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16. Abstract

This report examines the use of taxi firms as the providers of publicly supported demand responsive transit. These subsidized shared ride taxi (SRT) systems have become the predominant form of general public DRT in California, with 29 such systems now in operation. Based on California's experiences with subsidized SRT, this study presents case reviews of SRT implementation and operation, analyzes the issues associated with the development of taxi-based transit services, and evaluates the performance of subsidized SRT.

The major issues concern: (1) service provision, including the institutional reasons for contracting, competition for contracts, and contractual arrangements and their effects; and (2) the consequences for taxi firms of becoming public transit providers,including legal implications, operational changes, labor-management relations, the impact of subsidization, and the effects of contracting on the firm's financial situation and future plans. SRT performance is evaluated in terms of cost-efficiency and effectiveness and also compared to that achieved by other forms of community level transit.

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EXECUTIVE SUMMARY

Study Context and Scope

During the latter half of the 1970's the most significant development in demand responsive transit has been the emergence of taxi firms as providers of publicly supported DRT services. This movement of the private taxi firm into the public transit domain is largely a reaction to recent intersecting events in the public and private sectors of demand responsive transportation. The widespread diffusion of DRT systems for community level transit, combined with the quest for cost-effective ways of delivering DRT, have provided taxi firms with an opportunity to enter the transit arena. At the same time, the steadily worsening financial prospects of conventional taxi services have given taxi firms the motivation to diversify into new markets, among the most important being the delivery of DRT services under contract to public agencies. As these trends have drawn taxi firms and local government together, taxi-based public transit systems have been established in numerous communities.

This study is based upon experiences in California, where taxi-based community transit has been most widely implemented, and focuses upon a particular form of taxi-based transit, namely subsidized shared-ride taxi (SRT) services. Primary attention is given to California's subsidized SRT systems for the general public, 29 of which were operating as of mid-1979. These SRT systems exhibit great diversity in service area characteristics, sponsor objectives, system organization, and type of sponsor. To illustrate the influence of different institutional and locational factors on system initiation, organization, and performance, this report presents several case studies of the development and operation of taxi-based DRT.

The use of taxi firms as DRT providers raises a number of important institutional and performance issues. Accordingly, the primary purposes of this study are to:

1) analyze the issues associated with taxi firm provision of publicly sponsored community transit service, and
2) evaluate the performance of taxi-based community transit systems.

The institutional analysis component of this study focuses on three broad categories of issues. Institutional choice issues concern the reasons and processes by which public agencies and taxi firms become involved in subsidized SRT service, as well as the specific means of involvement chosen. Service organization issues pertain to the organization of the SRT system, and the reasons behind decisions about such parameters as use of vehicles, compensation arrangements, and sponsor oversight. The third set of institutional issues concern the consequences for taxi firms of becoming public transit providers. Among the most important consequences are operational changes, impacts on labor-management relations, legal implications, and the effects of contracting on the firm's cost-efficiency, profitability, and future financial game plan.

The performance of taxi-based public transit is the other major concern of this study. Performance analysis focuses upon the cost-efficiency and cost-effectiveness of subsidized SRT systems. In addition to measuring the efficiency and effectiveness of subsidized SRT, this study identifies the key determinants of system performance, analyzes the effect of system organization on performance outcomes, and compares the performance of SRT operators both to other DRT providers and to fixed route community transit.

Institutional Choice

Four factors explain why taxi-based DRT has flourished in California. First, the State's transit subsidy program, which allocates funds to local government and mandates that it provide public transit, has given communities the means to afford their own transit systems. In many communities DRT has been deemed the most appropriate service. Second, municipal governments are often the recipients of state transit funds, and for California municipalities contracting with the private sector is a well-established method of providing local government services. Third, local governments opt for subsidized SRT as opposed to other forms of DRT due to the perceived cost-efficiency superiority of taxi contracting. From the sponsor's perspective, the cost-efficiency advantages of subsidized SRT includes not only the low production costs of taxi firms, typically 10-30 percent less than the least expensive alternative providers, but also low capital costs for vehicles, the ability to purchase a packaged service from the taxi firm which can be quickly implemented, and the political advantages of giving business to

local private enterprise. Fourth, taxi firms in California have actively sought out DRT contract opportunities, in response to both their declining profitability and the threat of competition from publicly operated DRT. With numerous DRT systems operating in the state, taxi firms have been forced into the transit business to insure that they, not some other organization, operate any DRT systems in their service area.

While taxi firms enjoy a major competitive advantage compared to other DRT providers due to their low service production costs, formal competition has not been a prominent aspect of SRT contracting. In only about one-half of all cases did a formal competitive process occur, and serious competition among providers was present in only a handful of instances. The relative lack of competition for SRT contracts stems from limited (or no) competition within the taxi industry in suburbs and small cities, and major differences in the size and capabilities of potential DRT providers which make them unequal in the eyes of sponsors. Usually only a single firm possesses the combination of demand responsive expertise and low service costs a sponsor seeks. Contract renewals exhibit even less competition, inasmuch as sponsors are reluctant to change providers if the initial one proves competent.

Taxi-based transit has been widely implemented in both Northern and Southern California, but in substantially different forms in these two regions. The latter area of the state contains 28 of the 29 subsidized SRT systems for the general public, as well as a number of taxi-based elderly and handicapped systems, whereas virtually the only form of taxi-based transit in Northern California is elderly and handicapped service. The institutional structure for transit in Northern California, dominated as it is by large regional or subregional transit districts with traditional allegiance to fixed-route services, has been unfavorable for general public DRT operations generally. The result has been to limit the subsidized DRT market to specialized services. In Southern California, in contrast, municipal governments are much more likely to be the transit decision makers, and where there is no history of public mass transit they have often chosen to initiate DRT rather than fixed route service. This willingness to experiment with demand responsive services for the general public has created a much broader DRT market for taxi firms in the southern part of the state.

Service Organization

The key aspect of SRT service organization is whether the vehicles used to deliver the service must be dedicated exclusively to the SRT system, or can be utilized for other taxi services. Dedicated vehicle systems, the traditional method of organizing DRT, have been established by about 80 percent of California's SRT sponsors. The preference for dedicated vehicles stems from the desire of sponsors to identifiably link, through painting and signing of the SRT vehicles, the SRT service to the funding agency's sponsorship, thereby visibly claiming political credit for the community transit system.

While dedicated vehicle SRT systems are compatible with the credit claiming objectives of sponsors, they also require the use of provider-side subsidization, a compensation arrangement in which the SRT provider is paid per unit of available service (or on a cost-plus basis) rather than for actual service usage. This form of compensation gives the provider no incentive to maximize the productivity of the system, as payment is unrelated to performance. Incentive systems, which attempt to partially link provider compensation and system performance, have found little favor among sponsors. The result is that most subsidized SRT systems are not organized to provide internal incentives for cost-effective outcomes.

The alternative to dedicated vehicle operations is an SRT system built around a common fleet of vehicles for both SRT and conventional exclusive ride taxi (ERT) service. In these so-called integrated fleet SRT systems the provider is compensated only for service usage, i.e., only when transporting SRT passengers. Integrated fleet systems have managed to achieve high levels of cost-effectiveness, but this form of service organization often conflicts with such sponsor objectives as credit claiming (SRT vehicles are indistinguishable from regular taxi sedans) and strict accountability (the provider must be trusted to render an honest account of SRT service units, typically revenue vehicle miles). Consequently, only a handful of sponsors have adopted integrated fleet systems, despite the money saving potential of this service organization option.

The two principle sponsors of subsidized SRT, municipalities and transit agencies, are similar in their preferences for dedicated vehicle SRT systems (although municipalities are more willing to adopt the integrated fleet

option), but differ in their basic posture towards contracts and their administration. Municipalities, having chosen to contract for SRT in order to minimize DRT service costs and to avoid the administrative expenses of going into the transportation business, typically develop simple contracts and engage in only limited supervision of the provider. Transit agencies, on the other hand, are transportation providers and as such, are both more concerned with service quality and more inclined towards taking an active role in the service delivery process. Detailed contractual arrangements and close staff oversight, although they add to costs, are viewed as essential mechanisms to assure good contractor performance within established agency standards. They are routinely used by such organizations when they sponsor subsidized SRT.

Taxi Firm Impacts

Subsidized SRT has had two major impacts on participating taxi firms. The additional revenues resulting from SRT contracts have significantly improved the financial position of SRT providers, even while they have made financial well-being partially dependent on public subsidies. Over half of all taxi firms providing subsidized SRT in California obtain at least 25 percent of their revenues from public transit contract operations, and a few are receiving upwards of 50 percent of their revenues from this source. All report that subsidized SRT has enabled them to increase or at least maintain profitability. In addition, the managers of SRT providers have acquired a broader perspective on their firm's appropriate role in local transportation. Many consider their firms to be paratransit operations, not merely taxi companies, and almost all now actively seek out other publicly subsidized contract opportunities. Moreover, the interaction with government necessitated by transit contracting has enabled these managers to learn to work productively with the public sector, thereby facilitating the development of their firm's new role.

The impact of subsidized SRT has been much more limited in other areas important to the taxi firm. Few SRT providers have instituted radically new operational procedures, particularly for dispatching, the heart of any demand responsive transportation system. Although dispatching for SRT is qualitatively more difficult than for ERT, most providers have simply modified ERT dispatching practices. In the few cases where major changes in

dispatching systems have occurred, pressure by sponsors or levels of demand which would overwhelm incremental ERT procedures have been responsible. The result of this operational incrementalism has been mediocre system productivity for all but a handful of providers.

Somewhat surprisingly, labor-management relations under subsidized SRT have not changed significantly from the ERT situation. The major difference involves the compensation of SRT drivers, who normally are paid on the basis of an hourly wage rather than the commission system utilized for ERT employee drivers. Wages are quite low, typically in the range of $3.50 - $4.50 per hour. Drivers thus tend to fare no better monetarily under SRT than ERT, and often worse because tipping is discouraged. The only important monetary advantage is the guaranteed salary. SRT dispatchers are also paid approximately the same as their ERT counterparts.

It had been expected that labor-management relations within the taxi firm would undergo some noticeable changes with the advent of subsidized SRT. The more transit-like nature of the SRT driving job, the importance of good job performance to the firm's retention of the contract, and the subsidized revenues which provide a guaranteed source of funds to pay labor are all reasons why SRT workers would seem to have a more favorable position vis-a-vis taxi management than their ERT counterparts. The fact that SRT workers have not secured large wage gains or other monetary benefits is largely attributable to the unorganized status of the workers and to their typical view of the job as temporary (although often not short term), which itself is a disincentive to agitation and organization for better pay. Without union organization, which currently is not a serious prospect, SRT workers can command only as much compensation as taxi management considers necessary to obtain a competent work force. Manifestly, the needed level of pay has been low. Management determination to minimize labor expenses in order to keep production costs as low as possible apparently has not, so far, conflicted seriously with the objective of recruiting at least adequate workers.

The legal implications of public transit contracting could also potentially affect the labor situation of SRT providers. Although public transit contracting does thrust taxi firms into a new institutional arena often involving new legal rights and responsibilities, the impact has been quite

modest to date. One important reason is that many of California's SRT systems utilize no federal transit subsidies; the receipt of state transit subsidies is not accompanied by special rights or responsibilities for private providers, except as specified by local sponsors. However, when UMTA funds are involved SRT providers may qualify for protections from federally subsidized competition, and the labor protections established by Section 13(c) of the Urban Mass Transportation Act may also apply.

Section 13(c) labor protections pose the greatest potential for complications. The SRT employees of taxi firms which obtain a significant amount of their revenues from federally subsidized transit contracts apparently fall within the jurisdiction of 13(c). Although the actual consequences of extending 13(c) protections to taxi labor are quite uncertain, having yet to be tested, such a development could increase the likelihood of taxi unionization, lead to substantially higher wage rates for SRT workers, and undermine the competitive bidding process by guaranteeing the jobs of SRT workers. All of these prospects, even the last, are very disturbing to taxi management. Even though employee protections could serve taxi firms as a source of leverage either to prevent deployment of competitive public transit services operated by other providers or to obtain such services itself, they could also make the firm an unattractive contractor. Such might occur if 13(c) protections required a sponsor to guarantee employment (or suitable monetary compensation) to an SRT contractor's workers even if the firm eventually loses the contract to a competitor employing lower wage labor. Inasmuch as 13(c) ultimately protects workers only, not companies, there is very little incentive for an SRT provider to press for coverage of its workers in this risk laden area, particularly when the benefits accruing to the latter may damage additional contract opportunities for the taxi firm. In addition, taxi managers are often not well-informed about the possible legal implications of 13(c), a further deterrent to raising the issue.

SRT workers and public agency sponsors of subsidized SRT have not made 13(c) an issue either. The former are apparently ignorant of the potential protections afforded, a condition fostered by lack of union organization, management's silence on 13(c), and the "long term temporary" nature of the work force. As for SRT sponsors, like taxi management they wish to avoid 13(c) complications. Sponsors have thus seem fit to finesse the 13(c)

issue, even though they are required to obtain 13(c) certification from the Department of Labor before they can receive federal transit subsidies. Transit agency sponsors have continued to operate under their standard 13(c) agreement with DOL, making no special provisions for employees of SRT contractors, and two municipal sponsors have agreed to accept liability for protection even while stipulating that no employees are affected.

SRT Performance and Its Components

Taxi firms can produce DRT service for very low costs. The operating cost per vehicle service hour (exclusive of sponsor administration expenses) for subsidized SRT ranged from $10 to $16 in 1978-79, averaging about $12.50. Three factors account for the much lower production costs of SRT providers compared to other transportation organizations. First, taxi firms are low overhead organizations with a minimum of managerial/ administrative staff. Second, they are low wage employers. Public transit workers typically each two to three times as much as taxi labor. Third, taxi firms are able to share overhead between SRT and the other services they produce, most notably ERT. Overhead sharing almost invariably enables taxi firms to reduce DRT production costs below those of their private sector competitors, who must charge indirect expenses solely to the DRT service.

SRT performance has two aspects, however, namely production cost-efficiency, e.g., cost per vehicle hour, and consumption cost-effectiveness, e.g., cost per passenger. The latter depends on productivity as well as production costs. Most SRT providers have proven unable to achieve high vehicle productivities, averaging slightly less than 5 passengers per vehicle service hour. Consequently, their superior cost-efficiency has not been translated into highly cost-effective service: the average cost of an SRT trip is about $2.60. In contrast, the major DRT management firm operating in California was able to attain an average cost per passenger of about $2.30 in 1978-79, despite production costs an average of one-third greater than those of SRT providers. The reason is the much higher productivities (about 50 percent greater) achieved by this private contractor.

An analysis of the cause of the relatively low productivities of most SRT providers concluded that environmental factors (e.g. population density, demand density, service area size) had only a limited influence on performance, implying that dispatching weaknesses were a major culprit. The DRT

management firm has a much more effective dispatching system which, although it entails higher control room costs, results in better and more consistent performance. By not investing in improved dispatching capability, SRT providers are practicing a false economy, since low production costs are purchased at the price of mediocre, or worse, cost-effectiveness.

There is a method of organizing subsidized SRT, however, that can lead to much more cost-effective outcomes than that achieved by the average SRT system. This is the integrated fleet SRT system. Integrated fleet SRT systems register costs per passenger of about $1.65, or more than 25 percent less than those of the better performing dedicated vehicle systems, i.e., those systems not encumbered by poor provider performance or high sponsor administrative expenses. Illustratively, when the City of La Mesa switched from dedicated vehicles to an integrated fleet system, the cost per passenger was reduced nearly 15 percent compared to the previous system, one of the most cost-effective dedicated vehicle systems in the state. The cause of these outcomes is easily discerned. In an integrated fleet system the sponsor pays only for consumed output, not produced output, and the provider is motivated to maintain productivity at high levels (to the extent demand permits) in order to utilize vehicles and labor efficiently, thereby maximizing profits. The three integrated SRT systems in the San Diego area, for example, achieve vehicle productivities of 8.5 to 10.0 passengers per hour when vehicles are in SRT service, i.e., when hauling SRT passengers.

A few sponsors of dedicated vehicle systems have instituted performance incentives in an attempt to stimulate improved cost-effectivenss on the part of their providers, but without noticeable result. The affected SRT systems have not achieved significantly higher productivities or lower costs than other dedicated vehicle systems. Farebox retention is a weak incentive system, and more complex incentive systems, such as that developed and administered by the Orange County Transit District, have not only failed to spur productivity to above average levels, but seem to actually increase costs. The extra costs result from additional administrative/managerial expenses, for both provider and sponsor, required to implement an elaborate set of service regulations. They also stem from level of service standards which financially induce providers to depress productivity in the interest of reliable wait and ride times. Incentive systems may be justified on other grounds, but their ability to maximize SRT cost-effectiveness has not been

demonstrated. The only method of organizing SRT service which is consistently effective in promoting low costs per passenger is the integrated SRT-ERT fleet.

Conclusions and Policy Implications

The emergence of subsidized SRT as the preferred form of DRT in California has been a predominantly positive, trouble free development for both taxi firms and local government sponsors of public transit. Local government has been able to take advantage of the low service production costs of taxi firms to establish affordable DRT systems for the general public. Although the mediocre productivities of many SRT systems have prevented their cost-effectiveness potential from being realized, most sponsors are satisfied with system performance. Even when cost per passenger has been relatively high, sponsors have generally been of the belief that other forms of community transit would fare no better, and have not been eager to abandon the taxi contracting strategy. Moreover, taxi contracting insures the continued existence of both unsubsidized conventional taxi service as well as reasonably inexpensive subsidized SRT. Should taxi services cease entirely, as they have in some localities, the local government, as public transportation supplier of last resort, may find itself compelled to pick up the slack and introduce costly new services. An important benefit of SRT contracting is thus to maintain private sector alternatives to governmental provision of needed local public transportation.

For participating taxi firms, SRT contracts have resulted in an infusion of much needed revenue, contributing measureably to their financial strengthening. Public transit contracting has also given these formerly conventional taxi firms the opportunity and incentive to redefine their role, and to initiate the transition to broadly based paratransit companies positioned to serve a variety of profitable markets. This transition has not been accompanied, at least to date, by major legal or labor complications arising from either protections of Federal transit legislation or the firm's new status as a government subsidized public transit provider. The absence of such impediments is of major significance, for if California's experiences are representative, public transit contracting may well be an essential element in the future viability of taxi firms in all locales except large central cities.

Performance emerges as a potentially critical determinent of the future of subsidized SRT. As production costs inevitably rise, this form of DRT may become too expensive for sponsors to afford if cost-effectiveness cannot be improved through productivity advances. Cost-effectiveness can be substantially improved by utilizing the integrated fleet method of SRT system organization, but for political reasons many sponsors are reluctant to abandon the traditional dedicated vehicle system. Even if integrated fleet systems become more prevalent, the key to better performance will be managerial capability. The quality of management of many SRT providers is only barely adequate for the new demands (shared-ride operations, data gathering and analysis, public accountability) placed on the taxi firm. Substantial improvement will be required if the inherent advantages of taxi-based DRT are to be translated into cost-effective, high quality service. Should this not occur, sponsors may eventually sour on subsidized SRT, despite its low production costs.

Government policy has played at best a minor role in the proliferation of taxi-based transit in California. The driving force behind this development has been the economic and political advantages of taxi contracting to local governments. Higher level governments can play a facilitating role in this largely local level process, however, by adopting policicies which treat taxi-based transit like other forms of publicly subsidized local transit services. The State of California has moved in this direction. The fact that subsidized SRT accounts for 60 percent of the general public DRT systems in California indicates that when allowed to compete on a relatively equal basis, taxi-based services often become the most desireable option for community transit.

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CHAPTER ONE
STUDY CONTEXT AND APPROACH

The emergence of the taxi firm as a public transit provider represents one of the most significant developments in public transportation of the 1970s. Taxis, of course, have long been a major form of urban transportation, a mode carrying 40 to 60 percent as many passengers as the combined total of bus and rail transit.[1] Although taxi firms traditionally have confined their operations to the private sector of transportation, events of the past several years have altered this orientation. The advent of subsidized demand responsive transit (DRT) as a local transit option, and the search for cost-effective ways of delivering DRT, have provided taxi firms with an opportunity to enter the public transit arena. During the same time frame, the steadily worsening financial prospects of conventional taxi services have given taxi firms the motivation to diversify into new markets, prominent among them the provision of DRT services under contract to public agencies.[2] As these trends have drawn taxi firms and local government together, taxi-based public transit services have been established in numerous communities. The purpose of this study is to: (1) analyze the issues associated with this development, and (2) evaluate the performance of taxi-based community transit systems.

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[1]Control Data Corporation and Wells Research Company, Taxicab Operating Characteristics. Control Data Corporation, March, 1977; Wells, John D. and Selover, F. Fred, "Characteristics of the Urban Taxicab Transit Industry," in Economic Characteristics of the Urban Public Transportation Industry. Institute of Defense Analysis, 1972.

[2]For treatments of these developments, see for example: Control Data Corporation and Wells Research Company, op. cit; Gilbert, Gorman, "Taxi Innovations in Demand Responsive Transit," in Fielding, Gordon J. and Teal, Roger F., eds., Proceedings of the Conference on Taxis as Public Transit. Institute of Transportation Studies, University of California, Irvine, December, 1978. Remak, Roberta, Potential for Flexicab Services: Innovative Use of Taxis and Jitneys for Public Transportation. U.S. Department of Transportation, Office of the Secretary, December, 1975; Teal, Roger F., "Taxis as Public Transit," in Proceedings of the Conference on Taxis as Public Transit, op. cit.

This study is based upon experiences in California and focuses upon a particular form of taxi-based community transit, namely subsidized shared-ride taxi (SRT) services. The choice of California as the site for the study stemmed from a simple and compelling consideration. While the movement of the private taxi firm into the public transit domain is now underway in many areas throughout the U.S., it is already in full bloom in California, particularly Southern California. The use of taxi firms to deliver community level transit is now the norm, not the exception, in California. As of July 1979, taxi companies operated 29 DRT systems offering service to the general public. These subsidized SRT systems comprise nearly 60 percent of all general public DRT systems in the state. In Southern California, subsidized SRT systems represent over 75 percent of all DRT systems, including the largest operations. Added to these subsidized SRT systems for the general public is an even greater number of publicly subsidized taxi-based services restricted to the elderly and handicapped. California is the home, then, of over 60 publicly supported transit services operated by taxi firms under contract to public agencies.

California's experiences with taxi-based public transit have the benefit not only of numbers, but of longevity and variety as well. The oldest, El Cajon's shared-ride taxi system, has been in operation since 1973, and many other systems have been in existence at least three to four years. Consequently, most systems have long since passed the point of being experiments, and are now permanent fixtures in their respective communities. However, they have continued to evolve and change in response to ridership growth and funding requirements. These systems, while concentrated in Southern California, are found in all types of locales--central cities, suburbs, and small towns. The services themselves are organized pursuant to several different types of contractual arrangements. Compensation systems, the use of incentives, service parameters, and restrictions on vehicle use vary from system to system. The services, moreover, are provided under contract to different types of governmental units--transit districts, municipalities, counties, and joint power agencies.

These features of the California experience in contracting with taxi firms for community transit yield an ideal data base for analyzing the results and assessing the future prospects of this paratransit innovation.

Of particular importance, the amount and quality of the California data make possible a comprehensive, empirically based analysis. Previous studies, in contrast have had to rely primarily on either conceptual considerations or the results of specific demonstration projects.[3] California's experiences represent an excellent opportunity to assess the viability of the public/private sector relationship in demand responsive transporation, the forms this relationship is most likely to take, and the implications of service contracting for both taxi firms and government sponsors.

I. The Emergence of Taxi-Based Public Transit Services

The emergence of taxi-based public transit service, in California and elsewhere, is primarily a function of two developments: (1) the growing importance of demand responsive transit as a local transit mode; and (2) the increasingly unfavorable financial condition of the taxi industry.

While it is now recognized that DRT is the most viable transit mode for many low density communities, and DRT systems have in fact been implemented in scores of localities across the country, the advent of DRT did not automatically translate into service opportunities for the taxi industry. Indeed, quite the opposite was the case. The early Dial-A-Ride experiments were often established in competition with existing taxi operations.

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[3]For conceptual treatments of the issues associated with taxi firm diversification into public transit and SRT, see: Alschuler, David M. and Flusberg, Martin, "Establishing Contractual Relationships for Demand-Responsive Transportation Services," Transportation Research Record 608, 1976; Altshuler, Alan A., "The Federal Government and Paratransit," Paratransit: Special Report 164, Transportation Research Board, 1976; Remak, op. cit.; Zolla, Edward III, "Labor Requirements Under Shared-Ride Taxi Systems," in Proceedings of the Conference on Taxis as Public Transit, op. cit. Good analyses of some actual experiences are found in: Alschuler, David M., "Labor Protection, Labor Standards and the Future of Paratransit," Paratransit, 1979: Special Report 186. Transportation Research Board, 1979; Ernst, Ulrich and Miller, Gerald, The Taxi Feeder to Bus Demonstration Project in the St. Bernard Perish. Urban Mass Transportation Administration, U.S. Department of Transportation, August, 1979; Fitzgerald, Peter, "User-Side Subsidies on Shared Ride Taxi Service in Danville, Illinois," in Proceedings of the Conference on Taxis as Public Transit, op. cit.; Furniss, Robert, The Westport Connecticut Integrated Transit System. Urban Mass Transportation Administration, U.S. Department of Transportation, July, 1979.

However, the outcomes of these first generation DRT ventures rebounded to the advantage of taxi firms.[4]

First, DRT proved to be a very expensive service when operated by transit agencies, encumbered by high wage unionized labor and restrictive work rules. With the exception of a few well-publicized experiments (such as Haddonfield, Rochester, and Santa Clara County) the high costs of transit agency operated DRT rendered this mode of service delivery politically unacceptable to local officials. In addition to high costs, service unreliability plagued some of the early systems. Second, vehicle productivities turned out to be much lower than anticipated. Since too much travel time was required to pick up and drop off a bus load of passengers, the capacity of the mini-buses used in the early systems was effectively unutilizable, and hence often unnecessary under typical conditions. Third, taxi firms strenuously opposed the establishment of publicly subsidized DRT systems in their service area, and resorted on occasion to legal action in attempts to prevent their deployment.[5] While the lawsuits generally were unsuccessful, the reaction of the taxi operators served notice to public authorities that there existed an important transportation actor with prior claims on the demand responsive turf.

The problems with the initial Dial-A-Ride experiments have resulted in a second generation of DRT systems based upon different service and organizational arrangements: (1) contracting with private providers for service; (2) use of vehicles smaller than mini-buses, either vans or sedans; and (3) consideration for the interests of potentially affected taxi operators. These developments have been mutually reinforcing in creating conditions favorable to taxi involvement in DRT service provision. The most important of these trends, from the taxi industry perspective, has been the increased willingness of the public entities which fund transit service to contract for DRT rather than directly provide this service themselves.

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[4]For a good review of the problems and potentials of the first few years of DRT undertakings, see Ewing, Reed and Wilson, Nigel, Innovations in Demand Responsive Transit. Center for Transportation Studies, Massachusetts Institute of Technology, April, 1976.

[5]Gunderson, Richard, "Legal Aspects of Paratransit Deployment," in Proceedings of the Conference on Taxis as Public Transit, op. cit.

The opportunity to become public transit providers for government agencies is coming none too soon for taxi firms, for the taxi industry is in rather serious financial difficulties. In 1975, one quarter of all taxi firms nationwide failed to generate revenue sufficient to cover even their out-of-pocket costs, and as many as half may have failed to cover total costs (including depreciation).[6] Between 1964 and 1972, 25 percent of all taxi firms went out of business, and this trend has continued throughout the 1970's.[7] In California, for example, approximately 15 percent of all taxi businesses closed between 1972 and 1976.[8]

The nature of the taxi industry's financial problems is quite simple. Inflation has pushed all input costs upward, and the costs of two inputs, fuel and insurance (including social insurance), have increased dramatically. Operators, seeking fare increases to enable revenues to keep pace with costs, have encountered regulatory lag as political decision makers have only slowly and reluctantly authorized fare adjustments. But fare increases, even when promptly granted, are not a permanent solution, since the price elasticity of demand for conventional, exclusive-ride taxi (ERT) service appears to be in the neighborhood of -1.0[9]. That is, a 1 percent increase in price yields approximately a 1 percent decrease in ridership. By raising their fares, taxi firms are slowly pricing their ERT services out of the reach of many members of their market, a substantial percentage of whom are low income individuals.[10] Profits can never recover if this

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[6]Control Data Corporation and Wells Research Company, op. cit.

[7]Remak, op. cit., p. 16.

[8]Davidson, John and Gaylen, Ritchie, Taxicab Business Failures in California, 1972-1976. California Department of Transportation, Division of Mass Transportation, November, 1977.

[9]Kirby, F. R., Bhatt, K. U., Kemp, M. A., McGillivray, R. G., and Wohl, M. Paratransit: Neglected Options for Urban Mobility. Urban Institute, 1974, p. 123.

[10]Gilbert, G., Bach, R. O., Dilorio, F. C., and Fravel, F. D. Taxicab User Characteristics in Small and Medium-Sized Cities. Center for Urban and Regional Studies, University of North Carolina, January, 1976; Webster, A., Weiner, E., and Wells, J. The Role of Taxicabs in Urban Transportation. U.S. Department of Transportation, Office of the Assistant Secretary for Policy, Plans and International Affairs, December, 1974, p. 3-5.

situation persists, since each fare increase simply results in fewer fare paying passengers (albeit paying higher fares).

Many taxi companies have reacted to these financial difficulties by changing their internal organization. There is a strong trend in the taxi industry towards driver leasing arrangements in place of the employer-employee relationship between company and driver which has prevailed for many years. By leasing its taxi vehicles to drivers, the firm rids itself of the costs of social insurance (Workers Compensation, Social Security) and reduces administrative costs associated with a large payroll. Drivers apparently find leasing desirable as well, due both to the status of quasi-independent businessmen which they attain and the increased ability to shield their income from taxation. But while leasing offers short term relief to taxi firms, it does not eliminate the dilemma of rising costs and shrinking market, particularly in the many small and medium size communities the taxi industry serves.

An industry faced with the situation of pricing itself out of a limited market has essentially three options if it wishes to avoid financial ruin. It can seek new markets by offering new or different services, it can attempt to recapture and expand its traditional market, circumventing the problem of price by substituting a similar but somewhat inferior service at a lower price or it can seek a government subsidy. As applied to taxi firms, these choices consist of: (1) taking advantage of their demand responsive expertise to supplement their ERT business with contracts for the delivery of persons or goods as desired by other organizations in society; (2) instituting shared-ride taxi services, thereby increasing productivity and permitting lower fares; or (3) bolstering their revenues from the private sector with government subsidies, obtained either as a direct subsidy or through contracts for services made available at subsidized fares.

In addition to the trend towards leasing, the most common initial response by taxi firms to their financial problems has been to pursue a strategy of market diversification through contracting. As taxi companies have discovered, there exist a variety of modest scale contract opportunities in the private sector, but the most significant sources of additional revenue are contracts with public agencies for demand responsive transportation. DRT contracts have been available, at least in some states, from

government sponsors of public transit, and opportunities often exist to provide (under contract) transportation for the clients of human service agencies. For many firms, therefore, this diversification strategy results in the introduction of government transportation subsidies into their revenue base. A second important consequence is that firms often are required to expand their operations into shared ride services, since sponsors of sizable contract operations usually wish to take advantages of the economies of SRT. In many instances, then, all three of the above strategies come together. Taxi operators bolster their revenues and public agencies satisfy their desire for affordable DRT through subsidized SRT delivered under government contract.

II. Taxi-Based Public Transit: The California Context

These mutual series of developments in the public and private sectors of demand responsive transportation have reached their highest stage, and in fact maturity, in California. As noted previously, taxi firm provision of DRT has become the norm in California. Considering that subsidized SRT is only one of several ways of organizing DRT services, the fact that this service model prevails in nearly 60 percent of the cases involving DRT services for the general public indicates the impressive degree to which taxi firms have penetrated the local public transit market.

It should be emphasized, however, that neither taxi firms nor local governments have been entirely responsible for the proliferation of local transit services, and subsidized SRT, in California. The state's transit subsidy program is a prime causative agent, since it makes substantial funds for public transit available to local governments, eliminating the need to dip into local general revenues to finance community transit services. California's Transportation Development Act (TDA) allocates to transportation 0.25 percent of the receipts from the state sales tax and distributes the revenues back to local government in proportion to the source of origin. In counties with less than one-half million population TDA funds can be used by local government for either public transit or highways, but must be used for transit if "unmet transit needs" exist. In the large counties, those with more than one-half million population, TDA funds are reserved almost exclusively for public transit. As originally passed, the

legislation gives priority to rail transit and regional bus service in these counties. However, Article 4.5 of the Act was added in 1976 and provides for up to 5 percent of TDA funds to be used for innovative projects in community level transit. Thus, not only are funds available for community level transit (federal transit subsidies and revenue sharing funds are also available and have been used for this purpose), but local governments in California have a mandate to provide transit service.

The importance of TDA funding to the development of local public transit in California cannot be overemphasized. It is the single most important aspect of the California setting which may not be representative of conditions prevailing in other areas of the nation. TDA funds act as a powerful incentive for the establishment of community level transit services, not only by providing a reliable source of non-local revenues for this purpose, but also by carrying the condition that they cannot be used for other transportation purposes until public transit's needs are met. In the large urban counties, TDA funds are dedicated almost exclusively to transit, and have no competing uses. This puts public transit on sound, secure financial footing in all locales, and in most cases removes fiscal barriers to the establishment of community paratransit services. Localities in many other states are not so fortunate, which helps account for California's prominence in community level transit.

Taxi-based public transit in California has so far taken one of three general forms. DRT systems intended for the general public are established as subsidized shared-ride taxi service. The taxi operator sets up an SRT system and is compensated by the public agency sponsor through provider-side subsidy. Payment is either by a contracted fee per unit of service (vehicle hour or vehicle mile) or a cost-plus arrangement. Users pay a fare set well below the actual cost of the service--usually 25-75¢ per ride. Service is delivered primarily in taxi sedans, although larger vehicles are utilized in some systems. In most systems, vehicles are dedicated exclusively to the SRT operation and cannot be used by the taxi firm for other purposes.

The second major type of taxi-based transit takes the form of subsidized utilization of ERT service by targeted populations groups, notably the elderly and/or handicapped. In most schemes, eligible individuals are

provided with user-side subsidy for ERT travel, with the taxi operator compensated either on the basis of meter fares or a flat rate per trip or per mile. A new transportation system is not established, nor is a formal shared-ride system instituted in this service model (although group riding is encouraged). The new service consists simply of less expensive ERT travel, and involves little more than the creation of the necessary administrative arrangements involving taxi firm, public sponsor, and users.

The third, and to date most infrequently utilized service option, is the establishment of a separate taxi-based special transporation system for the elderly and/or handicapped. In this variation, a full-fledged shared-ride system available to users at low fares is instituted, as in the first option, but its use is restricted to particular groups, as in the second service model.

III. Study Approach

The principal focus of this study is California's subsidized SRT systems which are available to the general public (referred to hereafter simply as subsidized SRT), although all three forms of taxi involvement in public transit are included in the analysis. The reason for emphasizing subsidized SRT is three-fold. First, this service model most nearly resembles traditional DRT, the benchmark against which many community level transit services are compared. Second, subsidized SRT is more important to California taxi firms than other forms of taxi-based public transit, due to the greater revenue potential of a subsidized SRT system. Third, SRT type special transportation services is limited and subsidized ERT for the elderly and/or handicapped is of less conceptual interest. The latter service requires less change in the behavior of the taxi firm and is only marginally (if at all) a case of "mass transit" service.

The study is based upon qualitative and quantitative information obtained from California's 29 subsidized SRT systems, and from several of the taxi-based elderly and handicapped services in the state. The qualitative data consists of interviews with taxi operators and local officials involved in the establishment and operation of the SRT systems, as well as other individuals knowledgeable about the use of taxis for public transit purposes. These interviews generated information about the organizational,

financial, contractual, operational, labor, and legal issues associated with government subsidized SRT. The quantitative information consists of data on the operations, costs, financing, and performance of those SRT systems in operation during 1978.

The information obtained from these sources is used in several ways. Chapter Two consists of five case studies of taxi-based public transit services. These case studies examine the genesis, evolution, and performance of subsidized SRT systems established in different localities (small towns, suburban cities, large cities) and under the sponsorship of different types of public agencies (municipalities and transit districts). A case study is also included on taxi-based elderly and handicapped systems.

Chapter Three is devoted to an analysis of the institutional issues connected with taxi-based public transit. These issues can be divided into three broad categories. Institutional choice issues concern the reasons and processes by which public agencies and taxi firms become involved in SRT service, as well as the specific means of involvement chosen. Service organization issues relate to contractual arrangements between sponsors and providers and their effects on system costs and performance. The third set of issues concern the consequences for taxi firms of becoming public transit providers. Among the most important consequences are operational changes, impacts on labor-management relations, legal implications, and the effects of contracting on the firm's cost-efficiency, profitability, and future financial game plan.

The performance of taxi-based public transit services is analyzed in Chapters Four and Five. In Chapter Four, a performance analysis of subsidized SRT systems is undertaken. A framework for measuring performance is established and used to evaluate California's SRT systems. In addition, the factors behind different levels of system performance are identified and discussed. Chapter Five broadens the scope of performance analysis by considering community transit alternatives to subsidized SRT. This comparative analysis of local transit options is based on experiences in California cities.

Chapter Six consists of the conclusions of the study and the policy implications of California's experiences with subsidized SRT. In addition to identifying and analyzing key factors behind the observed pattern of

experiences, this chapter assesses the strengths and weaknesses of subsidized SRT (including different organizational forms) and evaluates the major issues connected with future development of taxi-based transit services. A central concern is the prospects for government policy to influence outcomes in this paratransit area.

CHAPTER TWO

TAXI-BASED COMMUNITY TRANSIT: FIVE CASE STUDIES

CASE STUDY 1: SMALL TOWN SRT

I. Development

The implementation of SRT services in Ceres and Barstow exemplify the development process of taxi-based community transit in small towns, i.e., those with less than 25,000 population. Ceres, a small community of about 10,000 persons, is located near Modesto in California's Central Valley, while Barstow, with a population of 18,000, is situated at the western edge of the Mojave Desert in San Bernardino County. Ceres, traditionally an agricultural town, is now beginning to also serve as a suburb of rapidly growing Modesto. Barstow, due to its relative isolation (70 miles from the nearest city of any size), is a self-contained community whose economic base rests on a major railroad yard and tourism.

Neither Barstow's nor Ceres' city government was particularly anxious to initiate local transit service. There had been no public transit in either community for many years, and both are thoroughly oriented to the auto-mobile. The size of the transit dependent population is small, since automobile-less households do not normally locate voluntarily in such semi-rural areas. The only significant group of transit dependents in either community consists of older persons who, for physical or financial reasons, can no longer avail themselves of auto-mobility. Given this situation, and the ever-present need for additional funds for local street improvements, it is hardly surprising that both Barstow and Ceres initially opted to spend all of their TDA funds for highway purposes, despite the requirement that "unmet transit needs" had to be "reasonably met" before TDA funds could be used in this fashion.

This lack of interest in transit presumably would have continued indefinitely had not both cities been subjected to pressures from their respective regional planning agencies (RPA) to initiate local transit. Barstow's RPA had been pressing the city for several years to establish

community transit, and Ceres' RPA threatened to cut off TDA funds if the City did not initiate some form of transit services. In Barstow's case, the decision to pursue local transit was facilitated as well by a change in city manager, whereas Ceres was galvanized into action solely by the prospect of losing its TDA funds for street purposes. Given the availability of TDA funds, neither community could use "lack of funds" as an excuse for avoiding at least an experimental investment in local transit. In both communities the city staff was the prime mover behind local transit; city residents did not pressure public officials into acting, although senior citizens subsequently voiced their support of the transit initiative.

In both communities, therefore, the decision to initiate local transit was based on state administrative requirements, not a desire for transit per se. Indeed, many local officials expected that the transit service would attract virtually no ridership, would be officially declared a failure, and, with the demonstration that no significant local transit need existed, TDA funds could revert once again to exclusive use for streets and roads. The widespread belief within both city governments that the service would not be permanent resulted in an emphasis on minimizing the initial investment in the transit system. This ruled out a city operated fixed route bus system due to the capital costs for buses and the requirement that a new city agency be created. Expensive vehicles and new city employees were deemed inappropriate for an experimental venture.

Based on the above considerations, and the recommendation of their respective RPA's, both Barstow and Ceres quickly decided that a DRT system would best suit their needs. In Ceres' case, the decision to opt for DRT led directly to a preference for contracting, since the City had no intention of providing the service itself. Barstow did investigate the option of operating its own DRT system, but rejected this course of action due to cost considerations and potential legal complications.

The involvement of the local taxi firm in the decision making process helped lead the Barstow city government to this conclusion. When Barstow was first considering a local transit system, Al Muncy, the president of Barstow City Cab, began to communicate with involved local officials in an attempt to dissuade them from initiating a city operated bus system. After the city government had decided to establish a DRT system, Muncy pointed out

that it could contract for DRT service from his firm for considerably less than the cost of providing DRT itself. Muncy also emphasized that if the City established a subsidized DRT service in competition with his taxi firm he would be forced to seek whatever redress he could to protect his business interests, and legal action certainly was one of the options. Muncy found a receptive ear at City Hall; the City decided that a taxi-based DRT system made the most sense and began negotiations with Barstow City Cab to establish such a system.

The choice of a DRT provider was somewhat more formal, but no less simple in Ceres. The City sent requests for proposals to several potential providers, mostly taxi firms in adjacent cities. The RFP simply specified that the contractor would be required to establish a one or two vehicle DRT system, with the important provision that its own vehicles had to be used for the service. This tended to limit the field to taxi companies.

The local taxi situation greatly simplified the selection of an SRT contractor in both Ceres and Barstow. City Cab is the only taxi company serving the Barstow area, and once this firm indicated its desire to become the DRT provider, the city government decided to look no further. Ceres does not possess a local taxi operator, although three Modesto-based taxi firms will occasionally provide service in Ceres. Two of these firms are small (2 or 3 small vehicle), marginal operations which provide a low level of service in Modesto. The largest of the three, Red Top Taxi, was the lone company to bid on the Ceres system, and subsequently became the SRT provider.

Red Top Taxi, which presently operates about 15 vehicles in Modesto, sought out the Ceres contract for diversification purposes. The firm was just keeping its head above water with its ERT operations, and was in urgent need of new sources of revenue if it hoped to survive in the long run. Previously, in 1976, the owner of Red Top had managed to obtain a modest contract for SRT service for the elderly and handicapped in the nearby community of Oakdale. With the acquisition of the Ceres contract SRT promised to become a significant part of the company's financial base.

Diversification needs similarly helped propel City Cab into the SRT business. Al Muncy had for many years recognized the marginal nature of ERT in small, auto-oriented Barstow, and had diversified into the ambulance

business and medical supplies delivery in order to maintain financial viability as ERT profits declined. Muncy's active role in obtaining the SRT contract also stemmed from a desire to protect his company from subsidized competition. A publicly operated transit system probably would have wiped out most of the taxi market in Barstow.

The process of actually establishing SRT service went quickly and smoothly in both communities, despite somewhat different local concerns. In both Ceres and Barstow, city officials set the fare, determined hours of service, and established response time requirements, while generally giving the taxi contractor a free hand in the operational area. Compensation arrangements were of central importance in both towns, and influenced substantially by local conditions. Operator and sponsor had agreed that a one-vehicle SRT system made sense initially in Ceres, and the compensation issue thus became how to pay for the use of this vehicle. Dennis McDonald, president of Red Top Taxi, had proposed that compensation initially be based on a rate per passenger carried. McDonald reasoned that since ridership would be low for the first few months of service, this strategy would both save the City money and provide Red Top with an incentive to increase ridership. However, the proposed rate of more than $4 per passenger struck city officials as grossly excessive, and they insisted on some other form of compensation. The only viable alternative was a rate per vehicle service hour. The virtual absence of any ERT market in Ceres made it imprudent for McDonald to accept a rate per revenue vehicle mile, since compensation from SRT alone would be inadequate at the low levels of demand expected initially, and there would be little or no ERT revenue to bolster total compensation. After some negotiation with city officials, McDonald proposed that Red Top be paid $10 per vehicle service hour, which the City readily agreed to.

Compensation arrangements were closely intertwined with the issue of control over the SRT service in Barstow. In contrast to Ceres, Barstow had determined that it would purchase the vehicles to be used in the SRT system, and that they would be painted in city colors and identify the service as city-sponsored. (In Ceres, a magnetic sign hung on the side of the taxi serves the same purpose, albeit less elegantly.) This ruled out the

integrated fleet option, and essentially dictated a vehicle service hour basis for compensation. The City favored vehicle hour compensation in any case because of the predictable costs associated with this arrangement. However, the City did not want this compensation arrangement to become a license for the operator to simply put the maximum number of available vehicles on the streets and receive payment for them being in service, irrespective of the level of demand.

After consulting with City Cab the City had decided that a three vehicle fleet would be appropriate initially. It was anticipated that demand would require one or two vehicles most of the time, and that only during peak periods would all three be required. In an attempt to insure that only as much capacity as is needed is actually provided, all SRT vehicles are required to be equipped with a tachograph, a device which measures the vehicle's speed of movement. Tachographs are subject to city inspection. Presumably, underutilized vehicles will experience a significant amount of idle time. The City guarantees the operator a certain number of vehicle hours per week, while compensating at a slightly lower rate after a specified number of vehicle hours per month is reached. The administrative official who oversees the SRT operation also checks system productivity on a weekly basis. These are all mechanisms the City employs in its attempt to keep performance at optimal levels, and costs to the minimim level commensurate with good service.

Sponsor control is much more limited and far less formal in Ceres. One reason is that cash is used for fares in the Barstow system, whereas SRT users in Ceres pay for their trips with tickets purchased from the City or the taxi driver (the company buys a few ticket books from the City). Hence all the money is handled directly by the City, eliminating potential honesty problems. More importantly, the Ceres system is so simple, and the operator deemed sufficiently expert by city officials, that formal oversight seems an unwarranted expenditure of administrative time. In many months the only interaction between sponsor and provider occurs when Dennis McDonald submits weekly ridership reports and a monthly bill to the City, and the latter in turn issues a check to Red Top Taxi. In contrast, Al Muncy is in frequent communication with the city administrator overseeing the Barstow SRT system. In fact, the Ceres service had been operating without an up to date contract

between Red Top and the City for an extended period, to the apparent consternation of neither party, while this study was being conducted.

II. Performance and Impacts

Contrary to the expectations of transit skeptics in Barstow and Ceres, the SRT systems in both communities have become successful, and in a relatively short period of time have assumed the status of a valued community service. Barstow's SRT system was well-patronized almost from the very beginning and within a matter of months established a performance record which most other communities would envy. The geographic layout of Barstow has proved most favorable to a DRT system, as local travel takes place primarily along the town's east-west spine. With most residences lying within a mile or two of this travel corridor, dispatching problems are simplified, because most trip origins or destinations are restricted to a well-defined area. Combined with efficient dispatching by the taxi operator, the result has been productivities consistently in the neighborhood of 8 passengers per vehicle hour, and costs per passenger of $1.25 to $1.50 per trip. These achievements are unmatched by any other dedicated vehicle SRT system in the state. Demand for the service has been quite robust, requiring an expansion in fleet size from three to five vehicles. As could well be expected, the City of Barstow is very pleased with its SRT system, and considers it a permanent part of the City's service package to its residents, as long as TDA funds continue to be available.

Ceres' SRT system required a considerably longer period of time to attract a critical mass of riders, but within a year of establishment it too, had achieved this objective. As in Barstow, the small service area and limited number of non-residential destinations simplify dispatching. The system now attains productivities of at least 5 passengers per vehicle hour, with considerably higher levels on those occasions when demand is greater than normal. Costs per passenger have consistently declined, and are now at or below $2. While the success of the system has been quite unexpected to local officials, they do not begrudge the "loss" of their street and road funds, and seem genuinely pleased that a useful community service is being provided through these diverted TDA funds. The system is very near capacity

for a single vehicle, and the City must soon make a decision on whether to authorize addition of a second vehicle, at least for a few hours per day. But in Ceres, as in Barstow, evolution of the system has resulted in no significant change in the basic relationship between sponsor and operator.

The SRT providers have benefitted substantially from the success of these two systems. Both city governments have been sufficiently pleased with performance to extend the SRT contracts on a sole source basis, and this practice seems likely to continue barring unforseen developments. Thus each taxi firm has secured a virtually guaranteed source of revenue. The importance of these contracts to the well-being of the two firms is indicated by the fact that the Ceres contract accounted for 15 percent of Red Top Taxi's total revenues in 1978, and the Barstow SRT contract for 16 percent of Barstow City Cab's annual revenues from all operations. Moreover, the success of the Barstow SRT system inspired the small unincorporated communities adjacent to Barstow to request San Bernardino County to establish an SRT system in their area, which the County agreed to do. City Cab was awarded this contract on a sole source basis, and SRT contract operations now account for nearly 25 percent of the firm's revenues. While Red Top Taxi has yet to secure any major additional contract business beyond its Ceres and Oakdale SRT services, it is actively seeking contract opportunities, and has stimulated interest among some small communities in the Modesto area. The firm's president is confident that over the next few years an increasing portion of company revenues will come from contract operations as these small towns develop local transit systems, at least for the elderly and handicapped.

CASE STUDY 2: SUBURBAN SRT

I. Development

El Cajon and La Mesa, two neighboring suburbs of San Diego, were the first municipalities in California to establish subsidized SRT systems as their form of community level transit. Despite geographic proximity, a common SRT provider, and initiation of the two services within a five month span in late 1973-early 1974, the SRT systems in El Cajon and La Mesa stemmed from rather different circumstances. The systems themselves were organized and operated quite differently until the summer of 1979. This combination of similarities and contrasts provides insights into local motives for SRT development, the interaction between sponsors and providers, rationales for ways of organizing services, and the evolution of SRT systems over time.

A. El Cajon

In contrast to most other SRT systems in California, TDA funds played no part in El Cajon's decision to establish a community paratransit service. External funds, namely federal revenue sharing, were an important catalyst, however. The fiscally conservative El Cajon city government has always kept the local budget strictly within local means, and the introduction of new state and federal funds--such as revenue sharing--has meant a fiscal windfall for the City. Thus the advent of revenue sharing enabled the City to fund all planned capital projects and still have money left over for other purposes. The availability of a substantial pool of revenues for a local transit experiment was not the only factor behind the new service. The fact that the revenue sharing funds eventually found their way into transportation resulted from: (1) a perception and subsequent documentation of need for additional local transportation; and (2) a strong local political actor who made this previously inarticulated need an issue, and who provided the political leadership needed to translate perceived needs into actual services.

Robert Cornett, a city councilman at the time the El Cajon SRT system (called the El Cajon Express locally) was initiated, became the prime mover

in this undertaking. His motivation was simple. El Cajon, a relatively self-contained suburb of 65,000 persons, had poor local transit service. San Diego Transit provided fixed route bus service on two routes, each with 45-minute headways, designed to service trips to San Diego and neighboring communities, not internal El Cajon travel. An analysis of regional planning data revealed a probable need by El Cajon's elderly, handicapped and low income persons for better transportation. Convinced that El Cajon's mobility disadvantaged persons needed a better local transportation alternative than that provided by existing transit services, Cornett forcefully brought the issue to the City Council's attention. His basic argument was that the availability of revenue sharing funds to finance a local transit system eliminated any valid fiscal reason for not acting.

The Council, in response to this initiative, and cognizant of the City's favorable fiscal situation, directed the City Manager's office to investigate the possible options for local transit. Although a variety of service options, mostly of the demand responsive variety, were investigated, three policy guidelines set by the Council heavily influenced the staff's recommendations. First, the Council did not want the City to be in the business of operating a transportation system. Second, the Council wanted as inexpensive a system as possible, albeit one which could provide a level of service superior to the existing fixed route operations. Third, the Council was unwilling to commit itself to a permanent system, preferring instead to begin on a trial basis, thereby enabling an unsuccessful experiment to be discontinued. Collectively, these guidelines pointed to a private operator which already possessed the necessary vehicles. A private operator without sufficient existing vehicles to provide service would be taking a considerable financial risk by purchasing new equipment for a venture which could prove to be shortlived. The only public operator, San Diego Transit, was much too expensive (the staff had looked into the cost implications of contracting additional service from San Diego Transit).

These requirements were well-suited to a subsidized shared-ride taxi system. During its investigation of alternative service options, the staff had approached Yellow Cab of San Diego, one of two taxi companies which then

provided service in El Cajon, and found its president, Bill Hilton, extremely interested in a shared-ride taxi venture. The staff thus recommended, and the City Council concurred, that the city should initially experiment with a taxi-based system. Both Yellow Cab and its lone El Cajon competitor, Radio Cab, were invited to submit proposals to the City for a community transit system. Only Yellow Cab responded. Its proposal featured a shared-ride mode of operation, thirty minute response time to any point in the community, adjustment of the number of vehicles in service to correspond to daily peaking characteristics, and compensation to the operator on a unit of service (vehicle hours or vehicle miles) basis, not per passenger.

When El Cajon's city manager indicated a strong preference for an SRT system in which the City paid only for service actually used, Yellow Cab developed the most distinctive feature of its proposed SRT system--the integrated SRT-ERT Fleet. The integrated fleet system, in which Yellow's taxi vehicles in El Cajon can be utilized for either SRT or ERT trips, depending upon demand, responded to two realities. First, the City wished to compensate the operator only for the time when vehicles were actually engaged in SRT service delivery. Second, the City required the taxi firm to provide the vehicles for the SRT system.

Although Yellow Cab's revenues from SRT are contingent upon demand and not guaranteed, the service must be available at all times. Consequently, in order to maximize the revenue potential of its vehicles, Yellow Cab could not assign them exclusively to SRT service. Rather, they had to be free to transport ERT passengers when SRT demands did not require their utilization. The City recognized that this efficient utilization of vehicles would benefit it as well as Yellow Cab, since the City would not have to pay for excess capacity. Even though SRT service would be delivered in vehicles indistinguishable from conventional taxis, the City was more concerned with low cost service than with making an immediate and indelible impression on the public. The City and Yellow Cab, therefore, agreed on a compensation system based on revenue vehicle miles, in which the taxi firm is paid on a mileage basis ($.74 per mile initially) whenever an SRT passenger is in the vehicle.

Two other aspects of the service design bear noting. First, the El Cajon Express is available 24 hours a day, seven days a week. This

reflects the city's desire (sparked by Councilman Cornett) to have service available whenever users need it, and thus to offer a true alternative to the automobile for the mobilily disadvantaged. It also takes advantage of the fact that, given Yellow Cab's around-the-clock ERT service in El Cajon, the incremental cost of SRT service with an integrated fleet set-up is quite low during the periods of low demand, e.g., nine p.m. to six a.m.

Second, patrons of the El Cajon Express must utilize prepurchased tickets as payment for the service--cash is not acceptable. The City enlisted El Cajon's banks in the enterprise of selling tickets (they are also available through the City) to make them widely available. The City favors this policy because of concern about Yellow Cab's drivers handling money destined for the City, fearing honest or dishonest losses of revenue. Indeed, the City's policy on separation of service delivery and fund collection is so stringent that drivers are not even supposed to purchase tickets to sell to the patrons who do not have one available. The use of tickets and a provider compensation system based on service usage gives the El Cajon Express something of the character of a user-side subsidy system.

On the basis of these service concepts, and with Yellow Cab's willingness to participate in a trial operation, the City Council authorized a $25,000 or three month experiment (whichever came first). The El Cajon Express thus began service in December, 1973.

B. La Mesa

The developmental process of SRT in La Mesa was quite different from that portrayed for El Cajon. This process began in 1973, when residents of the northern part of La Mesa began articulating demands for transit service. At this point in time, the only public transit in this suburb of 45,000 persons was fixed route bus service provided by San Diego Transit south of I-8, which bisects the city. TDA funds had just become available to La Mesa in 1973, enabling the City Council to respond to these requests for additional transit service without using general funds. The Council authorized the City Manager's staff to work with San Diego Transit and set up some new bus routes, and three fixed routes were established. However, service was on one-hour headways and ridership proved to be miniscule--200 passengers per week, in 15 bus trips per day. At a cost of $100,000 per year, and a

subsidy of $10 per trip, the City Council was quite dissatisfied with the results, and began searching for a more cost-effective method of providing local transit.

The motivation for demand responsive transit came from an investigation of the La Habra DRT system (in Orange County, California) by the City Manager's office. The staff was impressed with the La Habra experience. This DRT system, the first to be established in California, had achieved a good level of service and reasonable costs per passenger, and the staff held it up as a model for La Mesa. The city's political leadership, seeking the security afforded by previously demonstrated successes, found the La Habra experience reassuring. Thus persuaded of the merits of demand responsive transit, the City Council in January 1974 decided to authorize planning of a DRT system and engaged a consultant to develop a service design.

To use TDA funds for the community's paratransit system, La Mesa needed a designated "transit operator" to provide the service. At this juncture, the only such designated operator was San Diego Transit. Hence the City moved to qualify itself as a transit operator in order to expend TDA funds for the new system. At the same time, the City Council had no desire for the city to be directly involved in the transportation business. Therefore, it determined that the City would purchase the vehicles for the SRT system, and then lease them to the provider selected to actually operate the service.

When La Mesa was making these decisions in early 1974, it was operating under a tight deadline. The region's MPO had ruled that the City would have to have its transit system in operation by May if it were to qualify as a " transit operator" for purposes of receiving TDA funds. The City thus needed to move quickly, and decided it did not have the time to go through a formal competitive process. Following El Cajon's example, the city asked Yellow Cab of San Diego, which provides ERT service in La Mesa, whether it was interested in making a proposal to operate La Mesa's DRT system. SRT seemed desirable for several reasons. A taxi-based system seemed the most expeditious way to proceed, since the city staff had already been in contact with Yellow Cab as a result of the feasibility study. Observation of the La Habra DRT system had convinced the staff that the smaller capacity sedans (compared to vans or minibuses, then the vehicles typically used for DRT) would only rarely present problems. Finally, the success of El Cajon's SRT system was already becoming apparent.

As in El Cajon, Bill Hilton responded affirmatively to La Mesa's overture, and he and the City staff quickly agreed upon a service design. In contrast to El Cajon, the La Mesa SRT system was based upon dedicated vehicles, since vehicles would be owned by the City, and therefore available only for SRT. The vehicle service hour was established as the basic unit of compensation, with Yellow Cab paying the City a nominal leasing fee for use of the vehicles. While the basic active fleet size was set at five (with one vehicle in reserve), lesser numbers of vehicles would be on duty in the early morning and late evening hours. In a desire to assure wide service availability, the city established generous service hours, with service provided 15 hours a day (six a.m. to nine p.m.) during the week, ten hours on Saturday, and six hours on Sunday. An average response time of twenty minutes was specified by the City, although no maximum response time was set.

The City purchased six standard size automobiles to use as SRT vehicles, and in April 1974 operation commenced. The Council allocated $100,000 in TDA funds to the venture, enough for an entire year of service, although the contract with Yellow Cab enables La Mesa to terminate service on 30-days notice.

II. Maturation and Evolution

The El Cajon and La Mesa SRT systems can be accurately characterized as "mature" SRT operations. They have been established for approximately six years and have achieved a stable level of market penetration. Yellow Cab has developed time-tested operational procedures which produce a good level of service and excellent productivity. The relationship between sponsor and provider has been worked out to the satisfaction of both parties, and most interactions are for the purpose of solving problems. There is substantial evidence that local residents are very much aware of the systems--in La Mesa, the SRT system achieves a 95 percent recognition factor, while in El Cajon it was the subject of an advisory ballot (on funding) in 1976. In both communities there now exists a constituency for subsidized SRT comprised primarily of senior citizens, and these persons vigorously support the system's continuation in any political debate about its future. In sum, subsidized SRT has become a community fixture in El Cajon and La Mesa, barring unforseen funding problems.

A. Service Delivery Arrangements: Sponsor-Provider Relationships

One important consequence of maturation is that the respective city governments have become knowledgable about the SRT system, and have developed well-defined ideas about how service should be delivered and how they should manage their relationship with Yellow Cab. Yellow Cab, in turn, has shaped its SRT operations to correspond to the communities' desires. For example, both city governments place a high priority on courteous, responsive behavior by drivers, since the driver is the primary personal link between the users of the system and its sponsors. Accordingly, Bill Hilton personally selects the drivers for the SRT systems as a means of promoting quality control, choosing only those with ERT driving experience and requiring a brief training period of riding with a veteran SRT driver.

Hilton also works closely with the involved staff officials of the two city governments in an attempt to deliver service to their specifications. In La Mesa, where the dedicated vehicle system was employed until mid-1979 (the service changes which occurred in La Mesa at that time will be discussed subsequently), the task of matching service to demand was complicated by the fixed fleet size. It is important to note that La Mesa's only mechanisms for controlling service costs are fleet size and fleet scheduling. Once these variables have been established, total system costs are fixed, irrespective of Yellow Cab's productivity achievements. In the interests of efficient vehicle utilization, Hilton and the City had worked out a fleet scheduling arrangement which limited the number of vehicles in service during the early morning and evening hours, while deploying all available vehicles during daytime hours. This prevented excess capacity in the low demand periods; in fact, when Hilton reported that demand was virtually nil between six and seven a.m., the City pushed the starting time for the service forward an hour.

In the second full year of service, however, ridership increased over 20 percent from the first year, putting considerable strain on the system's capacity during peak periods. While one result was a marked increase in productivity (to nearly seven passengers per vehicle service hour) and a gratifying decline in net cost per passenger, service levels deteriorated. Hilton was constantly reporting to the City that wait times were both excessive and unreliable. The City, preferring to maintain a good level of

service rather than minimize subsidy, decided to expand the fleet size from five to seven in mid-1976. While this action increased costs, it also largely eliminated capacity problems for the next two years, and provided better service to users.

Although El Cajon, like La Mesa, is in no danger of exceeding its TDA budget through support of its SRT system, the City's traditional fiscal conservatism causes it to place great emphasis on minimizing the costs of El Cajon Express. During the first 3 1/2 years of SRT service this cost-minimization emphasis was important, since the revenue sharing funds used to subsidize the system could have been put to alternative uses. However, El Cajon's switch to TDA funding in mid-1977 relieved the financial pressure on the SRT system. (In El Cajon and La Mesa, TDA funds can only be used for transit; highway expenditures are not allowed.)

A major reason that cost minimization has been a continuing concern to El Cajon is that there is a direct linkage between Yellow Cab's performance and the cost of service to the City. Since El Cajon compensates the taxi firm on the basis of revenue vehicle miles travelled, low productivity translates directly into increased costs for the City. Moreover, a revenue maximizing strategy for the provider would be to depress productivity and increase the number of revenue vehicle miles for a given level of demand. (In practice, this would be difficult to do and stay within the thirty minute response time, without substantial increases in the number of taxis operating in the city.) Consequently, the City staff has always closely monitored Yellow Cab's performance, in particular exhorting Bill Hilton to keep vehicle miles per passenger, which affects both cost per passenger and productivity, to a minimum.

Hilton, however, is pulled in two directions by the City, for on the one hand it wants him to maximize productivity, whereas on the other hand it insists he adhere to the 30 minute response time criteria, which places an upper bound on productivity. Hilton thus is caught in the middle between service sensitive users, who will complain to City Hall if waiting time becomes excessive or unreliable, and a city government which is continually pressing him to maximize productivity, which means keeping waiting times near the 30 minutes limit so as to group as many passengers as possible on a vehicle tour. In this oversight system, interaction between Hilton and the

City staff occurs frequently, particularly during the inevitable periods of erratic performance resulting from the taxi firm's not always successful attempts to walk the tightrope between good service and low costs.

B. Contract Renewals and Competition

Contract renewal has turned out to be a pro-forma process in both El Cajon and La Mesa. Neither city formally commits itself to retain Yellow Cab as the service provider beyond a one year contract, but both are convinced that Yellow is currently the best operator for them. In La Mesa, the City staff, responding to requests from the City Council to investigate alternative providers for the DRT system, solicited bids from San Diego Transit and DAVE Systems, a major DRT provider in California. Both bids were far more expensive on a vehicle service hour basis than Yellow Cab's price; the City has never subsequently requested bids. The City would be quite willing to entertain proposals from other potential providers, but none have come forward. Hence the contract with Yellow Cab has been continued from year to year without a formal competitive renewal process.

El Cajon has also sought to interject some competition into the contract award process, but with no more success. After the City repeatedly attempted to interest Radio Cab in bidding on the SRT system, the latter finally did submit a proposal. However, the level of service proposed was so inferior to the Yellow Cab operated system that the City staff rejected the proposal out of hand. Because Radio Cab ran a much smaller operation in El Cajon, it could not come close to providing the maximum of 22 vehicles which Yellow Cab puts on the street during peak periods.

Within two years after the El Cajon Express was established, Radio Cab ceased operations in El Cajon. The City insists that Radio Cab, admittedly a marginal firm in El Cajon (it is based in San Diego), would have abandoned service in any case. More plausibly, the advent of subsidized SRT served as an important contributing factor to Radio Cab's demise in El Cajon. No other competitors for the SRT contract have since appeared, due in large part to the City's requirement that the operator provide the vehicles. This tends to limit potential providers to taxi firms, and no other San Diego area taxi companies are in a position to match Yellow Cab's level of service. Consequently, Yellow Cab has been continued as operator from year to year without formal competition for contracts.

While Yellow Cab's rate to the city has increased substantially since 1973 (it now stands at $1.10 per revenue vehicle mile, nearly a 50 percent increase) it has not risen more rapidly than the inflation rate. In La Mesa, moreover, Yellow Cab's rate to the City increased by a mere 7.5 percent between 1974 and mid-1979. A proposed 1979 rate increase would have boosted the rate to a level only 23 percent over that which prevailed initially. (The primary reasons for the less rapid increase in costs in La Mesa were stable driver wages, lower control room costs, and less impact of fuel price increases due to considerably fewer miles per hour per vehicle). It seems unlikely, therefore, that Yellow Cab has exploited its quasi-monopoly on SRT service provision to obtain rates above reasonable levels. It bears noting that the provider compensation rates in La Mesa and El Cajon are among the lowest of all SRT systems in California.

C. Changes in Service Organization

In mid-1977, when each of the two SRT systems had been operating for over three years, both local governments decided to raise fares. These actions were prompted by gradual but steady increases in the necessary subsidy per passenger and, particularly in La Mesa, the recognition that TDA regulations restricted the state's subsidy contribution to 50 percent of non-federally financed operating expenditures after 5 years of operation. At this point in time, La Mesa was using TDA funds to finance about 80 percent of the cost of the system--fares made up the difference, since no federal transit subsidies were involved. In El Cajon, the required subsidy had begun to consistently exceed $1 per passenger, and the City was interested in reducing or at least maintaining this amount. Thus in July 1977, La Mesa raised its base fare from 50¢ to 65¢, and increased the discounted fare for those who purchase ticket books or who travel from a common origin from 35¢ to 50¢. In September, El Cajon adopted a different fare raising strategy, leaving the base fare at 50¢, but discontinuing single fare group rides.

As might be expected, given the low, transit-like fares of subsidized SRT, demand proved to be relatively inelastic with respect to these fare increases. The El Cajon fare change had the affect of a 37 percent average fare increase, resulting in a short term ridership loss of 17 percent and a

long term decline of about 11 percent. The La Mesa fare increase boosted the average fare by about 50 percent, in response to which ridership declined 10-12 percent in the long term.

In El Cajon, however, the fare increase resulted in a development which no one had anticipated, namely a significant decline in system productivity, since fewer patrons were available to share rides. But not enough demand was eliminated to permit a reduction in the number of vehicles in service and still maintain a 30 minute response time. Consequently, the fare increase boosted revenues by about $20,000 annually, but had virtually no effect on service costs, despite reduced demand. It is conceivable that some of the productivity decline stems from less efficient operations by Yellow Cab, but since the El Cajon SRT system is one of the best performers in California, it is more likely that this development is attributable to the effects of lessened demand on the level of possible ridesharing.

La Mesa's decision in mid-1979 to change from a dedicated vehicle SRT system to an integrated fleet system represents the most important service organization change in either city. This decision was based strictly on funding considerations. Because the 5 year, 50 percent requirement of the TDA regulations became operative for La Mesa in mid-1979, the City needed to reduce the subsidy requirements of the SRT system to the minimum possible commensurate with adequate service. If any subsidy requirements remained after fares and a maximum 50 percent TDA contribution were subtracted from operating expenditures, the City would have to pick up the remainder itself, or seek Federal transit subsidies, which it did not wish to do. Based on conversations with Bill Hilton and an analysis of El Cajon's experience with the integrated fleet system, the City staff concluded that the City would save approximately $40,000, or nearly 20 percent of the system's projected 1979-80 costs, by switching to the integrated fleet operation.

Moreover, these savings would be achieved at the same time that SRT service would become available 24 hours a day, 7 days a week. City officials were most reluctant to abandon the distinctively painted dedicated SRT vehicles, which had become well known throughout La Mesa, but the costs to the City of retaining this mode of service delivery were unacceptable.

The switchover was made in early July, and was an immediate success, from the perspective of both the City and system users. Ridership increased sharply, in response to both the increased number of service hours and the

greater number of vehicles in service--as many as 15 taxis during peak periods in contrast to 7 dedicated SRT vehicles previously. Cost per passenger declined slightly from 1978-79 levels, whereas had the dedicated vehicle system been retained, per passenger costs would have increased about 15 percent. Due to the increased number of passengers, subsidy savings are likely to be small or nonexistent, but this is no longer a subject of serious concern due to new state transit legislation modifying the 50 percent TDA restriction as of mid-1980. Despite the fact that La Mesa could revert to its old dedicated vehicle system and conform to the new TDA regulations (which specify a 20 percent farebox recovery for systems not meeting the 50 percent requirement), the City has no intention of doing so in light of the superior service and lower per passenger costs of the integrated fleet system.

D. Provider Performance and Impacts

The SRT system in El Cajon and La Mesa have consistently ranked among the best performing SRT operations in California. In El Cajon, nearly 600 passengers (a figure representing almost 1 percent of the local population) use the system on an average weekday, at a current cost of about $2.00 per passenger, or a subsidized cost of about $1.50 per passenger. When the taxi vehicles are in SRT service they achieve productivities of about 8.5 passengers per vehicle hour; overall productivities (including non-revenue time and/or miles) have been estimated to be in the range of 5.5-6.0 passengers per vehicle hour. The La Mesa system is achieving comparable levels of performance and market penetration. During 1977-78 the El Cajon and La Mesa systems ranked in the top one-third of all SRT systems in the state in terms of both efficiency and effectiveness, and La Mesa's new integrated fleet system has improved its performance significantly. By all indications, El Cajon and La Mesa are receiving exemplary SRT service.

Yellow Cab has similarly benefitted from its SRT ventures in these two communities. In El Cajon, the taxi firm's revenue from its combined ERT-SRT operations has increased by a factor of about 3.5 since the El Cajon Express was established. While some of the increase is attributable to higher rates for ERT and SRT, most of the additional revenue reflects the greater market penetration made possible by subsidized SRT. The increase in Yellow Cab's

revenues in La Mesa since SRT service began is less dramatic--approximately a two-fold increase--but nonetheless a source of gratification to the firm. While Yellow Cab's SRT contracts in these two cities represent only about 8 percent of its total revenues, they are approaching $600,000 annually, and the loss of such an amount would be quite significant for the taxi firm. It is not surprising, then, that Bill Hilton spends a disproportionate amount of his time (relative to the revenue contribution of the systems) monitoring these two SRT operations and ministering to their needs. Even though Yellow Cab enjoys a strong position in the San Diego taxi market, in the current troubled state of the taxi industry a secure source of revenues such as subsidized SRT is a high priority concern for taxi management.

CASE STUDY 3: TRANSIT AGENCY SPONSORED SRT

The Orange County Transit District (OCTD) is one of three transit agencies in California which utilize taxi firms to provide DRT service. Its role as a sponsor of subsidized SRT is of very recent origin, although its committment to community transit services, and DRT in particular, is not. The development of subsidized SRT under OCTD's aegis reveals the problems and potential of this paratransit service when organized and directed by a reasonably knowledgable and sympathetic transit agency.

I. Genesis and Evolution of OCTD's DRT Program

OCTD's recent creation is one of its most important attributes. The agency was established de novo in 1971--it did not have a previous organizational existence as a private transit operator. Consequently, OCTD did not begin life wedded to the traditional transit outlook, which focused on fixed route services to the exclusion of other service modes. OCTD's operating environment militates against such an outlook in any case. Orange County is a rapidly growing low to medium density metropolitan area characterized by dispersed population and economic activity. None of the 26 cities functions as a true central city; the region is multi-nucleated. Trip patterns are diffused in space an' thus difficult to serve effectively with conventional transit service. Set down in this environment, at a time of great interest nationally in the potential of DRT services, the new agency quickly adopted a favorable view of DRT and made it a central feature of its future plans.

In 1972 OCTD proposed an integrated transit system consisting of fixed-route buses on major arterial streets and DRT to provide community service and transfers to the fixed-route system for regional trips. The DRT component of this plan was initiated in 1973 when the city manager of La Habra obtained a Dial-A-Ride demonstration grant. System design and operation of this experimental DAR system were OCTD's responsibilities. The transit district decided to provide the service in minibuses, and a DRT management firm, DAVE Systems, was contracted to operate the system. The City of La Habra participated by contributing part of the operating deficit. Although the service was expensive, it proved very popular in La Habra, and other communities began requesting their own DAR service.

In response to those requests, an expansion plan for DAR was completed in 1974. The expansion plan included a rank ordering of communities as candidate service areas and suggested a phased implementation sequence of DAR services for Orange County communities.

Extension of DAR to other cities commenced in 1975 in the City of Orange. The Orange DAR system was organized similarly to La Habra's, using minibuses as vehicles and to be operated by a private transportation provider. A local taxi company, North Orange County Yellow Cab (NOCYC), had submitted a proposal to operate both the La Habra and Orange DAR services, but had been turned down. OCTD management insisted that community DRT service be operated in District-owned minibuses rather than sedans. OCTD also wanted no conflict of interest between private local taxi operations and publicly subsidized DRT.

Threatened by loss of patronage and disappointed by its failure to win contracts, North Orange County Yellow Cab sued OCTD after the institution of the City of Orange's DAR system, claiming that in essence it had not be allowed to bid on the Orange contract. Other taxi companies joined NOCYC, arguing that they came within the scope of the definition (in the transit district's enabling legislation) of "an existing transit system," yet had not be permitted to participate in the DAR program and were not being compensated for their loss of business to public competition. The taxi companies won an injunction in 1975, but later lost on appeal.

One result of this legal action was to open up the communication channels between the taxi companies and the OCTD management. This in turn compelled the transit district's management to reconsider how it would treat private transportation businesses that might be affected by the implementation of its Dial-A-Ride program. Even if court cases could be won, delays to implementation of the program could prove very costly, both economically and politically. For example, OCTD had been forced to change the DAR system in the City of Orange to a community fixed route system while the litigation was in progress. The service was inappropriate and the cost could accurately be described as a financial disaster.

During more than a year of legal consultations, the taxi companies and the OCTD management gained a better perspective of each other's respective needs and capabilities. Once the injunction against OCTD was lifted, the

conditions on the requests for proposals to operate future DRT systems were made less restrictive. A program was instituted by which taxi operators received assistance in drawing up their proposals to OCTD for DRT service modules on which they wished to bid. OCTD engaged in DRT expansion planning and implementation with greater awareness of possible complications from private providers. For instance, before expanding the La Habra system into neighboring Brea, the District paid $4,000 compensation to the local taxi operator. (Buy out provisions are dictated by specific clauses in OCTD's enabling legislation.)

The City of Orange DRT system, with the addition of neighboring Villa Park, was put out to bid again in 1977. This time NOCYC won the contract. Prior to obtaining the Orange-Villa Park contract, NOCYC had won the contract to operate the community DRT system in Fullerton. In 1978, this company took over the operation of the La Habra-Brea system as well by underbidding the existing provider, DAVE Systems. Finally, in 1979 NOCYC won the contract for a service module in the East Anaheim area. This taxi firm is currently the provider for all four of these DRT systems.

Subsidized SRT service has also been established in southern Orange County. In September 1977, Orange Coast Taxi won the contract to operate the Saddleback Valley (Mission Viejo, El Toro) DRT system. This system began operations in mid-1978.

These five subsidized SRT systems for the general public are in all likelihood the last of their kind to be established in Orange County. In a recent shift in policy, the OCTD Board of Directors has decided to abandon community DRT systems for the general public in favor of a county-wide DRT system to serve the elderly. (A separate DRT system serves the physically handicapped). This action marks a major retreat from the previous goal of widespread development of community DRT, since even though the new systems will be organized on a city by city basis, a large segment (over 50 percent) of the current DRT market will be excluded from using them.

The reasons for this decision are financial and political. OCTD's community transit services cost one and a half to three times as much per passenger as fixed route service. The transit district has ambitious expansion plans for its fixed route services, which the extension of community transit service to all cities desiring it would interfere with due to lack of money

to accomplish both objectives. The Board has adopted fixed route expansion as its highest priority because of its greater cost-effectiveness, but has also promised several cities community transit service. The only way out of this political dilemma is to carry through on the community transit commitments, but to reduce their dollar costs by restricting ridership to the elderly. This satisfies two important constituencies (the cities and the elderly population) and minimizes the financial impact of additional community transit services.

Taxi firms should still be in an excellent position to capture DRT contracts, although their revenue potential will be much reduced from present subsidized SRT systems as less service will be provided. Providers of existing subsidized SRT services could be hurt by this new DRT strategy, since OCTD plans to change some of these systems from general public to elderly only. The transit district is meeting local resistance to this cutback in eligibility, however, and there is some doubt that it will carry through on this aspect of the plan. There is no doubt, however, that future community transit systems will be limited to the elderly, unless the funding situation changes dramatically.

II. Characteristic Features of OCTD's SRT Program

A. Planning

As the entity charged with delivering public transportation services in Orange County, including community-level transit, OCTD regards transit planning as one of its principal functions as an institution. In the past, paratransit planning was needed in order to develop "a well balanced, integrated transportation system comprised of a number of community or local area bus systems which serve intra-community travel needs, while simultaneously serving as collection and distribution subsystems for an extensive County-wide network of bus routes designed to facilitate inter-community travel."[1] The two main obstacles to efficient public transportation in Orange County were considered to be competition from the automobile and the

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[1]Orange County Transit District, Dial-a-Ride Expansion Plan for Orange County, 1974, p. 1-2.

diverse and diffused travel patterns within the County. An integrated system of community, County-wide and regional transportation services was considered the only way to meet effectively the transportation needs of county residents. Planning for community transit (as well as financing of these services) was important because it was required to accomplish an overriding organizational objective, rather than being an activity valued for its own sake.

At the time of the formulation of the Dial-A-Ride Expansion Plan for Orange County, the use of taxi sedans was not envisioned. It was presumed that the vehicles used for DRT would be mini-buses. Projected productivities for most of the proposed systems were well above those that a sedan could comfortably carry. Although the Management and Operations firms referred to in the report are described broadly enough so that they could conceivably include taxi firms, the tone of the description would indicate that taxi firms were being given scant, if any, consideration as possible providers. The presumption was that the District would provide the mini-buses and a DRT management firm would take care of operations.

OCTD's DRT planning thus was founded on an organization-specific perspective. In particular, DRT was to be more passenger responsive than conventional transit, but to resemble it as much as possible in appearance, size of vehicles, and productivity. Though some local taxi operators might have been able to provide valuable operational insight, they were not given serious consideration as DRT providers. Analysis of DRT experience was limited to a few experimental setups in other localities and DAVE Systems' brief experience of operating the La Habra and La Mirada DAR systems. In short, the horizon of understanding was DRT as conceived only through the eyes of a transit agency. Taxi firms, instead of being accepted as the resident experts on demand responsive transportation, as in many towns and smaller cities, were forced to break through such institutional self-concepts to compete for contracts and then to achieve any influence over operational procedures.

B. Contracting

From the beginning of DRT in Orange County, OCTD has insisted on a formal contract bidding procedure to select operators for all its community

transit systems. OCTD's eligibility criteria for contractors have acted to limit competition, however. As noted previously, OCTD initially discriminated against taxi firms. Even after the latter won the right to bid, OCTD's requirements relating to financial stability and maintenance capabilities have tended to reduce the field of serious competitors for any contract to a very few providers. In the six year history of community transit in Orange County, only five different firms have won contracts, and general public DRT services have been operated by only three firms.

OCTD is aware that there is more competition in the abstract than in actuality. Therefore, it informally attempts to assure that all qualified local operators get a piece of the action, but that none monopolize the contracts. The transit district also encourages provider continuity by giving firms a second year option at the end of the standard one-year contracts. After two years the contracts go to rebid. The district is not formally required to select the low cost bidder, however, and prior contract experience is obviously a major asset in the competitive process (assuming the provider has performed satisfactorily). To date, only one DRT contract has changed hands after a rebid. These stable relationships with experienced providers aid OCTD's staff in supervising the community transit services.

OCTD management believes that dividing the contracting "pie" among several local firms (transit management and taxi) fulfills its desire and mandate to help support private providers in the area. In addition, the possibility of labor problems and increased labor costs through unionization is minimized by spreading contracts among several operators. None of OCTD's DRT contractors has experienced labor difficulties, although their employees almost surely qualify as mass transit workers, and would on the surface be attractive organizing targets.

C. Operational Supervision

OCTD is very much control oriented in its management of the DRT service provision process. Some observers attribute this characteristic to general organizational factors--a large transit bureaucracy under the direction of a politically sensitive management and board. Staff members contend, however, that control tendencies result primarily from disappointing experiences in the early stages of contracting.

Some of the early problems experienced by OCTD stemmed from its inexperience in supervising contracts. In both cases of serious deficiencies by contractors the problem centered on service reliability. It should be emphasized, however, that in neither case was it a taxi firm which failed to provide the contracted service.

OCTD's solution to this problem was to greatly expand the Community Services Department, so that a staff member was available to oversee the performance of every contractor. After the initial negative experiences, the attitude of the Community Services Department became one of playing watch-dog, since presumably any private operator would cheat the District, if given the opportunity. The taxi operators were viewed with suspicion, both for this reason and because they appeared less "professional" than the transit agency, being unable to afford the luxury of a high-overhead, quality-service-at-any-cost perspective. The operational expertise of taxi contractors was simply ignored. They were considered inferior partners who would have to be carefully watched, to make sure OCTD got the service it had contracted for. It required much patient work on the part of the taxi operators to convince OCTD that they are transportation experts in their own right. Recently, the assistant manager of one of the firms was hired to direct the operations of the Community Services Department, a sign of OCTD's growing confidence in the expertise and professionalism of its contract partners.

OCTD's SRT providers are subject to close, comprehensive service regulation. They must meet stringent service criteria, must collect and report detailed trip and financial information, and are visited frequently by OCTD supervisors. Operational parameters are totally within the control of the transit district. Operators own and provide the sedans; mini-buses used, were provided by OCTD. All vehicles are dedicated, painted with OCTD's colors and logo. The appearance of the vehicles is very important to the transit agency. SRT drivers are separate from the ERT drivers on each taxi company's staff.

Service "efficiency" is understood by OCTD as much in terms of reliability and appearance as in dollar costs. This reflects important bureaucratic and political concerns that are built into any "cost-efficiency" considerations that the District might have. These considerations depend on

position within the organization. The Finance Department, interested in maximizing passengers carried within resource constraints, takes a dim view of SRT in relation to fixed route transit, even if the former provides a much better level of service. The Community Relations Department wants to maintain service image, forestall complaints, and keep OCTD's user constituency satisfied, even if the net effect of these goals is to reduce productivity. Top management and the directorate keep a sharp eye on the overall ratio of cost to production to forestall politically damaging criticisms of inefficiency, but must balance this with an equally strong concern for service quality and image. They also must try to extend service to those jurisdictions and constituencies to whom it has been promised, when possible. These various and too some extent conflicting service goals have an important effect on the SRT service configuration.

In May, 1978 OCTD imposed "Trip Performance Standards" on its SRT operators. Initially, operators were required to pick up passengers within 15 minutes of their call for service or suffer a financial penalty. The effect of this attempt to ensure service reliability was to cut productivity significantly, about 15 percent from the level achieved previously. The "wait-time" requirement forced operators to abandon multiple passenger tours--the essential feature of a shared-ride system-- in favor of ERT-type trips whenever there was a chance that the trip performance standards could not be met. Moreover, many callers were refused service, since peak demand strained capacity and service requests could not be met within the allocated response time. Rather than being penalized for being late, operators only agreed to service those requests which probably could be accommodated within the standards. The decision to establish these trip performance standards illustrates the unclear and sometimes contradictory operational priorities that result when a transit agency attempts to achieve all objectives simultaneously.

In addition to trip performance standards, SRT providers are also subject to a productivity standard. Operators are expected to carry between 3.1 and 7 passengers per vehicle hour. Financial incentives and disincentives are provided for falling outside the standards. These standards, however, are essentially meaningless. Productivities below 3.1 or above 7 are practically impossible to achieve in these systems. Many ERT operations

carry 3 passengers per vehicle service hour, and productivities of greater than 7 are uncommon among DRT sytems. The trip performance standards make such a productivity achievement implausible. Consequently, SRT providers pay no attention to the producitvity standards. Their effect on outcomes is nil.

The original trip performance standards were eventually modified at the suggestion of the assistant manager of one of the SRT providers (the same one who now heads the Community Services Department). Instead of a 15-minute wait-time standard, operators were required to respond to a call within a promised 15-minute interval, or window in time. This change helped to increase productivity to meet rising demand, since tours could be formed and rides shared. Refusals of service could be reduced. Another effect, though, is that the service tends more and more toward prescheduling since trip performance standards and ride sharing can be managed best in this way.

Besides illustrating the reliability versus productivity conundrum, this change in policy is symptomatic of an improvement in the relationship between the OCTD and its SRT providers. Taxi firms finally have been able to achieve a grudging respect for their expertise and professionalism. They are no longer perceived as operators that need to be controlled, planned for and directed by the professional transit bureaucrats if they are to perform adequately. Without question a great deal of growth has taken place in both parties to this contractual relationship. Although scornful of some of the more obviously ineffective operational demands of OCTD, the taxi operators have also grown to appreciate the complex constraints under which a transit agency operates. At times, the learning process has been painful (recall the lengthy litigation) but the result has been more effective cooperation between public entity and private enterprise, including handling areas of continuing disagreement.

III. Some Lessons to be Learned

The Orange County Transit District's subsidized SRT program clearly illustrates that such a program will be initiated and carried out within the institutional setting of a transit agency only in accord with its overall transit goals and the roles the various actors within such an institution envision for themselves and the organization. Because of this, considerable

advance planning and service design activities will be undertaken, resulting in long lead times for projects. Cost-efficiency and effectiveness will be of only relative importance within a complex of goals that place paramount importance on service reliability and image, that is, in the transit agency's being able to deliver the kinds of services it promises to constituents and to the taxpayers who foot the bill. In the coming era of both fiscal limitations and high energy costs, current perspectives on the appropriate balance between service quality and cost-effectiveness may change, but for now cost-effectiveness is certainly not the sole overriding objective.

Even cost-efficiency and effectiveness, narrowly understood, is a two-edged sword in the case of SRT. Transit agencies like OCTD can ill afford to squander their subsidies by fielding relatively unproductive services. Nevertheless, in some areas subsidized SRT is the only feasible way of providing economical service, while freeing up fixed-route resources for service areas where they are more appropriate, as well as more productive. Where SRT is more costly than fixed route services, OCTD now envisions it only as a means of providing service to the elderly, not the general public. SRT's future as a general purpose community transit mode is thus dim, unless the transit district's preoccupation with fixed route expansion proves short-lived.

OCTD's three years of experience with subsidized SRT demonstrates that productive working relationships between taxi operators and a transit agency are possible, although the process of developing mutually satisfactory relations has been rocky. The SRT providers discovered, somewhat to their surprise, that transit district actors responded primarily to an <u>image</u> of professional competence, not the extensive demand responsive experience the operators regarded as their greatest asset. Not initially projecting the appropriate image, the taxi firms began their involvement with a decided handicap, and their problems with unreliable response times further contributed to the transit district's lack of confidence. It was only when the operators convinced the staff that they understood the nature of the service problems being experienced, and in fact had more insight into how they might best be solved, that a marked improvement in relations occurred. For their part, the taxi operators now understand more fully the complexity of constraints operating on the transit agency, and appreciate that requirements

which suboptimize operational efficiency and productivity may reflect valid agency concerns. Reaching into the ranks of the SRT providers to select the manager of the Community Services Department represents a vote of confidence by OCTD in this public-private sector partnership.

If the lesson to be drawn from the above is that this partnership is a viable one, it casts a more favorable light on another lesson, namely that the revenues from transit agency contracts can in a short order of time make a private taxi company heavily dependent on public subsidies. Transit agency contracts tend to be lucrative. One of OCTD's SRT providers is grossing about $850,000 annually from its contracts, or over 25 percent of its total revenues, while the other provider's annual revenues from SRT exceed $400,000, about 50 percent of its revenue base. Although neither firm would be faced with financial catastrophe if it lost its contracts with the transit district, such an event would represent a serious blow. To a certain extent, the futures' of these firms are tied to OCTD's continued willingness to target substantial amounts of subsidies to community level transit.

CASE STUDY 4: BIG CITY SRT

Since December, 1975 the City of Los Angeles has been using taxi companies to deliver demand responsive community level transit. From its beginnings in 1973, the City's community transit program has been plagued by persistent financial, administrative and service difficulties even while a needed transportation service has been placed on the streets. The record of taxi involvement in this program is similarly checkered, with some taxi-based systems performing well, while others have done little to warrant praise other than to simply exist. This case study, then, is primarily a chronicle of problems, rather than an account of exemplary SRT organization and performance. However, the fact that these problems are rooted in structural conditions--of public transportation organization, of city government, and of the taxi industry--which are not unique to Los Angeles among large cities, indicates the possible relevance of Los Angeles' experience with subsidized SRT.

I. Genesis and Development of the Community Transit Program

The need for alternate forms of transit in the City of Los Angeles stems from two major factors. First, as is typical of many large metropolitan areas, the fixed route transit system has evolved over the years into a regional transit system which, while facilitating inter-community (and particularly commuter) transport, provides much poorer service for intra-community travel. Los Angeles' transit operator, the Southern California Rapid Transit District (SCRTD), provides good service to downtown, along major corridors, and to major centers, but its services are not designed to facilitate strictly local travel. Since the City of Los Angeles consists of many separate communities, each with its own center of commercial activity, the relative lack of some form of community level transit became an issue of public concern. The 1976 legislation creating the Los Angeles County Transportation Commission, for example, mandated the new commission to investigate the community transit situation and initiate new services where appropriate.

Second, the needs of the transportation disadvantaged, notably elderly, handicapped, and low income persons, are also inadequately met by conventional transit. The transportation problems of disadvantaged LA residents have been an issue locally ever since the Watts riots, which were attributed

in part to inadequate transit service for residents of low income neighborhoods. The problem of the transportation disadvantaged is that transit service is provided along corridors of high demand, but not to particular individuals with mobility problems. More specialized services aimed at the specific travel needs of such individuals were seemingly required.

The needs of the transportation disadvantaged provided the thrust for the City of Los Angeles' involvement in community transit activity. Planning studies and needs analysis for paratransit date back to the late 1960's and early 1970's. The Community Development Agency's Comprehensive Development Plan, approved in 1970, recommended improved transit service for low income neighborhoods through specialized supplemental transportation projects. The first two of these projects were implemented in 1973 through the Model Cities program when DRT systems were established in the greater Watts area and Northeast Los Angeles. The provider for each of these systems was a private non-private community based agency.

Subsequently, the Community Development Agency (CDA) assessed the extent of the transportation disadvantaged problem in each of the communities with Los Angeles. This needs analysis was then used to determine where additional community transit services should be established. During 1975 community transit advocates within the city government were able to persuade the administration to allocate about $500,000 from the new Community Development Block Grant program to community transit. These funds were sufficient to establish three new DRT projects, in the Beverly-Fairfax, Hollywood-Westlake-East Wilshire, and Pacoima areas of the city. These systems began service in December, 1975 and continued for approximately a year until operator difficulties and the imminent loss of funds forced them to terminate operations. However, in April, 1978 these systems, now expanded to four different service areas, were reinstated by the City using Public Works Title II Funds. In addition, in July, 1978 che Los Angeles County Transportation Commission awarded the City two TDA Article 4.5 grants to set-up community transit systems in the San Pedro-Harbor and Venice areas of Los Angeles. All six of the systems funded in 1978 are operated by taxi firms.

Due to the emphasis on service to the transportation disadvantaged, the community transit systems as originally set-up nominally gave priority to

elderly, handicapped, and low income individuals, although they were available to the general public. In practice, this proved to be a meaningless distinction except in the Harbor system. In that system prepurchased tickets are used to pay for the service, thus affording a check on eligibility at the time of ticket purchase. Elsewhere, no mechanisms existed to ascertain the identity of the priority users. To facilitate trip scheduling, 85 percent of the service is suppose to be reserved for users who call 24 hours in advance, but since the percentage of advance reservations is lower (one operator estimates 70 percent), the service is essentially available on demand (although wait times may be lengthy). These service restrictions began to have practical import only after mid-1979 when, as the result of yet another change in funding, the Beverly-Fairfax, Hollywood-Wilshire, Westlake-West Adams, and Pacoima systems were converted, in principle at least, into elderly and handicapped systems. (There is still no administrative mechanism to restrict use to the E&H population.) In late 1979 another E&H system was established, this a user-side subsidy system serving the Echo Park-Silver Lake area. All nine of Los Angeles' community transit systems are operating at present, with taxi firms providing service in seven of them.

II. Taxi Operator Participation

The structure of the taxi industry in the City of Los Angeles has exerted a definite influence on taxi firm participation in community transit projects. The Los Angeles taxi industry is organized on a franchise basis. The city is divided into geographic areas, and the franchise to provide service in that area is given to one or more taxi firms. Until 1974 only one firm was franchised in each area; in that year, a 40-year old policy was changed to allow two or more taxi firms to operate in each franchise area in the interests of competition. Another major change in the industry was precipitated in December, 1976 when Yellow Cab of Los Angeles went bankrupt due to the financial collapse of its parent company. At the time, Yellow Cab was by far the largest taxi operator in Los Angeles, with over 450 cabs. As the result of Yellow Cab's demise, a strong independent operator movement developed. When the situation had been stabilized by mid-1977, Yellow Cab was again operating (under new ownership), but was no longer the dominant presence in the taxi market, and there were nearly 200 independents (organized into two associations) licensed to provide taxi service. One of the

few things which survived this industry shake-up was the franchise system, although many of the franchise areas now are served by multiple operators.

The initial participation of taxi firms in the community transit program reveals the influence of the franchise system. The contracts for the Beverly-Fairfax, Hollywood-Wilshire-Westlake, and Pacoima DRT systems were awarded on the basis of competitive bidding. Only taxi firms holding franchises in these areas of the city submitted bids (although there was no restriction on bidders), and the two taxi companies which won contracts did so for systems in their respective service areas. Yellow Cab received the contract to operate the Beverly-Fairfax system and Valley Checker Cab obtained the Pacoima contract. The contract for the third system was awarded to a private charter bus company.

These three community transit systems were organized along conventional DRT lines. Vehicles were dedicated to the service and painted in city colors and a provider-side subsidy system was used with compensation on a vehicle service hour basis. Because the services were aimed at low income residents, the fare was set at a mere 15¢. Due to the use of funds from a non-transportation program, the City required the operators to provide the vehicles themselves, reasoning that purchase of service would not raise federal administrators eyebrows, but purchase of vehicles might.

These DRT systems operated for approximately a year, at which time they died a sudden death due to funding difficulties and problems with the operators. In November, 1976 the owner of Valley Checker Cab sold the company in response to intense union problems, and the Pacoima service was dropped. Yellow Cab went into bankruptcy in December, and the Beverly-Fairfax service ceased. The Community Development Agency, which was supervising the community transit program, had become dissatisfied with the performance of the third operator, and with continued funding looking doubtful, simply decided not to renew the contract. Thus from December, 1976 to April, 1978 no DRT service was provided in these areas of Los Angeles.

When the DRT systems were reinstituted in 1978, a new round of competitive bidding was undertaken to choose the provider. Eight providers, including both private transportation companies and private non-profit agencies, bid on the systems, which now were four in number, lumped together in a package deal. Yellow Cab, under new ownership, was one of the bidders, although the new management had agreed to submit a bid only at the urging of

a former city official interested in transportation problems. Yellow Cab hired this individual as a consultant to put together the firm's proposal and to subsequently manage the systems should Yellow Cab receive the contract.

Precisely what happened subsequently is the subject of controversy. After the bids had been submitted, the City Council selection committee recommended that Paratransit Ltd., a firm based in Oakland, be awarded the contract. Yellow Cab's consultant protested, claiming that the dice had been loaded by prior unofficial promises to select Paratransit Ltd. as the contractor. Apparently as the result of vigorous complaints to both the City administration and City Council, the Board of Grants Administrations decided to call for new bids. This time Yellow Cab won on the basis of its low bid. Yellow Cab's bid was a mere $11.03 per vehicle service hour (including vehicle depreciation), well below its competitors.

By winning the bid, Yellow Cab received a contract worth approximately $500,000 to operate DRT systems in the Beverly-Fairfax, Hollywood-Wilshire, Westlake-West Adams, and Pacoima areas of the city. The contract called for Yellow Cab to supply six vehicles in each service area--five station wagons and one lift-equipped van. All vehicles are dedicated to the service. Yellow Cab has no serious objections to this arrangement, since it is permitted to utilize used vehicles and the firm is large enough large that these SRT vehicles can be recycled into the regular ERT fleet if the contract is terminated.

Yellow Cab also won another community transit contract in 1978, this one to operate the Venice DRT system. The Venice system is essentially the same as the other Yellow Cab operated systems, with the exception that eight rather than six vehicles are used.

The Venice system was one of two Los Angeles community transit systems to be funded by the Los Angeles County Transportation Commission in mid-1978. The second system, which was established in the Harbor (San Pedro) area of the city, represented the first attempt by the Community Development Agency to organize a service specifically designed to take advantage of a taxi company's existing operations. The Harbor system added an SRT component to a taxi firm's ERT services, utilizing an integrated fleet arrangement rather than dedicated vehicles as in the other seven community transit systems.

An important reason for breaking out of the previous service delivery mold, was the potential availability of TDA Article 4.5 funds. The LACTC now determined how TDA funds would be allocated, and had indicated it would give serious consideration to proposed city projects to be funded under Article 4.5. It had also indicated that successful projects would truly have to be innovative. While the Venice system did not differ significantly from the previous projects, it was the first such DRT system to be proposed for Article 4.5 funding, hence the LACTC did not apply its innovation criteria so stringently in this instance.

In the case of the Harbor system, the CDA staff supervising the community transit program came up with the idea of the integrated SRT service. The idea was also to test user-side subsidy principles, since prepurchased tickets would be used and the taxi firm would only be compensated for service actually rendered. However, only one taxi firm, United Checker Cab, is franchised to operate in the San Pedro area of the city, so this would be a user-side subsidy scheme without competition among providers. Since competition for the subsidy revenues was infeasible, the CDA staff negotiated the service and compensation arrangements directly with United Checker. It was decided that the taxi operator would be compensated on the basis of meter rates, and that a $3.00 limit would apply to subsidized trips. At this time a $3.00 fare represented about a 2 1/2 mile trip. If the meter fare exceeded $3.00 the user pays the difference. Trips in principle would be shared ride (how to enforce the $3.00 limit or equitably apportion the meter fare when shared riding occurred was never worked out, a not unusual administrative oversight), although the taxi firm was directed not to practice shared riding at the expense of reasonably direct trips. As the mildest of all possible incentives to maximize ride sharing, United Checker Cab keeps all the user fares collected--but the fare is only 15¢ per passenger.

The most recently established community transit system also utilizes user-side subsidy principles, but this time with several different providers participating. In December, 1979 the City initiated a user-side subsidy system in the Echo Park-Silver Lake area. Both regular taxi firms and independent drivers are taking part, with users paying for service with scrip purchased from the City at reduced rates.

III. Performance

Except for the Harbor SRT system, the overall performance of the Los Angeles SRT systems has been relatively poor. The five SRT systems operated by Yellow Cab have achieved productivities of only slightly more than 3 passengers per vehicle service hour, comparable to ERT rather than shared ride systems. Cost per passenger for these systems has been about $3.70, over 50 percent greater than the average for the other SRT systems in California. The Harbor system, in contrast, is regarded by the CDA as a major success, and rightfully so in light of per passenger costs of about $2.00 and the highest ridership of any of the six taxi-based systems, although it has been operational the shortest time. The good performance of the Harbor system has been achieved despite a relatively low level of ride sharing--only about 15 percent of the trips are SRT in nature. Of course, given the very low productivities of the Yellow Cab operated systems (two of which carry 2.5 passengers per vehicle service hour or less), there is little shared riding in any of these nominally SRT systems.

What accounts for the dismal performance of the Yellow Cab operated SRT systems? No single explanation will suffice, but three considerations seem particularly relevant. One villain appears to be the dedicated vehicle arrangements, in conjunction with an oversupply of vehicles in some service areas. For example, the service area with the smallest population, Pacoima, is assigned the same number of vehicles as two other service areas which contain twice as many people. Not surprisingly, the Pacoima system has a very poor performance record. The CDA staff never reassessed the initial decision to establish a basic fleet size of six vehicles in each of the four original service areas, due both to political concerns about negative reactions to service cutbacks and to a lack of staff time and expertise to analyze operational problems. Yellow Cab has attempted, without success, to get CDA to change the contract provision which requires 24 hours advance notice before vehicles can be shifted among service areas.

A second contributing factor is the nature of the ridership. Due to the high proportion of elderly users, many of whom have mobility difficulties, several minutes are often required simply to make a pick-up of a passenger once the vehicle arrives at the residence. Communication and language difficulties also plague the systems. Operational personnel report that

order-taking is much more time consuming than for ERT, even though order-takers are required to be bilingual. Addresses get garbled as well due to language problems, and the many elderly users contribute to a higher than normal number of nonexistent or incorrect addresses. All this slows dispatching. Non-productive delays thus are built into the SRT systems. Yellow Cab's contract manager reports that two of the five SRT systems are operating almost at capacity, despite vehicle productivities of only 3.7 persons per hour.

Neither of the above considerations, however, can account for why patronage is so low in these systems, much lower than in SRT systems which serve a comparable size population. Given the favorable service area characteristics of medium to high density and a large transit dependent population, combined with the very low fare, one would expect the Los Angeles SRT systems to do even better than systems elsewhere. Yet in the Pacoima area, which has a population and density similar to El Cajon's, the SRT system carries less than one-sixth as many persons as in the latter city. Nonetheless, only one of the other six SRT systems in the city generates more passengers per service area population than Pacoima. This universally poor ridership suggests either that service quality is poor (busy telephones, very long wait times), that many potential users are not aware of the SRT systems, that travel patterns are not confined within the service area, or some combination of these problems.

A plausible candidate is poor service quality, for there is evidence that better performance can be achieved in these systems. During 1976, when Yellow Cab (under previous management) operated the Beverly-Fairfax system, it achieved productivities of about five passengers per vehicle service hour and a cost per passenger of $2.00. The present Beverly-Fairfax system registers productivities about 30 percent less and cost per passenger over 50 percent greater.

Neither the sponsor nor Yellow Cab have attempted to analyze the performance problems of these five systems and take action to improve the situation. Yellow Cab's revenues do not depend directly on performance, and as long as its contracts are not threatened, it has no incentive to spend resources on service improvements. As for CDA, it would prefer better

performance, but the present record is deemed acceptable. CDA's prime objective is to provide a service to city residents. The quality of the service is important, but it is not the overriding concern.

The relative success of the Harbor system seems almost entirely attributable to two factors: the service design and the short average trip length (which is a function, of course, of the $3.00 limit). The integrated fleet arrangement guarantees that only as much service as is needed is supplied, while the short trips (an average of 1 3/4 miles in length) have minimized the City's subsidy contribution. Whether the same service design would improve the performance of the other SRT systems is uncertain, but the City has shown no interest so far in converting the dedicated vehicle systems to integrated fleet operations.

IV. Funding and Administration

It is easy to find fault with the organization and execution of Los Angeles' SRT systems, but the structural characteristics of this community transit venture were almost guaranteed to produce problems. Because the program was established and operated outside the public transit bureaucracy of the SCRTD, funding has been a chronic problem. The Community Development Agency was forced to scrape together funds from federal urban programs which were not aimed explicitly at transportation, meaning that other claimants had higher priority and that funds could be cut-off if federal administrators ruled that public transportation was an inappropriate use of the moneys. The federal programs were also subject to alteration and outright elimination. Consequently, the CDA staff spent a great deal of time simply seeking to assure that funds would continue to be available. Moreover, since funds were so tight, and needs were perceived to be so great, there was an irresistable temptation to spend virtually all the money on service delivery and very little on planning and administration. The staff of the community transit program at CDA consisted of essentially two people, both of whom had other responsibilities within the agency. Given these limited staff resources, program administration consisted of little more than monitoring operating statistics, interacting with operators over day to day problems, and keeping the money flowing.

By the spring of 1979, it appeared that funding of the SRT systems being supported from non-transportation sources would cease later in the year.

Two interrelated events prevented this from occurring, and gave the community transit program a new lease on life, albeit with some changes in service format.

First, the City created its own Transportation Department to consolidate in one agency all the transportation programs and functions it was involved in. The community transit program thus was removed from CDA and placed under the jurisdiction of the new Transportation Department. Second, public officials (including both City Council members and the City administration) who supported the community transit program came to the realization that there did indeed exist a funding crisis, and that several systems would expire if a new source of funds could not be located. Accordingly, the City pressured the County Transportation Commission to use TDA Article 4.5 funds to continue the projects being supported by other funding programs. The only problem with this strategy was that Article 4.5 funds in theory are restricted to new systems. To circumvent this obstacle, the Beverly-Fairfax, Hollywood-Wilshire, Westlake-West Adams and Pacoima SRT systems were changed from general public systems to E&H services, thus at least maintaining an appearance that they are new systems. The LACTC was willing to allocate only $300,000 to these systems, however, a marked reduction from the $500,000 budget which had prevailed the previous year. As a result, the number of vehicles in service for these four systems has been cut from 24 to 11.

Despite the change in funding, there was no thorough going review of the SRT systems. Business as usual seems to be the order of the day. The LACTC has not carefully scrutinized the systems, and one of the program monitors was simply transferred from CDA to the Transportation Department when the program was shifted to that agency. The implicit philosophy behind the community transit program remains unchanged, namely that these are welfare-like services for which the highest priority is service delivery, not exemplary performance.

CASE STUDY 5: TAXI BASED TRANSIT FOR THE ELDERLY AND HANDICAPPED

Numerous communities in California utilize taxi firms to provide subsidized transportation for elderly and handicapped residents. These taxi-based elderly and handicapped (E&H) services typically take one of two forms: (1) a specialized transit system, predicated upon dedicated vehicles and supporting personnel and operated by a taxi firm; or (2) the establishment of arrangements whereby this population group can utilize conventional taxi services at highly subsidized fares. The latter is the most frequently used form of taxi firm involvement in E&H services in California. Among the most interesting aspects of taxi-based E&H services are the origins of such ventures, the reasons for the service delivery system selected, and the problems, performance, and costs associated with different service organization alternatives. Based upon a brief examination of experiences in several California cities, this case study examines these concerns.

I. Taxi-Based Special Transportation Systems

A. Get About

The Pomona Valley Senior Citizens and Handicapped Transportation Authority sponsors one of the largest taxi-based E&H systems in California. Known as Get About, this special transportation system presently operates eight vehicles in an area encompassing four municipalities and an unincorporated portion of eastern Los Angeles County. The organization which spearheaded the development of Get About, Pomona Valley Community Services (PVCS), is not unique in having established a viable special transportation service where none existed before. In numerous cities around the county, human service agencies have used funds from Department of Health, Education, and Welfare programs and UMTA's 16(b)(2) program to create major special transportation systems. What is relatively uncommon about Get About is the utilization of a taxi firm as the provider of the special transportation sevice, rather than the human service agency operating the system itself, as is more typically the case.

Special transportation service in the Pomona Valley (which includes the cities of Claremont, La Verne, San Dimas, and Pomona) initially developed along conventional, human service agency oriented lines. Using agency vehicles and assisted by a $15,000 grant from the Area Agency on Aging, four homes for the elderly established their own transportation service in mid-1975. The service was targeted at isolated, low income elderly persons; they did not have to be agency clients.

In late 1976, Pomona Valley Community Services, Inc. (PVCS) was founded to administer the transportation program, which had acquired the name of Get About. One of PVCS' prime objectives was to expand and upgrade the Get About System, which then was carrying relatively few passengers per day. In pursuit of this objective, PVCS began lobbying for funds with the municipal governments in its service area. It found a receptive audience at the City of Claremont, which two years earlier had established its own DRT system for the general public.

Paul Brotzman, then the Assistant City Manager of Claremont, played a key role in subsequent events. Brotzman helped PVCS in developing its funding proposals, which were aimed at obtaining financial support from the four cities in the Pomona Valley and from state and federal transportation programs. He also worked closely with the staffs of the other city managers in making a case for funding and otherwise building local support for PVCS' transportation program. Equally important, Brotzman brought together PVCS and Paul's Yellow Cab, the only large taxi firm in the Pomona Valley and the service provider for Claremont's DRT system. Gene Stallians, president of Paul's Yellow Cab, immediately perceived the opportunity for his firm presented by PVCS' objective of substantially expanding Get About's activities. Stallians became actively involved in the efforts of PVCS and the cities to develop funding proposals and to establish an organizational structure to deliver the service.

In October 1977, the four municipalities entered into a joint powers agreement, creating the Pomona Valley Senior Citizens and Handicapped Transportation Authority (PVSCHTA). PVSCHTA in turn entered into an agreement with PVCS, whereby the latter serves as the administrative arm of Get About. PVCS is responsible for such functions as eligibility checking, operator

supervision, budget preparation and monitoring, and overall day-to-day program management. In return, PVSCHTA acts as funding recipient and sponsoring body.

Gene Stallians of Paul's Yellow Cab was a participant in the negotiations that led to the above agreements. Although PVCS could have operated the expanded Get About system itself, extensive interaction with Stallians had convinced the agency's leaders that the taxi operator possessed far more DRT expertise than it did. Paul Brotzman had vouched for Stallians managerial capabilities, and had recommended to PVCS that it contract with Paul's Yellow Cab to operate the system. Although two other private transportation firms in the area initially expressed interest in bidding on the system, PVCS wished to establish a level of service these firms could not provide. Consequently, Paul's Yellow Cab was the only bidder and PVCS and Stallians simply negotiated the terms of the contractual agreement.

Get About provides true door to door transportation for anyone in its service area 60 years of age or older, and for physically handicapped of all ages. The service is available 8 hours a day Monday through Friday and 5 hours on Sunday. In addition to serving trips in the Pomona Valley, Get About provides transportation to both medical facilities and the nearest major shopping center in adjacent San Bernardino County. Coordination with the DRT services in western San Bernardino County is facilitated by the fact that Paul's Yellow Cab operates these as well.

The vehicles used in Get About are owned by PVSCHTA, although the taxi firm uses its own taxi sedans as backups. Starting from two vehicles, the fleet has been gradually expanded to eight vehicles at present. Half of these are vans or mini-buses with wheelchair lifts; the other half are sedans.

Paul's Yellow Cab is compensated on a cost-plus basis. The taxi firm keeps detailed records of all costs incurred in providing the service, and submits these to PVCS monthly. After review and approval by PVCS, the bills are paid by PVSCHTA, with a 10 percent profit allowance added on. Stallians was the leading exponent of cost-plus compensation, and his argument that it was the most equitable arrangement for both parties met little opposition.

Paul Brotzman judged this compensation scheme to be satisfactory, and worked with Stallians to set it up.

One of the most distinctive features of the Get About System has been the amount of cooperation and sharing of influence among the several parties involved. There is a very high level of operational cooperation and interaction between PVCS and Stallians. For example, Get About has always encouraged users to pre-schedule trips, and currently a mix of pre-scheduled and immediate requests for service characterizes demand. PVCS does all pre-scheduling while Yellow Cab's dispatcher then slots in requests for immediate service. The PVCS office is linked by radio to the Get About dispatch room at Yellow Cab, so adjustments can be made quickly when problems arise.

Over time, PVCS and Stallians have agreed to a division of authority in which user concerns are PVCS' baliwick, while Stallians reigns supreme in operational matters. This understanding emerged out of some early conflicts over PVCS role with respect to Get About's drivers. Because they consider Get About and PVCS to be synonomous, users from the outset lodged complaints about drivers with PVCS. Stallians was not happy with this procedure, since he wanted to receive complaints directly, not from an intermediary which did not understand the operational requirements of DRT. PVCS held firm, however, contending that the service must be user-sensitive, and that it was in the best position to judge whether complaints had merit. Eventually, Stallians accepted the legitimacy of PVCS' driver monitoring function, recognizing that the agency is better attuned to the needs of the systems' users than he is. Stallians has terminated drivers on PVCS' recommendation, and requires that all Get About drivers, who are Yellow Cab employees, undergo training by PVCS in how to deal with the elderly and handicapped clientele. In addition, Stallians attends meetings of PVCS Advisory Board, so he is kept in direct touch with user sentiment and needs.

The organizational and funding aspects of the Get About System also exhibit the pulling together of parts, in an appropriate manner, to form a whole. Operating and capital subsidies come from no fewer than eight sources--the State, Los Angeles County, the Area Agency on Aging, UMTA, and the four municipalities which comprise PVSCHTA. PVCS has persuaded the City

of Pomona to act as treasurer for the system and the City of La Verne donates office space, including paid utilities. With a budget now in the neighborhood of $300,000 per year, Get About has developed from a very modest transportation venture into a relatively sophisticated organizational complex for the delivery of transportation services to the elderly and handicapped.

Get About has been successful on several dimensions. It is widely available to the E&H target group, it is reasonably well-patronized with a current daily ridership level approaching 300, it is a user-sensitive system, and it provides access to a large geographic area. The price tag for the service is expensive, however. Total cost per passenger has been running at $4 or more. While hourly service costs are about $12, quite typical for taxi-based DRT operations, the productivity of Get About barely approaches 3 passenger per vehicle service hour, more typical of ERT than SRT service. Low productivity stems from several factors--long trips (4 to 5 miles on average), low demand density due to the large service area (over 40 square miles), and a high level of service to the user (door to door for many patrons) which entails considerable time for pick-ups and delivery--none of which are likely to change significantly. Given the prevailing trip lengths, the Get About service is less expensive than ERT travel, but not by a wide margin. (A four mile ERT trip in this area would cost about $5.)

B. Two Municipally Sponsored Systems

The taxi-based E&H systems in the small towns of Oakdale and Oroville are at the opposite end of the spectrum from Get About. Rather than creating an entirely new transportation service, the local governments which sponsor these E&H systems simply built upon existing taxi operations. Neither system employs wheelchair accessible vehicles at present; all service is in taxi sedans. The Oakdale SRT "system" consists of a single taxi vehicle which provides service 11 hours a day, 6 days a week. The Oroville system also originated as a dedicated vehicle system; 3 taxi sedans were to provide service to eligible residents 10-12 hours per day. (The system design was changed to an integrated fleet subsequently.) Vehicles are owned by the taxi operator in both systems.

In both communities state subsidy funds are used to finance the system (Oroville began as a state funded demonstration project). The service is available to all elderly and handicapped residents within the city limits and in Oroville to residents of an adjacent area surrounding the city as well. In order to purchase tickets which entitle them to subsidized taxi travel, eligible individuals must simply register with the City and receive an identification card which they show whenever using the service. Tickets are purchased from the City. The cost of each ticket is 40¢ in Oakdale and 65¢ in Oroville.

Once the City had developed the service concept, establishing the service was simplicity itself. Oakdale had no locally based taxi firm prior to the initiation of the SRT system, so firms in the surrounding area were invited to propose a system. Only Red Top Taxi from nearby Modesto made a proposal, which the City accepted. In Oroville, the City negotiated directly with the lone local taxi firm, Oroville Yellow Cab, to organize the system. In both cities, the sponsor established the fare, the hours of service, insurance requirements, and response time criteria. Both sponsors had a preference for compensation arrangements which pay the taxi firm only for service rendered, not for available service. The taxi firms were agreeable to this, with the result that Red Top Taxi receives $1.50 per passenger transported, while Oroville Yellow Cab is compensated at the rate of $1.75 per ticket collected. Up to three people can ride from the same origin to the same destination on a single ticket in Oroville. In addition a zone system was set up for the Oroville SRT system, in which a user crossing one zone boundary of the 4 zone system pays only one ticket, whereas patrons crossing more than one boundary must pay two tickets. Once these arrangements had been formalized in a contract, service commenced immediately.

Although the Oroville SRT system was initially set up as a dedicated vehicle operation with limited service hours, the taxi operator shortly moved to convert it into an integrated fleet service. Contending that improved service could be provided to users if the trip requests of the E&H patrons were integrated with requests from ERT users, the operator persuaded the sponsor to both drop the dedicated vehicle requirement and make the service available 24 hours a day. Trips by E&H patrons are in principle shared

ride in nature, and the taxi operator will also combine trips of regular taxi customers and E&H users if the former agree to share the ride. Regular taxi trips are on a meter basis, however, so this type of shared riding is limited to trips which do not deviate from the ERT patron's route. The operating statistics from the E&H system seemingly indicate that shared riding occurs in only a minority of cases. Nonetheless, the Oroville SRT provider has succeeded in demonstrating that integrated fleet principles can be applied to E&H systems as well as those SRT systems serving the general public.

Both the Oakdale and Oroville SRT systems have proven quite effective in providing needed transportation to eligible users at low costs to sponsors. Because of the fixed fee per rider (or ticket) arrangement, the total costs of the Oakdale system is only $1.50 per passenger and the Oroville system costs less than $1.75 per patron (how much less is impossible to determine). The Oakdale system carries only 30-40 riders per day, but only 290 persons are presently registered to use the system. The Oroville system has experienced significant ridership growth and is now carrying over 200 patrons daily. After the state demonstration project ended, the service was continued under regular TDA funding and expanded further beyond the city limits. Both taxi firms apparently find the E&H service to be profitable. Overall, these two systems represent a happy blend of cost-effective service delivery, good service to users, and significant new revenues for the taxi firms participating.

II. User-Side Subsidies for Taxi Travel

Subsidizing conventional taxi (ERT) travel as a means of providing affordable demand responsive transportation for the elderly and/or handicapped has become a popular service option among California communities, particularly in the San Francisco Bay Area. Throughout the state, at least 30 communities have adopted this method of establishing an E&H transportation service. Basic information was gathered on six of these systems--Berkeley, San Jose, Hayward, Los Gatos, and Sunnyvale in the Bay Area, and Lomita in Los Angeles County. Because these six systems exhibit several

important commonalities, they will be discussed separately only to illustrate distinctive features or problems.

All six cities are located in areas served by regional scale fixed-route transit operators, who absorb all regular state and federal subsidy funds. Consequently, TDA Article 4.5 funds (the 5 percent TDA allowance for innovative community transit services) have been instrumental in starting or developing each of the services. Sunnyvale and Hayward began their systems using federal revenue sharing funds, and Los Gatos (an affluent community) actually used local funds to initiate service. However, five out of six cities now utilize Article 4.5 funds exclusively. In the case of Sunnyvale, Article 4.5 is the predominant source of funds. The E&H programs require subsidies ranging from about $20,000 annually to $240,000, the level of financial support being related to municipal population.

Taxi operators did not play an active role in the planning and development of any of these systems. Sponsors developed the service concepts, and then approached the local taxi firm (or firms) to implement the program. While one of the advantages of user-side subsidy systems is the opportunity for competition among providers, competition has occurred only to the extent that two taxi companies operate in the same service area, which is the exception. Berkeley contracts principally with one company, which assumes the administrative responsibility for tabulating rides, fares and costs, and with five additional companies in Oakland as backups. Sunnyvale, Hayward, and San Jose each have only one local taxi company to choose from. Los Gatos has had to try to attract operators from outside the town to carry fares, and has had some difficulty in doing so. Senior citizen pressure helped get the Los Gatos program started, and the city council attempted to insure service by making operator participation a condition for doing business in the city. Even Lomita, which is served by two firms, found it necessary to resort to franchise cancellation threats to get these operators to participate in the service (and to stay involved subsequently).

The sponsors of these E&H services administer the program, determine and check user eligibility, establish user fares, negotiate reimbursement arrangements with the taxi firm(s), and sell tickets or scrip to patrons. All but the Lomita system utilize scrip or tickets, due to restrictions on

how much usage eligible individuals can make of the service. The Lomita service is available on an unlimited basis to E&H persons, and they pay a 25¢ cash fare to the taxi firm. The Berkeley system is the only one to use scrip. Patrons purchase $20 worth of scrip for $4, but are permitted only one such purchase per month. The operator collects scrip for the fare, which is discounted 10 percent for these users. The other four systems utilize tickets, with each ticket entitling the user to one ride. Multiple riders (up to five in one system) can travel on a single ticket if origin and destination are the same. In Sunnyvale, the cost of tickets depends on the household income; elsewhere, they range from 50¢ to 75¢. Hayward will subsidize rides up to an $8.00 fare, while none of the other cities impose a maximum limit on the subsidized fare.

The taxi firms which participate in these E&H subsidy programs receive compensation on the basis of either a fixed rate per trip or actual meter fares. (In Berkeley the scrip used by patrons is simply turned in for money.) Sunnyvale and Los Gatos each pay the taxi firm $3.00 per ticket returned to the sponsor. Hayward and San Jose pay the taxi firm the meter charge for the trip, although the Hayward operator gives the sponsor a 10 percent discount. Lomita makes use of both compensation arrangements, paying one firm a flat $2.68 per passenger and the other the meter fare. (Interestingly, the former company has virtually ceased to participate in the project, presumably because it is not making money at the current payment rate.)

These systems are explicitly ERT in nature, although the use of a single ticket for multiple riders represents an inducement to users to group rides. In no system, however, do group rides represent more than 10 percent of all trips, so this incentive is apparently weak. Shared riding is actually prohibited in most of the programs. Since the compensation structure is based upon ERT rates, taxi firms paid a fixed fee per party could make above-normal profits if they practiced shared riding. Moreover, demand densities for the E&H service are normally too low to make shared riding feasible.

Utilization of these services is a function of both restrictions on eligibility and limits on the number of trips per month. Only Lomita and

Los Gatos, both of which are small communities, permit unlimited use of the service to E&H patrons. Elsewhere, desired demand exceeds available funding, requiring eligibility and service limitations. Ridership ranges from 300 trips per month in Los Gatos to about 5000 trips per month in Sunnyvale. The total operating costs (non-administrative) of service are typical of ERT fares, ranging from $2.70 per passenger in Lomita to over $4.50 per passenger in Hayward and San Jose. Administrative costs are significant, but impossible to determine because of the widespread practice of using existing local government personnel to perform administrative functions. The average cost per passenger of these services is about $3.50, with user fares accounting for less than 20 percent of this amount.

Two main problems have plagued these user-side subsidy programs. The first has been difficulties in inducing taxi firms to participate on terms that are equitable to both sponsor and operator. The Los Gatos service has had the most severe problems in this regard. There is no locally based taxi firm in Los Gatos; the city is served only by San Jose companies, and is poorly located for convenient taxi service out of San Jose. Originally, the Los Gatos project offered taxi operators $2.10 for each ticket collected. This initially proved sufficient to attract service to the community, but taxi drivers soon realized that trips in Los Gatos were a money losing proposition. One could hardly expect lessee drivers to drive all the way to Los Gatos for a $2.10 fare, with poor prospects of linking their trip with a regular fare between San Jose and Los Gatos or vice-versa. The number of trip turndowns became substantial. Because the service was unreliable, many patrons stopped using it, and patronage dropped by 50 percent. Threatening the taxi company with revocation of its permit to operate locally was somewhat hollow, since the community would be left with no operator. In an attempt to make participation more attractive, the rate of payment was increased to $3.00 per ticket. This helped increase service reliability somewhat, but has not eliminated the problem. Los Gatos, therefore, intends to purchase a van and have a non-profit organization operate its E&H program. The taxi option then will be abandoned.

Lomita also has had trouble with its taxi operators. The two companies which serve the city were both needed to participate, since they hold service rights to different areas outside the city boundaries which contain

medical facilities heavily utilized by Lomita residents. One company was reluctant to participate initially, and had to be threatened with revocation of its permit to operate before it decided to become involved. The other company was a willing participant at the outset, but subsequently lost interest in the program and began providing such poor and unreliable service that it now carries a mere 5 percent of all trips. It has expressed a desire to formally opt out, but the City has told it that to do so would mean the loss of its service rights. Involvement with government and the attendant hassles, as well as concern about unremunerative compensation, are at the root of both of these reactions. The first company, however, became an enthusiastic partner after it discovered that the financial benefits outweighed the administrative burdens.

Program administration has been the second major problem with these user-side subsidy schemes. The cities which sell tickets or scrip to users have found the program to be more administratively intensive than anticipated. The day-to-day demands of administering the sale and receipt of vouchers or tickets, as well as monitoring the service, ties up staff time. Planning becomes reactive, rather than pro-active. Financial management (staying within the all-important budget) becomes clouded by the existence of a relatively large proportion of unclaimed service debits in the form of unused tickets. Hayward tried to impose an expiration date on 3,000 outstanding coupons, but was unsuccessful. Hayward also attempted to persuade their taxi operator to accept a voucher system, but fears about driver honesty have caused continuing resistance to such an arrangement. The lesson would seem to be that user-side subsidization is deceptively simple. If it is to work efficiently, advance planning must be sufficient to assure overworked administrators operating within tight budget constraints that they can retain, rather than continually attempt to regain, control over the flow and development of their programs.

CHAPTER THREE

TAXI-BASED COMMUNITY TRANSIT: AN ISSUE ANALYSIS

I. Institutional Choice Issues

A. Local Government Decisions to Implement Subsidized SRT

The most obvious question raised by the widespread use of subsidized SRT for community level transit in California is why this development has occurred. As emphasized in Chapter One, the State's transit subsidy program has been instrumental in stimulating community level transit in California, not only by making transit subsidies available to localities, but also by mandating the latter to provide some type of transit service. But even though the TDA program has made possible the proliferation of taxi-based public transit services, its existence alone does not explain why local governments have opted for these specific forms of community transit rather than other alternatives. Three other factors are of prime importance to understanding why subsidized SRT has become so attractive to local governments.

First, although service contracting with private firms is a relatively recent development in public transit, it is well-established and pervasive practice on the part of local governments. In California, about 20 percent of all municipal services are provided in this fashion.[1] Since local government--in the form of municipalities, counties, and transit districts--is the level at which transit service and financing decisions are made in California, one would expect that the considerations which shape local government attitudes toward contracting generally would influence decisions in the transit arena as well. In making contracting decisions, the following objectives seem significantly important to local governments: the "efficient" production of (transit) services; minimal to acceptable cost levels; and a comfortable interface between government control and service production.[2]

These objectives are not perfectly complementary; some tradeoffs are required as local decision-makers seek to strike a balance among all three

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[1]Sonenblum, Sidney, Kirlin, John J., and Ries, John C. How Cities Provide Services. Ballinger, 1977.

[2]Sonenblum, Kirlin and Ries, op. cit.

in contracting with private providers for public services. Whatever balance local governments in California reach among these three elements, however, yields a strong preference for contracting when DRT services are at issue. As of July 1979, approximately 80 percent (39 of 49) of the general public DRT systems in the state were contract operations. Moreover, nearly 75 percent of these contract operations are subsidized SRT systems (see Table 1).

Second, taxi firms have made their presence known to local governments considering establishing community transit services. The basic position of the affected taxi operators has been that the sponsoring public agency should give them an opportunity to bid on the provision of any subsidized transportation service which would compete with existing ERT operations. Some taxi operators have been quite aggressive, to the point of threatened or actual legal action, in advancing this proposition. For example, Yellow Cab of North Orange County, together with the Yellow Cab companies of Newport Beach-Costa Mesa and Santa Ana filed a lawsuit against the Orange County Transit District (OCTD) in an attempt to prevent deployment of DRT systems in its service area. Although the lawsuit was ultimately unsuccessful, the taxi firm did succeed in persuading OCTD to let it bid on the District's proposed DRT services and subsequently became a major SRT provider. No other SRT provider found it necessary to resort to legal action to secure contract opportunities, but most reported that they had directly communicated their interests to sponsors of proposed new services.

The prior relationship between taxi firm and local government did not usually seem to be a determining factor in the choice of SRT by the latter. The quality and level of this relationship varied widely among the jurisdictions surveyed. In some, the taxi operator was well-known to local officials; in most, the relationship was characterized by limited contact. By all accounts, two firms used political influence to secure their SRT contracts, and one of these operators possesses sufficient political clout to have steered SRT contracts towards his firm in three different cities. However, these seem to be unusual cases. Most taxi operators perceived that they had little or no political influence vis-a-vis the local governments in their service area, a perception that involved local officials generally shared. Typically, the process of establishing the SRT system represented the first occasion for intensive and continuing communication between the taxi firm contractor and the public agency sponsor.

TABLE 1

MODE OF DRT DELIVERY IN CALIFORNIA

Public Agency Provision		Contracted Provision	
Transit Agency	4	Taxi Firm	29
Municipality	6	DRT Management Firm	8
		Private Non-Profit Organization	2
Total	10	Total	39

The third factor in the equation, and the principle reason most local governments opt for subsidized SRT rather than other types of DRT service, is the perceived cost-efficiency of this service option. Ordinarily, one might think of "cost-efficiency" as the relationship between economic input and service output. From local government's perspective, however, cost-efficiency takes the form of a complex of cost, service, and political advantages that local decision makers perceive to be connected with their choice of SRT as the means of delivering community transit services.

Quite clearly, the cost advantages of SRT are a major reason for its prevalence. Based on data collected from California's DRT systems, it is possible to compare the cost per vehicle service hour (VSH) of three basic modes of DRT service delivery: SRT, direct municipal operation, and DRT management firm operation (see Table 2). The costs used in the comparison are reported total operating costs per VSH, based on an unweighted average of all systems in each category. For the contract operations, total costs include the administrative costs of the sponsoring agency, and any other costs incurred by the sponsor (such as insurance and fuel for vehicles) in providing the service. The reported costs for contract operations are likely to be relatively accurate, whereas municipal operations almost invariably underestimate total costs. As Table 2 indicates the local taxi operator is able to provide significantly less expensive DRT service than either local government itself or a DRT management firm. The fact that more local governments contract with the latter than provide DRT themselves suggests, however, that the "cost-efficiency" of contracting, and SRT, goes beyond simple direct dollar considerations and includes other factors.

For purposes of subsequent analysis, it is important to distinguish between two different types of local government sponsors of public transit: general purpose local governments (cities and counties), and transit agencies. Different elements comprise the "cost-efficiency" perceptions of these two types of community transit sponsors.

General Purpose Local Government

Approximately two-thirds of the local government sponsors of subsidized SRT in California are municipalities. Excluding the City of Los Angeles, the municipalities involved in SRT provision are small cities, ranging in population from 10,000 to 100,000. Most municipalities use TDA funds to

TABLE 2

COMPARATIVE COSTS OF THREE MODELS OF DRT SERVICE DELIVERY

Operator	Cost/VSH
Taxi Firm	$12.55
Municipality	14.23
DRT Management Firm	17.24

subsidize SRT; a few use UMTA Section 5 moneys or Federal revenue sharing funds. None subsidize SRT directly out of municipal general revenues.

Contracting for SRT has several "cost-efficiency" advantages for municipalities. First, the local taxi firm is in a position to sell the city a "packaged" service, in which the former assumes primary responsibility for service design and complete responsibility for system operation. The municipality need only make policy decisions--hours of service, fares, maximum response time, etc. This enables the city government, usually lacking in transit expertise, to avert an unwelcome planning and managerial burden. The municipality has compelling financial reasons, moreover, given external sources of funds, to internalize as few of the costs of public transit provision as possible. Contracted SRT is ideal in this regard.

Second, when local governments assume the costs of DRT vehicles, as most do, it obviously is far less expensive to capitalize taxi sedans than minibuses or modified vans. This leaves more money for operational purposes or for alternative transportation uses.

Third, SRT systems can be established in a very short period of time, a matter of weeks. The needed service planning is relatively minimal, and sedans can be readily purchased or the taxi operator's own vehicles used until new vehicles arrive. This lack of lag time permits constituents to connect service provision with the political decision to implement it.

Fourth, contracting with a local taxi firm provides the opportunity for a comfortable, relatively informal relationship between funding agency and service provider. The taxi firm does not possess the potentially threatening aura of sophisticated expertise that a non-local DRT management firm might. Control can be less formal, hence less burdensome and expensive for the municipality. It is politically advantageous, moreover, to give business to a local company, particularly when the latter may create legal difficulties otherwise. Overall, SRT represents a low cost method of providing a new community service without requiring that local officials, elected or bureaucratic, learn or practice novel modes of behavior.

Transit Agencies

Transit agencies, no less than general-purpose local governments, have found subsidized SRT to be an extremely attractive form of DRT. Of the 13 DRT systems in California funded and organized directly by transit agencies, 9 are contract operations, and 8 of these are SRT systems. While only three transit agencies have embraced DRT as a major form of service delivery, each has turned to subsidized SRT as its primary means of providing DRT.

The three transit agencies which use taxi firms as service providers are the Orange County Transit District (OCTD), the Riverside Transit Authority (RTA), and OMNITRANS, San Bernardino County's transit agency. The latter two entities are constituted quite different from OCTD. Whereas OCTD is an autonomous, statutorily created transit district, RTA and OMNITRANS are joint powers authorities (JPA) of several cities. The transit agency is the planning and service delivery arm of the JPA, but the cities retain ultimate authority for all planning, financing and service decisions. Nonetheless, there are sufficient similarities in behavior among these three agencies to permit generalizations, although OCTD's experiences are particularly useful benchmarks.

The decision making process for community level transit differs in two important ways between transit agencies and general purpose local government. First, "cost-efficiency" is more narrowly understood by transit agencies in terms of dollars. OCTD, for example, has a legislated community transit mandate which insures a certain level of interest in DRT, but cost is a major consideration. In some communities, DRT is less expensive to provide than fixed route transit; in others, fixed route transit along major arteries is cheaper, but a political commitment has been made to the city to provide community level transit. OCTD has selected taxi firms to operate its DRT systems because they are the lowest cost providers. Similarly, RTA and OMNITRANS have opted for subsidized SRT because it offers the best combination of low cost and good service for local transit in particular situations. Neither organization is wedded to DRT, or SRT, but other alternatives are either too expensive, ineffective, or both. In fact, some transit agency planners would prefer to see DRT service provided directly by their agency, not a taxi firm (which in their eyes, at least, suffers from a low quality image), but recognize that fiscal realities dictate a different posture.

The second important difference is that transit agencies are far more active and pro-active partners in structuring SRT service than are municipalities. The latter often find taxi firms attractive providers because of their transportation expertise, but the transit agency possesses this quality itself. It is likely to have a well-defined idea of what type of service it wants, and how that service should be established. OCTD, for example, has: adopted a community transit policy; mobilized the planning department to assess community needs and establish a priority list for community transit; instructed potential bidders in how to prepare contract proposals; established (albeit gradually) service parameters and reporting criteria and monitored their fulfillment. RTA and OMNITRANS have bureaucratized the service delivery process somewhat less, but all three transit agencies view the SRT provider as an operator, not a service designer.

B. Taxi Firm Diversification into Public Transit Services

The current financial plight of the taxi industry has been well-chronicled. Virtually without exception, taxi firms in California have felt the financial pinch caused by dealing ERT profitability, and most operators have been actively exploring avenues for bolstering their revenues. Although diversification opportunities exist in both the private and public sectors of transportation, the most prevalent diversification strategy to date has been contract operations financed through public funds. While not shunning new private sector services (some firms provide parcel delivery and/or medical supplies delivery), there has been a notable lack of interest in unsubsidized SRT among California taxi firms. In fact, not a single firm which provides taxi-based public transit services is presently offering unsubsidized SRT.

This pattern of choices is not as surprising as might initially appear. Regulated industries have a well-deserved reputation for risk-averseness, and diversification involves risks as well as potential benefits. To a firm seeking to minimize its risks, services delivered under contract will always be preferred to services offered in the private marketplace, since the former produce guaranteed revenues (and profits), whereas the outcome of a market test is uncertain. Thus, while many SRT providers are willing to concede the possible merits of private, unsubsidized SRT, their skepticism that it can be a profitable service has led them to consider it too risky to

try as long as other diversification opportunities exist. Several firms had first hand experience with unsubsidized SRT in the 1940's and 1950's, and remembered it to be ultimately unprofitable. Large numbers of passengers had used the service, but in order to attract this demand, fares had been set at what eventually turned out to be unremuneratively low levels.

The reluctance of subsidized SRT providers, and virtually all other taxi firms in California, to experiment with unsubsidized SRT has little to do with restrictive taxi regulations. In many communities the taxi ordinance restricts or prohibits SRT, although such regulations do not apply to services delivered under contract. Taxi operators, however, describe such ordinances as paper tigers. In their view, the anti-SRT regulations could be charged without undue difficulty if the operator wished to make an issue of them. In fact, a large firm in Fresno has succeeded in doing precisely that. Financial considerations, not outmoded regulations, are the major reason California taxi firms have concentrated on subsidized contract services and largely ignored unsubsidized SRT.

In the case of proposed general public DRT services there seems to have been a combined "push-pull" motivational character to the decision by taxi operators to pursue SRT contracts. The "push" was supplied by the imminent prospect of public sector initiation of a subsidized transportation service that would directly compete with and eventually destroy their operation. The "pull" came from the operators' perceptions of an opportunity for guaranteed profitability through the provision of public transit service under contract. Some operators actively wooed sponsors for contracts; others responded to informal feelers or formal requests for proposals. Whatever their initial reaction, the affected taxi firms made every effort to insure that they, not some other organization, would be the financial beneficiary of the new DRT system.

Schemes to subsidize existing taxi services for the elderly and handicapped typically do not carry either the financial rewards associated with a general public DRT system nor the possibility of financial disaster to the taxi firm if another organization secures the service contract. Consequently, taxi operators have been more passive about pursuing such opportunities, generally adopting a "let them come to us" attitude towards sponsors of such services. While the subsidies to users assure a certain level of demand for taxi service, most of the target individuals already utilize

taxis for some trips. Moreover, there are limits, sometimes quite strict, on the number of subsidized trips allowed. Taxi operators have usually readily agreed to take part in such ventures once the sponsor has worked out the arrangements, but they recognize that they do not portend a major increase in revenues. On the other hand, proposed new DRT systems for the elderly and handicapped, whether organized by local government or human service agencies, promise more significant impacts. These systems have the potential to siphon off significant numbers of current taxi users, and taxi operators affected by the proposed systems have been quick to offer themselves as service providers and to lobby for their participation.

Those taxi firms which have entered into the public transit arena, whether as subsidized SRT providers or through elderly and handicapped services, have proven quite flexible in structuring their participation. Although operators are confident that their suggestions about service organization or compensation arrangements will save sponsors money, they invariably accomodate sponsor preferences in these matters. As long as the scheme is workable and gives the operator an opportunity to make a reasonable profit, it will be acceptable.

C. The Role of Other Institutions in Establishing Taxi-Based Transit Services

Human Service Agencies

Transportation has become a major concern of human service agencies due to the fact that so many of their clients lack adequate transportation. This study did not focus in-depth on the utilization of taxi firms by human service agencies, nor did it attempt to determine with precision how widespread such practices are in California. The following information, therefore, is less than definitive, based as it is on a relatively small and possibly unrepresentative sample of taxi-based elderly and handicapped transportation services.

In California, as elsewhere, numerous human sevice agencies attempt to provide transportation to their clients, either through direct operation of their own vehicles (or those of individuals affiliated with the agency) or by purchasing service from private transportation providers. If the taxi firms interviewed in this study are representative, individual human service

agencies in California are doing very little contracting with taxi operators for service. On the other hand, working through general purpose local governments, transit agencies, or such umbrella social service organizations as the Area Agency on Aging, the human service sector has begun to utilize taxi firms as service providers. Human service agency consortiums, in cooperation with and assisted by the financial support of local governments (whether cities, counties, or transit districts), now contract with taxi firms to provide services for the elderly and handicapped in Alameda, Santa Clara, and San Francisco counties in the Bay Area, and San Bernardino and Los Angeles counties in Southern California.

The specific organizational and funding arrangements for such taxi-based transit services vary widely, but the common theme is participation by a local government entity, usually with prior transportation experience. Local government involvement typically broadens the scope of effort from a particular agency's clientele to the more general elderly and handicapped population (although non-organizational restrictions on eligibility may exist). When a human service agency "goes it alone" in providing transportation, there seems to be a strong tendency to operate service directly rather than contracting for it. Taxi firms also have more experience in dealing with local government than the human service sector. Local government participation thus tends to facilitate taxi operator interface with what is otherwise an unfamiliar organizational setting.

Regional Planning Agencies

Regional planning agencies (RPAs) have often been supportive of the concept of taxi-based community transit service, but RPA's possess little direct influence over local government decisions about transit. What influence they do have depends on their fiscal powers and the competing uses of transit funds. For example, two small communities were persuaded to initiate local transit service when their respective regional planning agencies threatened to withhold TDA funds. Although these actions eventuated in the two communities establishing SRT systems, the RPAs were simply attempting to implement TDA regulations, and did not influence service decisions. More generally, the political weakness of RPAs restricts their role primarily to dissimination of information about paratransit and encouragement of cost-effective services. For example, the Metropolitan Transportation Commission

in the Bay Area has encouraged the establishment of taxi-based services for the elderly and handicapped. However, the MTC has little money to support such services due to severe competition from conventional transit and it cannot mandate that local governments initiate such services. Similarly, the Southern California Association of Governments has conducted studies of community transit options, including the performance of systems in its jurisdiction, and has made the information widely available. While this activity has undoubtedly contributed to the favorable climate for taxi-based public transit in Southern California, SCAG is unable to assure funding of proposed DRT systems--this power lies with local governments and the region's four transportation commissions.

Even where fiscal constraints on community level transit are not present, RPAs have reacted to developments rather than playing a leading role in decisions about taxi-based transit services. Ten different cities in San Bernadino County have subsidized SRT systems, but the county's RPA played a minimal part in the establishment of most. For instance, the RPA's early plans for DRT service in one part of the county never contemplated the utilization of a taxi firm as service provider. The involved local governments, not the initially hesitant planning agency, made the decision to contract with a taxi operator. In another part of the county two municipal governments decided on their own to establish subsidized SRT systems. The RPA has been concerned ever since about the quality of service provided by the SRT contractor, as well as its accountability to the sponsors, but has been unable to persuade the involved municipalities to adopt a less laissez-faire attitude towards the service. In the San Diego region local governments have similarly assumed the initiative in establishing subsidized SRT systems, although the RPA has supported such decisions and offered planning assistance to the localities.

State and Federal Transportation Agencies and Policies

The choice of taxi-based community transit services in California is almost entirely attributable to developments at the local level of government. While California's TDA subsidy program has made community transit financially feasible for local governments, the subsidy program is neutral towards the choice of service provider. Recent state legislation exempts subsidized SRT services from payment of the 6¢ of state's 7¢ per gallon

gasoline tax, but this simply puts taxi-based public transit on a par with transit services directly operated by public agencies. As the result of a petition by the California Taxicab Owners Association, the Workers Compensation Board established the same insurance rates for the employees of private DRT contractors as for public DRT services, another equalization measure. While these actions both benefit SRT providers and increase the cost advantages of subsidized SRT, they are the result of the widespread implementation of SRT, not its cause. Local governments had already indicated a strong preference for contracting with taxi firms for DRT service at the time these measures were implemented.

The California Department of Transportation's (CALTRANS) posture towards taxi-based transit services is also one of reacting to developments rather than catalyzing them. Through its demonstration program CALTRANS has participated in the establishment of a few taxi-based community transit systems, but the initiative for these ventures came from local actors. CALTRANS recently completed a statewide survey of the taxi industry, including its current participation in publicly subsidized paratransit services, an indication that the department is intent upon improving its knowledge of this area. However, except in rural areas, there is really no role for CALTRANS to play in community transit planning and initiation. Even if it wanted to encourage taxi-based services, CALTRANS lacks any mechanism other than verbal persuasion to influence local decisions.

Federal transportation agencies and their policies have had an even more nebulous effect on the development of taxi-based community transit services in California. Federal transit subsidies are used to finance a number of subsidized SRT systems, but with two exceptions the sponsors of such systems are transit agencies who receive these subsidies as a matter of course. Federal transit funds are intermingled with other sources of subsidy, and are not designated at SRT services explicitly. Even before UMTA stated that subsidized SRT was eligible for federal assistance, the involved transit agencies had established several such systems. In only two instances are federal subsidies targeted directly at SRT systems, and the involved municipalities initially financed the systems with federal revenue sharing funds.

This limited impact of federal transit funds and policies on SRT development in California stems primarily from the fact that local governments already have a source of funds for subsidized SRT in the form of TDA moneys.

Only where federal transit subsidies are an essential element in the establishment of community transit services can UMTA influence local attitudes towards different forms of service delivery. In any event, UMTA policy cannot dictate local service decisions, nor does the federal transit agency have any desire to do so.

D. Competition for Contracts

The cost advantages of public-private sector contracting are assumed to result not only from the greater efficiency of private firms relative to public agencies, but also from competition among potential contractors which enables service to be purchased at the lowest possible cost. Competitive bidding is required for many government contracts for just this reason. Even when competitive bidding requirements do not exist, wise public agencies attempt to insure that alternative service providers exist, and avoid locking themselves into a single supplier of service in an effort to maintain incentives for cost-efficiency.

Despite these well-known benefits of competition, California taxi firms have faced relatively little competition for their DRT contracts. In only about half of the cases was there any sort of competitive process for the award of contracts, and in several instances of formal competition there was but a single bidder. Meaningful competition, in which at least two potential providers submitted bids in the realm of financial feasibility, occurred in less than one third of all cases. Competition between different taxi firms occurred in a mere two instances, and successful taxi firm bidders faced competition from a DRT management company in less than a half dozen cases.

Two major factors account for this competitive situation. First, there is a genuine paucity of potential, capable providers in many areas. Due to territorial monopolies, it is not uncommon for communities to be served by only a single taxi firm. Some of the larger firms, in fact, have a quasi-monopoly on service in several adjacent cities. Thus, even when taxi involvement in transit services is by means of user-side subsidy schemes, it is typical for only one, or at most two taxi firms, to provide all the transportation.

Competition from outside the taxi industry is similarly limited. Only one DRT management firm is presently operating in California, and it does

not compete for all DRT contracts. Other potential providers, notably non-profit organizations (usually human service agencies), school bus companies, charter bus operators, and medical transportation firms, have only belatedly recognized that DRT contracts are an opportunity for them as well. However, such providers lack the extensive demand responsive experience of taxi companies, and some sponsors do not consider them capable contractors. In many instances, therefore, the local taxi firm is considered to be the only serious candidate for service provider.

Second, local governments are less interested in encouraging competition than in getting the type of DRT system they desire. But once the sponsor has determined the latter, the choice of operator may be preordained. For example, a city which decides it wants a DRT system based on SRT experiences in other communities is already predisposed to select a taxi firm as operator. If a city is satisfied that the sole local taxi company is a competent, low cost provider, competition for the contract may be viewed as an unnecessary burden and waste of time. Similarly, should a sponsor determine it wants an operationally sophisticated DRT system using 12-20 passenger vehicles, the small local taxi firm may simply not be a relevant competitor. Competitive bidding, moreover, tends to reduce decisions to dollar and cents judgments, but sponsors typically are just as concerned about the capability of the provider they select. When a capable local provider exists, sponsors often believe they can achieve their cost and service objectives as well through negotiation as a competitive process.

The preference of sponsors for negotiated agreements rather than competitive processes extends most emphatically to SRT contract renewals. Some contracts are written to permit extensions without competitive bidding; in other cases informal agreements accomplish the same purpose. Over the past six years not a single taxi firm has lost an SRT contract after initially receiving it, except when funds ran out. In fact, only one DRT system in the state has changed providers due to a competitive process. In sum, the first contract is the crucial one, since the initial provider is likely to remain the system's operator indefinitely as long as performance is adequate. Taxi firms thus not only enjoy favorable competitive positions initially, but they are also often shielded from further competition for their SRT contracts.

E. Trends in the Choice of Taxi-Based Transit Services

One of the most striking features of California's experiences with taxi-based transit services is the pattern by which different types of services are distributed throughout the state. Of the 29 subsidized SRT systems for the general public, all but one are located in five counties in Southern California. The one exception is located in California's Central Valley, where a few other cities are currently discussing the desirability of establishing similar systems. In contrast, no subsidized SRT systems have been established in either the nine county San Francisco Bay Area (approximate population: 5 million) nor the populous and rapidly growing Sacramento area. Indeed, not one community in Northern California currently utilizes a private taxi firm to provide general public DRT service.

On the other hand, numerous cities in Northern California have involved taxi firms in the delivery of elderly and handicapped (E & H) service through various user-side subsidy schemes for ERT travel. Such services are now proliferating in the Bay Area, and represent the taxi industry's main source of subsidy revenues in that geographic locale. In Southern California, however, less than a half-dozen of these ERT-based E & H services exist. The more prevalent form of taxi firm participation in E & H services in Southern California has been as providers for special transportation systems (shared ride in principle) dedicated exclusively to the use of this target population. Few such DRT systems exist in Northern and Central California, and even fewer use taxi firms as providers.

This distinctive geographic pattern for the implementation of different service models is a function of both geographic factors and institutional situations. Geography influences how innovations diffuse, since sponsors of new public transit services typically investigate the experience of nearby communities. If one community has a favorable experience with a subsidized SRT system, its neighbors are likely to consider subsidized SRT to be a desirable service option. If a particular service model works out well, it may spread throughout an area, crowding out competing service models. Sponsors will be hesitant to experiment with a relatively untested type of service when another type has been extensively utilized with satisfactory results.

Probably even more important than diffusion of innovation considerations is the institutional situation into which the new service must fit. Southern

California differs significantly from Northern California, and the Bay Area in particular, in this regard. The latter contains several large regional scale transit agencies (AC Transit, Santa Clara County Transit, San Francisco Muni, Golden Gate Transit) which dominate the transit picture. These large transit agencies command nearly all transit subsidies in the region, which they jealously guard, and exert a monopoly on service provision in their service districts. They, not municipalities, determine if there will be community level transit, and if so, how much. In general, the transit agencies concentrate on regional scale bus service, and give community transit low priority. When they have established DRT services they have operated them with their own equipment and personnel instead of contracting with private providers. Consequently, taxi-based transit services have found a niche only at the edge of the margin. Taxi participation has been confined to E & H programs spearheaded by human service agencies or municipalities, operated on small budgets with limited service objectives. The region's planning authority, the Metropolitan Transportation Commission, is neither anti-community transit nor anti-taxi, but it has decided that the subsidy needs of the large transit operators come first.

The institutional situation of public transit is much different in Southern California. In Southern California, Los Angeles County most resembles the Bay Area, due to the presence of a large regional transit agency, the Southern California Rapid Transit District (SCRTD). The SCRTD consumes most of the transit subsidies in the county, and has shown no serious interest in community transit services. To fill this gap, the City of Los Angeles for several years scraped together funds from non-transportation sources to finance community level DRT services, most of which are provided by taxi firms. Only when the funds were about to finally run dry did the City manage to induce the Los Angeles County Transportation Commission to allocate a modest amount of TDA funds to the systems to keep them afloat, albeit only as elderly and handicapped systems. A few other taxi-based transit services exist in the county, but their municipal sponsors have had to rely on either revenue sharing funds or TDA demonstration funds, or resort to applying for UMTA assistance. Like the MTC, the County Transportation Commission's highest priority is regional transit, not community transit.

Elsewhere in Southern California, municipalities have much greater influence over transit service decisions, and it is in these counties that community transit, and subsidized SRT, has flourished. Whether as direct recipients of TDA funds, as members of joint power authorities, or as influential constituents of a transit agency (as with OCTD), the municipal governments possess the ability to at least influence, and in many cases outright determine, precisely how transit subsidies will be used. Not surprisingly, municipalities have placed a high priority on community transit services. Moreover, transit funding constraints are either nonexistent or limited in most instances, enabling local governments to establish large community transit systems aimed at serving the general public, not a small target population. Private providers other than taxi firms have also benefitted from this favorable environment for community transit, but taxi-based systems have quickly become predominant for the reasons outlined previously.

II. Organizing SRT Services

A. Contracts and Their Administration

The contract between funding agency and taxi firm provides the basis for implementing SRT. The contract delineates the responsibilities of each party, establishes service parameters, specifies compensation arrangements (including the use of incentives), and spells out who shall own and maintain the vehicles and how they may be used. In a broader sense, contractual arrangements determine how closely the sponsor will attempt to control the performance of the operator.

Contracts can be viewed simply as a means of getting service on the streets, or as a device to maximize the accountability, efficiency and effectiveness of the service. In California, when contract administration is a municipal responsibility the former perspective tends to apply, whereas transit agency sponsors are more appreciative of the broader function of contracts, and often utilize them accordingly. This difference in perspective stems not only from the greater transportation sophistication of transit agencies, who believe themselves to be sufficiently knowledgeable about DRT to establish contractual arrangements which can improve performance, but also from different managerial and financial situations. Detailed contractual arrangements impose significant monitoring requirements on the sponsor, and such control is not costless. Municipalities have chosen to contract

for service precisely to avoid the bureaucratic and other costs inherent in providing the service themselves, and are reluctant to incur significant managerial expenses for contract administration, even though external funds are available for this purpose.

In a transit agency, in contrast, administrative oversight is the raison d'etre of the staff. Thus the Orange County Transit District has erected a bureaucratic structure to supervise its SRT contractors. This structure is necessary because OCTD's contractors are subject to detailed service regulations. Providers must meet stringent service criteria, their payment is partially based on performance, and they are required to collect detailed operating information which the transit agency then analyzes. Although these contractual arrangements result in substantial administrative costs for both OCTD and the taxi contractors, such control is deemed necessary by the District. Transit agencies in San Bernardino and Riverside counties also closely monitor their SRT systems, although neither attempts as much control over providers as does OCTD.

The control orientation of transit agencies stems not only from contractual arrangements, but also from their general attitude towards taxi firms. Whereas municipal sponsors seem willing to defer to the operational expertise of taxi firms, transit agencies tend to view their qualifications skeptically. Unable to afford the high overhead, quality-service-at-any-cost perspective which many transit agencies embrace, they appear less than fully professional to transit bureaucrats. Moreover, they are not transit experts, only taxi experts--or so the transit agency perceives. Consequently, the SRT provider is likely to be viewed as an organizationally inferior partner which requires much oversight if it is to perform adequately.

As might be expected, substantial administrative costs associated with transit agency sponsored SRT systems have a measurable effect on overall operating performance.* Transit agency sponsored SRT systems, although

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*As discussed in Chapter 4, SRT performance has five different aspects:

1. PRODUCTION EFFICIENCY - the ability of the operator to produce a given amount of service with a minimum amount to inputs.
   Typical measure: vehicle service hours/employee hours.
   (footnote continued)

ranking about average on consumption effectiveness and service quality, fare rather poorly in terms of cost-efficiency and cost-effectiveness. For example, the Rubidoux SRT system, sponsored by Riverside Transit Agency, operates in an unincorporated area similar in size and density to the cities of Barstow and Ceres. However, the municipally sponsored SRT systems in the latter two communities are operated at significantly lower costs--$11.24 and $10.00 total cost per VSH respectively compared with $15.16 in Rubidoux. Although the Rubidoux system achieves the third highest level of productivity (as measured in passengers per vehicle service hour) of any SRT system in the state, its high total costs, nearly 25 percent of which are attributable to sponsor administrative expenses, prevent it from attaining an above average cost-effectiveness ranking.

Even more revealing is the experience of OCTD's SRT systems. As noted above, OCTD closely supervises the performance of its SRT contractors, and imposes a high level of contractor administrative effort due to reporting requirements and the incentive-based method of compensation. Compliance with these regulations is costly to the taxi firms, and quite naturally they pass the additional costs on to the sponsor. OCTD's SRT contractors thus receive significantly more compensation per vehicle hour than do operators of municipally sponsored SRT systems (significant at the .05 level). Moreover, OCTD must incur substantial administrative costs to accomplish the

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(footnote continued)

2. COST EFFICIENCY - the ratio of expenses paid to all inputs to produced output.
   Typical measure: total cost/vehicle service hour.

3. COST EFFECTIVENESS - the ratio of expenses paid to all inputs to the number of passengers.
   Typical measure: total cost/passenger

4. CONSUMPTION EFFECTIVENESS - the system's success in matching supply (service parameters and quantity) with demand.
   Typical measure: passengers/vehicle service hour

5. SERVICE QUALITY - response time and the availability of service through time and space.
   Typical measure: average response time.

necessary oversight. The consequence is total costs/VSH for the OCTD systems about one-third higher than for the average SRT system in California. Despite all this expenditure of time and energy on the part of both sponsor and providers, consumption effectiveness is merely average. The net result is total operating costs per passenger ranging from $2.50 to $4.75, high by any standards.

The generally better cost-effectiveness of non-transit agency SRT systems coupled with the fact that low cost is one of SRT's most attractive attributes indicates a conflict between intensive administrative oversight and SRT provision. As administrative expenses mount, the cost advantage of SRT relative to other forms of local transit declines. If sponsors deem it necessary to establish formal administrative structures for transit service delivery, those which can provide service themselves using non-unionized labor may find it no more expensive than contracting with taxi firms for SRT. Equally important, the average overall performance of OCTD's SRT systems indicates that such administrative structures do not necessarily yield major performance benefits. If low cost is very important to a sponsor, the evidence suggests that close and comprehensive administrative supervision is a counterproductive strategy.

This is not to assert that competent sponsor supervision of SRT systems is unnecessary. Inadequate sponsor oversight has undoubtedly contributed to the below average performance of several of the City of Los Angeles' SRT systems. In Los Angeles, providers operate the systems much as they see fit, although one operator has completed a relatively poor performance record. The original sponsoring agency never attempted to reduce chronic excess capacity in some of the SRT systems, although this adds unnecessarily to overall costs. It also lacked the manpower and expertise to pinpoint problems or initiate improvements in operations. (In mid-1979, the City shifted administrative oversight to a different department.) Since Los Angeles sponsors several SRT systems, the scale of administrative effort needed adequately to supervise SRT is clearly greater than in a small or medium size municipality. Nonetheless, the fact that the administrative resources devoted to SRT in municipalities typically consist of a relatively small portion of a single staff member's time suggests that it is the quality, not the mere quantity of administrative supervision which is critical.

B. Service Structures and Compensation Arrangements

One unfortunate aspect of past and existing SRT systems is the fact that program sponsors have been reluctant to take advantage of service structures that have the potential to increase system productivity. Different service structures depend primarily on whether the SRT fleet is integrated with or separated from the rest of the taxi fleet (ERT fleet). When taxi vehicles can be used interchangeably for ERT or SRT, the system is referred to as an integrated fleet system. When vehicles can be used only for SRT, the result is a dedicated vehicle system.

The ability to switch vehicles from SRT to ERT as demand dictates can result in significant cost savings due to improved utilization of vehicles. To illustrate, El Cajon's integrated fleet system costs 18 percent less per vehicle service hour equivalent than the average compensation rate for all California SRT systems. In fact, on a VSH equivalent basis, the El Cajon system ranks second lowest in cost. The City of La Mesa, which utilizes the same SRT provider, is enjoying a 15 percent savings due to its recent conversion from a dedicated vehicle system to an integrated fleet operation. The three integration fleet systems in operation during 1978 achieved a cost per passenger of $1.66, compared to a per passenger cost of $2.72 for the dedicated vehicle systems, or 39 percent less. Even eliminating the high cost OCTD systems and the low efficiency City of Los Angeles systems from this comparison, the integrated SRT systems achieve per passenger costs 26 percent lower than their dedicated vehicle counterparts. A relatively new integrated fleet system in Lemon Grove (begun in March 1979) has amassed an even more impressive performance, registering costs per passenger of only $1.10.

While service area conditions probably have some effect on these results (for example, short trips are an important feature of the Lemon Grove system), a significant amount of this cost-effectiveness is due to the high SRT productivities attained by the integrated systems. The El Cajon system, for example, achieves an average vehicle productivity in excess of 8 passengers per hour when vehicles are in SRT service, and Lemon Grove's SRT operator is transporting 13 passengers per revenue service hour. But then, more efficient utilization of vehicles should have a salutory effect on productivity.

Despite the cost advantages associated with fleet integration, few sponsors have been willing to take advantage of this option. Many sponsors

insist on dedicated SRT vehicles, primarily for reasons of system identifiability. With the SRT vehicles painted in distinctive colors and also indicating system sponsorship, the SRT service is easily linked in the public mind with the funding agency. Local governments typically are eager to receive the political credit associated with new community transportation service. Moreover, sponsors are acutely sensitive to citizen complaints that "expensive" taxi service is being provided to low income transit dependents. Painting and signing vehicles helps distinguish the subsidized SRT service from ERT in the public eye.

A second barrier to the implementation of integrated fleet SRT systems stems from the method of provider compensation. In an integrated fleet system the SRT operator is compensated only for service usage, that is, only when actually transporting SRT passengers. (It is important to note that an SRT passenger is one which has requested SRT service, not necessarily one which actually shares a ride with another passenger.) Compensation is linked to SRT revenue miles, either by means of mileage charges or through meter rates. In most cases, the basis of compensation is the revenue vehicle mile.

This has two drawbacks from the sponsor's point of view. First, the sponsor must depend on the provider to render an honest accounting of in-service miles, a problem not encountered when compensation is on a vehicle service hour basis. While sponsors typically require drivers to turn in log sheets of their daily activities, actual checking of all these sheets would be time consuming and expensive in a large system, and clever drivers could still cheat. Second, this type of compensation system creates budgeting problems. It is virtually impossible to predict in advance exact required expenditures for a given period of operation, since they are dependent on both actual demand and the operator's productivity achievements. In contrast, when compensation is on a vehicle service hour basis, a budgetary limit can be established by specifying in advance the number of hours of service. The integrated fleet SRT system implies a relatively open ended budgetary commitment.

When sponsors opt for dedicated vehicle SRT systems, they also are making a commitment to a compensation arrangement based on service availability rather than service usage. Sponsors are forced to pay for service availability because no provider will operate a dedicated vehicle fleet without

assurance of receiving revenues to cover its costs, and the only two compensation methods which meet this criteria are a fee per vehicle hour of service or cost-plus payment. While a sponsor can closely monitor vehicle use and insist that the operator fine-tune the number of vehicles in service to bring capacity into line with demand, this is not ordinarily done. The operator, after all must maintain and pay a staff sized for a relatively predictable level of temporal demand. In addition, such monitoring imposes staff burdens on the sponsor.

As Table 3 indicates, over 80 percent of all SRT systems are based on contractual arrangements specifying dedicated vehicles and compensating the operator for available service. The problem with such arrangements is that sponsors often pay for underutilized capacity. All other things being equal, it makes more sense for sponsors to only pay for consumed service rather than service availability. But in most sponsors eyes there <u>is</u> a significant difference between dedicated vehicles and integrated fleet systems, hence other things are <u>not</u> equal. While cost-efficiency and effectiveness are important to sponsors, they are not the sole criteria by which they make decisions on how to organize SRT service. Political factors are quite relevant, and dedicated vehicle systems are manifestly superior both in linking the SRT service to the public entity which supports it and in insuring fiscal accountability (minimizing the likelihood of provider malfeasance).

C. Incentive Clauses

The vehicle hour type compensation formula utilized in a majority of SRT systems provides operators with no incentive to maximize ride sharing, which is directly related to consumption effectiveness. Despite the lack of ride sharing incentive inherent in the basic compensation arrangements, inclusion of incentive clauses in SRT contracts is un- typical. In most cases, sponsors never considered inventive clauses. Other sponsors, unable to come up with a workable system, eventually abandoned the idea.

Of the 26 SRT systems operating in California during 1978, only 6 systems made use of incentives. A comprehensive system of incentives is employed only in the OCTD systems. In these systems, provider compensation is adjusted on the basis of productivity and level of service achievements,

TABLE 3
BASIC CONTRACTUAL ARRANGEMENTS FOR SRT SERVICE

Type of Arrangement	Number of Systems	Percent of Systems
Dedicated vehicles, VSH* compensation, no incentives	12	41%
Dedicated vehicles, cost-plus compensation, no incentives	5	17
Dedicated vehicles, VSH compensation, farebox incentives	2	7
Dedicated vehicles, VSH compensation, performance incentives and disincentives, farebox incentives	5	17
Integrated fleet, RVM** compensation, no incentives	3	10
Integrated fleet, meter compensation, no incentives	2	7

*Vehicles service hours

**Revenue vehicle miles

with providers keeping all fares. The provider for the municipally sponsored San Bernardino and Colton SRT systems also keeps all fares collected, but this farebox incentive was its idea, not that of the sponsors. Moreover, the provider was motivated to advance this proposal out of a concern for driver honesty. As no meter would be running to keep track of fares, the provider concluded that stealing would be eliminated as a potential problem by allowing the drivers to keep fares.

In other SRT systems, providers have seen no need to implement incentive schemes. Not only do they prefer guaranteed compensation, but many are skeptical whether they could increase productivity over current levels given service area conditions. Several operators claimed that they simply could not significantly improve performance, and that incentives would not alter this situation.

Although it is in the self-interest of such operators to denigrate incentive systems which relate compensation to performance, the evidence suggests that their position has a factual basis. Quite simply, incentive systems (especially farebox incentives) have failed to live up to expectations. While the waters are muddied by different service area conditions and the effects of other sponsor policies, the data nonetheless show that SRT systems in which providers keep the fares achieve, on average, no greater productivities than other SRT systems.

There are two plausible explanations for this outcome. First, performance may be so heavily dependent on service area conditions that potential productivity increases are limited. Second, it can be easily demonstrated that farebox incentives are not powerful. Consider, for example, a provider receiving a base compensation rate of $10 per vehicle service hour and a 50¢ per passenger fare incentive. If this provider initially attained a productivity of 5 passengers per VSH, it would receive only 4 percent more revenue by increasing productivity 20 percent (to 6 passengers per VSH). Achieving such a large productivity increase through improved operating procedures would probably require increased control room expenditures, thus offsetting all or part of the revenue gains. Increasing productivity by depressing level of service could lead to user complaints and funding agency dissatisfaction.

A provider may well prefer to attempt to persuade the sponsor to add vehicles to the system to meet additional demand, rather than absorbing it

by increasing passengers per vehicle hour within the constraints of the present fleet size. Incentive payments are rarely as profitable to the operator as adding extra vehicles to the system. Alternatively, if the fleet size is fixed but additional compensation per service unit is desired by the provider, a far less problematic strategy than increasing productivity is to directly seek a rate increase from the sponsor. Most sponsors are willing to periodically adjust compensation upwards to reflect the impact of inflation on the operator's costs.

From the perspective of most sponsors, incentive systems more complex than provider fare retention are simply out of the question. The additional administrative requirements, in terms of manpower and effort, are not worth the perceived payoff. For a transit agency like OCTD, which already has a large administrative-planning staff, the incremental cost and effort of a comprehensive incentive system is not an important issue. To a small municipality, such an incentive system is grossly out of scale with the SRT operation. As for fare retention incentives, most sponsors do not perceive them to contribute to a reduction in the net costs of service, at least in the short run. In fact, if system capacity is fixed (as it often is in any 6 to 12 month period), productivity increases by an SRT provider operating under farebox incentives increases the net cost of service to the sponsor compared to the situation of returning fare revenues. Only if the productivity improvements deter the need for capacity expansion does the sponsor benefit financially from such incentives. In general, sponsors wish to have gains from productivity increases accrue to them, thereby reducing subsidy requirements. This largely explains why incentives have been ignored or resisted by most sponsors, particularly municipalities. Alone among the sponsors, OCTD has recognized that productivity gains will not be achieved without costs to operators. Therefore, it has attempted to design appropriate incentive payments.

D. Vehicle Ownership

With the exception of integrated fleet SRT systems, most SRT operators do not own the vehicles with which they provide service. In a dedicated vehicle system, operators are reluctant to purchase vehicles solely for SRT, since there is usually no guarantee that the SRT contract will be of a duration to amoritize capital expenditures. This factor, in conjunction with a

requirement in the TDA legislation specifying that 15 percent of a sponsor's TDA funds must be used for capital purposes, has resulted in most sponsors directly assuming the capital costs of SRT vehicles. Such vehicles are then leased or given to the SRT provider, which becomes responsible for maintenance, repairs, and insurance.

When providers own SRT vehicles, one of the following sets of circumstances typically prevail. (1) An integrated fleet system, in which the provider must own the vehicles, since they are used interchangeably for SRT and ERT. (2) The provider is permitted to utilize vehicles it already owns for SRT, thus eliminating the need for capital expenditures on new vehicles. (3) Providers are required to buy new vehicles and dedicate them exclusively to SRT use, but in return receive certain contractual protections such as multi-year contracts or a sponsor agreement to buy back the vehicles if the contract is terminated.

OCTD's SRT providers operate under the last of these arrangements. At the contractor's option, the standard one year contract can be extended an additional year. Even after two years of service, competitive renewal of the contract is the transit agency's discretion, not compulsory. Moreover, the latter agrees to buy back the SRT vehicles (if this is the provider's preference) should the contract not be renewed. Since OCTD only requires providers to purchase sedans, not larger vehicles, they could also be integrated into the ERT fleet in the event that the SRT service contract is terminated. Although OCTD's SRT providers would prefer that the transit agency assume the financial burden associated with vehicle ownership, the above protections minimize the risks of purchasing new vehicles for SRT.

E. Services for the Elderly and Handicapped

Sponsors of taxi-based transit services for the elderly and handicapped face somewhat different issues in organizing service than do sponsors of general public DRT systems. The latter have typically organized contract operations along traditional public transit lines, utilizing provider-side subsidy systems which yield predictable budget estimates and extend subsidy benefits to all users regardless of need. Integrated fleet systems differ somewhat in that the provider's compensation is related to demand for the service, but the principle of benefitting all users remains intact.

Elderly and handicapped services provided by taxi firms must be organized differently if only to account for the fact that there are restrictions on eligible users. While the needed restrictions can usually be accomodated by requiring potential users to register for the service (at which time eligibility is checked), the more important issue is how to set-up the service given the relatively low level of demand which characterizes most E & H systems. The choices are essentially two: (1) the system can be organized like a regular DRT operation, except that only the E & H population may use it, or (2) a user-side subsidy system can be established in which eligible individuals can travel by taxi at subsidized fares.

The choice between these two methods of organizing services seems to be primarily a function of two factors. The first is the fiscal condition of the sponsor. Where funds are severely limited, user-side subsidy schemes are prevalent, whereas more affluent sponsors have established special purpose SRT systems. Second, the organizational outlook makes a difference. When sponsors desire to simply provide some minimal level of supplemental transportation for those persons not able to utilize fixed route transit effectively, the apparent simplicity of a user-side system has great appeal. On the other hand, if the sponsor intends for the service to meet a broad range of the mobility needs of the E & H population, it typically aspires to a new transportation system which it can directly control. This means dedicated vehicles (lift-equipped vans, taxi sedans, or some combination), provider-side subsidy, and few, if any, restrictions on eligibility within the E & H population.

There are problems associated with both of these service models. Unless an SRT system already exists, sponsors of user-side subsidy systems are forced to pay for ERT travel. This has been the universal situation in California to date. The taxi firm will not establish a shared-ride service for a small portion of its market, given the attendant dispatching and fare-setting difficulties. Sponsors of user-side subsidy schemes thus compensate the taxi firm on the basis of meter fares (some operators give a 10 percent discount) or a flat charge per trip. The only major difference pre- and post-service is that the sponsor, not the user, pays the ERT rates.

Special purpose DRT systems not only face the problem of low demand density which minimizes the potential for ride sharing and leads to long trips, they also have the added expenses of operating an organizational structure

established exclusively for the service. With all organizational expenses charged solely to the E & H system, the result is inevitably an expensive service. In fact, these systems often register higher costs per passenger than user-side subsidy systems, even though the latter are ERT in nature. For example, some taxi-based special transportation systems in Los Angeles and San Bernardino counties are transporting the E&H (sometimes only the handicapped) for costs of $4 per passenger or more, whereas user-side subsidy ERT systems in the San Francisco Bay Area average about $3.50 per passenger trip.

III. SRT Contracting: Taxi Firm Consequences

A. Internal Changes Resulting from SRT

Every taxi firm which has made the transition from ERT operator to public transit provider has found it necessary to shift gears internally. Consistent with the human and organizational inclination to minimize change, most firms have adapted incrementally to their new situation. This is particularly evident in their operational procedures and labor practices, both of which have undergone far less change than might have been anticipated given the different circumstances surrounding ERT and SRT provision.

Dispatching

The heart of any demand responsive operation is the dispatching function, which includes trip assignment, trip scheduling, and vehicle routing. The dispatching requirements for SRT are considerably more demanding than those for ERT, since the principal objective of the latter is simply to minimize waiting time, whereas SRT dispatching attempts to simultaneously minimize waiting time and maximize vehicle productivity subject to constraints on both vehicle capacity and in-vehicle time for users. When the dispatcher makes trip assignments directly, as opposed to choosing among drivers bidding on trip requests, the complexity of SRT dispatching is such that it has been estimated to exceed the mental capabilities of humans at a level of approximately 20 vehicles in service or 100 requests per hour.[3]

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[3]Heathington, K. W. et al., Summary of Organizational and Environmental Review of Two Privately Owned, Shared-Ride Taxicab Systems. Transportation Research Record 553, 1975.

Human capability starts to degrade at lower levels of demand, and at every level of demand it should be apparent that SRT dispatching is qualitatively more difficult than ERT dispatching. Nonetheless, most SRT providers have not instituted completely new dispatching procedures for SRT, but have chosen to simply modify ERT dispatching practices to conform to the requirement for shared riding.

When major changes in dispatching procedures have occurred, it has been in response to one of two stimuli: (1) pressure from sponsors to adopt dispatching procedures explicitly designed for shared riding; or (2) levels of demand which clearly would overwhelm incremental ERT procedures. The first set of circumstances pertains primarily to OCTD's SRT systems. OCTD's early DRT systems had been operated by DAVE Systems, a DRT management firm which has developed sophisticated manual dispatching procedures. OCTD had adopted the DAVE dispatching system, and when taxi firms began winning DRT contracts the transit agency insisted that they too utilize these dispatching principles.

In a few SRT systems, the level of demand or the number of vehicles in service make operational control by a single central dispatcher extremely difficult, if not impossible. The dispatcher must process too much information to both control all the vehicles in the system and maximize the amount of ride-sharing. Rather than having the dispatcher handle assignment, scheduling and vehicle routing, the managers of these SRT systems have decentralized the dispatching process by shifting the scheduling and routing tasks to the drivers. Integrated fleet systems are particularly attracted to this option, since the dispatcher must handle both SRT and ERT vehicles and typically lacks the time to make scheduling and routing decisions for SRT drivers. In the integrated El Cajon system, 22 vehicles are in service during the middle hours of the day, and the dispatcher simply could not control the fleet without decentralizing responsibilities. Saddleback Valley, a dedicated vehicle system, also allows drivers to do much of the routing and scheduling, and the provider reports that this has increased system capacity.

The main drawback of this strategy is that not all drivers possess the mental capability to efficiently handle routing/scheduling tasks. Experienced taxi drivers with a detailed working knowledge of the service area

usually prove adept at routing and scheduling, but inexperienced drivers often encounter difficulty. In El Cajon, for example, the taxi firm attempts to assign only experienced drivers to SRT, since the decision-making demands are great--a driver may handle up to 40 SRT trip requests driving an 8 hour shift. This is not always possible, however, and long-time drivers in the system report that new, inexperienced SRT drivers are much less efficient. Overall, the El Cajon dispatching operation functions adequately because it has the advantage of six years of experience, and because the same dispatcher has been on the job the entire time.

Labor Relations

Probably the single most desirable attribute of SRT systems is their relatively low cost. In contrast to other forms of community level transit, or other providers of DRT, SRT providers have the advantage of very low labor costs. For example, wage rates for SRT drivers are half or less of those for transit agency bus drivers, and similar wage differentials hold for all types of taxi and transit labor. However, as subsidized SRT continues to become a more viable and extensive form of public transportation in urban and rural areas, there is the possibility that much of its cost advantage over other forms of DRT service production could erode. SRT costs would rise if the wages of SRT workers were to increase at a higher rate than has historically been the case for taxi labor.

Why might this occur? That is, why might SRT workers secure wage increases more resembling those of public transit workers than their ERT counterparts? This possibility stems from the combined influence of three factors distinguishing subsidized SRT from ERT. First, the SRT driving job could be considered more onerous than ERT driving, since throughout the shift the driver is under direct operating control and engaged in service delivery, whereas ERT drivers enjoy more autonomy and free time. Second, the job performance of SRT workers is more critical to the well-being of the taxi firm. Competent, dependable, and courteous drivers are needed to deliver service to the standards expected by public agencies, and capable SRT dispatchers are also a necessity. Third, the SRT contract provides the taxi firm with a guaranteed source of funds from which to compensate personnel, unlike ERT in which revenue is dependent on market demand. Together,

these factors imply increased ability on the part of labor to influence the terms of its relationship with management, and in particular to secure improved wages and benefits relative to ERT labor.[4] Moreover, given the obvious importance to sponsors of good operating performance, it might be expected that SRT providers would attempt to insure high quality performance by drivers and dispatchers through labor compensation practices.

Neither of these hypotheses have been borne out by experience. Management unilaterally dictates the wages and working conditions of SRT labor, just as it does with ERT labor except in the relatively few ERT operations which are unionized. Relative to wage levels, neither SRT drivers nor dispatchers fare better than their ERT counterparts, and drivers do worse in some cases, because tipping is discouraged. The most important monetary advantage to SRT driving is the guaranteed salary, since compensation is normally paid on the basis of an hourly wage rather than the commission system utilized for employee ERT drivers. However, wages are quite low, virtually never more than $4.50 per hour, and typically in the range of $3.50 -$4.00 per hour. Only eight systems offer drivers an incentive to boost their compensation, and the incentives are usually quite limited. As for SRT dispatchers, they are paid approximately the same as ERT dispatchers. One firm did experiment with an incentive system for its dispatchers (basing compensation particularly on system productivity), but discontinued the practice when it could not detect any significant benefits.

The continuing phenomenon of low wage SRT labor is attributable in large part to the relatively unchallenged primacy of taxi firm management in SRT labor-management relations. SRT workers have not improved their bargaining position relative to ERT workers for two reasons.

First, drivers, who constitute the bulk of SRT labor, tend to view their jobs as temporary--they do not ordinarily expect to make a career of it. For many it is an entry or re-entry into the job market. Students, former housewives, and job mainstream drop-outs are heavily represented among SRT

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[4]Zolla, Edward III, "Labor Requirements Under Shared-Ride Taxi Systems," in Proceedings of the Conference on Taxis as Public Transit. Institute of Transportation Studies, University of California, Irvine, December, 1978.

drivers. Perceiving the job as temporary, such persons do not have the investment in the position that would cause them to agitate and organize for better compensation arrangements.

This leads directly to the second point. SRT workers are unorganized, and unions presently are making no attempts to change this situation.[5] Taxi labor typically has been non-union except in large central cities. Recently, the uncertain financial prospects of ERT have caused the traditional taxi unions, most notably the Teamsters, to exhibit little interest in additional organizing efforts. Nor have transit unions indicated any interest in organizing SRT workers, even though the existence of low-wage SRT providers makes direct transit agency provision of DRT uneconomical. Of course, with relatively few transit agencies involved in any way with DRT, this is not presently a relevant issue for most transit bargaining units.

Over the longer run, as SRT contracts become an important part of the financial foundation for involved taxi firms, unions may recognize that the secure revenues of subsidized operations give SRT workers a major source of leverage over their employer (as transit unions have recognized) and view such workers as attractive organizing targets. At present, however, organizing activity among SRT workers is confined to a single taxi firm, and the impetus had nothing to do with SRT. It is noteworthy, nonetheless, that this firm's status as a government contractor brought it within the jurisdiction of the NLRB, which ordered a representation election for the employees.

Although SRT workers presently are not in a position to successfully demand major wage increases, why have SRT providers not improved compensation (relative to ERT) in order to attract a better quality of employee, ostensibly needed for the level of performance demanded by public sponsors? The simple answer is that they see no need to do so. Operators maintain that attracting qualified SRT personnel does not represent a major difficulty, despite the prevailing low wages and admitted quality problems with ERT drivers. They report that SRT attracts safer and more dependable drivers than ERT, which they attribute to the improved working conditions of the former--regular daytime hours, better vehicles (often air conditioned),

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[5]Zolla, op. cit.

safe service areas, more job status--and to the stable, predictable earnings. There seems little reason, therefore, to institute special compensation practices for SRT (beyond hourly wages for drivers) simply to recruit decent employees. Moreover, many taxi operators are philosophically opposed to paying SRT labor significantly more than ERT labor. Most report that their best ERT drivers make more money than SRT drivers, which they believe to be appropriate given their perception that the former have to work harder for their money.

Nor are SRT operators persuaded that additional labor compensation costs can be recouped through better performance. In their view, performance is affected most significantly by service area conditions--demand density, area size, trip lengths, and the pattern of origins and destinations (many to many or many to few, for example)--and funding agency policy on response time. Furthermore, considering that their workers are now at the lower end of the wage scale, the wage increases needed to markedly increase operating efficiency--if such could even be accomplished--would be of such a magnitude as to destroy the provider's cost-competitiveness. They prefer to pay low wages and accept less than optimum performance in order to maintain a cost advantage relative to potential competitors for DRT contracts.

B. Legal and Labor Implications

By contracting with public agencies, taxi firms enter into an institutional arena different from that prevailing when they were exclusively ERT operators. As these firms are now providing transit-like government services, many have become subject to the same legal rights and responsibilities that public transit providers possess. To date, however, there has been virtually no action by SRT providers to assert these new rights.

Whether or not providers of subsidized SRT possess new legal rights or responsibilities depends on the source of funding for the system. Many of California's SRT systems utilize no federal transit subsidies, and the receipt of state transit subsidies directly imposes no special rights or responsibilities on private providers. (The State makes sponsors responsible for such requirements as fiscal accountability, vehicle safety, and handicapped service, which does have an impact on operator responsibilities.)

In contrast, the Urban Mass Transportation Act grants "mass transportation companies" protections from federally subsidized competition in Section 3(e), while also making receipents of federal subsidies subject to labor protection requirements under Section 13(c). The critical issue, then, is whether taxi firms which provide SRT under contracts supported at least partially by federal funds are considered "mass transportation companies" for purposes of federal law. UMTA has administratively concluded that SRT does indeed fall within the purview of "mass transportation," but no definitive criteria yet exists as to how much of a taxi firm's total operations must be in shared-ride services in order to qualify for "mass transportation" company status.[6] The U.S. Department of Labor has, in recent rulings on 13(c) protections, considered this status to be attained if at least 15 percent of the taxi company's revenues came from SRT services.[7] Although this particular figure may be superseded, and in any case is not binding on DOT's administration of Section 3(e), it does provide a means of determining how many California SRT providers might be subject to these provisions of federal transit legislation.

Currently, 9 of California's 15 SRT providers derive at least 15 percent of their overall revenues from their SRT contracts, and the contract revenues of 6 of these 9 companies are at least partially comprised of federal transit subsidies. These 6 companies, moreover, provide service for 18 different SRT systems (although federal funds are not utilized in all these systems) and include most of the large SRT providers. In not a single case, however, have either Section 3(e) or Section 13(c) protections become an issue.

This has occurred in large part because SRT providers have no compelling reasons to make such protections an issue. Section 3(e) problems can arise

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[6]Gundersen, R. "Legal Aspects of Paratransit Deployment," in Proceedings of the Conference on Taxis as Public Transit. Institute of Transportation Studies, University of California, Irvine, December 1978, pp. 205-208.

[7]Alschuler, D. M. Labor Protection, Labor Standards and the Future of Paratransit. Speical Report 186, Transportation Research Board, National Academy of Sciences, 1979.

only if federally subsidized public transit services are established in direct competition with an SRT operator's services. Since no sensible transit funding entity will establish new services in direct competition with other of its services, there is virtually no likelihood that contract SRT operations could be affected adversely by subsidized competition. On the other hand, in areas where an SRT provider operates ERT but no subsidized SRT, its ERT operation could be impacted by new fixed route transit services. (While ERT is not considered "mass transportation" by UMTA, Section 3(e) protections arguably apply to all services of "mass transportation companies," not just their shared-ride services.) When such situations do occur, however, the taxi company invariably finds itself in the position of having to bite the hand which feeds it should it attempt to prevent deployment of the new service, since the sponsoring agency is the very same entity which funds its own subsidized SRT services. While several taxi operators firmly believed that their ERT business has been hurt by expansion of conventional transit services, they had no intention of challenging this expansion on Section 3(e) grounds for fear of jeopardizing their SRT contracts. They were much more concerned with maintaining a good relationship with their funding agency than protecting every bit of their ERT market. Any loss of revenue from the latter typically pales into insignificance compared to the loss of an SRT contract.

Section 13(c) presents a seemingly greater impact on the rights and responsibilities of taxi operators qualifying as "mass transportation companies." Section 13(c) stipulates that federal assistance cannot be used in a manner such that the employment conditions of affected employees are worsened, unless adequate compensation is given to such employees. Irrespective of whether SRT providers are considered to be mass transportation companies, recent Department of Labor rulings strongly indicate that those of their employees engaged exclusively in SRT provision hold the status of mass transportation employee, and are eligible for 13(c) protection.[8]

The labor protections that such SRT workers might receive as the result of 13(c) could well undermine the cost advantages and general attractiveness of (federally) subsidized SRT. Section 13(c) requires that sponsors of

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[8]Alschuler, op. cit., p. 14

federally supported transit services stipulate how any affected employees adversely impacted by such services will be indemnified for loss of employment or compensation, and that these so-called 13(c) agreements be certified by the U.S. Department of Labor before UMTA releases Section 3 or 5 assistance. When a transit bargaining unit is directly involved in or affected by federal subsidies, the sponsor typically negotiates the 13(c) agreement with this bargaining unit before seeking DOL certification. When no organized transit workers are involved, the sponsor deals directly with DOL. In either case, DOL must certify that the sponsor is in compliance with 13(c) before funds can flow, and as a condition for such certification the sponsor must accept liability for employee indemnification.

For SRT services provided under contract to a public agency, the crux of the 13(c) issue is whether DOL will insist that employees of SRT contractors be indemnified even against losses (of employment or compensation) arising out of competition for the SRT contract. That is, if a taxi firm which initially possesses an SRT contract loses that contract in subsequent competitive bidding, will its SRT workers be guaranteed compensation? If sponsors are required by DOL to make such guarantees in their 13(c) agreements, the competitive bidding process is essentially destroyed, and with it, the most important incentive for good performance by SRT providers.

The reason this development would render competitive bidding virtually useless is that the SRT employees of the initial SRT contractor would become the only feasible employees to deliver the service. Should the sponsor award the contract to a different provider, it would find itself in the position, under this worst case 13(c) scenario, of paying one firm to operate the SRT system while paying the SRT employees of the former contractor the compensation due them under the 13(c) agreement. If the 13(c) agreement resembled the current norm, the displaced SRT employees would be eligible to be compensated (at the rate they had enjoyed while employed under the SRT contract) for up to six years, depending on the length of their previous employment.[9]

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[9]Lieb, Robert L. Labor in the Transit Industry. May 1976, p. 34. Washington, D.C., U.S. Department of Transportation.

Duplicate compensation obviously would make SRT uneconomical to the sponsor. Should it wish to continue the SRT service, only two options would seem to be available. On the one hand, the sponsor could resign itself to doing business with the original contractor, with the knowledge that the compensation rate is likely to rise sharply, particularly if the SRT employees use their now advantageous bargaining position to secure large wage increases. On the other hand, the sponsor could continue to utilize competitive bidding, but require any new contractor to give the right of first refusal for all SRT jobs to the SRT employees of the original contractor. This would protect the sponsor from compensation claims by such employees, although it would do nothing to hold their wages down, as their advantageous bargaining position would be explicitly recognized, and indeed institutionalized.

Retaining the employees of the original contractor to operate the service under the new contractor is not an inherently undesirable option. In fact, in two cases where an initial DRT provider ceased operating service, either because it went out of business or due to loss of the contract through competitive bidding, the new SRT provider hired many of the drivers of the first contractor. The new provider needed additional employees to operate the service and the experience of the former drivers made them an ideal choice. Should such workers be given formal perpetual claim to SRT jobs, however, they would become very attractive organizing targets. With unionization, wage rates would probably escalate dramatically, and the use of such prior SRT employees would no longer be cost-effective for a new provider.

In should be emphasized that this is a worst case scenario and that developments at the federal level could take a different turn. DOL, which has never previously had to deal explicitly with the labor implications of contract operations, may decide that 13(c) agreements based on traditional modes of transit service delivery are inappropriate in these cases. Alternatively, DOL may impose the typical 13(c) framework, but it may turn out that the employee protections are worth more on paper than in actuality. The legal system could decide that competitive bidding is neutral in its effect so long as the 13(c) agreement does not guarantee protections against employee losses stemming solely from contract loss or cancellation. Under

these circumstances, whether employees are eligible for indemnification turns on findings of fact, and adversely affected workers then must demonstrate that it was the use of federal transit subsidies which resulted in their loss, not competitive bidding per se.

While the implications of 13(c) for subsidized SRT are far from definite at the present time, it is apparent that the final outcome could be detrimental to its development. Although several of California's SRT providers (or more precisely, their employees) seem to fall within the jurisdiction of 13(c), and most of the affected SRT systems have been in operation for at least 2 or 3 years, California's experiences shed only a limited amount of light on how the 13(c) issue will ultimately be resolved.

One conclusion which could be drawn from the impact to date of 13(c) on SRT in California is that the potential complications have been considerably exaggerated. In not a single instance of SRT services involving federal transit subsidies has 13(c) become an issue. The first 13(c) hurdle, DOL certification, has not become a problem anywhere. Transit agency sponsors have continued to operate under their standard 13(c) agreement with DOL, making no special provision for employees of SRT contractors, and two municipal sponsors have agreed to accept liability for protection even while stipulating that no employees are affected. This is apparently a viable situation for sponsors in the absence of agitation by either organized transit labor in their employ or SRT workers.

Nor have SRT providers in California demonstrated any interest in gaining 13(c) protections for their employees, despite the precedent set by an Akron, Ohio taxi firm which attempted to do so.[10] While not ignorant of 13(c) in most cases, SRT providers apparently would like to avoid the issue entirely if possible, as they are frankly fearful of the potential organized labor complications. Moreover, 13(c) protects employees, not companies, and it makes little sense for an SRT provider to go to bat for its workers in such a risk laden area when the benefits accrue to the latter, not the taxi company itself. In fact, the benefits to employees may damage further contract opportunities for the firm. Such damage could occur if extension of

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[10] Taxis, the Public and Paratransit: A Coordination Primer Multisystems, Inc., August 1978, p. 115.

13(c) protections to the provider's employees required a sponsor to guarantee employment for them, even if the firm loses the contract.

While these developments are certainly compatible with an optimistic conclusion about the impact of Section 13(c), they are by no means definitive evidence. It may well be that outcomes to date have reflected conditions which are unrepresentative of those existing elsewhere in the country, or that additional time must pass before SRT workers or taxi unions recognize the potential of 13(c) and begin to use it on their behalf. Perhaps over time SRT providers will see positive aspects to 13(c) protections for their employees, not merely the negative consequences they now fear. Eventually a 13(c) dispute will occur and the outcome will affect the prospects. Nonetheless, these events have not yet taken place, indicating that widespread impacts from 13(c) on SRT's development are by no means inevitable. At least this much can be concluded from California's SRT experiences.

C. Financial Impacts of SRT Contracting

Taxi firms which have diversified into SRT contracting have invariably done so for financial reasons, either to bolster their revenue base or to protect themselves from subsidized competition. Those firms which hoped that contract operations would prove to be their financial salvation have not been disappointed. For most SRT providers, contract services have become very important contributors to revenue and profitability.

As of mid-1979, 15 taxi firms in California were involved in the delivery of subsidized SRT services for the general public. The data collected in this study indicate that 9 of these firms derive 25 percent or more of their revenues from public transit contract operations. Moverover, all but one of the remaining 6 firms have benefited significantly from contract services, although to a somewhat lesser degree.

For example, for two large central city firms, Yellow Cab of Los Angeles and Yellow Cab of San Diego, subsidized SRT represents less than 10 percent of their revenue base but a very substantial amount of gross revenues, approaching $600,000 annually. Two medium size firms receive 10-15 percent of their revenues from subsidized SRT. An interesting case is the small firm in the Palm Springs area which was founded upon subsidized services. The firm began operation only after the small community of Rancho Mirage guaranteed it a minimum of $50 per day to provide subsidized SRT service to

the city's residents, using the company's lone vehicle interchangeably for SRT or ERT. With this financial guarantee as its base, this taxi firm has now expanded its fleet to 4 vehicles and its operations into several adjacent communities.

Of those taxi firms deriving at least one quarter of their revenues from subsidized services, some have benefited dramatically, as operations with poor long term prospects have become financially secure. For example, Paul's Yellow Cab of Pomona, one of the largest SRT providers in California lost nearly $34,000 in 1975 on revenues of $780,000 but acquired the first of a string of SRT contracts during that year. By 1978, this company was making a $48,000 profit and grossing revenues of nearly $1,250,000. During this same period its ERT ridership declined by nearly 50,000 passengers, or over 25 percent, yet the firm's financial health is better than it has been for a decade. In 1979, revenues from paratransit contracts are projected to constitute close to 50 percent of total revenues, which themselves will be up significantly from 1978. In 1973-74, the owner of the firm was seriously considering closing the company's doors.

Paul's Yellow Cab has benefited from subsidized SRT more than most taxi companies, but it is by no means an exception, as the following two cases indicate. Yellow Cab of North Orange County, one of OCTD's SRT contractors, has in the space of approximately three years built up an SRT business now grossing $850,000 annually, representing in excess of 25 percent of the firm's total revenues. In 1975 this firm found it necessary to sue OCTD to get an opportunity to bid on DRT contracts. Now it is OCTD's most important contractor, operating four different SRT systems.

The case of Rubidoux Cab, a small firm located in an unincorporated community near Riverside, is equally revealing. Before SRT, this firm by every indication was a marginal operator. It owned a handful of vehicles, operated in a sparsely populated, low density area, and recorded gross ERT revenues of less than $50,000 annually. Subsidized SRT changed all this. Rubidoux Cab now operates three SRT systems as well as a fixed route service, to the tune of nearly $500,000 annually in contract revenues. Its subsidized services represent over 90 percent of the firm's revenue base.

The Rubidoux Cab case illustrates an important point. Several of the SRT providers would instantly become marginal taxi operators if they lost their contract operations. Long term financial prospects would be grim for

all but the largest firms. Even a firm the size of Paul's Yellow Cab (which operates about 30 ERT vehicles) would be in serious financial straits without subsidized SRT. SRT contracts are not financial frosting on the cake for most taxi companies--they are one or more layers of the cake itself.

This is not to say that the SRT providers are ready to abandon their traditional taxi operations. To an individual, they believe that ERT will continue to be an important part of their revenue base, but most recognize that ERT is at best a no-growth, marginally profitably enterprise. In fact, the majority have found it necessary to institute leasing or owner-driver arrangements in order to avoid losing money on ERT. In light of these financial realities, the more insightful of the SRT providers realize that their future growth prospects are in paratransit, not conventional taxi operations. Accordingly, they are in the process of redefining their firms' capabilities and image.

CHAPTER FOUR
PERFORMANCE ANALYSIS OF SHARED-RIDE TAXI SYSTEMS

Performance of SRT systems is an important consideration for both sponsoring agencies and transportation analysts. By evaluating performance, it can be determined whether SRT systems provide the level and quality of service anticipated by sponsors. Performance evaluation can also provide the means to analyze differences between systems, and to test hypotheses relating system performance and selected institutional and service area characteristics. Finally, SRT performance can be compared to other types of community transit in order to better understand the potential of SRT as a public transit alternative. This chapter develops a performance indicator framework for evaluating SRT systems, and uses this framework to evaluate the performance of 23 SRT systems. The chapter concludes with a discussion of some of the factors affecting SRT performance.

I. DEVELOPING PERFORMANCE INDICATORS FOR SRT SYSTEMS

Shared-ride taxi systems are a type of demand-responsive transportation system. The major differences between SRT systems and conventional DRT systems are that the service is provided by a taxi firm under contract to a sponsoring public agency, and that five to seven passenger vehicles (usually taxicabs) are generally used, rather than the larger mini-buses of conventional DRT services. An extensive literature review provided little basis from which to develop a performance evaluation scheme for SRT systems. While performance evaluation frameworks consisting of several indicators focusing on different aspects of system performance have been developed for

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[1]G. J. Fielding, R. Glauthier, and C. Lave, Development of Performance Indicators for Transit, Final Report, USDOT and UMTA, 1977; Marian Ott, Evaluating the Performance of Demand-Reponsive Transportation Systems, M.A. Thesis, Department of Civil Engineering, MIT, 1978.

fixed-route transit systems, attempts to develop such schemes for demand-responsive transit are almost non-existent.[1] Consequently, the approach taken here is one of adapting fixed-route performance techniques to the somewhat different characteristics of demand-responsive service.

A. Efficiency and Effectiveness

The performance of public transportation systems can be evaluated from several different perspectives--from that of the user, the operator, or the sponsor-analyst. Since the primary purpose of this research is to evaluate SRT as a feasible public paratransit option, the point-of-view here is that of the policy analyst. There are also many different aspects of public transit performance. In the literature, performance is divided into three general categories: efficiency (technical productivity), effectiveness (goals attainment), and impact (social benefits). However, not only are the social benefits of public transportation (such as reduced air pollution or increased employment among the transportation disadvantaged) difficult to identify and measure, there has been little evidence to show that they are significant. Thus, Fielding, Glauthier and Lave argue that performance evaluation should focus on the criteria of efficiency and effectiveness.

Efficiency concerns the technical process by which transit services are produced, particularly through the relationship of inputs to produced output; that is, "doing things right." Because efficiency focuses on the process of providing services, it utilizes only measures of "produced" rather than "consumed" output. Produced output is defined by such measures as vehicle hours or vehicle miles. Effectiveness, on the other hand, is the comparison of produced output (produced service) to intended output or objectives; that is, "doing the right things." Measures of effectiveness are concerned with the extent to which the service provided corresponds to the goals and objectives established for it by government and to the needs of citizens.[2]

Consumed output is defined by such measures as revenue passengers or passenger miles. The Fielding et al. study points out that if transit agencies do not share the same goals, they are not comparable on effectiveness

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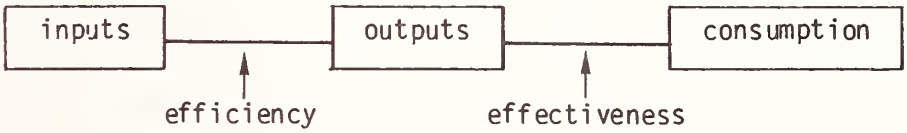
[2] Op. cit., Fielding, Glauthier, and Lave, pp. 5-7.

criteria, because different goals may lead to different patterns of service provision and consumption. The transit provision process, then, is conceived as having two stages: the transformation of inputs to outputs or transit service, and the conversion of outputs to consumed service or transit ridership, as illustrated in the figure below:



This differentiation between produced and consumed output is made on the basis of two factors. First, the technology of fixed-route transit is such that produced and consumed output can never be exactly equated. Public transit service is produced in fixed quantities, determined by the capacity of the vehicles, while demand is continuous (but not constant) across time and space. The degree to which equality between produced and consumed output is approached depends in part on the peakedness of demand through time and its concentration in space, and in part on the ability of the operator to predict demand for the service. Only if the operator were able to predict demand exactly, and if the technology existed to match every trip supplied with every trip demanded, could equality between production and consumption be achieved.

The issue of goals is the second factor considered in differentiating output. Maximizing ridership may or may not be the common goal of transit providers. Particularly in the short run, transit agencies may provide service in some areas so as to improve accessibility (travel opportunities) which might lead to ridership gains in the long run, or they may be constrained by law or political pressure to provide some minimal level of service throughout the service area, whether it is utilized or not. In this case, the provision of service is considered to be socially beneficial independent of service consumption. If ridership were the only consideration, ridership or productivity indicators would be sufficient to measure the performance of transit systems. If the transit agency has other goals, however, performance must also be measured in terms of service availability and quality. In the absence of common goals, then, the appropriate measure

of output on which to base assessments of operator efficiency is that of produced output, while measures of effectiveness must be based on the objectives of the transit service provider.

In the case of demand-responsive service, the differentiation between efficiency and effectiveness, or produced and consumed output, is not so clear. First, the nature of DRT is such that service need only be provided when demand exists. Rather than "cruising" the service area looking for business as ERT taxis often do, or having to travel prescribed routes in order to make service available as fixed route transit vehicles must, DRT vehicles need only enter service in response to passenger requests. Since in most cases the ferry time between garage and service area is quite short, DRT vehicles can be taken in and out of service with some degree of freedom. One would expect, then, that a greater proportion of "produced" DRT service is also "consumed" than is the case for fixed route systems.

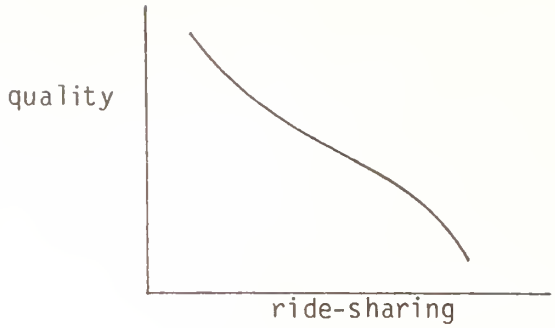
Secondly, the goal of DRT service is clearly one of attracting ridership. It should be recalled that unlike fixed route operations, by the time public provision of DRT services was considered, the private counterparts of DRT (such as jitney services) no longer existed. Thus, the purpose of DRT was not to preserve a major transportation option that could no longer be privately supported, but rather to provide a type of service better suited to certain kinds of travel demands. In particular, DRT has been proposed in place of fixed-route service where demand is low and travel patterns dispersed, and to provide a subsidized transportation option for those who cannot use the fixed-route system because of physical or other disabilities. In either case, the general objective of the service is the same. The concern is with ridership--with serving a specific segment of the transportation market. While there may be differences in service parameters and service area characteristics which impose limitations, DRT systems are broadly comparable both in terms of efficiency and effectiveness. The distinction between efficiency and effectiveness should be maintained, however, because they are conceptually different aspects of performance.

B. Dispatching

The key issue in DRT performance is not so much the ability to match production with consumption, but rather the intensity of utilization of that which is produced. In other words, once vehicles have been sent into service, the efficient utilization of these vehicles determines how much service will be necessary to serve existing demand. Because DRT vehicles produce service in response to demand rather than in anticipation of demand as a fixed-route system must, the central question becomes "how much demand can the system accommodate?"

This leads directly to a consideration of dispatching, or the process of trip assignment, routing and scheduling. Theoretically, the service area of a demand responsive system can be described as a probability surface of trip origins and destinations. The task of the dispatcher/scheduler is to route vehicles so as to maximize the number of trips served, given system constraints: the number of vehicles available, and maximum allowable wait times and ride times. In the case of DRT, a definite trade-off takes place, as every additional passenger picked up imposes a time cost on all other passengers in the vehicle. Clearly, then, the less stringent the time constraints, the more rides can be shared. At the same time, the greater the possibility for ride-sharing, the more complex the scheduling problem becomes, since more possible combinations of pick-ups and drop-offs will have to be considered in the dispatching/ scheduling process. When more than a few vehicles are involved, the problem becomes so complex that it cannot be solved for an optimal solution even by a computer. It would appear, then, that the competence of the dispatcher/scheduler in grouping rides and routing vehicles in large part determines the capacity of a DRT system.

Given a fixed number of vehicles, the relationship between service quality and vehicle productivity can be conceptualized as a constantly decreasing function as illustrated in the figure below:



If no ride sharing occurs, service quality is comparable to a conventional taxi service. As ride sharing increases, service quality decreases. As system capacity is approached, quality decreases at an increasing rate as all vehicles are filled to capacity and wait time rapidly increases. The slope of the curve, or the rate at which quality declines, and the point at which capacity is reached is determined by system dispatching ability.

The importance and complexity of the dispatching task has been recognized by many researchers. Wilson et al. have published a number of studies which develop computerized scheduling algorithms for use in demand-responsive systems.[3] So far, however, results from the few computerized systems in operations have been mixed; the increase achieved in dispatching efficiency has not covered the additional costs of the system.[4] One algorithm, for example, is based on minimizing the total length of routes (i.e., more trips can be served when total travel is minimized). It is interesting to note that under this assumption, an efficient DRT system would generate fewer vehicle-miles in servicing a given number of trips than an inefficient system. This could present problems when using performance efficiency indicators based on vehicle-miles, since labor inputs would be spread over fewer output units.

C. Service Parameters, Service Area Characteristics, and Performance

When attempting cross-sectional comparisons across a set of many DRT systems, the existence of different service parameters must be taken into consideration. Since demand for service depends on price and quality, it is

[3]See, for example, Nigel Wilson et. al., Scheduling Algorithms for a Dial-A-Ride System, MIT Urban Systems Laboratory, Mass, 1971.

[4]Chris T. Hendrickson, "An Evaluation of Automated Dispatching for Flexibly Routed Public Transit Systems," unpublished paper, Department of Civil Engineering, Carnegie-Mellon University, n.d.

expected that given similar conditions, more service would generate more demand. In general, service quality derives from the service objectives set for the system by the sponsor. These service parameters not only affect demand, but may even work at cross purposes. For example if a low fare is coupled with stringent wait and ride time requirements, an excess of demand may be created making it impossible to maintain the wait time requirement.

Differences in service area characteristics must also be taken into consideration in any evaluation scheme. The socio-economic make up of the service area contributes to the system's ability to attract riders. Variables such as auto ownership, income, and age determine the tendency to use transit. The existence of competing modes, like fixed-route transit or regular taxi service, also affects the ability of the system to attract riders. Population density is another important factor, because ordinarily the trip origin-destination pattern becomes more concentrated and trip length decreases as density increases.

In the case of SRT systems where service is provided under contract with a sponsoring agency, these external factors which affect performance can be divided into two groups: those under the control of the sponsor, such as service parameters and selection of the service area, and those not under the control of the sponsor, such as local travel patterns and geographic layout of the service area. While both groups of factors affect performance, it is not clear that both should be taken into account in the evaluation scheme. The second group of factors should be controlled for, since they are constraints that cannot be eliminated or changed. It may be, for example, that the service area population density is quite low, and consequently service is expensive to provide. If, however, the need for such service exists, and this type of service is the best alternative, then certainly the negative effect of low density on performance should be taken into account.

The first group of factors, on the other hand, is the result of sponsor decision making, and as such should be evaluated in the performance scheme. SRT systems, like other forms of public transit, are heavily subsidized public services. Resources required to support these systems should be distributed so as to maximize social benefits. If, for example, service is instituted in an area where there is little demand then, from a public interest point-of-view, system performance is unsatisfactory because subsidy

funds could be better invested elsewhere. Moreover, the system parameters selected (price and quality) should complement or reflect sponsor objectives. If the objective is to provide a community level transit system to transit dependents, for example, then the area with the most need (the highest proportion of transit dependents) should be served first, and the price should be affordable to target riders, while service quality should be a less important consideration.

D. Performance Indicators for SRT Systems

When performing empirical research, data availability is frequently a major constraint. This proved to be the case with the SRT systems. Both the range and quality of information available from system to system were extreme. In order to obtain a sample of sufficient size which was representative of the universe of SRT operations, it became necessary to select performance indicators on the basis of available information as well as conceptual acceptability. Consequently, the performance indicators are not an ideal set.

Five different aspects of performance can be identified. The first is what might be termed production efficiency, or the ability of the operator to produce a given amount of service with a minimum amount of inputs. As in the production of any other good or service, the inputs to production are labor and capital. The measure of output selected is vehicle service hours, a "produced" output unit. Vehicle hours is a better measure of produced output than vehicle miles because it is less affected by network characteristics, traffic congestion, and other factors outside the control of the transit operation.[5] Vehicle service hours per employee hour measures the efficiency of labor in producing vehicle service, or the proportion of labor producing vehicle service. Since there is extensive use of part-time and overtime labor within the taxi industry, simply using the number of employees would not accurately measure the labor input in SRT systems. Vehicles are the major capital input in SRT systems. Since fixed facilities are shared with the rest of the taxi operation, vehicles make up an even

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[5] Op. cit., Fielding, Glauthier, and Lave, pp. 11-12.

larger proportion of capital in SRT operations than is the case in traditional transit systems. Consequently, vehicle service hours per vehicle per maximum possible service hours is the selected measure of capital input utilization. It measures the proportion of actual vehicle service hours to total possible service hours. Thus it should reflect the degree to which fleet size matches service needs. This indicator may be of particular interest when comparing SRT to other types of transit services (transit agency DRT, for example) where the availability of capital grants may have given rise to overcapitalization.

The second aspect of performance is cost efficiency, or the ratio of expenses paid to all inputs to produced output. The problem here is to determine which costs should be considered. From the taxi operator's point-of-view, the total costs of providing the service are the appropriate consideration because these will determine the price at which the firm is willing to provide the service. Because of the incomparability of capital expense accounting practices, the selected performance indicator is based on operating expenses: operating expenses per vehicle service hour.

As discussed earlier, the social or public costs of providing SRT service must also be considered. The social cost may be defined as the sum total of all expenses involved in the provision of SRT service. This includes all compensation paid to the taxi operator, all fares paid by system users to taxi operators (not returned to sponsors), and all administrative expenses incurred by the sponsoring agency. Social cost, then, is a measure of the amount of society's resources committed to SRT service. Another important consideration is the level of public subsidization the SRT service requires. Thus, the third cost considered is subsidy cost, which is social cost less fares. Fares make up the portion of social (total) costs paid by system users. The remainder of these costs must be paid by public or non-user funds, and therefore is the subsidy cost of the service. Cost efficiency, then, is measured by the following three indicators: operating expenses per vehicle service hour, social cost per vehicle service hour, and subsidy cost per vehicle service hour.

In discussing the efficiency-effectiveness differentiation of performance, it was observed that for demand-responsive systems, intensity of utilization is the important performance factor. One way to evaluate

utilization intensity is to determine costs based on "consumed output," that is, per passenger costs. Given a fixed amount of produced output, greater system utilization will result in lower per passenger costs. Furthermore, if higher costs per vehicle hour imply better quality service, these higher costs should be offset by more system usage. Therefore, the third aspect of performance is what might be called cost-effectiveness, and the three indicators selected are operating expense per passenger, total cost per passenger, and subsidy cost per passenger.

A fourth aspect of performance may be termed consumption effectiveness, or the system's success in matching supply (service parameters and quantity) with demand. Total passengers per vehicle service hour is a very important indicator for demand-responsive systems. Traditionally called vehicle productivity, it measures the number of passengers carried per vehicle per hour. Unfortunately, it is an imprecise measure because it is a function of both service demand and dispatching/scheduling effectiveness. In a system where demand is low, all demand can be accommodated at a low rate of vehicle productivity, which implies that too much service is being provided. Low vehicle productivity can also be the result of dispatching problems. Since dispatching ability has been identified as the key factor in determining system capacity, it is unfortunate that data for a more precise indicator is not available.

The degree to which the service matches supply and demand can also be measured in terms of market penetration. Total passengers per service area population measures system usage among all potential users. Since SRT systems are frequently aimed at providing service to transit dependents, indicators measuring system usage by different groups are also appropriate. The ratio of the proportion of elderly passengers to the proportion of elderly population measures the degree of system usage by the elderly.* Other such

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* The ratio is $\dfrac{\dfrac{\text{elderly passengers}}{\text{total passenger}}}{\dfrac{\text{elderly population}}{\text{total population}}}$ or $\dfrac{\%\text{elderly passengers}}{\%\text{elderly population}}$

ratios could be constructed for low-income passengers, or passengers who do not have access to an automobile if such passenger information were available.

The degree to which service matches demand can also be measured in terms of passenger willingness to pay. Thus, the fourth consumption effectiveness indicator selected is the ratio of fare revenue to social cost, and it measures the service user's contribution to the expenses of providing the service.

The fifth and final aspect of performance is that of service quality. As discussed earlier, there is an inverse relationship between service quality and vehicle productivity; the better the service, the less rides are shared, all other things being equal. Service quality must, therefore, be considered in terms of the goals of the sponsor. Clearly, the purpose of SRT service is not to provide an exclusive-taxi type of service, but rather to strike some compromise between auto-like service and fixed-route service. Thus, excessively high service quality standards would be counterproductive to a shared-ride type of service.

Service quality is determined by two sets of factors: service parameters and the overall supply of service through time and space. Performance indicators for service quality proved to be the most difficult to obtain. Ideally, the ratio of total SRT trip time (wait + ride time) to estimated auto trip time is an appropriate measure. However, no such information was available. Even in the cases where service quality standards were part of the contract agreement, only one of the sponsors gathered the data necessary to determine whether these standards were being met. The only service quality measure that could be collected even in a majority of cases was average response time, and it proved to be quite unreliable. Thus no suitable indicator could be selected for this aspect of performance.

Overall service supply is the second factor affecting service quality. Service availability through time is measured by the hours of service per week the system operates. The extent of supply is measured by the ratio of the number of vehicles per 1000 service area population. This provides a rough estimate of system capacity; the more vehicles available, the more demand can be accommodated at any given level of service quality.

Table I presents the set of indicators selected for the performance evaluation and a brief description of what each measures. While these indicators provide a good way to compare SRT system performance, they cannot be summed up to measure the overall performance of each system because the relative importance attributed to each of these indicators depends upon the objectives of the service sponsor.

II. PERFORMANCE ANALYSIS

The fifteen selected performance indicators were applied to a set of 22 SRT systems. While there are currently 29 SRT systems operating in California, not all 29 systems were in operation during the period of data collection. In order to work with comparable data, only those systems for which 1977-78 fiscal year data was available were included in the sample. In some cases, data from a shorter period of time (4 months or 6 months) was annualized in order to include it in the sample.

A cautionary note on data quality is in order. Since taxi operators have no reason to keep detailed records of SRT service unless the sponsor so requires, and since they have no legal responsibility to make this information public, certain types of information proved difficult to obtain. Operating expenses were particularly difficult, because taxi operators tend not to separate the different services they provide. For example, garage and maintenance facilities are shared among all service vehicles. It will also be noted that taxi operator confidentiality has been maintained by not identifying any SRT system or operator by name in this chapter.

The SRT systems provide local transportation service to the general public under a great variety of operating conditions. Service areas range from high density inner city neighborhoods to moderate and high income suburbs to small towns in rural areas. Sixteen systems are under contract with a municipality; the remainder with a transit district or joint powers agency. The sample includes what is probably the oldest subsidized SRT system in the country, as well as some which initiated service during the past two years. While the rich variety of this sample provides a unique opportunity to evalute performance under all possible kinds of conditions,

TABLE 4 - PERFORMANCE INDICATORS

Performance Aspect	Indicator	Description
Production Efficiency	Vehicle Service Hours per Employee Hours (VSH/EMP)	Efficient utilization of labor in producing service
	Vehicle Service Hours per Maximum Vehicle Service House (VSH/MAX VH)	Efficient utilization of vehicles in producing Service
Cost Efficiency	Operating Expenses per Vehicle Service Hour (OPEXP/VSH)	Efficient utilization of taxi operator inputs in producing service
	Social Cost per Vehicle Service Hour (SC/VSH)	Efficient utilization of sponsor, user and public inputs in producing service
	Subsidy costs per Vehicle Service Hour (SUBSIDY/VSH	Efficient utilization of public inputs in producing service
Cost Effectiveness	Operating Expenses per passenger (OPEXP/PASS)	Cost effectiveness of taxi operator expenses
	Social Cost per Passenger (SC/PASS)	Cost effectiveness of sponsor, user and public inputs
	Subsidy Cost per Passenger (SUBSIDY/PASS)	The public cost per passenger, or the cost effectiveness of public inputs
Consumption Effectiveness	Passengers per Vehicle Service Hour (PASS/VSH)	Vehicle productivity
	Passengers per Service Area Population (PASS/SAPOP)	Market penetration, or intensity of service utilization
	% Elderly Passengers to % Elderly Population (%ELDPASS/%ELDPASS)	Market penetration to target population group
	Fare Revenue to Social Cost (FAREV/SC)	Passenger willingness to pay; relative contribution of passenger revenues
Service Quality	Average Response Time	Average wait time
	Service Hours Per Week (SERVHR)	Service availability over time
	Vehicles per 1000 Population (VEH/1000POP)	Potential quantity of servive available

the small size of the sample makes it very difficult to generalize or draw conclusions about the reasons for performance differences between systems. Furthermore, many taxi companies operate more than one SRT system; thus the 22 systems in the sample represent only 12 different taxi operators.

Table II presents performance indicator descriptive statistics for the sample. Performance indicator values from which the averages were calculated may be found in Appendix B. It will be noted that the number of observations varies from one indicator to another. Data on employee hours, operating expenses, and service quality proved most difficult to obtain. The efficiency indicator VSH/EMP could not be used in the performance analysis because it could be computed for only 9 of the 22 systems. The quality indicator, average response time, was also deleted because in most cases it was only an estimate, the usual estimate being 15-30 minutes. Given the absence of information on service quality, it appears that service quality is not of major concern to service sponsors unless it is so unsatisfactory as to generate a high level of public dissatisfaction.

Of the 22 systems in the sample, 19 will be the subject of the following analysis. For the remaining 3 properties, there was insufficient information to make statements about overall performance. On the basis of scores on the remaining 13 indicators, these 19 SRT systems fall into 4 general groupings. The first group contains the highest scoring systems in the sample, scoring above average on all indicators and very high on some indicators. Performance indicator values for this group are presented in Table III. These systems report low operating expenses and low sponsor administrative overhead. High ridership levels and high vehicle productivity combined with low costs make for the lowest per passenger costs and the highest fare recovery rates in the sample. These systems seem to be the outcome of a happy combination of efficient taxi operators and municipal sponsors who exercise a minimum of control over the SRT operation. These taxi operators have been particularly successful in efficiently integrating SRT service into the ERT organization. Costs are contained by the sharing of maintenance, garage, and administrative services. Since this group includes some of the oldest SRT operations, it seems evident that these low costs are not the result of underreporting or failing to properly allocate costs (otherwise by now costs would have increased or service suspended),

TABLE 5 - PERFORMANCE INDICATOR DESCRIPTIVE STATISTICS

	PRODUCTION EFFICIENCY		COST EFFICIENCY			COST EFFECTIVENESS		
	VSH/EMP	VSH/MAXVH	OPEXP/VSH	SC/VSH	SUBSIDY/ VSH	OPEXP/ PASS	SC/PASS	SUBSIDY/PASS
MEAN	.55	.65	10.08	12.80	11.01	2.39	2.87	2.50
STANDARD DEVIATION	.08	.24	2.51	3.65	4.22	1.28	1.14	1.20
MIN	.47	.19	6.98	9.27	6.63	.86	1.41	.86
MAX	.73	1.00	14.79	22.94	20.75	5.03	5.16	5.00
N OF OBSERVATIONS	9	20	14	20	20	12	22	22

	CONSUMPTION EFFECTIVENESS			SERVICE QUALITY			
	PASS/ VSH	PASS/ SAPOP	% ELDPASS / % ELD POP	FARE/SC	AVE. RESPONSE TIME	SERVHR	VEH/1000POP
MEAN	4.69	1.16	5.96	.15	22.08	75	.125
STANDARD DEVIATION	1.44	.76	4.13	.11	8.99	40	.063
MIN	1.99	.23	1.67	.01	15.00	40	.017
MAX	7.81	2.89	18.31	.39	45.00	168	.292
N OF OBSERVATIONS	20	21	15	22	12	22	19

TABLE 6 - PERFORMANCE INDICATOR VALUES FOR GROUP I SYSTEMS
HIGH OVERALL PERFORMANCE

SYSTEM	A	B	C	D	E	TOTAL SAMPLE MEAN
EFFICIENCY						
RVH/MAXVH	.22*	.48	1.00	.58	.51	.65
OPEXP/VSH	9.02	8.86	6.98	10.73	N/A	10.08
SOCIAL COST/VSH	9.42	11.24	10.00	10.22	11.76	12.55
SUBSIDY/VSH	6.63	7.00	7.53	8.50	8.20	11.01
EFFECTIVENESS						
OPEXP/PASS	1.53	1.14	1.41	2.10	N/A	2.39
SOCIAL COST/PASS	1.60	1.44	2.02	2.01	2.25	2.84
SUBSIDY/PASS	1.12	.90	1.52	1.67	1.56	2.50
CONSUMPTION EFFECTIVENESS						
PASS/VSH	5.90	7.80	4.95	5.10	5.23	4.69
FARE REV/ SOCIAL COST	.30	.38	.25	.24	.30	.15
PASS/S.A.POP	2.82	2.89	1.48	1.71	.74	1.16
$\frac{\%\ \text{ELD PASS}}{\%\ \text{ELD POP}}$	N/A	N/A	9.98	5.77	3.44	5.96
QUALITY						
SERVHR	168	68	55	84	84	75
VEH/1000POP	.29	.22	.10	.13	.22	.125

*INTEGRATED FLEET

but rather the result of true economies of an efficient organization. In one case, the SRT fleet itself is integrated--vehicles are called into SRT service only when demand exists. In this way, the vehicle fleet remains productive even outside of the SRT service hours of operation.

Social costs of these systems are contained both by the absence of stringent reporting requirements and counterproductive operating requirements, and by the low level of sponsor administrative costs. Subsidy costs are contained by high levels of patronage and vehicle productivity. The below average scores on vehicle utilization suggest that the number of vehicles in service is closely matched to demand--that an excessive supply of service is avoided. It is interesting to note that these systems charge the highest fares in the sample, ranging from about 50¢ to 70¢. If demand theory holds, the implication is that service quality is also high.

There may also be external environmental factors which help to explain the high performance of this group of systems. Those systems which do not have integrated fleets operate in small cities, where presumably trip lengths are short and destinations few. In the three small cities in this group, most commercial activities are located in a relatively small concentrated downtown area. In addition, the SRT operation is quite small, with 4 and 1 service vehicles respectively in the highest scoring non-integrated systems. Thus the dispatching/routing problem is greatly simplified--few vehicles and few destinations--resulting in high vehicle productivity.

The second group of systems scored below average on efficiency and cost effectiveness, and average on consumption effectivenes and service quality (see Table IV). System G operates in a rural small city, similar to the areas of systems B and C in the high performance group. In contrast, however, costs are significantly higher, and high vehicle productivity is sufficient to bring per passenger costs down to average levels, but not down to the levels achieved by systems in the first group. Relatively low fares combined with these higher costs result in a fare recovery rate of 9%. System I is relatively new, having initiated service in January 1978, and some of the expenses are one-time start-up and marketing costs which should decline in the future. System H performance is slightly different from the other systems in this group. While operating expenses are higher than average, social cost and subsidy costs are below average. This is because the

TABLE 7 - PERFORMANCE INDICATOR VALUES FOR GROUP II SYSTEMS
LOW EFFICIENCY, AVERAGE EFFECTIVENESS

	G	H	I	J	K	L	M	TOTAL SAMPLE MEAN
EFFICIENCY								
VSH/MAXVH	.38	.74	.28	.48	.45	.47	.47	.65
OPEX/VSH	N/A	11.29	N/A	12.80	14.79	12.80	12.80	10.08
SOCIAL COST/VSH	15.16	11.69	N/A	17.53	21.33	15.48	13.35	12.55
SUBSIDY/VSH	13.36	10.52	16.96	16.99	20.75	14.59	12.49	11.01
EFFECTIVENESS								
OPEXP/PASS	N/A	2.60	N/A	N/A	3.24	N/A	N/A	2.39
SOCIAL COST/PASS	2.44	2.69	3.91	4.14	4.68	2.86	2.50	2.84
SUBSIDY/PASS	2.14	2.42	3.57	4.01	4.55	2.69	2.34	2.50
CONSUMPTION EFFECTIVENESS								
PASS/VSH	6.24	4.34	4.75	4.24	4.56	5.43	5.33	4.69
FARE REV/ SOCIAL COST	.12	.10	.09	.10	.09	.12	.13	.15
PASS/SAPOP	1.40	1.29	N/A	1.38	.98	1.27	1.52	1.16
% ELD PASS / % ELD POP	3.58	N/A	N/A	6.07	N/A	4.06	3.30	5.96
QUALITY								
SERVHR	68	54	63	78	78	78	91	75
VEH/1000POP	.16	.14	N/A	.17	.12	.12	.13	.125

administrative expenses of the sponsor are not charged to the SRT operation. The service area of system H has recently been increased to 75 square miles. The long trip lengths and relatively high proportion of dead head time that one would expect with such a large service area might account for relatively high operating expenses.

Transit district sponsorship is common to all systems in this group, and it appears that such systems consistently report higher costs. Transit district sponsored SRT operations tend to be characterized by high administrative costs (in some cases administrative costs account for 20% or more of the total costs of the operation) reflecting substantial monitoring activity and control over the contract operation. A number of rules or constraints on the service operation, high compensation rates, moderate fares, and larger than necessary vehicle fleets are also associated with transit district sponsorship. In order to determine whether the observed differences between transit district and municipally sponsored systems in the sample were statistically significant, T-tests were performed on the performance indicators. Indicator mean values for the two groups were found to be significantly different for the four efficiency indicators (VSH/MAXVH, OPEXP/VSH, SOCIAL COST/VSH, SUBSIDY/VSH) and for the fare recovery ratio, with transit district system performance poorer in each case, as expected. T-test results may be found in Appendix C.

These differences may be accounted for as follows. Transit districts are "in the transportation business," and therefore are much more willing to exert control and influence on the service operation. This is in direct contrast to municipalities, which tend to contract for service precisely to avoid having to become a transit provider. Transit districts, on the other hand, contract for DRT services because it is cheaper than district provision of such services. As long as it is cheaper, transit districts seem willing to pay, even if the price is substantially higher than comparable operations. While transit district managers argue that the competitive bidding process assures cost-conscious bids on the part of prospective contractors, it was found that in reality there is little competition for such contracts, for there is seldom more than one private transportation operator in the area with the business volume and expertise necessary to implement an SRT contract operation.

Furthermore, transit districts appear to be less concerned with costs and more concerned with service quality and the general image of the service. Vehicle fleets are all dedicated and painted to match the transit district fleet, and substantial costs are sometimes incurred in marketing the service. Deep concern with service quality on the part of one transit district is manifested in the compensation arrangements: compensation to contractors is reduced by $.25 to $.75 per service hour if trip performance standards (which limit passenger wait and ride time) are not met. In four cases, the operator is provided the added incentive of keeping the fares. The relatively low rates of vehicle utilization among these systems may reflect some degree of overcapitalization, as transit districts tend to supply operators with special equipment such as lift vans and mini-buses which are not utilized on a regular basis.

This does not explain, however, why the taxi operators in this group should have higher than average operating expenses. Under conditions in which little competition exists and the sponsor shows only limited concern for costs, the incentive might be to allocate as much cost as possible to the SRT segment of one's operation in order to justify high compensation rates. In order to explore the problem further, a comparison was made between the operating expenses of two taxi operators, one under contract to a municipality, the other providing service for a transit district. The former reported SRT operating expenses of $9.02 per VSH and the latter $12.80 per VSH. The results are shown in Table V.

Overall, there seems to be little difference between the proportion of expenses in each category between the two operators, with the exception of driver wages, dispatching expenses, and vehicle insurance expenses. When the relative percentages are transformed into expenses per vehicle service hour, it is shown that Firm J's expenses are higher in every category. One major difference between the two firms is that SRT business accounts for about 7% of the total revenue for Firm A and 25% for Firm J. Thus, while Firm A has been able to handle SRT service within existing facilities, Firm J has had to enlarge its operation considerably as a result of the SRT contracts. The higher operating costs of Firm J are due in part to less efficiency (high dispatching costs) as well as to a higher level of costs in all categories.

TABLE 8

Expense Category	Firm A $9.02/VSH		Firm J $12.80/VSH	
	Percent of Total Operating Expense	$/VSH	Percent of Total Operating Expense	$/VSH
Driver Wages & Benefits	59%	5.32	45%	5.76
Dispatching/Scheduling	4%	.36	9%	1.15
Vehicle Supplies	11%	.99	12%	1.54
Vehicle Insurance	7%	.64	12%	1.54
Maintenance	8%	.72	6%	.77
Administrative & Misc.	11%	.99	11%	1.41
Leases & Rental	Ø	Ø	5%	.63
Total	100%	$9.02	100%	$12.80

The third group of systems is characterized by low consumption effectiveness and quality, medium to low cost effectiveness, and apparently high efficiency. These systems are all operated by the same taxi firm and are located in medium to high density urban areas. They are sponsored by a municipal agency, and are the only systems in the sample that, while available to the general public, are specifically aimed at serving the elderly, handicapped, and poor on a priority basis.

These systems exemplify what can happen when a lack of funding agency control is combined with a weak (inefficient) taxi operator. Table VI gives performance indicator values for these systems. In spite of an average fare of 15¢, overall ridership and vehicle productivity are substantially below average in most cases. Poor productivity results in some of the highest costs per passenger (in some cases higher than a regular taxi fare), in spite of average or above average scores on efficiency indicators. Subsidy cost per vehicle hour is average primarily because the sponsoring agency does not allocate any internal administrative costs to these systems. Operating expenses are underestimated, as maintenance and administrative costs are not charged to the SRT contract expense account by the taxi firm. The operating expense figure for system Q is probably a better estimate of the actual expenses of these systems. The high rate of vehicle utilization in conjunction with the low rates of vehicle productivity indicates an oversupply of vehicle service hours. The low fare recovery rate is the result of low fares as well as poor ridership. Since one of the goals of these systems is to serve the poor, there was never any intent to achieve a high rate of fare recovery. However, it probably is lower than it need be because of poor vehicle productivity.

Given service area characteristics of medium to high density, a large proportion of transit dependents, and the low fare, it is surprising that patronage is so poor. There are three plausible explanations for this: (1) Service is so poor that potential users are discouraged--the telephones are always busy and wait time extends for hours; (2) potential users have not been adequately informed of the availability of the service; (3) service areas do not match existing travel patterns. Unfortunately, there was no way to explore these possibilities because the necessary information simply does not exist. To date, the sponsoring agency has not made efforts to look

TABLE 9 - PERFORMANCE INDICATOR VALUES FOR GROUP III SYSTEMS
AVERAGE EFFICIENCY, LOW EFFECTIVENESS

SYSTEM SAMPLE	N	O	P	Q	R	TOTAL MEAN
EFFICIENCY						
VSH/MAXVH	.91	.82	.87	.74	.88	.65
OPEXP/VSH	7.44	7.44	7.44	11.30	7.44	10.08
SOCIAL COST/VSH	11.03	11.03	11.19	10.28	11.03	12.55
SUBSIDY/VSH	10.46	10.46	10.62	9.96	10.62	11.01
EFFECTIVENESS						
OPEXP/PASS	2.07	2.02	2.01	5.67	2.91	2.39
SOCIAL COST/PASS	3.07	3.00	3.02	5.16	4.32	2.84
SUBSIDY/PASS	2.91	2.84	2.87	5.00	4.16	2.50
CONSUMPTION EFFECTIVENESS						
PASS/VSH	3.59	3.68	3.71	1.99	2.55	4.69
FARE REV/ SOCIAL COST	.05	.05	.05	.03	.04	.15
PASS/SAPOP	.56	.33	.27	.45	.51	1.16
% ELD PASS / % ELD POP	3.79[a]	3.62[a]	3.74[a]	9.37[a]	18.31[a]	5.96
QUALITY						
SERVHR	55	55	55	55	55	75
VEH/1000POP	.07	.05	.04	.13	.10	.125

a. Estimate

into service difficulties, and of course as long as the taxi firm receives its subsidy "with no strings attached" it has no incentive to do so either. The sponsor in this case is far more concerned with making the service available than with evaluating system performance.

The remaining systems in the sample do not fit neatly into any category, and thus must be discussed individually (see Table VII). These systems are operated by the same taxi firm, and exhibit some of the same problems discussed above. The taxi firm holds an exclusive franchise in the area, and was able to obtain service contracts without having to go through a competitive bidding process. While the cities involved have made some attempt to impose reporting requirements on the operator and to recommend service improvements, they have been unsuccessful so far. Although one system has been in operation since October 1975, for example, the actual operating expenses of the operator have never been obtained. The result is a performance record over which the sponsors have little control. It is interesting to note that the taxi operator has the additional productivity incentive of keeping fare revenue, and fares have increased from 25¢ in 1975 to 75¢ at present. As with the systems discussed in Group II, the incentive appears to have little impact.

The performance record of these two systems is a contrasting one: the overall performance of system T is average or above average, while system S scores below average on many indicators. Since the two systems share all services including the same dispatching facilities, and since they operate under the same service parameters (fare and vehicle availability), it would appear that performance differences are the result of service area characteristics. The primary difference is that system T operates in a medium size, medium density city and system S operates in an adjacent, low density city, where presumably demand density (the concentration of demand in space and time) is relatively low. There is another difference between the two service areas which may be important as well. The travel pattern in city S is predominantly to the larger city T, as there is little commercial activity located in S. Consequently, the local SRT service probably does not serve the transportation needs of many potential system users in city S.

TABLE 10

PERFORMANCE INDICATOR VALUES FOR GROUP IV SYSTEMS

	S	T	TOTAL SAMPLE MEAN
EFFICIENCY			
VSH/MAXVH	.67	.79	.65
OPEXP/VSH	N/A	N/A	10.08
SOCIAL COST/VSH	9.27	10.66	12.55
SUBSIDY/VSH	8.20	8.25	11.01
EFFECTIVENESS			
OPEXP/PASS	N/A	N/A	2.39
SOCIAL COST/PASS	4.34	2.01	2.84
SUBSIDY/PASS	3.84	1.56	2.50
CONSUMPTION EFFECTIVENESS			
PASS/VSH	2.14	5.30	4.69
PASS/SAPOP	.72	2.25	1.16
%ELDPASS / %ELDPOP	N/A	2.95	5.96
FARE REV/SOCIAL COST	.12	.23	.15
QUALITY			
SERV HRS/WEEK	62	67	75
VEH/1000S.A.POP	.16	.15	.125

III. CONCLUSIONS

The performance analysis has shown that the SRT systems are characterized by significantly different "performance profiles." It remains now to discuss the major factors which affect the performance of SRT systems: type of sponsorship, service integration, and dispatching productivity and service area characteristics.

A. Sponsorship

Sponsors have been shown to affect system performance in important ways. The amount of supervisory or administrative overhead assigned to monitor SRT systems has a direct negative effect on the cost efficiency of these systems. On the other hand, substantial monitoring of SRT operators does not appear to have any positive influence on operator effectiveness. While close control adds substantial costs to the SRT operation, little return in the form of improved performance is achieved. Moreover, this seems to be the case whether incentives or disincentives are applied. SRT operators who keep farebox revenue are no more effective than those who do not, and operators working under specific performance standards seem equally unaffected. It would appear that the problem is one of inappropriate incentives; the potential rewards are not sufficient. In the case of farebox revenues, for example, the marginal increase in revenue generated by an additional passenger is apparently not enough to persuade a taxi operator to make the operational changes necessary (particularly in the dispatching procedure) to improve performance.

Through their decisions regarding the quantity of service to be supplied and the parameters under which the service must operate, sponsors also have a direct impact on system performance. Systems Q and S (Tables VI & VII) are examples of the kind of performance that can result from oversupply decisions on the part of the sponsor. In both cases, the taxi operators probably could have served existing demand with half the number of vehicle service hours. Again, since contract operators are paid by the vehicle service hour, there is little incentive for them to initiate a reduction in service unless poor performance might endanger future service contracts. The operator of system S, who has been quite successful in expanding SRT

contract services, did request that one vehicle be taken out of service because of poor system productivity.

B. Integration

Integration is another factor which can profoundly affect SRT performance. An integrated SRT system is one in which non-dedicated vehicles are used. Vehicles are shared with the ERT service, and thus can be taken in and out of SRT service in response to demand. Little has been said up to now about service integration because of the lack of data. Of the three integrated systems operating during 1977-78, only one could provide sufficient information to be included in the performance analysis. In addition, operating statistics between integrated and non-integrated systems are not strictly comparable. While non-integrated systems charge vehicle service hours from the time the vehicle enters the service area to the time it goes off duty, integrated systems charge revenue vehicle hours only while carrying passengers. Consequently, there is no fair way of comparing the two types of systems, except on a cost per passenger basis.

There are a number of advantages associated with service integration. First of all, integration allows for a more complete sharing of inputs among SRT, ERT, and any other services the taxi operator might provide. While all SRT providers integrate the service into the ERT operation to some extent, usually by sharing maintainance and garage facilities and administrative overhead, an integrated fleet makes it possible to share labor and vehicles as well, thus reducing service costs. Secondly, integration is the one service arrangement which provides a direct incentive for good performance to the operator. Since the same vehicles are used for both SRT and ERT, the more efficiently the operator can service SRT demand, the fewer vehicles must be used for SRT service. With service integration, the operator allocates his vehicles among two revenue producing alternatives, SRT and ERT, and therefore efficient vehicle utilization will also maximize profits. Without integration, however, the operator's choice is either to provide SRT or leave vehicles idle, and the incentive is of course to provide as much SRT service as possible. Third, the flexibility of integrated SRT services allows the operator to accomodate extremes of service demand. Service can be made available during off hours, and peak demand can be handled by increasing the number of vehicles in SRT service for short periods of time.

Because of this flexibility, operators are willing to accept compensation for integrated SRT on a consumed service basis.

All of these advantages add up to greatly reduced service costs compared to dedicated vehicle systems. The one integrated system in this sample (system A) costs the city 18 percent less per vehicle hour equivalent than the average compensation rate for all SRT systems. Moreover, the three integrated fleet systems in operation during 1978 achieved a cost per passenger of $1.66, compared to a per passenger cost of $3.10 for the dedicated vehicle systems, a difference of 46 percent. Eliminating the high cost transit district systems and the low efficiency Group III systems from this comparison, the integrated SRT systems achieved per passenger costs 28 percent lower than their dedicated vehicle counterparts. While service area conditions probably have some effect on these results, a significant amount of this consumption cost efficiency is due to the high SRT productivities the integrated systems attain. System A, for example, attains an average vehicle productivity in excess of eight passengers per hour when vehicles are in SRT service.

The benefits of integration are clearly illustrated by the data presented in Table VIII. This system had been operated as a dedicated fleet system for the past four years. Concern over increasing costs and the continued availability of state subsidy funding led the sponsor (a municipality) to switch to an integrated system for the 1979-80 fiscal year. Column A gives operating and cost statistics for the dedicated fleet operation in the 1978-79 fiscal year; column B gives similar statistics for the integrated system annualized for the 1979-80 fiscal year. For the integrated system, cost per passenger is only slightly less ($2.01 compared to $2.03) while net or subsidy cost is approximately $24,000 more. However, the taxi operator would have increased the rate charged under the old system. Columns C and D give estimates of 1979-80 costs, had the dedicated service continued. Column C assumes a trend-estimated increase in passengers, while column D assumes the same number of passengers as in 1978-79. In either case, it is clear that the shift to an integrated system has brought about substantial per passenger cost savings, as well as an increase in passengers. More passengers result from the ability of an integrated system to serve more peak demand. Lower per passenger costs result from the higher vehicle productivity of the integrated system. Furthermore, because

TABLE 11

The Effects of a Shift From Dedicated Fleet Service

to Integrated Fleet Service

	A 1978-79 Dedicated Service	B[a] 1979-80 Integrated	C[b] 1979-80 Estimate 1 for Dedicated	D[c] 1979-80 Estimate 2 for Dedicated
Passengers	97,550	117,150	105,000	97,550
Operating Cost	$198,067	$235,437	$242,550	$225,340
Fare Revenues	$ 47,730	$ 60,915	$ 54,600[d]	$ 50,725[d]
Net (Subsidy) Cost	$150,337	$174,522	$187,950	$175,615
COST/PASS	$ 2.03	$ 2.01	$ 2.31	$ 2.31

a Annualized from August-November 1979 data.
b Assumes a 3 year trend estimated increase in passengers.
c Assumes same passengers as 1978-79.
d Assumes August-November revenue per passenger.

of recent increases in fuel costs, the taxi operator required a fuel escalator clause in the new (1979-80) contract. If this clause were to go into effect, the difference in cost between the two systems would be even greater, since more miles are charged to a dedicated system than to an integrated system.

C. Dispatching Productivity and Service Area Characteristics

The key issue in DRT performance seems to be the intensity of system utilization, or system productivity. More productive systems can serve the same number of passengers with fewer vehicle hours. For example, imagine a small SRT system carrying 18,250 passengers annually. If the system could carry 6.25 passengers per vehicle hour, it would require 2920 vehicle service hours, whereas if it could only carry 5.00 passengers per vehicle hour, it would require 3650 vehicle hours in order to carry the same number of passengers. Using the mean social cost of $12.55 per vehicle hour, the annual cost of the service would be $36,646 and $45,808 respectively, and cost per passenger would be $2.01 and $2.51 respectively, a difference of 25 percent. It is clear then, that productivity can have a dramatic effect on system performance.

Productivity is thought to be a function of both system dispatching ability and service area characteristics; in particular, demand density, population density, service area size, and the spatial pattern of trip making (many to many or many to few, for example). Only the first three of these characteristics can be measured, unfortunately. Demand density, which is the concentration of demand for the service both in time and space, is important because one would expect trip origins to occur closer together as demand density increases, thus increasing the ease of ride sharing. Trip length and the concentration of origins and destinations is associated with population density. More concentrated travel patterns and shorter trips would be expected as population density increases, both of which would allow for greater productivity. When service demands come from a larger area, trip lengths may increase and the travel pattern may become more dispersed. Therefore, service area size is thought to be inversely related to productivity. Even at the same level of demand densities, larger areas would require a larger vehicle fleet to provide a given level of service, and the dispatching operation would become more complex.

In order to try to separate the impact of service area characteristics from operator efficiency on productivity, a number of statistical tests were performed. A measurement problem was encountered however, because the only measures available were those which measure the outcomes of the dispatching operating--passenger trips. When measuring system demand, a more appropriate focus would be on trip requests. Since this information was not available, the rather heroic assumption was made that trips measure demand. In other words, all requests become trips. Thus demand density is measured by passengers per hour per square mile (pass/hr/mi).[2] In effect, it was assumed that the number of passengers was fixed, and that dispatching efficiency would be reflected in the amount of vehicle service used in carrying these passengers.

Another productivity measure widely used in the industry is vehicle miles per passenger. As vehicle productivity increases, the distance traveled by the vehicle is divided among more passengers; consequently there is a strong inverse relationship between these two measures. Vehicle miles per passenger is not to be confused with passenger miles, or the distance each passenger travels. Passenger trip length affects both measures of productivity, since longer trips would imply both greater distance and more time in the vehicle per passenger.

The first test performed was a simple Pearson correlation, the results of which are given in Table IX below:

TABLE 12
Pearson Correlation of Productivity Measures
and Service Area Characteristics

	PASS/VSH	VM/PASS	PASS/HR/MI^2	DENSITY	SA SIZE
PASS/VSH	X				
VM/PASS	-.8513**	X			
PASS/HR/MI^2	INSIG	INSIG	X		
DENSITY	INSIG	INSIG	.5687**	X	
SERVICE AREA SIZE	INSIG	INSIG	INSIG	-.3948*	X

*sig at 95%
**sig at 99%

As expected, a strong negative relationship was revealed between PASS/VSH and VM/PASS, but no significant relationship was found between any of the service area characteristic variables and the productivity measures.

Because population density has consistently been identified as an important factor affecting transit performance, two other approaches were taken. The SRT service areas were divided into the following density categories: (1) low, less than 2000 POP/MI^2, (2) medium, from 2000 to 5000 POP/MI^2, and (3) high, greater than 5000 POP/MI^2. The indicator PASS/VSH was used as the dependent variable in a three-way analysis of variance, and in a simple cross-tabs test. Differences in the mean value of PASS/VSH between groups were found insignificant in the analysis of variance. The Chi square statistic for the cross-tab test was significant at the 90% level, indicating a weak relationship between vehicle productivity and population density.

Since the cross-tab test is the least robust of all the tests performed, it can only be concluded that the relationship between density and productivity is marginal at best. Cross tabs tests were also performed for demand density and service area size with vehicle productivity, and again no significant relationships were found. Results of the Chi-square test on density are presented in Appendix D.

If service area characteristics were important, one would expect that the same operator would achieve different levels of productivity under different operating conditions as was the case with the Group IV systems discussed above. However, this does not appear to be the case with the other operators. More typically, service area characteristics seem to have little relationship to system productivity. For example, Table X gives productivity and service area characteristics for the SRT systems of two taxi operators. In the first case, vehicle productivity ranges from 5.43 to 4.24 under almost identical operating conditions, and in the second case, the more productive system is the one with less favorable service area characteristics.

TABLE 13

Productivity and Service Area Characteristics

For Two SRT Operators

Operator I	PRODUCTIVITY (PASS/VSH)	POPULATION DENSITY (POPDEN)	DEMAND DENSITY (PASS/HR/MI^2)	AREA SIZE (MI^2)
SYSTEM:				
L	5.43	4477	1.40	22
M	5.33	4264	1.39	22
J	4.24	4069	1.37	16
Operator II				
SYSTEM:				
A	5.90	4893	1.58	14
C	5.10	5889	2.31	9

It would appear that the variation in vehicle productivity (passenger/vehicle service hour) observed in this sample of SRT systems is due primarily to operator efficiency. Admittedly, not all potentially important service area characteristics can be precisely measured, but the lack of influence of those which can is significant. Service area characteristics may be conceived as acting as constraints which define the upper bounds of system productivity. However, many SRT operators appear to be operating at levels well below these bounds and therefore are little affected by them. In other words, the low productivities exhibited by several of the SRT systems are the result of internal constraints rather than external constraints.

D. Conclusion

It can be concluded that many factors affect system productivity, and that for the sample SRT systems, operator efficiency is a more important determinant of performance than service area characteristics. Unfortunately, there appears to be little incentive for SRT operators to develop efficient dispatching operations. More efficient dispatching would require operators to use more sophisticated manual techniques. Such improvements are costly, and they require training efforts on the part of the operator. Even for operators who keep passenger fares, the marginal gain in revenue received may be less than the cost of increasing productivity, or may not be as profitable as providing an additional vehicle hour of service. On the other hand, if demand for the service is more or less fixed, and if operators contract to provide a fixed amount of vehicle service hours over the contract period, increased productivity on the part of the operator would actually result in a revenue loss, since fewer vehicle service hours would be necessary. Moreover, if the demand for service increases and productivity remains the same, the taxi firm can request an increase in the number of service hours it provides in order to meet the increased demand. Overall, the tendency among SRT operators is to operate at some target level of efficiency which is relatively easy to achieve within the confines of traditional dispatching practices and which is acceptable to the sponsor. Under these circumstances, the only service arrangement which has a positive effect on SRT performance is that of ERT-SRT integration, for it is the only one which provides a clear efficiency incentive to the taxi operator.

CHAPTER FIVE

COMPARATIVE ANALYSIS OF SRT WITH OTHER COMMUNITY TRANSIT ALTERNATIVES

When communities consider the provision of a public transit service, they not only have a choice between direct and contract provision, they also have a choice between different types of transit service: either demand responsive or fixed-route service. This report has discussed the institutional reasons why contracting has become the preferred method of transit service provision, and why SRT has become the preferred DRT service alternative. This chapter compares SRT with other forms of DRT service and with community fixed-route service in order to evaluate SRT performance in terms of the other major service options.

I. COMPARISON OF SRT WITH OTHER FORMS OF DEMAND-RESPONSIVE TRANSIT

While publicly subsidized SRT has become the major form of DRT in California, two other forms of DRT exist: DRT provided under contract by DRT management firms and DRT directly operated by public agencies. This section compares the performance of these three forms of DRT. The sample consists of data from the 22 SRT systems previously discussed, five municipal systems, and eight DRT management firm systems. Data on the latter two sets of systems were gathered via telephone interviews and state annual operating and financial reports. Two major problems were encountered in conducting the comparative analysis. One was the small number of other types of DRT services in operation, which made generalization about performance differences difficult in some instances and clearly impossible in others. The second problem was the lack of comparable data, particularly cost data. Municipalities tend to integrate the transit operation with other municipal services. As a result, the cost of providing the service is typically underestimated. Costs may also be underestimated for systems operated by DRT management firms. The most likely source of cost underestimation stems from the fact that the operator often does not provide a complete service. Unlike SRT systems, in several instances the DRT management firms do not provide vehicle maintenance and repair, telephone services, or

office and garage space. Municipal sponsors, in particular, may not completely account for these costs, and they may also underestimate administrative costs. The SRT cost figures are likely to be more comprehensive and therefore quite possibly higher than cost figures reported for the other types of DRT service delivery systems, particularly services operated by municipalities.

A. Municipal Systems

Public agency provided DRT, which may be considered the "traditional" form of DRT, is the least common form in California. During the 1977-78 fiscal year there were only five such general public DRT operations in existence. Since June 1978, one of these has become a fixed route operation, and another an SRT system, leaving just three municipal systems operating in 1979. All five systems in the sample are municipal operations.

Performance indicators for the five municipal systems, together with average, minimum, and maximum values, are presented in Table I. Fewer performance indicators are used in the comparative analysis because of the lack of comparable data for the different types of transit systems. It can be seen immediately that there are many differences between these systems.

El Segundo provides a free transit service to residents which is financed completely by municipal funds. It is a one-vehicle operation with very limited service hours, and serves a predominantly elderly clientele. The El Segundo system is a reserved exclusive-ride system. Passengers must make advance reservations, and one ride is assigned per ten minute service interval. Group riding occurs only when more than one person is going to the same place at the same time. Although only part-time city employees (who are not entitled to regular raises or fringe benefits) are utilized in the system, operating costs per hour are moderately high. The high rate of vehicle utilization is typical of one-vehicle systems. A high level of vehicle productivity is probably generated by the large groups which are transported to senior citizen activity centers. The limited nature of the operation is further indicated by the low ratio of vehicles to population.

Merced Transit System is the only large scale system in the group. It has experienced a dramatic increase in patronage over the past few years. Ridership increased from 44,495 passengers in 1974-75 to 172,811 passengers in 1977-78, while the vehicle fleet was increased only from 8 to 10 over the

TABLE 14

MUNICIPAL SYSTEMS 77-78
PERFORMANCE INDICATORS*

Name	OPEXP / VH	VH / MAXVH	OPEXP / PASS	FAREREV / OPEXP	PASS / VH	PASS / SAPOP	VEH / 1000POP	SERVHRS / WK
El Segundo	$16.61	.90	$2.34	N/A	7.09	.68	.063	32
Merced	16.06	.68	1.64	.14	9.82	5.73	.332	50
Monterey Pk.	11.65	.99	3.38	.08	3.44	.10	.020	30
Perris	19.00	.63	2.86	.09	6.65	2.56	.185	64
Ukiah	7.85	.50	1.43	.57	4.57	3.02	.351	72
$\bar{X}$ =	14.23	.76	2.33	.22	6.31	2.42	.190	50
Min =	11.65	.50	1.43	.08	3.44	.10	.020	30
Max =	19.00	.99	3.38	.57	9.82	5.73	.351	72

*Operating and descriptive statistics are presented in Appendix E

same period. With even more growth forecast for the future, system managers felt that a demand-responsive system was no longer suited to the area's transportation needs, and it was replaced by a fixed route system in September 1979.

Moderately high operating expenses were attributed to frequent vehicle breakdowns and costly repairs. Vehicle problems prevented full utilization of the 10 vehicle fleet in spite of almost chronic excess demand. Transit managers stated that two to three hour wait times became the norm, and that service quality had declined significantly from previous years. The extremely high level of vehicle productivity was therefore the result of system overload and poor service quality. The high level of system utilization was reflected in the high number of passengers per service area population.

Monterey Park is another limited service system in which one pick-up is scheduled for each fifteen minute service interval. Like El Segundo, it is also a reservation system. Employees charged to the system are one driver and one order taker/dispatcher. Although the service is available to the general public, it is used primarily by senior citizens and is geared to non-work trips. Low operating costs are the result of low labor costs. Again, the high rate of vehicle utilization is typical of one-vehicle systems. Since service hours are limited, vehicle maintenance can take place after hours. High cost per passenger is the result of low system utilization, which is further reflected in the low number of passengers per population and low vehicle productivity. Low fare recovery is due to low fares (25¢) and few passengers. Lower than average performance in this case is self-imposed, due to the four passenger per hour reservation limitation.

The city-operated Perris DAR was short-lived. It began operation in early 1977, and in January 1979 the city contracted with the Riverside Transit Agency to have the service continued as an SRT system. The city was dissatisfied with the DAR system because of its high costs and low service quality, which generated a large number of passenger complaints. Due to vehicle problems and the lack of a back-up vehicle, service was frequently interrupted. These conditions resulted in a relatively low rate of vehicle utilization. High costs are attributed to vehicle maintenance costs and marketing expenses. In spite of its problems, Perris had an average level of system utilization. Relatively high vehicle productivity was again

achieved at the expense of service quality; two to three hour response times were relatively common.

Ukiah represents an interesting contrast to the other municipal systems. An examination of the performance indicators reveals more similarity to an SRT system (particularly system C in our SRT sample) than to the other municipal systems. In fact, the city in this case took over a failing cab company, and essentially went into the SRT business itself. Like many of the cities who chose SRT contract service, Ukiah has made every effort to provide a satisfactory service at minimum cost. Costs are kept low by the use of part-time employees with an average wage of $3.50 per hour. Even taking into account this wage rate, operating costs seem to be unusually low, probably because of unreported costs. There are no performance standards, and vehicle usage is geared to demand. The system enjoys a fairly high level of passenger utilization, in spite of an average fare of $1.00. Low costs combined with high fares have allowed for a 57% fare recovery rate. It will be noted that vehicle productivity is average for an SRT system, and that low costs per passenger are more the result of extremely low operating costs than high vehicle productivity. Ukiah also enjoys a very favorable operating environment; it is a small city where most destinations are concentrated in the central area and where no other public transportation is available.

There is a great deal of variability among the five municipal systems. El Segundo and Monterey Park could be placed at one end of a spectrum, representing services whose primary purpose is to provide a fairly convenient service to needy residents. Performance is obviously not a major consideration, and overall costs are kept low by restricting service. This is reflected in the low values on service quality indicators and high per passenger costs. Merced and Ukiah could be placed at the other end of the spectrum as cities which are definitely "in the transportation business" (the Merced system had its own municipal department), and in which the service is designed to serve a much larger proportion of the transit market. This is reflected in the relatively high level of service quality and low per passenger costs.

B. Management System DRT

The eight management firm systems chosen for this analysis are all operated by the same company. It is a company which has been involved in many aspects of demand-responsive transportation over the past several years, particularly in the development and implementation of computerized dispatching systems. The company is a well established contract provider, operating both general public DRT and a number of Dial-a-Lift* services for municipalities and transit districts around the state.

Sponsors who contract with the management firm are purchasing a fairly standardized product. It has been operating DRT systems for over six years, and all operations are substantially the same. The management firm trains all system managers and provides each system with detailed operating procedures. A special type of manual dispatching developed by the firm is used by all systems. Thus the decision to contract for management firm service is a decision for a standard, predictable type of DRT service.

Performance indicators for the group of management systems is presented in Table II. The homogeneity of these operations is reflected in the performance indicators. Operating expense per passenger, for example, has a range of only 72¢. Average values in this case do have some reliability, and it is not necessary to discuss these systems on an individual basis. The indicators demonstrate that an efficient system carries a high price tag when costs are measured in terms of services supplied. But while the average operating cost per vehicle hour is the highest of the three service types, operating cost per passenger is the lowest. This DRT firm achieves a high level of consumption effectiveness through efficient vehicle utilization and high vehicle productivity. The low fare recovery ratio is to be expected, given fares in the range of 25¢ to 50¢. Little can be said about service quality in terms of wait times and ride times. System managers say their systems are "on time" 90% of the time, meaning pick-ups occur within plus or minus ten minutes of the promised pick-up time, but there is no way to determine whether there is any variability in how long passengers must wait from the time the request for service is made. In any case, these

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*Demand-response lift-equipped vans for service to the handicapped.

TABLE 15

Name	OPEXP / VH	VH / MAXVH	OPEXP / PASS	FAREREV / OPEXP	PASS / VH	PASS / SAPOP	VEH / 1000POP	SERVHRS / WK
Corona	$16.48	.57	$2.32	.16	7.09	2.58	.169	73
Fairfield	17.67	.58	2.17	.17	8.14	1.95	.118	68
La Habra	16.90	.57	2.62	.11	6.46	2.12	.154	72
La Mirada	19.00	.60	2.27	.10	8.37	2.31	.111	80
Morro Bay	14.43	.53	1.93	.10	7.47	7.33	.517	69
Tracy	22.03	.49	2.56	.12	8.60	2.71	.227	55
Turlock	14.69	.88	1.90	.19	7.72	2.90	.164	50
Hemet	16.68	.48	2.51	.12	6.66	N/A	N/A	67
$\bar{X}$ =	17.24	.59	2.29	.13	7.56	3.13	.209	67
Min =	14.69	.49	1.90	.10	6.46	1.95	.111	55
Max =	22.03	.88	2.62	.19	8.60	7.33	.517	80

*Operating and descriptive statistics are presented in Appendix F

systems are intensively utilized when measured by passengers per service population.

The high productivity of these systems may be explained by two factors. The first is the sophisticated dispatching procedures utilized. While all of the systems are manually dispatched, a number of techniques have been developed which simplify the process and make it easier to group rides. By training dispatchers to do the job in a specific way, system performance tends to be less dependent on the individual ability of the dispatcher and consequently more consistent.

The use of larger vehicles is the second reason for high productivity. These systems have a large number of subscription riders who use the service for work and school trips and during peak periods these larger vehicles are filled. Of course these subscription riders are the result of aggressive marketing and reliable service quality.

The performance effectiveness (i.e., the high values on effectiveness indicators) of the management systems lends additional support to the hypothesis that service area characteristics are less important than dispatching efficiency in explaining performance differences. While the range of environments in which these systems operate is not as great as that of the SRT systems, they do operate under conditions which range from rural/small city to medium size city and suburban areas. In spite of these differences, the range of vehicle productivity is small: from 6.46 in a suburban, medium density area to 8.60 in a small city. Because of the small sample size, there was no way to perform a statistical analysis of the relationship between service area characteristics and performance as was done in the previous chapter. If one were to speculate on general trends, however, it would appear that small cities are more favorable places for good performance, and that as service area size increases, performance tends to decline.

Another way to approach this question is by comparing two DRT systems which have operated in the same service area at different times: one operated by a management firm and the other by a taxi firm. Table III presents this comparison.

TABLE 16
Comparison of Management Firm DRT and SRT
in the Same Service Area

	VH/MAXVH	COST/VH	COST/PASS	FARE/COST	PASS/VH	PASS/SAPOP	VEH/1000POP	SERVICE HRS/WK
MGMT DRT	.57	$16.90	$2.62	.11	6.46	2.12	.15	72
SRT	.48	18.85	4.45	.10	4.24	1.38	.17	78

Unfortunately, operating conditions are not strictly comparable between the two systems because service parameters were changed with the shift to SRT. Also, the cost figures are not comparable, as they come from two different years. Consequently, there is less difference in operating costs than the numbers would seem to indicate. In spite of these differences, however, it is apparent that the SRT system is much less effective than the management system, resulting in much higher per passenger costs for SRT. It seems evident that the better performance of the management system is because of supervisor dispatching practices not because of favorable operating conditions.

C. Comparisons

Table IV presents average values on performance indicators for the three types of DRT service. Clearly, the management systems have the best performance effectiveness record. While the cost of producing management firm service is high relative to the other DRT service options, the high cost is offset by greater productivity.

TABLE 17

Average Values on Performance Indicators
for Three Types of DRT Services

	VH/MAXVH	COST/VH	COST/PASS	FARE REV/COST	PASS/VH	PASS/SAPOP	VEHS/1000POP	SERVICE HRS./WK
SRT	.65	$12.55	$2.84	.15	4.69	1.16	.125	75
MUNI	.76	14.23	2.33	.22	6.31	2.42	.190	50
MGMT SYSTEM	.59	17.24	2.29	.13	7.56	3.13	.209	67

Given the apparently superior performance of management DRT systems, one may ask why SRT has become the predominant form of DRT in California. On the basis of average performance, it would appear that sponsors choosing SRT are in fact trading off the benefits of better performance for the convenience of dealing with local taxi operators, for being able to set up a system within a short period of time, and for the low production costs of SRT service.

There may be other factors involved, however. First, the management firm does not provide a full service package. Vehicle maintenance and repair is not usually done by the firm, and in some systems, it provides only the driving, dispatching, and management operations. Cities that contract with the firm must incur the added cost and inconvenience of either providing these services themselves or seeking out another contractor.

Second, the management firm requires that the sponsor provide the vehicles. While there are no requirements regarding the type of vehicle to be used, these systems use either vans or mini-buses. Currently, the price of these vehicles can range from $22,000 to $90,000 each, representing a capital outlay many times greater than would be required to purchase the $8,000 Checker Cabs most frequently used in SRT systems. Thus the front-end costs of contracting with the management firm are far greater than contracting with a taxi firm. While state transportation assistance provides a source of funds for such expenditures, public transit projects compete for

these funds with highway projects outside the large urban areas of the state. Therefore, the cost of initiating the transit service is an important consideration.

A third factor is that sponsors have not had the benefit of complete information on which to base their decisions. While there is little uncertainty or risk associated with management firm service, there is a great deal more uncertainty associated with contracting with a taxi operator. There is no way to know in advance how the taxi operator will perform unless the operator has had experience in SRT. The diffusion of SRT around the state seems to have been facilitated by results achieved by the best SRT systems, and the expectations of prospective SRT sponsors are probably based on the widely distributed information on these systems. Under these circumstances, SRT service would be the most reasonable choice, as Table V demonstrates. It shows what $100,000 would buy under three alternative service possibilities: (1) an average management firm system, (2) an average SRT system, and (3) an SRT system with average costs and the average productivity of the Group I high performance SRT systems. Management firm system averages were used because there was no way to determine an unambiguous "best" sub-group of these systems. The Group I SRT system can serve the most passengers at the lowest cost (the third column in Table V), and assuming all other service parameters equal, would be the best choice, albeit by a small margin.

It would appear then, that in terms of "bottom line" performance statistics, SRT contract service is not always the best alternative. It is the advantages of SRT contracting--low production costs, low start-up costs, and the convenience of dealing with a local firm--which have made SRT the preferred choice. This is reasonable, since these are considerations that are foreseeable. Performance, on the other hand, is something that can only be evaluated after the fact. Thus the decision to initiate contract SRT is based more on the consideration of these foreseeable factors than on a concern for good performance. On the other hand, the ability of taxi operators to perform at satisfactory levels may determine the extent to which individual operators can expand such service. As sponsors gain experience with DRT it is likely that only the better SRT operators will continue to renew contracts with relative ease. Poor SRT performance may provide the incentive

TABLE 18

$100,000 BUDGET DRT SERVICE ALTERNATIVES

	MANAGEMENT FIRM	AVERAGE SRT	GROUP I SRT
VSH	5,800	7,968	7,968
Passengers	43,847	40,716	46,214
$/Pass	$2.28	$2.46	$2.16
Subsidy Cost	$89,038	$89,821	$88,446

(a) Parameters: operating expense/vehicle hour = $17.24
passengers/vehicle hour = 7.56
average fare = $.25

(b) Parameters: operating expense/vehicle hour = $12.55
passengers/vehicle hour = 5.11
average fare = $.25

(c) Parameters: operating expense/vehicle hour = $12.55
passengers/vehicle hour = 5.80
average fare = $.25

for further experimentation on the part of sponsors, either with other forms of DRT or with other local transit alternatives. Consequently, performance may help to determine the longevity of SRT as a successful paratransit option.

COMMUNITY FIXED ROUTE TRANSIT

While SRT has become the preferred alternative for demand-responsive transit service, a number of communities comparable in size and circumstances to those which have contracted for such service have chosen to provide fixed-route community transit service. This section compares the performance of the two service options, discusses the differences between them, and presents some tentative conclusions as to the reasons why different service options are chosen.

Fixed-route service is the predominant mode of general public transit service. In California, approximately 23 fixed-route transit systems are operating in small and medium size cities (population less than 100,000), indicating that fixed-route continues to be a popular service option in smaller communities. A sample of five of these systems was selected for a performance evaluation, the results of which are presented in Table VI. All of these systems are municipal operations, and as was the case with the municipally operated DRT systems, the operating costs appear to be underestimated due to the integration of the transit system with other city functions. Moreover, fixed route systems currently report only total passengers. This results in some double counting of passengers, since each transfer is counted as a passenger. On the average, the statistic total passengers is about 20% higher than revenue passengers, and revenue passengers is more comparable to the DRT passenger counts. Of the five systems, three are owned and operated by municipal agencies and two are contract operations.

The performance indicator averages presented in Table VI are striking to say the least. Although every effort was made to verify the operating statistics of these systems, it seems that operating costs are underestimated. The statewide average fixed-route system operating cost for 1976-77 was $19.40 per vehicle hour, indicating that these systems are operating far

TABLE 19

COMMUNITY FIXED ROUTE SYSTEMS
PERFORMANCE INDICATORS
FY 1977-79*

	OPEXP / VH	VH / MAXVH	OPEXP / PASS	FARE / COST	PASS / VH	PASS / SAPOP	VEH / 1000POP	SERVICE / HRS
BANNING	$13.03	.62	$.84	.24	15.55	4.08	.163	50
CHULA VISTA**	15.21	.53	.93	.16	16.41	6.13	.138	102
EUREKA	13.87	.41	.54	.41	25.70	11.19	.285	72
NAPA**	14.24	.80	.53	.25	26.83	8.28	.106	70
SANTA ROSA	16.23	.48	.77	.14	21.20	10.94	.226	92
$\overline{X}$	$14.52	.57	.72	.24	21.14	8.12	.184	77

*operating and cost statistics are listed in Appendix G
**contract operation

more efficiently than might be expected.[1] It became clear during the telephone interviews that municipal integration is the reason for the low operating costs of the transit service. Administrative costs were either not considered at all, or shared with other city services. Maintenance is generally performed by the Public Works Department, and the transit service is charged only for work performed. This is different from the usual transit district situation, in which mechanics are paid whether service is performed or not, but not unlike the usual DRT service arrangements. Overall, the costs of small municipal fixed route operations appear to be quite comparable to DRT service provision costs, rather than to transit district costs.

The most important difference between fixed-route service and DRT is service effectiveness, as Table VII demonstrates. Fixed-route transit attains an average productivity about three times greater than the DRT services, and per passenger costs are only about one third as high. Furthermore, the intensity of service usage, as measured by passengers per service area population, is more than twice as high as the DRT averages. While service availability (vehicles per 1000 population) appears comparable to the DRT systems, it is actually about two to three times as great, since these systems use either maxi-vans (18-20 passengers) or conventional buses (35-40 passengers). If the fixed-route passenger count is corrected to reflect revenue passengers (the last row in Table VII), these performance differences are somewhat less astonishing, but still remarkable. It would seem that small fixed-route systems have the best of both worlds--the low costs of municipal systems combined with high productivities possible only with larger vehicles.

The greater effectiveness of fixed-route systems is to some extent a reflection of lower service quality. By reducing the number of origins and destinations served by the system, and by not serving the feeder portion of each passenger trip--the home to bus stop and bus stop to destination portions--the total amount of service provided to each passenger is reduced. The result is higher productivity and fewer miles per passenger. Lower

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[1]Genevieve Giuliano, "Transit Performance in California 1976-1977," unpublished paper, January 1979, page 9.

TABLE 20

Average Values on Performance Indicators
for Three Types of DRT and Fixed Route Service

	VH / MAXVH	COST / VH	COST / PASS	FARE / COST	PASS / VH	PASS / SAPOP	VEH / 1000POP	SERVICE HRS/WK
SRT	.65	$12.55	$2.84	.15	4.69	1.16	.125	75
MUNI	.76	14.23	2.33	.22	6.31	2.42	.190	50
MGMT. FIRM	.59	17.24	2.29	.13	7.56	3.13	.209	67
FIXED ROUTE	.57	14.52	.72	.24	21.14	8.12	.184	77
FIXED* ROUTE	.57	14.52	.90	.24	16.91	6.50	.184	77

*passengers = 80% of total passengers: an estimate of revenue passengers

service quality, however, does not seem to result in less system usage. Indeed, the high degree of system usage indicates that these fixed-route systems have been very effective in the selection of origins and destinations served. It is also possible that small fixed-route systems serve a different market than DRT--more work and school trips and less shopping and discretionary trips. While no statistics were gathered on this subject, interviews with transit managers seemed to bear this out. Chula Vista, for example, estimates that 60% of its passengers are high school and junior college students.

If transit service providers are primarily interested in ridership, one might ask why the DRT service alternative is ever chosen for a general public system. Using the same $100,000 hypothetical service alternative as presented in Table V, for example, an average fixed route operation would carry 116,459 passengers with cost per passenger of $.86. Assuming an average fare of $.25 per passenger, the subsidy cost of such a service would be $70,885, or about $18,000 (about 20%) less than the best SRT alternative.

Why then have general public DRT systems, and SRT systems in particular, been able to proliferate? The reason seems to be a combination of timing, geography, and imperfect information.

The small fixed-route systems in California tend to be systems which have been in operation for a number of years, long before DRT was thought of as a public transit option. This is true of all five fixed-route systems in this sample. Thus, a consideration of DRT would occur only when a system change is contemplated. The Napa system considered DRT in 1973 in conjunction with service expansion plans, and Santa Rosa considered conversion to DRT in 1978 in order to comply with the new Federal handicapped accessibility standards. In both cases, DRT was rejected on the grounds of inferior cost effectiveness--per passenger costs would be too high. Moreover, since both systems had been successful fixed-route operations for many years, there was no real incentive to make drastic service changes, especially since such changes were associated with substantially higher costs.

It is interesting that SRT systems are located primarily in Southern California, and general public DRT systems are, with only three exceptions (Tracy, Ukiah, Fairfield), located in the southern half of the state as well. DRT has had a very different history in the south than it has in the north, and the result has been different perceptions of the service on the part of prospective service providers. In northern California, DRT service has been provided primarily by transit districts. Consequently, the costs of such systems were very high compared to contract DRT. Moreover, a few of these transit district operated DRT systems were unsuccessful; for example, the Santa Clara County and Richmond DRT operations. Thus, while contract operated DRT service was gaining attention in Southern California as a cost-efficient way to serve local transportation needs, transit district DRT in the north was perceived as both a costly and risky service alternative. In contrast, in Southern California it is the small fixed-route systems which have experienced failure. In portions of both Orange County and San Bernardino County, several local fixed-route services operated by transit districts were abandoned because of both low ridership and high costs. This record of failure with local fixed-route service also helped to generate a willingness to experiment with innovative service alternatives, a necessary condition for the introduction and proliferation of SRT. This willingness

to experiment was further encouraged by the availability of a surplus of state transit funding in all Southern California counties except Los Angeles.

DRT service seems to have proliferated in areas where population growth has been rapid and where transit service is not well-developed, precisely those areas where fixed-route service has had a history of failure. This seems to indicate that while local fixed-route service is quite effective in areas where it has been established over the years, the prospects for its success in new areas are much slimmer. That is, the market potential for fixed-route service outside the older metropolitan areas is limited. Under these circumstances, some form of DRT, and in particular SRT, is the best service option, as it is the only type of service which is successful in attracting passengers.

CHAPTER SIX
CONCLUSIONS AND POLICY IMPLICATIONS

I. Organizing SRT Services

A. Performance, Contractual Arrangements, and Sponsor Perspectives

Local governments in California have turned to taxi firms to provide DRT because the latter can produce SRT services at low costs. But while the cost of produced SRT output is low, most taxi firms have not been able to translate this advantage into lower cost per passenger than other private DRT contractors. Productivity is the link between these two measures of performance; the merely adequate vehicle productivity of many SRT systems makes it difficult for them to achieve low consumption costs.

Sponsors, of course, cannot know in advance that a provider's cost-effectiveness accomplishments may turn out to be no great bargain. Sponsors can attempt, however, to organize SRT services and contract for their delivery so as to maximize the likelihood of a cost-effective outcome. In general, two strategies are available to achieve this aim. The first is to organize the SRT service so that the provider is paid only for consumed output or a surrogate, such as compensation based on revenue vehicle miles. This requires either an integrated fleet system or a user-side subsidy arrangement, neither of which has achieved wide acceptance among sponsors of SRT systems. The second strategy is geared to the preference of many sponsors for dedicated vehicle fleets and vehicle service hour compensation arrangements. When SRT systems are organized in this fashion, providers are selected on the basis of production costs. This gives the firm an incentive to be cost-efficient, since it must keep its operating costs below its rate of compensation in order to make a profit, but no direct incentive to be cost-effective, since system productivity does not affect contract revenues. To establish linkage between production efficiency and consumption effectiveness, productivity related contractual arrangements can be imposed. These provide the SRT operator with a financial incentive to achieve higher levels of consumption effectiveness, thus reducing the necessary public subsidy per passenger.

The conceptual merits of this second strategy are undeniable, but it suffers from three practical defects. First, with the exception of

sophisticated transit agencies like the Orange County Transit District, local governments strive at all costs to avoid complexity in contracting, since this imposes administrative burdens and costs. From the municipal perspective, incentive systems more complicated than fare retention are simply out of the question. Farebox incentives, however, are both relatively weak and perceived by many sponsors as a net drain on subsidy revenues. Second, OCTD's experiences with more complex incentive systems suggests that they do not necessarily reduce the cost of consumed service. Not only have incentives failed to spur productivity to above average levels, but OCTD's SRT contractors seem to have simply increased their basic compensation requirements in order to account for the uncertainty associated with actual compensation and for the additional administrative costs of meeting contract standards. This upward pressure on compensation rates has occurred despite competition for OCTD's contracts. Third, providers have less than complete control over productivity, since it is affected by service area conditions (e.g., level of demand, population density, trip lengths) and sponsor decisions about capacity and response time. In some systems, high levels of productivity, and hence low costs per passengers, are simply unattainable.

When provider-side subsidy is utilized, the only consistently effective contractual arrangement for achieving low passenger costs is an integrated SRT-ERT system. There is no mystery as to why this is the case. In an integrated fleet system, the sponsor has adopted the first strategy above, namely to pay only for consumed output, not produced output. The provider in turn is motivated to utilize vehicles and labor efficiently in order to maximize profits. By so doing, the provider maintains SRT productivity at high levels, as the relatively low costs of integrated fleet systems indicate.

Of the five integrated fleet SRT systems presently operating in California, all are achieving per passenger costs of approximately $2 or less. In contrast, only two of the 24 dedicated vehicle systems have achieved a similarly low level of consumption costs. Both of the latter two systems are located in small communities with favorable service area characteristics, whereas the integrated fleet services operate in small communities, medium-size suburbs, and an area of the City of Los Angeles. If low costs are the primary consideration of sponsors, the only fiscally prudent SRT service alternative is the integrated fleet system.

Significantly, the most cost-conscious cities--those whose funds were restricted, or so they perceived--have opted for this type of SRT system. Most sponsors in California, however, perceive themselves to be affluent enough, principally by virtue of relatively abundant TDA subsidies, to afford the less cost-effective dedicated vehicle system. Few sponsors make a detailed investigation of both service options, but even if all did, it is unlikely that choices would change dramatically given the current funding situation. To the agency which financially supports the service, the political benefits of community transit vehicles identifiably linked with its sponsorship are certainly of value.

B. Competition, Contracting, and Subsidization Options

If California's experiences are a reliable indicator, sponsors of community level transit for the general public strongly prefer to contract for service with a single firm and to utilize a provider-side subsidy system in compensating this operator. While a number of elderly and handicapped transit service in California have been set up along user-side subsidy lines, in virtually every case the taxi firm provides ERT service. SRT services provided through the integrated fleet arrangement are close cousins to user-side subsidy systems, but differ in that all revenues are channeled to a single provider. At present there is not a single taxi-based community transit system operating in California which incorporates all three principles of a user-side subsidy SRT system, namely compensation for consumed service, user ability to choose among providers, and shared ride operation.

User-side subsidy SRT systems enjoy some important conceptual advantages. They foster competition among local providers rather than targeting all revenue benefits to a single firm, quite possibly to the detriment of others. Users are able to choose the provider which best meets their trip needs and quality of service standards. Shared riding permits lower costs per trip than conventional taxi service. By paying only for consumed service, the sponsor minimizes subsidy requirements. Despite these advantages, as well as others, the dearth of user-side subsidy SRT systems in California indicates either that these conceptual benefits are offset by certain practical disadvantages, or that local conditions mitigate in some way against the implementation of this form of taxi-based community transit. Since user-side subsidy schemes have attracted considerable interest, and

advocates of this form of subsidization view it as a superior mechanism for organizing taxi-based community transit, the reasons for this outcome are worth exploring.

Several factors account for the paucity of user-side subsidy SRT systems. One of the most important is that in California taxi-based transit has diffused largely via the "Dial-A-Ride" service model, rather than as distinctive forms of DRT that offer unique possibilities for service organization. The key feature of the Dial-A-Ride service model is the creation of a DRT system separate and distinguishable from other transportation services in the area. Such a system utilizes dedicated vehicles and is operated by a single organization.

Strongly ingrained patterns of local government behavior contribute to the popularity of the Dial-A-Ride service model. The use of vehicles physically identified with the public sponsor of the service reflects the desire of local government to obtain political credit for its service provision and funding decisions. When local governments contract with the private sector for various types of services, the standard method of doing so is by awarding a contract (usually after competitive bidding) to a single supplier, which then is responsible for delivering the service to the specifications (and under the supervision) of the government entity. The contract and the government agency's control over the funds paid to the contractor comprise the means for insuring the latter's accountability, a high priority to government officials since they in turn are accountable to the public.

User-side subsidy systems require a departure from such practices. Accountability, for example, is achieved through the market mechanism of user decisions among providers, not direct government oversight of the service provision process. Local governments, however, tend to view the supplier of the service, not the user, as the focal point for fund disbursement and subsequent government supervision, and are resistent to delegating responsibility for this function. It bears noting that almost all the user-side subsidy E&H systems implemented to date in California involve but a single provider, an outcome consistent with local government's desire to simplify program administration while not diluting control.

A second obstacle to user-side subsidies is sponsor ignorance or confusion about this alternative. Many sponsors have little insight into the

nature of the user-side subsidy concept, and hence are aware only of its novelty, not its advantages as well.

A third major obstacle to the implementation of user-side subsidy SRT systems in California is the absence of existing SRT services in all but a handful of locales. When no SRT system is in place prior to the establishment of community transit service, sponsors have essentially three options for taxi-based transit. First, they can contract for SRT service from a taxi firm, utilizing provider-side subsidy arrangements. Second, they can organize the service on the basis of user-side subsidy, but require little or no change from conventional taxi services in the way the involved taxi firm(s) delivers the service, thus encouraging a predominantly ERT-like service. Third, the sponsor can employ user-side subsidy and attempt to induce the involved taxi firm(s) to establish shared ride services and an appropriate mechanism for charging SRT fares.

User-side subsidy for ERT is obviously more expensive than services based on shared riding, and is in practice more expensive than all but poorly patronized or inappropriately organized Dial-A-Ride systems. Consequently, it is not a viable option for general public DRT systems, although the much lower demand densities of most E&H systems make them suitable candidates for this service model.

The alternative of attempting to induce SRT service through user-side subsidy is also problematic. If the local taxi firm(s) is not interested in SRT, the sponsor needs a source of leverage to persuade it to see SRT, and lower fares, in a favorable light. While the subsidies themselves represent such leverage, sponsors of general public systems frequently lack the motivation or the ability to use them in this fashion.

In the first place, sponsors see little sense in user-side subsidies if all users are to be subsidized. They tend to view user-side subsidies as a means of targeting service, not as a conceptually attractive compensation device. Moreover, recent research on other local public services indicates that contracting with a single firm results in significantly lower costs than allowing several private firms to compete for the business of consumers.[1] The lower costs stem primarily from economies of scale and

[1]E. S. Sevas, The Organization and Efficiency of Solid Waste Collection. Lexington, Mass.: D.C. Heath, 1977.

economies of contiguity (i.e. less distance travelled per service unit delivered). These findings are directly applicable to user-side subsidy SRT. With multiple providers the economies of overhead sharing are reduced, and the existence of a number of independent production units lessens the opportunity to share rides. Whether sponsors are aware of it or not, it would appear that they can often obtain a good community transit bargain by pitting several providers against each other for the contract for a provider-side subsidy system. This is particularly true if the sponsor opts for an integrated fleet SRT system.

If the prospects of provider competition are remote, the sponsor's leverage to induce SRT is reduced. Operating its own DRT system is then the sponsor's only alternative to working with the local taxi firm, which may or may not be receptive to SRT and user-side subsidies. As for E&H services, the relatively small sums of money involved in most such systems give sponsors little influence to mandate SRT, particularly in light of low demand which makes shared riding infeasible much of the time.

There is yet another significant impediment to the establishment of true user-side subsidy systems, namely the frequent absence of the multiple providers, particularly taxi operators, needed to foster competition. Without competition among providers for passengers, a nominally user-side subsidy system is essentially the same as a provider-side subsidy, integrated fleet SRT system. In many of California's suburbs and small towns, the presence of but a single taxi firm mitigates against user-side subsidies for this very reason. If the local taxi firm is the only feasible private provider, the only incentive for sponsors to look beyond provider-side subsidization is the possibility that user-side subsidies will over time attract additional providers. Local governments tend to be more concerned with the present than the future, however, and desire a solution to their immediate problem.

The reliance of California's SRT systems on provider-side subsidy arrangements, typically without incentive clauses, raises an important question. With SRT revenues guaranteed, inasmuch as they are sheltered from competition once contracts are awarded, what if anything motivates SRT operators to devote attention to the cost-effectiveness of the service they deliver? The answer, quite simply, is the fact of contracting itself.

Their status as contractors give SRT providers a continual incentive for good performance. A contract guarantees revenues only for a specified period of time, and then is subject to nonrenewal, either as the result of competition or due to cancellation of the service. For many SRT providers, the loss of a contract would represent a serious financial setback. Consequently, most taxi managers pay close attention to their firm's SRT performance out of simple self-interest even when there is no apparent competitor for the contact. They are aware that it is a rare local government which has no alternative to their services. Even if no other taxi firm operates in the area, a DRT management firm could be engaged to provide the service. The sponsor could also dispense with the need for the taxi firm by changing service design, to a fixed route bus system for example. Most SRT providers are sensitive to the fact that if the costs of SRT service are perceived to be excessive, elected officials are apt to pursue other forms of local transit in order to forestall politically damaging criticisms of using public funds wastefully. Contracting, with its potential for impermanence and its opportunity for fostering competition, and the "political market" surrounding community transit thus represent the prime mechanisms for reconciling provider-side subsidies with sponsor desires for cost-effectiveness and good performance.

II. Benefits of SRT Contracting

The financial benefits accruing to both taxi firms and local governments are primarily responsible for subsidized SRT becoming the dominant form of DRT in California. For local governments, subsidized SRT is ordinarily the least expensive method of providing (although not necessarily delivering) community level transit. For taxi firms, SRT contracts result in an infusion of much needed revenue, in many cases representing the difference between financial health and sickness.

Less obvious benefits to both parties also flow from this public-private sector partnership. For SRT providers, the transition from conventional taxi firm with a clouded financial future to broadly based paratransit company positioned to serve a variety of profitable markets can be made at least partially at public expense and with a minimum of risk. Local governments, often lacking detailed knowledge about transit, can take advantage of

taxi operator expertise to design and implement their community transit system, thereby enabling them to place a desired service on the streets quickly and with a minimum of administrative effort and expense. Moreover, a competent, accountability-conscious SRT provider minimizes the need for subsequent government supervision once the system is in place.

The last two benefits are associated with any capable provider, particularly a DRT management firm. Taxi firms are unique among potential DRT contractors, however, in that they also provide unsubsidized transportation services to the general public. By keeping local taxi firms in existence, SRT contracts can insure that local public transportation service, both subsidized and unsubsidized, will continue to be available. Should taxi services cease entirely, as they have in some localities, the local government, as public transportation supplier of last resort, may find itself compelled to pick up the slack and introduce costly new services. An important benefit of SRT contracting is thus to maintain relatively low cost private sector alternatives to governmental provision of needed local public transportation.

Legal and Labor Impacts of SRT

Considerable trepidation has been expressed about the legal and labor implications of the movement by taxi firms into SRT and publicly supported contract operations.[2] While conceptually well-founded, the fear that this movement could upset the legal applecart in public transit, particularly with respect to Section 13(c) labor protections, is not supported by California's SRT experiences.

It is virtually certain that several SRT providers are covered by Section 3(e) protections from federally subsidized competition, and that their employees come under the jurisdiction of Section 13(c). None have seen fit to make an issue of these federal protections, however. One reason is that their implications are not well-understood by many taxi managers. Equally important, taxi managers recognize that they have little to gain and

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[2]Alschuler, op. cit.; Altshuler, Alan A., "The Federal Government and Paratransit," Paratransit: Special Report 164. Transportation Research Board, 1976.

potentially much to lose by raising these issues. With respect to Section 3(e), their status as government contractor compels them to be accommodating, not confrontative. As for Section 13(c), any broaching of the labor protection issue on behalf of their employees could end in catastrophe, in the form of a severely impaired competitive position resulting from either union organization of their workers or extensions of protections to them which increase their cost and incur liability on the part of sponsors.

Despite the infusion of government subsidies into the revenue base of SRT providers, SRT workers in these firms have proved unable to obtain wages and benefits (other than the greater amenity of driving SRT vehicles) above ERT standards. Management calls the tune in labor relations, and has successfully classified the SRT job as a taxi-like position, for which taxi-like wages are appropriate, rather than a more highly paid transit-like job. The composition of the driver work force, the "long term temporary" nature of the job to workers, and the lack of union organization account for this outcome. The uncertain long term prospects of the ERT business have made organization of taxi workers a low priority to unions, and the advent of subsidized SRT apparently is not yet a significant enough development to alter this judgment. How long SRT workers will continue to accept low wages for the sake of inexpensive public transit services depends to a large extent on their willingness, and that of the appropriate unions, to forgo organizing efforts. To date, at least, Section 13(c) has not seemed to affect this calculus, perhaps because its potential to subtlely alter the balance of power between taxi labor and management has not been grasped by either SRT workers or organized labor.

Sponsors, no less than taxi management, want to avoid 13(c) complications, and all have so far managed to finesse the 13(c) issue. This has occurred even though they are required to obtain 13(c) certification from the Department of Labor before they can receive federal transit subsidies. Transit agency sponsors have continued to operate under their standard 13(c) agreement with DOL, making no special provision for employees of SRT contractors, and two municipal sponsors have agreed to accept liability for protection even while stipulating that no employees are affected. Almost inevitably a 13(c) or 3(e) embroglio will eventually occur, but the evidence to date suggests that in many situations these provisions of Federal law will not significantly affect taxi-based paratransit services.

Taxi Firm Consequences

The declining profitability of their ERT operations has caused most taxi firms to recognize that they must change in order to survive. For SRT providers, the direction of change is quite clear. ERT will continue, albeit under driver leasing arrangement in many cases, but the firm will increasingly seek revenue and profitability opportunities in the public sector of transportation. This trend is already strongly at work in California, with over half of the SRT providers now securing at least 25 percent of their revenues, and an even greater portion of profits, from their publicly subsidized contract operations.

Another important indication that these providers perceive their future financial viability to depend upon the public sector is their attitude towards new private sector services, notably unsubsidized SRT. Problems with fuel cost and availability have made unsubsidized SRT appear more attractive to taxi operators in California, but not attractive enough to rush into. Providers of subsidized SRT are not planning to diversify into private SRT services in the immediate future, preferring to rely on their contract revenues for financial well-being for the time being. These taxi entrepeneurs are looking primarily to the government, not the private market place, for innovation opportunities and additional revenue sources. Contract operations produce guaranteed revenues, whereas an element of risk (and hence the potential of failure) is always present in non-contract service innovations. Of course, once a firm has secured an SRT contract based on provider-side subsidy, it has no incentive to offer unsubsidized SRT in the affected locality.

These considerations suggest that in California we may be witnessing the beginnings of a new phase in the taxi industry, one in which taxi firms continue to be privately operated and controlled, but many draw a substantial portion of their revenues from the public purse. If so, it portends significant managerial changes for taxi firms, and shake-ups in industry structure as well. As the importance of public sector contract operations increases, taxi managers will devote an increasing portion of their time to interacting with government or responding to its requirements. Taxi managers must develop methods of complying with government imposed accountability and data reporting requirements as well as managing the service provision process. A talent for communicating with government officials,

and the acquisition of at least a minimal amount of political skill to play the "government game," become extremely important assets. Knoweldgeable taxi operators discover that their interactional capabilities influence how sponsors evaluate their performance, and that cost-effectiveness becomes only one factor, albeit a very important one, in the evaluation matrix. Some taxi managers may experience difficulty functioning in this new environment, with adverse consequences for their firms.

Changes of similar magnitude may take place at the industry level. While the trend towards leasing and owner-driver arrangements is likely to improve the financial prospects of the taxi industry in areas where there is a substantial market for taxi service, notably large central cities, contract operations may be the key to survival elsewhere. This applies particularly to fleet operators, who tend to serve a broader and more dispersed market than owner-operators. Unless a marginal taxi firm enjoys managerial astuteness or a lack of competition for government contracts, it is likely to fall by the wayside, possibly pushed by government financed competition from other providers. With financial health of fleet operations dependent on substantial contract activity, successful new entry into this portion of the industry may well become the province of management firms with a strategy for capturing contracts, not individual entrepreneurs hoping to make a go of ERT operations. Smaller firms may find it most advantageous to join forces with such management entities, to sell out to them, or to join forces to create one themselves. Larger, and fewer, taxi companies seem to be the long term implication. However, these companies should also be financially stronger and more managerially and operationally competent, as their greater assets enable them to acquire the capabilities (such as improved dispatching services) needed to become full-fledged paratransit providers.

III. Government Policy and SRT Development

Public transit in California is funded predominantly by the State and the federal government. Local governments, however, exert the greatest influence on the expenditure of transit subsidies, since it is at the local level that specific service and fare decisions are made.

Local governments in California have chosen to contract for subsidized SRT because of: (1) its low costs (at least on a production basis) relative to other community transit options; (2) the aggressiveness of taxi operators

in seeking transit contract opportunities; and (3) the political advantages of contracting with a local firm, including maintaining a supplier of conventional taxi service. It is difficult to see how state or federal transit policies could strengthen any of these factors or, in situations where they are nonexistent, create them. By the opposite token, a strong committment by local government to fixed route transit services, to the exclusion of DRT (at least for general public service), is the primary reason that subsidized SRT has been almost completely shunned in Northern California. Again, there seems to be little that policies of higher level governments could do to alter this outcome, other than to directly dictate local service decisions, a politically unthinkable alternative in the absence of a legislative mandate to do so.

It is instructive to note that even in California, where political support for community transit is considerable and the taxi industry's trade association is able to influence transit legislation, the State Legislature has merely authorized large urban counties to spend up to 5 percent of their TDA funds on innovative community transit projects, not directed them to utilize the money in this fashion. DRT advocates must still persuade local/regional transportation decision makers to allocate funds to their pet projects. Due to the opposition of fixed route transit agencies to any redistribution of subsidies, very little financial support has gone to DRT services in most of these large counties.

DRT services (of which subsidized SRT is simply one form) have flourished primarily in areas which do not possess fixed route operators or in which general purpose local governments have direct claims on TDA funds. In these circumstances, which primarily exist in smaller urban counties or semi-rural areas, DRT need not directly compete with politically entrenched fixed route transit interests. This is of crucial importance. When DRT and fixed route transit are in direct competition, the latter almost inevitably prevails if it has managed to establish itself as a viable service, due to its lower costs per passenger. DRT has replaced fixed route transit, or obtained substantial financial support at its expense, only when the latter service mode has been an outright failure or at least relatively unsuccessful in attracting passengers.

California's experiences with community level transit suggest that the prospects for subsidized SRT turn primarily on the choice between fixed

route transit and DRT, and only secondarily on decisions about the specific type of DRT system to be established. Given a reasonably competent taxi firm and a local government interested in minimizing the costs of its community transit system, a decision to pursue DRT will more likely than not result in an SRT system. Individual instances of unfair treatment of taxi firms have been reported, but the general pattern is one of sponsors taking advantage of the contracting option and the low operating costs of taxi firms to develop taxi-based DRT systems. Thus, while policies requiring explicit consideration of contracting by sponsors and competitive bidding for all contracts would assure that taxi firms were guaranteed opportunities to become DRT providers, economic and political realities already lead to such an outcome in most situations. A case can be made for formalization of these practices (explicit consideration of contracting, use of competitive bidding) through policies of funding sources, but it should be recognized that the practical impact will be less than dramatic.

Much the same can be concluded about government policies which place taxi-based transit on equal footing with other public transit services. In California, for example, subsidized SRT services are exempted from payment of 6¢ of the state's 7¢ gasoline tax and SRT workers are treated like employees of public DRT systems for purposes of establishing Workers Compensation rates. While these policies help keep SRT costs to a minimum, the cost differential between subsidized SRT and other forms of DRT is much greater than the financial relief afforded by these measures. Again, one can argue for such policies on grounds that all forms of local transit should be treated equally while recognizing that their impacts will not be decisive.

The issue of appropriate government policy towards taxi-based transit is most topical with respect to UMTA's long-awaited Paratransit Policy, now over three years in the making. The existence in California of nearly 30 general public subsidized SRT systems, and at least 50 taxi-based E&H services, is living testament to the fact that under appropriate circumstances the lack of an UMTA policy is not an important impediment to the development of taxi-based public paratransit services. The appropriate circumstances consist primarily of making secure sources of transit subsidies available to local governments, whatever their size or location. To the extent that the absence of a formal Paratransit Policy gives sponsors the impression that taxi-based transit services are not eligible for UMTA subsidization, or

makes UMTA Regional Office officials reluctant to approve funding for such services, it is a roadblock to the development of subsidized SRT. Nonetheless, UMTA's own pronouncements on the subject state clearly that subsidized SRT, when sponsored by a public agency through which UMTA funds can be channelled, is a legitimate use of Federal subsidies.[3] One benefit of an official policy would be clarification of the present status of taxi-based transit in Federal eyes but the fact remains that UMTA has funded such services for some time.

Other than resolving the funding issue, it is difficult to discern how an UMTA Paratransit Policy might positively impact the development of taxi-based transit. In fact, formal policies in this area may have a retarding effect, since they will almost certainly have to contend with the 13(c) issue. As emphasized previously, 13(c) has been something of a non-issue in California due to the desire, and ability, of both sponsors and SRT providers to ignore or finesse its potential application. This will no longer be a viable response if an UMTA policy specifies procedures or guidelines for dealing with 13(c). Standardization (of procedures, agreements, or protections) will destroy the flexibility which characterizes the present approach to 13(c). The result may be to create the type of problems now being encountered in UMTA's new Section 18 program of assitance to small urban and rural areas. Although it was expected that private transportation firms would be heavily utilized as providers for Section 18 projects, the 13(c) procedures established for this program have reportedly caused many prospective sponsors to forgo participation, for fear of being saddled with unacceptable liability for 13(c) claims.

It would appear, then, that the main positive contribution of state and federal transit policies is to make funds as available for taxi-based community transit as for any other local transit mode. A second possible contribution of such policies would be to encourage the most cost-effective forms of subsidized SRT, notably integrated fleet SRT systems and, where appropriate, user-side subsidy SRT arrangements.

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[3]Schulman, Lawrence L., "Federal Policy, Local Planning, and the Use of Taxis for Paratrnsit Services, in Proceedings of the Conference on Taxis as Public Transit, op. cit.

Here too, state and federal leverage is limited. State and federal transit operating subsidies are allocated on a formula basis, thus effectively preventing higher level governments from directly influencing local choices about specific service delivery systems. Where regional entities, such as MPO's or county transportation commissions, are responsible for allocating subsidies among different localities and transit operators, they can encourage explicit consideration of the cost-effectiveness of different local transit options, and have done so in many cases. State governments and UMTA could strengthen this "alternatives analysis" by making it a formal requirement for the receipt of subsidies by sponsors. Although such a requirement would increase the paperwork burden and planning costs to local government sponsors (the needed analysis could probably be accomplished quickly and inexpensively, however), it would at least expose them to the financial implications of a broader range of service options than many now consider. If funds are not tight, sponsors may still opt for more expensive service delivery systems, but with the knowledge that they are trading-off the lowest possible service costs for other desirable attributes, such as higher quality vehicles, political visibility, and strict budgetary accountability. Policies more stringent than this are difficult to imagine in view of local/regional prerogatives in making transit service decisions.

IV. Future Prospects for Taxi-Based Community Transit

Assuming that funds will continue to be available for community transit services, the future viability of subsidized SRT, as well as other types of taxi-based transit services, is primarily a function of two factors: (1) the quality and cost of SRT services compared to other community transit options; and (2) the advantages which local government sponsors derive solely from the fact that the provider of community transit is a local taxi firm, not some other organization. To date, both of these factors have worked in favor of subsidized SRT in California. Is this likely to continue, or is taxi-based local transit now at the crest of its popularity and destined to become less prevalent in years to come?

Several factors must be considered in addressing this question. The most basic concerns sponsor choices between DRT and fixed route transit (FRT). Subsidized SRT has taken root in California because of the proliferation of general public DRT systems in the southern and central portions of

the state. Should sponsors begin abandoning DRT in favor of fixed route services, the market for taxi-based transit would contract proportionately. Inasmuch as local fixed route transit is usually less expensive than any form of DRT, as revealed in Chapter 5, there would seem to be the potential for erosion of DRT's popularity among sponsors.

Cost per passenger comparisons can oversimplify a rather complex calculus, however. Even though DRT typically costs two to three times as much per passenger as FRT, it represents a higher level of service, one which many sponsors believe is necessary in their community due to density, geographic layout, or the nature of the passengers. Moreover, the figures reported in Chapter 5 for FRT are for successful systems. If FRT cannot attract substantial patronage, not an untypical outcome in low density suburban areas or small cities, its costs can be higher than DRT. Cost comparisons also do not include capital costs for vehicles, an area in which DRT has a decided advantage. Finally, most California sponsors possess sufficient transit subsidies (due to the TDA program) to afford DRT service if the benefits from improved service quality are believed to compensate for the higher per passenger costs. Manifestly, many sponsors have decided accordingly. Whether quality of service will remain the dominant consideration in choice of local transit mode if funds become tighter is an important, albeit presently unanswerable question. What is known is that only one community transit system in California has switched from DRT to FRT during the past five years, and that was due to steadily increasing demand which eventually overwhelmed the capacity of the DRT system, not disenchantment with the service itself. It bears mentioning that the performance of the FRT system has been consistently worse than its DRT predecessor.

Sponsor choices among different DRT providers are a second major consideration. Taxi firms are very much the current favorite, but the Achilles heel of subsidized SRT is its lackluster cost-effectiveness compared to alternative DRT providers. The good SRT systems are very good, but the mediocre systems perform worse than services delivered by DRT management firms, and no better than municipally operated DRT systems. This indicates deficiencies in taxi firm capabilities, and suggests that the taxi hold on the DRT market is somewhat shakey, and will remain so until more effective dispatching procedures are devised by SRT contractors. Nonetheless, there are few sponsors of SRT systems who are dissatisfied with the performance of

their providers and eager to change to a different DRT contractor. These sponsor responses may stem from the attractiveness of SRT's low production costs, a belief that other providers could do no better given service area conditions, the indirect benefits of contracting with a local taxi firm, or some combination of these factors. Whatever their source, these sponsor perspectives suggest that mediocre performance per se will not lead to a wholesale abandonment of SRT in favor of DRT delivered by other types of providers.

Another reason for confidence about the ability of subsidized SRT to hold its own in competition with alternate forms of DRT service delivery is the potential to develop uniquely cost-effective SRT systems. Integrated fleet SRT systems are not only the most cost-effective method of organizing SRT service, they also are superior to any form of DRT in this respect. (Integrated fleet systems cost about 20-25 percent less per passenger than the systems operated by the DRT management firm). This superiority stems from a combination of the efficiencies of service integration and the ability of sponsors to pay only for consumed output. Taxi firms are probably the only providers capable of prospering under either integrated fleet or user-side subsidy arrangement.* They are able to use their vehicles productively during periods when they are not transporting subsidized passengers while operating enough vehicles to provide the needed level of SRT service during periods of heavy demand. Thus, if either budget tightening or disenchantment with the performance of dedicated vehicle SRT systems causes local officials to search for more cost-effective forms of DRT, taxi firms are uniquely capable of providing such services. The usual suboptimal method of organizing subsidized SRT means that there is great potential for improving the performance of such systems, thereby increasing their attractiveness vis-a-vis other forms of DRT.

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*In even the busiest integrated fleet systems, vehicles are in SRT service only 40-45 percent of the time. A provider which had to rely solely on revenues produced by subsidized SRT could probably not break even in view of the large amount of dead time. Reducing the number of vehicles to decrease dead time would be infeasible, since the provider's level of service would then be inadequate to meet passenger demand or, in user-side subsidy systems, to compete effectively with other providers.

A fourth consideration in assessing the prospects of taxi-based transit is whether DRT systems are aimed at serving the general public or only the elderly and handicapped population. While many community transit systems are now general public in nature, sponsors may be forced to restrict usage to the E&H if transit subsidies become tight. This is already occuring in both Orange County and the City of Los Angeles. Despite the lower revenues associated with E&H systems, the net impact on taxi firms of any movement away from general public DRT services may be limited, as there is probably greater potential for widespread implementation of E&H services. Pressures emanating from both Federal law (particularly the 504 regulations) and the political activism of the elderly all but guarantee that E&H transportation will be a continuing priority, and much of this transportation seems destined to be demand responsive in nature.

Taxi firms are, if anything, better positioned to capture contracts for E&H services than subsidized SRT for the general public. When E&H services are organized along user-side subsidy lines, as is happening with increasing frequency (albeit often as ERT services and without competition among providers), taxi companies are usually the sole beneficiaries. A dedicated vehicle special transportation system also offers an excellent opportunity to a taxi firm. Not only are low operating costs an obvious competitive advantage, but the combination of relatively low demand density and frequent trip prescheduling requirements minimizes the need for efficient shared ride dispatching, a major problem area for general public services.

The unique advantages associated with utilizing a local taxi firm as community transit provider is another factor affecting the viability of taxi-based transit. By contracting with a local taxi firm for subsidized transit services, the local government helps maintain the existence of conventional taxi service, which is becoming increasingly unprofitable in many smaller cities. This perpetuates a needed public service as well as preserving an alternative to government self-provision of local transit, which usually is more expensive than contracting for service. Furthermore, taxi contracting benefits a local enterprise, a political and economic advantage, and often results in an easy working relationship between provider and sponsor.

The final consideration, but by no means the least important, is the attitude of taxi firms towards participation in community transit ventures.

In many areas of California this attitude has been one of aggressive interest, which has helped propel taxi firms into the mainstream of DRT provision. Economic realities dictate this posture. Many firms need the infusion of government revenues to stave off serious financial difficulties. Although involvement with government is often uncomfortable and burdensome initially, most taxi managers recognize that subsidized services represent an important, if not essential, strategy for overcoming the gradual disintegration of the ERT foundations on which their firms were usually founded. They also are well-aware that subsidized local transportation services, whether for the general public or E&H, are here to stay. If taxi firms do not operate such services, other organizations will, to their detriment.

Consequently, taxi operators are not merely sitting back and waiting for local government to come to them, but are actively attempting to sell their capabilities to prospective sponsors. This operator aggressiveness represents an important ingredient in the spread of subsidized SRT within California. Because they literally cannot afford for the transit contracting option to be lost or diminished, taxi operators may become the most effective advocates of community transit, in anticipation that they will reap the lion's share of the benefits. A handful of California operators already have adopted this stance.

This brief review of the major factors influencing the future prospects of taxi-based community transit suggests a favorable prognosis, provided that funds for such services are available. The wide availability of community transit subsidies in California has sparked a veritable explosion of subsidized SRT and other forms of taxi involvement in local transit, and there is no reason to believe that California's experiences would not be replicated elsewhere given similar funding circumstances. In fact, on a more modest scale, similar outcomes have followed the adoption of state transit subsidy programs in Michigan and Minnesota. As long as there is a demand for DRT services among local governments and their constituents, the market for subsidized SRT in its various formats is likely to be bullish.

Name	Taxi Operator	Sponsor	Funding Source	Date Service Began	Number of Vehicles	Average Fare	Service Area Size (mi^2)	Service Area Population
Arcadia	San Gabriel Valley Cab	City of Arcadia	Municipal Sec. 5	4/75	3	$ .68	11	47,000
Barstow	Yellow Cab of Barstow	City of Barstow	TDA	7/76	4	.54	22	18,500
Barstow County	Barstow Yellow	S.B. County	TDA		2	1.00	N/A	N/A
Beverly-Fairfax	Golden State Transit (Yellow Cab of LA)	Los Angeles City Demonstration Agency 9/79-to LA Transportation Dept.	Public Works	12/75	6	.16	7	81,342
Ceres	Red Top Taxi	City of Ceres	TDA	12/77	1	.50	5	9,544
Chino	Paul's Yellow	City of Chino	TDA Sec. 5	6/79	1		11.2	33,200
Claremont*	Paul's Yellow Cab	City of Claremont	Municipal	10/74	N/A	.57	12	26,171
Colton	San Bernardino Yellow Cab	City of Colton	TDA	11/76	3	.50	15	19,110
El Cajon*	Yellow Cab of San Diego	City of El Cajon	TDA	12/73	up to 22	.47	14	68,500
Fullerton	Yellow Cab of North Orange County	Orange County Transit District	TDA+ Sec. 5	2/77	12	.38	22	98,500
Harbor*	United Checker Cab Co.	Los Angeles City Demonstration Agency 9/79 to LA City Transportation Dept.	TDA	6/78	N/A	.16	23	110,318
Hollywood-Wilshire	Golden State Transit (Yellow Cab of LA)	Los Angeles City Demonstration Agency 9/79-to LA Transportation Dept	Public Works	12/75	6	.16	14	130,342
La Habra-Brea	Yellow Cab of North Orange County	Orange County Transit District	TDA+ Sec 5	7/78	11	.44	16	65,100
La Mesa*	Yellow Cab of San Diego	City of La Mesa	TDA	4/74	up to 15	.53	9	53,000
Lemon Grove	Lemon Grove-Spring Valley Taxicab Assoc.	City of Lemon Grove	TDA	3/79	2	.50	N/A	21,800
Moreno Valley	Rubidoux Cab	RTA	TDA	1/78	2	.33	N/A	N/A
Ontario-Upland-Montclair	Paul's Yellow Cab	OMNITRANS	TDA+ Sec 5	1/76	18	.27	75	125,924
Orange/ Villa Park	Yellow Cab of North Orange County	Orange County Transit District	TDA+ Sec 5	11/78	12	.35	22	93,800

Name	Taxi Operator	Sponsor	Funding Source	Date Service Began	No VEH In Fleet	Average Fare	Service Area Size (mi^2)	Service Area POP
Pacoima	Golden State Transit (Yellow Cab of LA)	Los Angeles City Demonstration Agency 9/79-to LA Transportation Dept.	Public Works	12/75	6	.16	12	62,111
Perris	Rubidoux Cab Co.	Riverside Transit Agency	TDA	1/79	2	N/A	N/A	N/A
Rancho Cucamonga	Paul's Yellow Cab	City of Rancho Cucamonga (OMNITRANS)	TDA+ Sec 5	6/79	2	N/A	32.0	50,000
Rancho Mirage*	Desert Cab Co.	City of Rancho Mirage	TDA+	6/77	up to 4	.50	10.0	7,310
Rialto	S.B. Yellow	City of Rialto (OMNITRANS)	TDA+ Sec 5	1/79	2	.51	14.7	32,100
Rubidoux	Rubidoux Orange Cab	Riverside Transit Agency	TDA+ Sec 5	8/75	3	.29	20	18,000
Saddleback Valley	Orange Coast Taxi	Orange County Transit District	TDA+ Sec 5	6/78	14	.47	36	120,000
San Bernardino	San Bernardino Yellow Cab	City of San Bernardino	TDA	4/75	10	.45	17	64,700
South Gate	Southeast Checker Cab (Day & Nite Taxi as of 4/79)	City of South Gate	Municipal	12/74	1	.25	8	59,900
Venice	Golden State Transit (Yellow Cab of LA)	Los Angeles City Demonstration Agency 9/79-to LA Transportation Dept.	TDA	11/78	8	.16	11	61,178
Westlake/ West-Adams	Golden State Transit (Yellow Cab of LA)	Los Angeles City Demonstration Agency 9/79-to LA Transportation Dept.	Public Works	12/75	6	.16	N/A	167,940

*Integrated fleet

NAME	VSH / EMP	VSH / MAX VSH	OPEXP / VSH	SOCIAL COST / VSH	SUBSIDY / VSH	OPEX / TOTAL PASS	SOCIAL COST / TOTAL PASS	SUBSIDY / TOTAL PASS
El Cajon	.61	.22[a]	$ 9.02	$9.42	$ 6.63	$ 1.53	$ 1.60	$ 1.12
Barstow	.52	.48	8.86	11.24	7.00	1.14	1.44	.90
Ceres	N/A	1.00	6.98	10.00	7.53	1.41	2.02	1.52
La Mesa	N/A	.58	10.73	10.22	8.50	2.10	2.01	1.67
Arcadia	.48	.51	N/A	11.76	8.20	N/A	2.25	1.56
Claremont	N/A	N/A	N/A	N/A	N/A	N/A	1.41	.86
Rubidoux	.50	.38	N/A	15.16	13.36	N/A	2.44	2.14
Ontario-Upland* Mountclair	.73	.74	11.29	11.69	10.52	2.60	2.69	2.42
Moreno Valley	N/A	.28	N/A	18.55	16.96	N/A	3.91	3.57
La Habra	.59	.48	12.80	17.53	16.99	N/A	4.14	4.01
Saddleback	.54	.45	14.79	21.33	20.75	3.24	4.68	4.55
Fullerton	.48	.47	1.80	15.48	14.59	N/A	2.86	2.69
Orange/Villa Park	.48	.47	12.80	13.35	12.49	N/A	2.50	2.34
Beverly-Fairfax	N/A	.91	7.44	11.03	10.46	2.07	3.07	2.91
Hollywood-Wilshire	N/A	.82	7.44	11.03	10.46	2.02	3.00	2.84
Westlake West Adams	N/A	.87	7.44	11.19	10.62	2.01	3.02	2.87
Venice	N/A	.74	11.30	10.28	9.96	5.67	5.16	5.00
Pacoima	N/A	.88	7.44	11.03	10.62	2.91	4.32	4.16
Colton	N/A	.67	N/A	9.27	8.29	N/A	4.34	3.84
San Bernardino	N/A	.79	N/A	10.66	8.25	N/A	2.10	1.56
Southgate	N/A	1.00	N/A	12.50	10.83	N/A	1.87	1.62
Harbor	N/A	N/A	N/A	N/A	N/A	1.97	1.97	1.81

(N = 22)

*3 separate systems

NAME	PASS / VSH	FARE REV / SOCIAL COST	TOT PASS / S.A. POP	% ELD. PASS / % ELD. POP	AVE RESPONSE TIME	SERVICE HRS/WEEK	VEH 1000 S.A. POP
El Cajon	5.90	.30	2.82	N/A	20	168	.29
Barstow	7.80	.38	2.89	N/A	16	68	.22
Ceres	4.95	.25	1.48	9.98	15	55	.10
La Mesa	5.10	.24	1.71	5.77	15	84	.13
Arcadia	5.23	.30	.74	3.44	16	84	.22
Claremont	N/A	.39	1.40	1.67	15	168	N/A
Rubidoux	6.24	.12	1.40	3.85	20	68	.16
Ontario-Upland Mountclair	4.34	.10	1.29	N/A	N/A	54	.14
Moreno Valley	4.75	.09	N/A	N/A	N/A	63	N/A
La Habra	4.24	.10	1.38	6.07	20	78	.17
Saddleback	4.56	.09	.98	N/A	45	78	.12
Fullerton	5.43	.12	1.27	4.06	30	78	.12
Orange/Villa Park	5.33	.13	1.52	3.30	30	91	.13
Beverly Fairfax	3.59	.05	.56	3.79[b]	N/A	55	.07
Hollywood-Wilshire	3.68	.05	.33	3.62[b]	N/A	55	.05
Westlake West Adams	3.72	.05	.27	3.74[b]	N/A	55	.04
Venice	1.99	.03	.45	9.37[b]	N/A	55	.13
Pacoima	2.55	.04	.51	18.31[b]	N/A	55	.10
Colton	2.14	.12	.72	N/A	N/A	62	.16
San Bernardino	5.30	.23	2.52	2.95	23	67	.15
Southgate	6.67	.13	.23	N/A	N/A	40	.02
Harbor	N/A	.02	.48	9.31[b]	N/A	168	N/A

a. integrated fleet

b. estimate

APPENDIX C
T-TEST ON PERFORMANCE INDICATORS
TRANSIT DISTRICT VS. MUNICIAL SPONSORSHIP

INDICATOR: VSH/MAXVH	TRANSIT DISTRICT	MUNICIPAL
N OF CASES	8	13
$\bar{X}$	.52	.73
T-value, pooled variance = -1.95 Significance 90%		
OPEXP/VSH	TRANSIT DISTRICT	MUNICIPAL
N OF CASES	2	9
$\bar{X}$	$13.04	$8.52
T-value, pooled variance = 3.39 Significance ≥ 99%		
SOCIAL COST/VSH	TRANSIT DISTRICT	MUNICIPAL
N OF CASES	8	13
$\bar{X}$	$16.03	$10.82
T-value, separate variance = 3.46 Significance ≥ 95%		
SUBSIDY/VSH	TRANSIT DISTRICT	MUNICIPAL
N OF CASES	8	13
$\bar{X}$	$14.24	$9.02
T-value, separate variance = 3.53 Significance ≥ 99%		
FARE/SC	TRANSIT DISTRICT	MUNICIPAL
N OF CASES	8	15
$\bar{X}$	.12	.18
T-value, separate variance = -1.75 Significance ≥ 90%		

APPENDIX D

CROSS TABULATION OF PASS/VSH BY POPULATION DENSITY

POPULATION DENSITY

		≤2000 POP/Mi^2	> 2000 ≤ 5000	> 5000 POP/Mi^2	ROW TOTAL
COUNT	≤4 PASS/VSH	1	0	0	5
ROW %		20.00	.00	80.00	26.32
COL %		25.00	.00	66.67	
TOTAL %		5.26	.00	21.05	
COUNT	4 ≤ 5 PASS/VSH	1	4	0	5
ROW %		20.00	80.00	.00	26.32
COL %		25.00	44.44	.00	
TOTAL %		5.26	21.05	.00	
COUNT	> 5 PASS/VSH	2	5	2	9
ROW %		22.22	55.56	22.22	47.37
COL %		50.00	55.56	33.33	
TOTAL %		10.53	26.32	10.53	
COLUMN TOTAL		4 21.04	9 47.37	6 31.58	

Raw Chi Square = 9.17 (with d.f. = 4)
Significance = ≥ 90%

Pearson's R = -.3014
Significance 90% (barely significant)

APPENDIX E

MUNICIPAL DRT SYSTEMS
FY 77-78 OPERATING STATISTICS

	NO VEH	OPERATING EXPENSES	TOTAL PASSENGERS	OPERATING REVENUE	VEHICLE HOURS	VEHICLE MILES	SERVICE AREA MI^2	SERVICE AREA POP	HOURS OF SERVICE
El Segundo	1	$ 24,910	10,639	$ Ø[c]	1,500	16,000	5.5	15,750	32
Merced	10	282,505	172,678	38,943	17,588	254,494	10.0	30,114	50
Monterey Pk.[a]	1	18,042	5,332	1,356	1,548	17,340	7.3	51,979	30
Perris	1	39,528	13,824	3,456	2,080	26,880	13.2	5,400	64
Ukiah[b]	4	59,030	34,372	33,882	7,522	76,839	4.0	11,400	72

a Annual estimates based on data from 6/78 - 12/78

b Fiscal year 1978-79

c Free fare system

MANAGEMENT FIRM DRT SYSTEMS
FY 77-78 OPERATING STATISTICS

	VEHICLES[a]	OPERATING EXPENSES[a]	TOTAL PASSENGERS[b]	OPERATING REVENUE[b]	VEHICLE HOURS[b]	VEHICLE MILES[b]	SERVICE AREA[a]	SERVICE AREA POP[a]	HOURS OF SERVICE[b]
Corona	6	$212,827	$ 91,562	$ 34,012.80	12,912.45	401,420	12.5MI^2	35,458	73
Fairfield	6	215,700	99,401	37,299.75	12,207.50	180,999	25.1	50,900	68
La Habra	10	361,042[c]	137,957	41,021.85	21,362.25	276,763	15.8	65,128	72
La Mirada	5	235,873	103,877	22,952.92	12,414.00	204,574	7.0	45,000	80
Morro Bay	4	109,557	56,698	11,355.66	7,590.75	104,823	4.2	7,740	69
Tracy	4	122,600	47,881	15,024.25	5,566.25	80,885	12.0	17,638	55
Turlock	4	135,038	70,950	25,787.50	9,193.00	119,115	10.2	24,454	50
Hemet-San Jacinto	9	251,120	100,176	30,993.45	15,052.50	242,311	N/A	N/A	67

a Source - TDA Report 77-78
operating expenses could not be verified with the company

b Source - Management company monthly reports

c Source - OCTD figure = payments to management firm + $3.03/VSH administrative costs

APPENDIX G

COMMUNITY FIXED ROUTE TRANSIT
FY 1977-78 OPERATING STATISTICS

	VEHICLES	OPERATING EXPENSES	TOTAL PASSENGERS	OPERATING REVENUE	VEHICLE HOURS	VEHICLE MILES	SERVICE AREA SIZE	SERVICE AREA POP	SERVICE HOURS/WK
Banning	2	$ 42,000	50,145	$10,100	3,224	40,820	15 mi^2	12,300	50
Chula Vista	11	454,629	490,463	74,569	29,896	480,100	25	80,000	102
Eureka	7	148,517	275,217	61,237	10,710	150,122	8.5	24,600	72
Napa	5	207,000	390,000	52,127	14,535	191,000	10	47,100	70
Santa Rosa	15	556,000	726,193	80,000	34,261	391,000	31	66,400	92

Source - State TDA Reports and telephone interviews

*U S GOVERNMENT PRINTING OFFICE: 1981 351-904/8612

TECHNOLOGY SHARING

A PROGRAM OF THE U. S. DEPARTMENT OF TRANSPORTATION