Jitney Paratransit Services: An Appraisal of Present and Future Operations

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Jitney, one of the oldest paratransit modes and one of the few that are privately owned, is examined to ascertain its present and future viability. Land use, population, travel patterns, and transportation system characteristics are drawn from field observations and census sources for jitney corridors in Atlantic City, Chicago, and San Francisco. These corridors are prototypes of two different types of jitney operations: (a) taxicabs operating as jitneys and (b) specially licensed jitney vans. Jitney and bus operations are compared to differentiate the relative start-up and operating cost advantages of each mode. An advantage of the jitney is its low start-up cost. Corridors appraised to be suitable for jitneys are those that have a mix of intense land uses that generates a consistent demand for intracorridor travel, low rates of automobile ownership, and travel demand that is evenly dispersed spatially and temporally to reduce deadheading. However, the future viability of jitney could be endangered if fare increases instituted to provide adequate wages for drivers threaten jitney's competitiveness with publicly subsidized transit services.

Since the growth of American cities has been shaped largely by the automobile, the development of transportation modes other than the private automobile that could provide an acceptable level of service is a challenge. This is especially true in suburban areas where gross densities are far too low to permit broad geographic coverage or frequent service by conventional transit. Recently, innovative solutions have been proposed to address public transit needs in contemporary suburban America. Many of these solutions rely principally on paratransit modes, and the jitney has been increasingly proposed as a mode that might provide or augment transit services.

Jitney is a fixed-route, route-deviation service with unscheduled, variable, but frequent headways. The service is provided in a 6- to 18-passenger vehicle by a self-employed professional driver. Jitneys offer an intermediate level of service between conventional bus and demand-responsive dial-a-ride or taxi. The jitney driver is a private businessman who either owns the vehicle or leases it by the day. So there must be a sufficient level of demand if each driver is to make a profit.

It is the purpose of this paper to note the characteristics of land use and population, trips and trip makers, and competing modes and mode choices in three U.S. corridors in which jitneys have operated successfully. The costs, revenues, and profits of existing jitney services in Atlantic City, Chicago, and San Francisco are presented. This cost information will help to identify those areas in which jitney service would be feasible. A comparison is made between the cost components of jitney and bus service. These cost components are then projected into the future for the purpose of assessing the relative advantages and disadvantages of the modes in the next 20 years.

The evidence in this study suggests that jitneys can be economically viable and beneficial to the community in a limited range of corridor types. Jitneys have a potential for increasing average vehicle occupancy in corridors, especially when they are provided as a component of a family of shared-ride services, since they can divert trip makers from the automobile, increase the mobility of service-area residents, reduce travel time and dollar costs for the user (and for the nonuser through reduced congestion), increase the vehicle occupancy of local taxis, supplement regular transit in peak hours, and provide a higher, though slightly more costly, level of service than bus during off-peak hours. Jitney can, however, be disadvantageous if many riders are diverted from bus in a corridor in which bus services must be maintained to serve high travel demand. The implementation of jitney could also result in roadway congestion if jitney diverts riders primarily from conventional public transportation rather than from the automobile, if it induces a significant degree of new trips, or if roadway capacity along the route is already low. Moreover, inflationary trends, particularly in labor and fuel prices, are shrinking the profits of jitney operators. Jitney operators will be forced to raise fares while the fares of their primary competitor, the municipal transit company, can be kept low through public subsidy.

CORRIDOR LAND-USE AND POPULATION CHARACTERISTICS

Jitneys operate in highly developed corridors in which there is sufficient demand and automobile use is constrained either because of the lack of physical space to work or operate an automobile or the lack of sufficient family incomes to own and maintain an automobile.

Atlantic City

Atlantic City is a narrow development built on the Atlantic coast whose primary industry is tourism. The jitney route runs the length of the city, and the jitney corridor, which is realistically defined as a band 0.8 km (0.5 mile) on either side of the jitney's route, approximately half the width of the city. The indigenous population numbers 477 889; density is 1485 persons/km^2 (3862 persons/mile^2) but swells to about 1 million during the summer (1). In the jitney corridor, the 1970 median family income of permanent residents was approximately $10 500, and 52.3 percent of the households were without automobiles. Nearly 32 percent of the population were elderly and 21 percent were under 18 years of age, which suggests that a large proportion of the population does not drive (2).

Three major thoroughfares run the length of the city and serve distinctly different trip purposes and populations. Jitneys operate 6.7 km (4.2 miles) on Pacific Avenue to serve hotels, restaurants, churches, and small, less gaudy shops. This is located between Atlantic Avenue with its department stores and government and private offices, and the boardwalk, with its eateries, novelty shops, and amusements for tourists.

Pacific Avenue has two narrow lanes in either direction and numerous traffic signals. Parking is prohibited at all times, and illegally parked automobiles are towed away within minutes. (Overall parking is scarce in the jitney corridor except in off-street lots, where a fee of

$1.00-$1.50/day was charged in 1977.) Jitneys are better suited to this thoroughfare than conventional buses since the vehicles are shorter, narrower, more maneuverable, and able to accelerate and decelerate more rapidly.

Chicago

The Chicago jitney runs to within 2.4 km (1.5 miles) of the central business district (CBD). The total population, within a band 0.8 km (0.5 mile) on either side of the 7.2-km (4.5-mile) route, is 137 245 persons. The 1970 median family income in that band was $6309, and 63.7 percent of the households were without automobiles. A total of 40 percent of the corridor population was under the age of 18 or over the age of 65, and many in this group are likely to be nondrivers (2).

There is a substantial contrast in the characteristics of housing and population within the corridor. In the south end, the housing stock is significantly older: About 66 percent of the housing is older than 30 years as opposed to less than 2 percent in most northern tracts, closer to the CBD. In the past, new housing was built at greater distances from the CBD. Recently, however, urban redevelopment has brought middle-income families to the fringe of the CBD. There are moderately dense residential areas that contain three- to nine-flat apartment houses at the corridor's south end. Strip commercial development is clustered at major cross streets, approximately 0.8 km apart. Much of this residential and commercial property is deteriorating, and about 5 percent is abandoned. The vitality of this area is more critical to the viability of jitney than to its legalization since the lower capacity of this mode requires short trips to maintain high passenger turnover and sufficient revenues. Consequently, income extremes vary from $4563 in a southern tract to $11 580 in a northern CBD fringe tract (2).

Finally, there is a noticeable difference in the percentage of households that have no automobile: 45 percent and 69 percent, respectively, in the northern and southern sections. The relatively low automobile ownership in the higher-income areas to the north can be attributed to the limited parking that is available in that region, which is characterized by high-rise and townhouse development. Population density is roughly 20 000 persons/km^2 (52 000 persons/mile^2) in the north and 3378 persons/km^2 (8750 persons/mile^2) in the south. In the north, retail stores are concentrated at a modern plaza, whereas to the south, retail stores are located along (and especially at) the intersection of primary and secondary arterials (2).

For 5.6 of the 7.2 km (3.5 of the 4.5 miles) of the Chicago jitney route, King Drive is a broad parkway with four lanes in either direction. No parking is permitted on this section, so jitneys and buses need not maneuver around parked vehicles. Along the southernmost 0.62 km (1 mile) of the route (farthest from the CBD), King Drive is a four-lane street on which parallel parking is permitted.

San Francisco

San Francisco jitneys operate along a 16-km (10-mile) route through the CBD, offering service from the Civic Center through the tourist, retail, and residential areas and running southeast from the CBD to the city limits. The population within the 0.8-km (0.5-mile) band of the route is 63 000, and there is considerable retail business in the corridor. The 1970 median family income in the corridor was approximately $10 500, and 66.6 percent of the jitney-corridor households had no automobiles [the latter statistic is 34 percent in the San Francisco central city and 19 percent in the San Francisco standard metropolitan statistical area (SMSA)]. Senior citizens and juveniles constitute 41 percent of the corridor population (2).

Comparison of Jitney-Corridor Land-Use Intensities

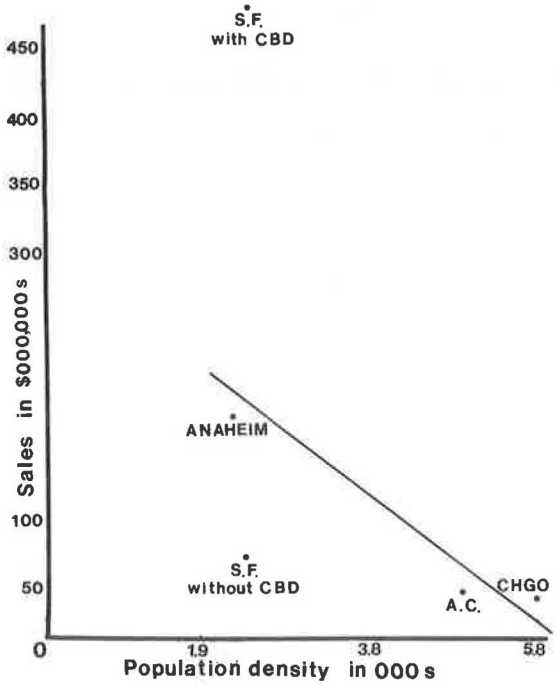
Two rough indicators are used to quantify the intensity of residential and commercial land use along the jitney corridor. For both measures, corridor width was set at 0.8 km (0.5 mile) since a frequently used rule of thumb specifies that fixed-route, nonexpress bus service draws most heavily from the residences and businesses within two to three blocks of its route. In addition, in areas of moderate- to high-intensity land use, transit routes are frequently spaced within 0.8 km of each other. Finally, the use of jitney in conjunction with some other mode—bus, for example—is discouraged by the lack of transfer privileges between jitney and other modes; potential riders must therefore walk to the route.

The first measure examined is the density of corridor population. As Figure 1 shows, the density of jitney routes varies from 2431 persons/km^2 (6300 persons/mile^2) along Mission Street in San Francisco to 4898 persons/km^2 (12 690 persons/mile^2) in Atlantic City. These densities are at least two to three times the density of most suburbs and, since trip demand is a function of population density, this suggests that jitney services may not operate successfully in the suburbs (2).

Another key factor in the suitability of jitney service for any corridor is the intensity of its commercial development. To easily quantify this, a second measure was developed from the 1967 U.S. Census of Business (3), which is a count of major retail centers along the route, the total sales, and the number of stores in each center.

As Figure 1 shows, residential and commercial development compensate for or counterbalance one another,

Figure 1. Sales at major retail centers versus population density along jitney routes.



and as population density diminishes sales at major retail centers increase. It is essential that residential and commercial users be intermixed so that trips for various purposes can originate and be completed within the corridor.

As in most market situations, jitney supply responds to demand. This can be both an asset and a liability. Jitney operators conserve their resources by not operating when demand is light; it is more difficult, however, to maintain a policy-stipulated minimum level of service. In an attempt to maintain a minimum level of service, San Francisco stipulates that drivers must not fail to work for more than 10 consecutive days without a reasonable excuse (4).

COMPETING MODES AND MODE CHOICE

Since jitney offers a significantly different level of service, it coexists and competes with a broad range of other modes. Jitney offers an intermediate level of service between conventional bus and the demand-responsive modes of dial-a-ride and taxi. Unlike conventional buses, jitneys (a) provide a seat for every passenger, (b) deviate two to three blocks from their route during periods of low demand to drop off passengers, (c) run more frequently than buses (which often results in shorter wait times for passengers), and (d) have vehicle speeds that are more comparable to automobile speeds (although speeds are slow since jitneys generally travel on congested arterials). In contrast to demand-responsive service, jitney fares are low, often comparable to bus fares, probably because of lower labor costs and the minimization of deadheading.

Atlantic City

Atlantic Avenue, the retail and office strip in Atlantic City, is serviced by conventional buses. But, since street parking is permitted, automobiles are still the predominant vehicle mode. Motels, restaurants, and other businesses that serve tourists are located along Pacific Avenue. Automobiles share the street with jitneys, but street parking is prohibited and off-street parking is available at the maximum cost of $1 for a full day or any portion of a day. Travel times for automobile users do not seem to be any shorter than those for jitney users because of the numerous and closely spaced traffic signals.

The only other mode that might operate on Pacific Avenue is taxi. In a two-day period in 1977, however, we observed only a single taxi, and even that was without passengers. Because of the linear layout of the city, most fixed-route modes deliver passengers to within 0.4 km (0.25 mile) of their destinations without a transfer. In addition, taxi rates are quite exorbitant at $0.95 for the first 0.22 km (0.14 mile) and $0.10 for each additional 0.8 km (0.5 mile), plus $0.20 for each additional passenger.

The Atlantic City boardwalk is unsuitable for the traffic of heavyweight vehicles. Lighter-weight, motorized trams shuttle tourists along the approximately 7.2-km (4.5-mile) boardwalk for a $0.60 fare. One can also engage a rolling chair—a wheeled chair pulled by a motor bike—at $3.50/half-hour.

No mode-split estimates are available for this corridor. An origin-destination (O-D) survey of Atlantic City should include tourists as well as residents to fully represent trip-making patterns since the population doubles during tourist seasons (1).

Chicago

The King Drive corridor in Chicago is serviced by four public modes: conventional bus, rail rapid transit, metered taxi, and jitney. The standard bus fee is $0.50 plus $0.10 for transfer privileges. Transfer privileges for transit users are crucial to the mode-choice decision for the trip maker who is leaving the corridor.

Metered taxis also operate in the corridor, charging $0.85 cents for the first 0.3 km (0.2 mile), plus $0.10 for each additional 0.3 km. In September 1977, when an ordinance fixed these higher fares, the previous $0.20 charge for each additional passenger was dropped as an incentive to group riding. However, taxi drivers are still legally prohibited from picking up additional passengers except at the request of the first passenger and usually refuse to carry more than four passengers.

Bus is the predominant work-trip mode in the corridor: Bus is used for 39 percent of the work trips, automobile for 31 percent, and taxi for 1 percent. In comparison with all but the most affluent and densely populated areas of the city, this is an extremely high share for taxi (5). It is our feeling that the overwhelming majority of those who reported taxi actually used jitney service.

San Francisco

San Francisco jitneys compete with automobiles, trolleys, municipal buses, and Bay Area Rapid Transit (BART). Belknap (4) has compared jitney and BART travel time and fares and concluded that, although fares are nearly the same for both modes, BART in-vehicle times are less, especially for longer trips. Jitney in-vehicle times are usually 2-2.3 times longer than those of BART. Three factors that probably result in shorter walk and wait times for jitney users are that (a) jitney stops are spaced at every block instead of every 0.8-3.2 km (0.5-2 miles), (b) jitney average headways are usually less than 4 min whereas BART headways are 12 min throughout the day, and (c) jitney stops are closer to businesses and residences, which cuts access time.

CHARACTERISTICS OF TRIPS AND TRIP MAKERS

Available information on characteristics of jitney users and the length and purpose of passenger trips is sometimes sparse. In an attempt to round out the picture, other factors are discussed here, including spacing and major traffic generators in relation to passenger-trip lengths and the types of activity centers in relation to user characteristics and trip purpose.

Chicago

Chicago's King Drive jitneys serve an area of closely spaced trip generators and varied land uses: high-rise and three-flat residences, shopping strips and malls, numerous hospitals, and park and school facilities. Trip makers were observed to use the jitney for the following trip purposes: (a) medical, (b) school, (c) shopping, (d) social, and (e) commuting to work (if both their residence and employment were in the corridor and also if the final leg of their trip was faster by jitney than by bus). Passengers were of all ages and both sexes. The average passenger-trip length on Chicago jitney is approximately 1.9 km (1.2 miles), little more than one-fourth of the total route length.

Demands per square kilometer per hour for the Chicago jitney service are given in Table 1. These estimates, and those for the Atlantic City jitney service,

Table 1. Average passenger-trip length, demand density, and productivity of Chicago and Atlantic City jitney systems.

System	Number of Jitneys in Operation	Avg Vehicle Occupancy	Passengers per Vehicle Run	Passengers per Vehicle Kilometer	Avg Passengers per Vehicle Hour	Avg Headway (min)	Passengers per Hour (all vehicles)	Demand Density (demands/km²/h)
Atlantic City								
Morning peak	65[a]	4.0[a]	12.8[a]	1.9	23.0	1.3[a]	1498	137.8
Midday off-peak	30[a]	6.3[a]	16.3[a]	2.4	37.5	2.2[a]	1125	103.4
Evening peak	70[a]	3.9[a]	11.5[a]	1.7	20.7	0.7[a]	1449	133.2
Chicago								
Morning peak	40[b]	7.0	18	2.5	46.8	1.1[b]	1872	160.6
Morning off-peak	10[b]	4.0	10	3.5	24	5[b]	240	20.6

Notes: 1 km = 0.62 mile; 1 km² = 0.386 mile².
[a] From Urbanek and Guenther (6). [b] From observation by the authors (1976).

Table 2. Costs for Chicago King Drive jitney.

Item	Costs or Revenues ($)		Percentage of Operating Cost	Percentage of Gross Revenues
	Per Day	Per Vehicle Kilometer		
Variable cost, fuel and oil	8-9	0.043-0.049	29	11.8
Fixed costs				
Lease of vehicle[a]	20-22	0.011-0.119	71	28.9
Chauffeur's license	0.027	0.0006	1	-
Total daily cost	28-31	0.158-0.168	100	40.7
Profit	44-47	0.25	-	60.6
Gross revenue	75	0.41	-	100

Note: 1 km = 0.62 mile.
[a] Includes vehicle licensing, capital costs, maintenance, and garaging.

are derived by using statistics observed and reported for both peak and nonpeak periods on average passenger transactions per jitney run, the average number of jitney runs per hour, and the number of jitneys in operation.

Demand peaks are strong in Chicago: 720 demands/km²/h (1872 demands/mile²/h) in the morning rush hours versus 92 (240) in the morning off-peak hours. Although jitney operation is most profitable when demand is steady and evenly spaced, Chicago jitney drivers have the flexibility to operate their vehicles as jitneys or taxis, and many choose to resume legal taxi operation in the off-peak periods.

Atlantic City and San Francisco

Atlantic City and San Francisco jitneys operate around the clock, shuttling tourists between hotels, restaurants, shops, and nightclubs. In addition, it has been reported that, along Pacific Avenue in Atlantic City and Mission Street in San Francisco, jitneys serve students, teachers, office workers, and local shoppers (4, 6).

Average passenger-trip lengths are not reported in the literature on Atlantic City jitneys. Based on our observations of approximately 30 passengers, most jitney passenger-trip lengths range from 1.6 to 3.2 km (1 to 2 miles) on the 3.6-km (2.25-mile) midportion of the route. Few, if any, passengers were observed to ride jitneys at the end section of the route. On the midportion, trip generators are very closely spaced so that trip purposes can be satisfied close to the trip origin.

Demand does not peak as strongly along Pacific Avenue or Mission Street as it does along King Drive in Chicago (Table 1). By using data of Urbanek and Guenther (6), demand for the Atlantic City jitney service was estimated at 576, 557, and 433 trips/km (1498, 1449, and 1125 trips/mile) during the morning peak, afternoon peak, and midday off-peak periods, respectively. Average demand for the San Francisco jitney was reported as 274 and 198 demands/km²/h (714 and 514 demands/mile²/h) for the morning and afternoon peak hours, respectively (4). These demand figures were derived by multiplying the number of jitneys observed in service by the average vehicle occupancy at a peak load point. This is a conservative estimate of demand since it assumes no passenger turnover.

ECONOMIC ANALYSIS

Jitney, in contrast to many other paratransit services, is still an unsubsidized, profit-making enterprise. Jitney drivers are in business for themselves as owner-operators or leasers of their vehicles.

Chicago

The fixed and variable operating costs given in Table 2 for Chicago jitney drivers were reported by the drivers in the fall of 1976. (Attempts to question owners of jitney cabs about their operations failed. Owners denied that their cabs operated jitney service.)

Jitney drivers lease their vehicles and operating permits for $20-22/day. They must also obtain a chauffeur's license at a cost of $10/year. These are their only fixed costs and make up 71 percent of their total expenditures. The driver purchases a full tank of gasoline from the cab owner before taking the cab on the road. When the cab is returned, the driver is reimbursed for the unused gasoline. In 1976, drivers estimated that they spent approximately $8-$9/day for gasoline. If they are accruing 185 km/shift (115 miles/shift), the cost of gasoline is 4-5 cents/km (7-8 cents/mile) and represents 29 percent of total costs.

Our observations revealed about 4 h of peak demand with an average of 47 jitney passengers/h and about 5 h of off-peak demand with an average of 24 passengers/h. If drivers transported about 300 passengers/day for a $0.25 fare, they would gross $75.00/day. If they worked 200 days/year, they would gross $15 000/year. (Note that all observations of King Drive jitney operations were made on clear, mild days.)

The Chicago jitney driver's net earnings are approximately $45.00/shift or, assuming 200 shifts/year,

Table 3. Costs for Atlantic City jitney.

Item	1969 Cost per Vehicle Kilometer ($)	Growth (%)		1975 Cost per Vehicle Kilometer ($)
		Actual Annual Rate	Total Six-Year Rate	
Fuel[a]	0.022	8.5	67	0.038
Maintenance[a]	0.029	8.1	60	0.047
Insurance[a]	0.024	4.6	31	0.032
Administration[a]	0.005	6.6	47	0.008
Fees and licensing[a]	0.005	2.1	13	0.005
Medallion[a,b]	0.004	6.6	47	0.005
Capital[a,b]	0.036	6.6	47	0.053
Total without labor	0.125	-	47[c]	0.188
Gross income	0.375	-	20[d]	0.592
Profit or labor	0.249	-	8[c]	0.404

Notes: 1 km = 0.62 mile.
Costs are based on 20 000 km/year, 100 shifts/year, and 200 km/10-h shift.
[a]From Urbanek and Guenther (6).
[b]Cost per kilometer based on methods explained in text.
[c]Growth rate calculated from ratio of 1975 to 1969 costs (or profits).
[d]Growth rate is ratio of 1975 to 1969 fares.

$9000/year. In contrast to Atlantic City jitney drivers, who net 74.6 percent of their revenues, Chicago jitney drivers net slightly less—60.6 percent (Table 2). This 14 percent difference is attributable, at least in part, to the fact that Chicago jitney fares had not increased in 20 years until 1977, when fares were raised to $0.35. Atlantic City jitney fares have doubled since 1956, in correspondence with increases in the consumer price index, which has also doubled (7).

Atlantic City

In Atlantic City, jitney operators are individual entrepreneurs. They own their vehicles and their operating permits (referred to as franchises) or medallions. The limited number of operating permits are bought and sold as a jitney operator would buy and sell his or her vehicle.

From calculations based on the frequency of service and the number of jitneys known to operate on the route at a given time, an overall route speed of 16 km/h (10 mph) is estimated. Speeds are relatively slow because of the short blocks, closely spaced traffic signals, and many turning vehicles.

It is assumed that the jitney operator drives an average of 200 km (125 miles) each day and 20 000 km (12 500 miles) each year. The jitney vehicle accumulates about 161 km/day (100 miles/day) in service but is also used off the route as the driver's transportation to and from work, for lunch, and for other incidental trips. The use of the jitney vehicle off the route is one of the few operator benefits. It is a form of indirect income, like the gratis use by employees of a company automobile or transit.

Fixed and variable costs per vehicle kilometer are given in Table 3. The 1969 costs were inflated to 1975 prices by using commodity-specific consumer price indices (8). In that same period, fares increased 40 percent, from $0.25 to $0.35. Fixed costs make up 34 percent of total driver expenditures and have increased 38 percent in 6 years. The vehicle has been amortized over 10 years. Since the value of an operating permit is assumed to keep pace with inflation, its annual cost is equal to the interest that money could have earned if it had been invested.

Variable costs, which compose 66 percent of all expenditures, have increased 61 percent in the six-year period. Both vehicle maintenance and fuel costs have increased at rates greater than the general inflation rate. If this trend were to continue, it would become increasingly difficult to economically operate so many kilometers while serving so few passengers.

The total costs of operating jitney have increased 47 percent in six years (Table 2). Despite a 40 percent increase in fares (and in revenue, assuming demand has remained constant), jitney drivers' real earnings have not kept pace. If jitney is to remain viable, drivers' earnings must be comparable to wages in other occupations that require similar levels of effort and skill.

Urbanek and Guenther (6) observed an average of 11.5 transactions/jitney run during the peak period and 16.3 during the off-peak period. Overall speed is estimated at 12.5 km/h (7.8 mph) during peak periods and 16 km/h (10 mph) during off-peak periods so that 1.8 and 2.3 runs/h are made during these respective periods. Assuming 2.5 h of peak demand and 7.5 h of off-peak demand shifts, an average number of transactions per 10-h shift is 340, or 34 transactions/h. At $0.35/passenger, average daily revenue is $119.00 for the daily 200 km (125 miles) driven.

If a driver works one hundred 10-h shifts/year, as Urbanek and Guenther (6) suggest, the annual gross is $11 900. Each driver is permitted to work 273 shifts/year by jitney association rules, but demand is sharply curtailed when tourism falls off in the winter. It is not possible to accurately estimate a jitney driver's annual salary from these data. Assuming that 450 passengers/10-h shift are carried, Lea's Compendium of Paratransit (1) estimates a driver's annual net revenue at $10 500. This implies that the driver works more than 100 shifts/year.

COST COMPARISON: JITNEY VERSUS CONVENTIONAL BUS

To illustrate more clearly the different organizational structure and labor requirements of jitney and bus operations, their component costs are compared. The average bus costs used in this comparison were developed from a sample of 32 transit companies that reported their component costs to the American Public Transit Association (8). The accuracy of the comparison would be improved if costs from more jitney services could be used, but very little information is available on the economics of jitney operations, primarily because most such American operations are illegal. Even in cities where jitneys are legal, the jitney operators' associations do not keep detailed records since each operator is self-employed and works a flexible schedule. However, even though adequate data are available only for the Atlantic City jitney, the costs of van-type operations are expected to be similar elsewhere.

A comparison of cost components illustrates the relative simplicity of jitney operation, its lower start-up costs, and the lack of income security for the driver. Jitney costs per vehicle kilometer are lower than those for bus. The differences in the cost-component breakdowns are not insignificant [see Table 4 (6, 8)]; rather, they dramatically reflect the different types of organizational structure and labor used by each mode.

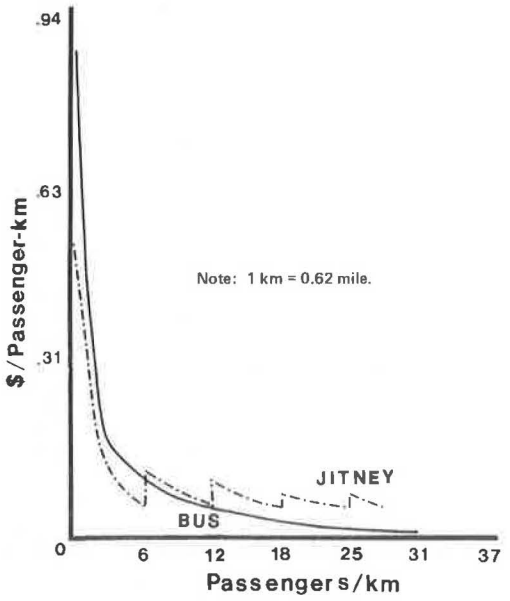
Because of the seasonal and demand-responsive nature of the jitney business, an owner-operator's vehicle accumulates approximately 20 000 km/year (12 500 miles/year). Typically, a conventional bus, which is likely to have many drivers, accumulates about 48 200 km/year (30 000 miles/year). The difference in kilometers traveled by each vehicle type will affect vehicle costs per kilometer and per year. For example, fixed costs such as annual fees, administrative expenses, and, in part, insurance decrease on a per-kilometer basis as vehicle kilometers of travel increase. On the other hand, if a vehicle is driven more kilometers, annual fuel and maintenance costs increase.

Table 4. Comparison of bus and jitney costs in 1975 dollars.

Category	Cost ($)			
	Per Vehicle Kilometer		Per Vehicle	
	Bus	Jitney	Bus	Jitney
Fixed costs				
Insurance	0.035	0.032	1 710	637
Administration	0.148	0.008	7 140	162
Fees and licensing	0.03	0.005	1 440	113
Operating permit	-	-	-	138
Capital	0.102	0.053	4 905	1062
Subtotal	0.315	0.105	15 195	2112
Variable costs				
Fuel	0.045	0.037		
Maintenance	0.148	0.047		
Labor*	0.357	0.404		
Subtotal	0.550	0.488		
Total	0.865	0.593		

Note: 1 km = 0.62 mile.
*Costs per vehicle hour for bus and jitney are $7.19 and $7.18, respectively.

Figure 2. Costs versus vehicle load factors for bus and jitney.



Probably as a result of reduced vehicle size and capacity, annual jitney insurance, licensing, fees, and capital costs are lower than they are for bus. These fixed annualized costs are $1975 for each jitney and $17 026 for each bus in operation. Figure 2 shows that, at low passenger loads, fixed costs for jitney are lower per passenger kilometer. The savings in labor costs in a jitney operation result from the lack of guaranteed wages to operators during periods of low demand. The hourly earnings of a jitney operator are competitive with those of most bus drivers. If part-time or seasonal labor supplies were to dry up or if a jitney-type service were to be provided by union drivers, much of the cost efficiency of jitney would disappear.

It is difficult to determine a standard for comparing the labor costs of bus with the profits of jitney. Bus drivers are assured a set hourly wage for a minimum number of hours each year, whereas the jitney operator's profits depend on factors such as corridor activity, the weather, and the season. In sum, the jitney operator has no guaranteed income. In the peak season, the bus driver and the jitney operator have similar hourly earnings, but the jitney driver's annual earnings are 50 percent less (Table 4).

Comparison of gasoline and maintenance costs per kilometer is complicated by the fact that local bus costs were computed by assuming an average 19.7-km/h (12.1-mph) speed. Jitneys operate at 16 km/h (10 mph) since they characteristically operate on congested arterials in high-density corridors where traffic signals are closely spaced. Fuel and maintenance costs for local buses that travel on these same congested arterials might be expected to be slightly higher than the costs given in Table 4. Nevertheless, it seems most appropriate to compare fuel and maintenance costs on a per-vehicle-kilometer basis, fixed costs on an annual basis, and jitney operator profits and bus labor costs on a vehicle-hour basis.

Administrative costs constitute 17.1 percent of the budget of a conventional bus operation compared with only 1.2 percent of the budget of a jitney operation. This stems from the intricate scheduling of bus routes and train lines, the management of a large labor force, the planning of new services, and the acquisition of the capital equipment and maintenance facilities that are needed to guarantee a high level of transit coordination and reliability. Moreover, some of the administrative costs incurred by a bus operation are assumed by the municipal and state agencies that regulate jitneys.

It is evident in Figure 3 that variable costs per passenger kilometer are a larger cost component for jitney than for bus. In general, variable costs, which are already 66 percent of operator expenditures, can be expected to increase at a faster rate than fixed costs. This does not bode well for jitney since jitney operators may have to raise fares more rapidly than the subsidized municipal bus company, perhaps eventually pricing themselves out of the market.

SUITABLE CONDITIONS FOR JITNEY

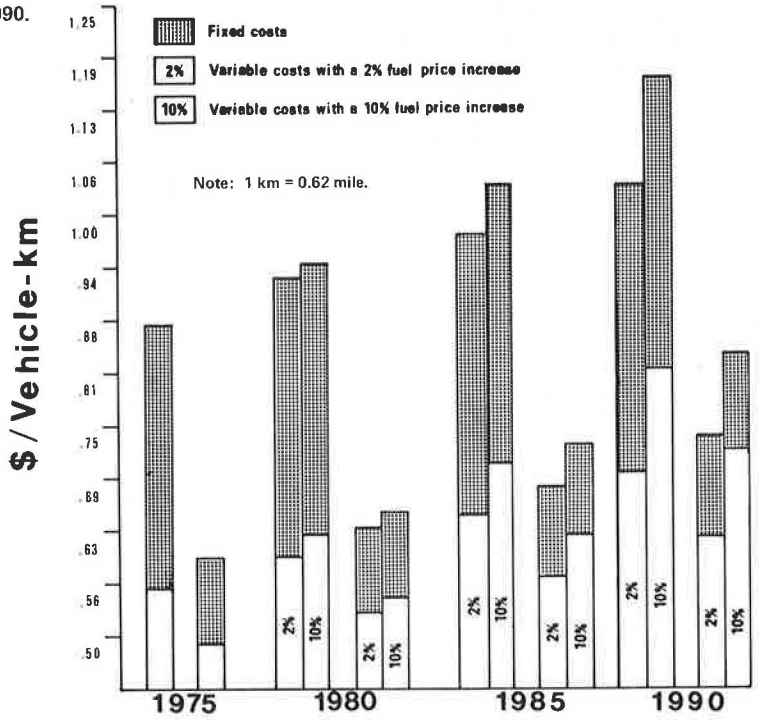
Land Use

Jitney serves a broad range of land uses: motels, tourist attractions, businesses, schools, hospitals, residences, and shopping centers. In each of these categories, the intensity of land use is high. Generally, however, it can be said that a mix of land uses increases the likelihood that trips for various purposes can be generated and satisfied within the corridor and will be distributed throughout the day. Since this land-use pattern would tend to generate travel demands that are evenly dispersed in time and space and result in fewer deadhead vehicle kilometers traveled, it is advantageous that traffic generation be evenly dispersed along the corridor. Closely spaced generators could translate into shorter passenger trips and, consequently, higher passenger turnover and more revenue per kilometer. For these reasons, jitneys are frequently successful in these types of corridors rather than in the low-density, low-trip-frequency suburban areas occasionally proposed as areas for jitney service.

User Characteristics

Jitney operations appear to be successful in corridors in which automobile ownership is low. Automobile ownership is often lower among the elderly, high-rise dwellers, visitors or tourists, and the poor. In Chicago, those too young to drive regularly use the King Drive jitney for trips to schools, parks, and shopping areas. Jitney is

Figure 3. Projected bus and jitney costs to 1990.



also advantageous for the moderately handicapped since each rider is guaranteed a seat and the first step is lower than that of a bus.

Types of Trips Served

To assume jitney profitability, passenger trips must be short—less than 3.2 km (2 miles). Though further investigations need to be made, it appears that jitney is better suited to routes of 6.4-8 km (4-5 miles) and operate most profitably in the intensely used portion of a ribbon development.

Roadway Conditions

The most heavily traveled routes are good candidates for jitneys that operate alone or in conjunction with transit during peak periods. A word of caution, however: Jitney can increase road congestion. If jitney is to be implemented, a careful investigation should be made of probable mode shifts, current and projected corridor congestion, and the feasibility of altering the operational characteristics of the roadway to facilitate jitney operation.

Most contraints on automobile use in a corridor would be to the advantage of jitney. Automobile use is often constrained in heavily used corridors. In these situations, street parking is usually restricted, off-street parking is insufficient and high priced, and various types of vehicles congest the roadway. In some intensely used corridors, a community may desire to restrict private automobiles. Fringe parking can be provided at the borders while jitneys shuttle within-corridor trip makers. If a suitable environment for jitney does not already exist, it can be created.

Economic Conditions

Because jitney offers an intermediate level of service between automobile and bus, it would be an amenity in any corridor in which user time (especially wait time) and comfort are highly valued. However, as in any operation in the private sector, the service must provide an adequate profit.

One of the advantages of jitney is low start-up costs. An owner-operator can purchase a vehicle, a license, and insurance for less than $10 000. If current prohibitions were relaxed, taxicabs could begin jitney operation almost at once. The jitney owner-operator does take risks: When demand is low, so are profits. Although the jitney operator's hourly profits are comparable to a bus driver's salary, work is occasionally seasonal or clustered in a few hours of the day. An adequate reserve force of part-time or seasonal workers (e.g., students or the semiretired) would contribute to the economic feasibility of jitney.

Jitney is not the most cost-effective choice if demand is high and buses can be filled at frequent headways. In this case, jitneys might supplement the bus service in order to reduce bus-company expenditures for labor and capital to meet the peak-hour demand.

Variable cost components, which make up approximately 13 percent of the costs of jitney operation, are all increasing at a rate greater than the general rate of inflation. If this trend continues, and especially if fuel costs increase at a rate that exceeds the inflation rate, jitney operators will be forced to increase their fares accordingly. They will then run the risk of increasing prices more rapidly than subsidized municipal bus service and eventually pricing themselves out of the market. Current jitney users may choose to give up the added comfort and convenience of the jitney and ride the bus; at the same time, some automobile users may choose to use jitney because of increased automobile operating costs.

SUMMARY

Jitney has frequently been grouped with other paratransit modes as suitable for low-density communities. Actual jitney operating experience, however, has been in high- to moderate-density areas. A major conclusion

of this study is that, unlike most other forms of paratransit, jitney is best suited to corridors of high travel-demand densities—in the range of 77-154 trips/km^2/h (200-400 trips/mile^2/h). This is because jitneys by definition are low-capacity vehicles that operate on frequent, but variable, schedules. To obtain significant benefits from these low-capacity vehicles, passenger trips must be short and passenger turnover high.

Conditions that are conducive to the economic health of jitney include the high premium the user places on wait time and comfort, an adequate supply of part-time or seasonal labor, and a relaxation of the municipal codes that prohibit jitney. In the long run, a moderation of inflationary trends in fuel, maintenance, and labor would favor jitney, but serious competition from subsidized municipal transportation services can be anticipated and may be jitney's greatest challenge.

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Dial-A-Ride in Rochester: Search for a Viable Suburban Transit Alternative

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The evolution of the federally assisted demand-responsive transportation demonstration in Rochester, New York, is examined. The history of dial-a-ride in Rochester is divided into four phases: (a) the growth period, from 1973 to late 1975; (b) 1976, the transition period, during which growth of dial-a-ride service ended and reassessment began; (c) 1977, the period of drastic cutbacks; and (d) the new demonstration, which began in November 1977. The problems and achievements of the program in each of these phases are evaluated, and the implications of the Rochester experience for suburban transit services in other cities are cited.

Since August 1973, the Rochester-Genesee Regional Transportation Authority (RGRTA) has experimented with various demand-responsive transportation operating strategies in order to develop an attractive and affordable transit service in suburban areas of Rochester, New York. As in other cities, the population of metropolitan Rochester has become increasingly suburban over the past three decades and, because of the low population density and diffused trip patterns that characterize these suburban areas, conventional fixed-route bus services can generally not be efficiently provided. In the early 1970s, RGRTA viewed dial-a-ride (DAR) as a more effective means of providing transit service in low-density areas and subsequently developed plans to implement DAR services in several suburban areas of Rochester where little or no fixed-route transit service existed. Rochester is thus a prime example of a metropolitan area in which DAR was intended to play a major role in an areawide transit system. Ann Arbor, Michigan, and Santa Clara, California, are the other two major American examples thus far.

The Rochester DAR service began on August 6, 1973, in a 25-km^2 (9.6-mile^2) area within the suburban town of Greece. Service was provided between 8:15 a.m. and 5:30 p.m. on weekdays only. Approximately 51 000 people were served. The regular one-way fare was $1.00, considerably higher than fares on most other DAR operations. Additional passengers making the same trip, however, paid only 25 cents. Customers could request immediate service or make an advance reservation. In addition to DAR, a work subscription service was implemented to Kodak Park in the southeast corner of the service area, for which the weekly fare was $7.00. One month later, a subscription service to four schools began, for which weekly tickets cost $5.00. Seven small Twin Coach buses were acquired to provide the service, which was called PERT (PERsonal Transit).

Even before service in Greece began, plans were being made to expand PERT services into other suburban areas. In January 1974, only five months after PERT service started, plans were made to expand Greece services and implement DAR systems in five other suburban areas within two years. A total PERT vehicle fleet of 70 vehicles was envisioned by February 1977. Computerized dispatching was to begin in early 1975 (1).

PERT expansion plans culminated in an October 1974 application to the Urban Mass Transportation Administration (UMTA) for a $2.6 million grant to establish a 2.5-year demonstration project in which demand-responsive services would be expanded and integrated with existing fixed-route services. The application called for the implementation of computerized dispatching in early 1975, the expansion of the Greece system and the initiation of a PERT system in Irondequoit in