,074 passengers that year and produced 45,991 trolley car miles, with an average one way trip load of 7.19 riders. Average passengers per car-mile was 5.13. MATA's average variable direct cost was \$1.43 per car-mile, 20 cents of which was for electricity. In its first 2 years of operation, MATA has carried over a half million passengers. These results were produced with four vintage cars, 2.8 mi of track, volunteer labor, and seven paid employees. Paid employees included those identified in the planning process, an office/operations manager, an advertising director, and an additional shop person.

Ridership Profiles

MATA has undertaken no formal surveys of ridership. However, some informal assessments are held with some confidence. Well over 90 percent of the traffic is pleasure-related and, therefore, highly discretionary. Ridership is almost evenly split among males, females, and children. Essentially all of the traffic is round-trip, with about one-fourth of the passengers departing, then reboarding a car with a return coupon at some point during the journey. The split between local and out-of-town riders is heavily convention-dependent, and this is further influenced by the level of preconvention planning that has been done jointly between MATA and the Dallas Convention Bureau. Generally the younger the age group of the conventioners, the more traffic MATA gets.

Whatever the source of the traffic, one-half go for a trolley ride, and the others use the cars to visit stops around the route. Ridership is also highly weather-dependent. Even though the cars are heated in winter, cold weather kills ridership. Moderately hot weather does not seem to appreciably affect traffic. Very little lunchtime traffic from the CBD has developed. Commuter ridership is nil. Among the local riders, all age groups are represented, with senior citizens accounting for a small proportion of the total, relative to other groups. Although MATA's old cars are not modified for wheelchair lifts, those few passengers with wheelchairs have been accommodated informally and lifted on board.

More than 90 percent of MATA's first-time riders have never before taken city transit of any type. They are either transit-ignorant or transit-hostile and must be cultivated with friendly and gentle handling by the crew. These riders are generally apprehensive and intimidated about their first-time ride. They are afraid of getting lost and of looking foolish because they do not know how things "work." Everything is

a new experience, from boarding, paying the fare, and finding a seat to managing a return to the vicinity of their automobiles. Car crews must ensure that these riders do not take a trip to the "twilight zone."

Charter business is solicited from any organized group. MATA has chartered for school groups, reunions, corporate functions, birthdays, "murder-mystery" dinner groups—and even one memorable prewedding groom's party (that probably will not be repeated). MATA provides basic car decoration, including tables and bar (if needed), and the buyer is encouraged to arrange any on-board catering of food, drink, or music.

Labor Profiles

MATA's time sheets reveal that two-thirds of the operating labor hours are volunteer. This volunteer group includes the chief of cardiology at a major hospital, a retired public utility chairman, a bus driver's union president, educators, business owners, wage earners, and college students. Generally they are reliable, motivated, and professional in demeanor. Their accident rate is lower than that of MATA's paid employees. Volunteer motormen and women undergo the same training and recertification programs required of the paid employees. Volunteers also work a variety of other jobs, from shop work and housekeeping to administrative assistance. VT jobs cross craft lines. VT volunteers will work at several different tasks during the month, limited only by their skills and attitudes. MATA's policy assigns each volunteer to a specific task or project that is defined with specific beginnings and completions. Once the volunteer is matched with the job, they usually carry out the assignment with minimal supervision. The volunteer has both the responsibility and the personal recognition for a job well done. The key to volunteer motivation is organization, individual responsibility, recognition, and praise. This policy does not vary with the paid employees, who, because of their comparatively low pay, tend to consider themselves semivolunteer anyway. Though scheduling of volunteers during weekdays may be difficult, MATA could not exist in its present form without these people.

Though MATA has not sought an all-male volunteer force, that has almost been the outcome. At any given time, there has never been more than one regular female car operator nor more than one female conductor (one of MATA's four cars requires a conductor). The rail enthusiasts' movement, from which MATA's volunteers are largely drawn, tends to include few female participants. MATA's agreement with the city requires car operators to have, or obtain, a commercial driver's license. Although seven or eight female students have enrolled in the operators training course, all but two have dropped out rather than undergo a state driving test with MATA's line truck. Additionally the prospect of operating an empty car at late hours, alone, along a nearly deserted urban street may have deterred greater female participation. As a result, MATA's few female volunteers have usually elected office projects.

Advertising and Public Relations

Although MATA has been the subject of a number of media features, the public's memory is short, and few residual ben-

efits occur. It is estimated that more than half of the metropolitan area population has yet to learn that MATA exists. Management subsequently agreed that consistent promotion was needed, although the board's concerns about reduced cash flow precluded allocation of any significant funds to the effort. Lack of systematic, ongoing liaison with city convention hosts cost MATA many riders; those conventions for which VT personnel worked closely with the convention bureau, in advance, business was good. Available funds were used to hire an in-house public relations person who worked almost exclusively to promote, sell, and coordinate charter business and, here, modest success was forthcoming.

Souvenir merchandising is an important advertising, as well as revenue, adjunct to MATA's operation. MATA policy requires that the inventory be unique, of good quality, and related to MATA or to Dallas. This part of the enterprise needs floor space, sales personnel, a keen eye for product selection, and good inventory control. As most of the cars are one-person operations, it is not feasible to do more than advertise these items on board and suggest the operator direct interested riders to the car barn sales area.

FINANCIAL DISTRESS AND REACTIONS

On opening day, July 22, 1989, MATA began service with \$156,000 of its bank credit line spent. When negotiating the initial project with city government, MATA represented as a condition of the city's approval that it did not expect to seek future public subsidy. Also, when MATA applied to UMTA for its two construction grants, DART's Amalgamated Transit Workers Union believed that MATA would not seek future UMTA Section 9 operating assistance grants. Distress in the local oil and real estate sectors triggered private-sector pledge defaults of \$1.1 million.

By early 1990, with MATA's cumulative deficit exceeding \$300,000, the executive department acknowledged that no backup deficit financing plan was in place. A new chief operating officer was hired and charged with reducing the rate at which this deficit was accelerating. Formal advertising and public relations were addressed by the creation of a new paid position in the office.

By midyear, it was evident to the executive department that new fund-raising efforts were mandatory. Concurrently they began to recognize the impact on farebox revenues of MATA's inadequate route length (and lack of access to The West End). In July the most popular car was indefinitely withdrawn from service, reducing the fleet by 25 percent. Its repair was estimated at \$37,000 and 1 year's work. MATA applied for \$200,000 in unused UMTA Section 9 operating assistance funds. In November two full-time and one part-time motormen were laid off and subscription to Workmen's Compensation was terminated. By the end of the year, the executive department imposed a general moratorium on restocking any merchandise and tokens, and imposed severe restrictions on the already conservative advertising and promotions program.

In early 1991 adult fares were increased in the face of an unmistakable decline in ridership that exceeded seasonal variances. By mid-1991 the approved budget was suspended and all advertising ceased. Deferred maintenance of both track and overhead began to accumulate, and the inventory of ma-

for spares for the rolling stock was depleted. Three weeks prior to MATA's scheduled receipt of its requested \$200,000 UMTA operating grant, DART's Amalgamated Transit Workers Union declined endorsement under the required 13C Provision. The funds were withheld. By the end of August MATA had reached the \$400,000 limit of its bank line of credit and service on this debt, \$42,000 per year, became MATA's third-highest expense, after insurance and payroll. September operation was funded directly by board members. At the end of this month, all employees were laid off, except for one caretaker shopman; MATA reduced weekday operation to evenings only and began an all-volunteer operation. Rough calculations suggest that, if MATA had ceased operation at that time, each of its passengers would have been subsidized slightly more than \$12 from public and private grant monies over those 26 months of operation (excluding proceeds from salvaging the operation).

VINTAGE TROLLEY AS AN INTRODUCTION TO LRT

Whether VT can favorably introduce a transit-ignorant rider to the possibilities of LRT—in the abstract—will depend upon how serious VT management is about the proposition. The trolley ride itself will probably do little more than create impressions about riding streetcars among automobile and bus traffic. This alone is not enough. The missing ingredient is a proactive, on-board educational program with, perhaps, attractive souvenir handouts. Passengers must be led to recognize both differences and similarities between VT and LRT. This program is a sales effort designed to leave the rider with a favorable disposition toward LRT.

PERSONAL PERSPECTIVES AND EXPERIENCE

Based on personal involvement on MATA's staff, some views have been developed as to the applicability of the MATA experience to VT in general.

Can VT Support Itself?

No, VT cannot support itself. The convenience, cultural, and emotional appeals of automobile possession, as well as its generally unacknowledged full costs, present a formidable hurdle for any for-hire passenger transport operation. Philip Locklin long ago opined that passengers, unlike pigs, can never be carried for a profit because the value of humans, per unit weight, is so high. If the unit fare is set high enough to cover all true costs of the service, traffic volume will be inadequate to produce a profit; someone will have to cover the deficit.

What Is an Optimal VT Organization?

The issue of what an optimal VT organization is will be influenced by unique considerations of each potential VT. A public/private venture such as MATA's, with its emphasis on volunteer labor, offers potential benefits in the form of both

lower unit cost and operational flexibility that might not be obtainable if the VT were organized as an adjunct to other city services.

What Are Essential Planning Elements of VT?

Before planning can proceed, a clear definition of the VT's mission must be developed. If transportation is not the only mission, if property development or job creation—or any other competing goals—are determined, a careful assessment of the trade-offs among these goals is required and costs shared accordingly.

Route planning may be influenced by available abandoned trackage. Nevertheless, some flexibility probably always exists in route choice and length. Three generic route types emerge. Route Type 1 is anchored at one end by a traffic-generating attraction. Initial demand results from the strength of the terminal and from the number (and strength) of intermediate stops along the route. Route length is a function of the number of such intermediate attractions.

Route Type 2 is anchored at each end by terminals. So long as their strength will provide at least threshold ridership, the extent of the terminals' separation will generally determine the length of the route.

Route Type 3 approximates MATA's case; both ends are weak attractions. This type of route concentrates destinations along its length such that traffic density is "bell-shaped" and traffic thins out quickly on either side of this bell. Unless new attractions can be developed and the amplitude of the bell increased, failure of the project is likely. The best probable route outcome would be a combination of Types 2 and 3.

Can VT Planning Prompt Further Economic Development?

VT route planning and promotion turns transport history inside out. Early transit routes were the engines that drove development. Today the attractions drive VT success. VT, in turn, can augment the attractions and, with luck, synergy will evolve.

What Are VT Rolling Stock Considerations?

The location of restorable VT bodies, as well as the parts needed to resurrect an operable car, can be a formidable task. Realistic survey of each restoration candidate is the essential precondition for the acquisition of such relics. The survey requires a person versed in both general streetcar repair and with experience in the restoration of VT technology. Hidden problems can be located if the surveyor has the trained eye that only hands-on experience can develop. Europe is a source of fairly complete VT cars. MATA's experience discloses that vintage car bodies should be avoided in the direct proportion to the amount of wood, as opposed to metal, contained in the car construction.

Restoration and maintenance of genuine vintage cars requires people who have learned obsolete skills and who understand both obsolete techniques and technology. Local job shops with intrepid master workers in both machining and

woodworking are necessary. Take nothing for granted; inspect or rebuild everything. Shortcuts do not save money. If restoration is not feasible, reproduction VT cars of excellent quality are available from two domestic suppliers. Expect them to cost from twice to three times the outlay for a practical restoration.

What References Exist for VT Construction?

Although VT and LRT may share a common, contemporary route design, old reference materials can be highly useful as a substitute for "organizational memory." For a project manager new to VT, a most useful reference is the *Electric Railway Handbook* by Albert S. Richey, published by McGraw-Hill in 1924. Reprints of this volume are available from the Association of Railway Museums. The volume is of value as a compendium of considerations to be dealt with rather than a source of absolute data, because materials and standards have changed over time. Much of the information, however, concerning cars, carbarn, overhead, and track design is still valid.

What to Look for When Reclaiming Abandoned Track

MATA experience indicates that revival of abandoned track in-place can be done at 10 percent of the cost of new track on a new route. Two factors influence this potential saving: location of public utility distribution systems above and below the street surface and the condition of the old track. An early survey of the entire track structure is a must. Each rail joint must be excavated to reveal the condition of ties, hardware, bonds, and rail. A rail flaw detection car should be run over the line to ensure mechanical, as well as electrical, integrity. Broken rail should be thermite welded and rail bonds must be double-checked. Expect to replace rail sections where utility cuts have been made. Bridge all these cuts with reinforcement, otherwise subsidence of the subgrade will occur soon after service begins.

Expect to find that some of the old rail is worn out. Worn girder rail is a major problem as it places car weight on the flanges, rather than tread. If electrolytic corrosion has removed much rail web or base, expect early rail failure regardless of railhead condition. MATA has used "T" rail to replace failed girder rail. Girder rail is difficult to bend and must be laid to close tolerances, especially on curves and in special work. References published as early as 1905 recommend against the use of girder rail where possible. Where guard rails are required, Bethlehem Steel's Strap Guard is an excellent replacement.

What to Look for When Building New Track

Utility relocation can be a major cost of new, as well as revived, track if insulated rail is not used. Aerial cables that cross the route may also need relocation, as the nominal height of trolley wire is 18 or 19 ft above the railhead. In some cases it will require 22 ft. City ordinances generally require that an uninsulated metallic conductor (pipe or structural reinforcement) be no closer than 5 ft below the base of a noninsulated

rail. This separation is to prevent stray currents from causing electrolytic corrosion. Utilities placed when the old track was in service should conform to this standard; new placements will probably need relocation. Utility plats may not be accurate references.

Street railway trackwork requires techniques not normally demanded of a conventional railroad contractor. Sharp curves and special work need to be designed carefully and manufactured with precision. Curves of less than 50-ft radii should be bent to jigs and fitted on an erection floor before installation. Plan for proper drainage of turnout points and throw boxes. Turnout points should be located opposite car weight when operating. All curves should be spiraled. Inside the carbarn, avoid any curves or special work. Guard rails on tight curves may cause tracking problems, even if the track is in gauge. Before curves and special work are spiked down, any car with a long wheelbase (such as a single-truck Birney) should be test run over such sections. Gauge bars should be installed at frequent intervals.

Some Rules for VT Overhead Wire

The best source of basic overhead design will come from the domestic supplier of the components. Available contractors may have never seen trolley overhead and must be willing to work with component suppliers in execution of the job. The operational quality of the overhead depends almost entirely upon the quality of the installation, whatever the quality of the components. Special attention is needed on curves and special work, as well as proper wire tensioning along the entire route. After the wire has been in service for some months, expect it to undergo an initial stretch. The expense of initial retensioning should be included as part of the original construction cost.

Judging VT Personnel Matters

If the VT is an adjunct within city transit, volunteer, or part-time, workers may not be an option. If the VT is organized along MATA's profile, however, consideration of volunteer employees will be a likely event. It should be expected that properly selected volunteers will behave, usually, with high motivation and as independent agents. If they come from a trolley museum background, it may take some managerial expertise to convert their attitudes from those that involve casual operation to those that fit with serious, regular service demands.

SUMMARY

A properly planned and executed VT, that is promoted vigorously, can both benefit the locality of its route and generate external benefits that will augment city development in general. In the best case, VT will require subsidy at some level. As a result VT must be recognized as both a political and managerial activity that transcends running obsolete trolleys along restored trackage through interesting locations.