

DIAL-A-BUS EXPERIMENT IN BAY RIDGES

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The Bay Ridges dial-a-bus experiment was planned and designed and is currently being operated by staff of the Ontario Ministry of Transportation and Communications. The experiment was implemented in July 1970 to demonstrate the potential of a demand-responsive transportation mode as a feeder service to a commuter rail facility. The decision to implement a feeder service demonstration project may be traced to an original recommendation of the Metropolitan Toronto and Region Transportation Study, which was conducted during the mid-1960's. This study led to the establishment in May 1967 of a commuter rail service (GO Transit) linking several suburban communities with downtown Toronto and to a limited experimental fixed-route feeder bus experiment in Bay Ridges, the eastern terminal of the commuter rail system.

Bay Ridges was chosen as the site for the feeder bus experiment largely because it was a well-delineated community with no existing transit service. Therefore, unlike most other communities served by the commuter rail service, there was no existing transit franchise to complicate the implementation of the experiment.

This fixed-route feeder system was operated from May 1967 to March 1968 when it was discontinued because of the low level of its patronage. There was thus no internal transit system operating in the community during the 2 years immediately prior to the introduction of the dial-a-bus service. Ridership on the commuter rail service, however, flourished during this period; 52 percent of the 800 or so daily person work trips originating in Bay Ridges and destined for downtown Toronto were made on the rail system. The 20-mile trip to downtown Toronto takes about 40 minutes whether by road or by rail, and a recent

household survey in the community showed that the average driver estimates his trip cost, excluding parking, to be about 82 cents, which is almost identical to the train fare. For those drivers who do pay for parking in downtown Toronto, the same survey showed that the average daily parking cost is about 80 cents.

Bay Ridges itself is typical of many modern Canadian middle-income subdivisions; 94 percent of 3,000 dwelling units are single-family houses serviced mainly by a street system of crescents and cul-de-sacs and, therefore, lacking the through streets necessary for an efficient fixed-route bus system. The gross area of the community including Frenchman's Bay is about 1,200 acres, but the actual occupied area is only 800 acres and houses a population of approximately 14,000. It is not a self-sufficient community, for there are almost no job opportunities available in the area.

The dial-a-bus service designed for Bay Ridges comprises 2 basic components. The most important is the many-to-one feeder service that operates on 20-minute cycles during peak periods and 60-minute cycles during off-peak periods. These cycle headways, of course, are governed by the commuter rail headways. Hours of service are from 5:30 a. m. to 1:00 a. m. the following day. The second service component is an off-peak many-to-few system that has a limited many-to-many capability centered on the local shopping center and operating from 8:00 a. m. to 4:00 p. m. This service was inaugurated in February 1971 to utilize some of the spare system capacity during off-peak hours. The cycle time for this service is 30 minutes.

Neither the feeder nor the local services require very sophisticated dispatching techniques. In the case of the feeder service, a potential rider simply phones the dispatcher a minimum of 1

hour before he requires service. His request is recorded by the dispatcher in a specially prepared log and then transferred either manually or by radio to the map used by the driver. The driver uses this marked-up map to plan his route through his particular zone. People requiring service from the station simply board the bus at the station and give the driver their destination addresses as they do so. Hence, as he leaves the station, the driver has in his bus a map marked with both pickups and drop offs he must make before returning to the station at the next train-arrival time.

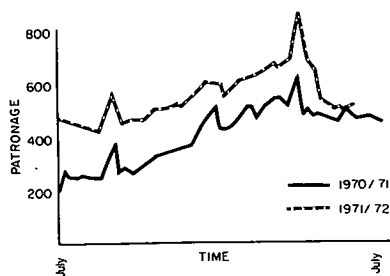
In peak periods a total of 4 buses are allocated to the service; each one covers 1 of 4 zones. This equipment requirement is reduced to only 1 vehicle in the off peak except when the local service is operational. During this latter period the addition of 1 further bus allows the operation of a 30-minute-cycle service that meets at both the station and the local shopping center. Each bus is assigned to one-half of the community and sweeps its assigned zone every 30 minutes before returning to the shopping center where a passenger can make a free transfer to the bus allocated to the other zone. The call-in time for this service is $\frac{1}{2}$ hour as opposed to the feeder service's requirement of 1 hour. Apart from this, the service's operation is essentially similar to that of the feeder service.

The buses used in Bay Ridges are basically a special conversion of a Ford Econoline van costing about \$7,500. Perimeter seating for 11 passengers and details such as the raised roof and lowered entrance step are provided. Our experience in Bay Ridges suggests that the 11-seat vehicle used there is too small and that a 15-seat arrangement would have been more appropriate.

Figure 1 shows the total average weekday patronage experienced by the experiment during its first 2 years of operation. Although typical seasonal variations and the influence of special events in Toronto are apparent, a continuous growth in patronage is exhibited. The current annual average daily patronage is about 530 although a high of 980 was reached last March. The patronage of the local off-peak service, which represents about 20 percent of the total daily patronage, has been analyzed as to the percentage of true many-to-many trips made. It would appear that only 24 percent of the trips can be so classified. Overall operating statistics for the experiment show that the average trip productivity per mile is 1.5. Interestingly enough, this figure is fairly similar to that exhibited by the Regina telebus service.

Inasmuch as a fixed-route service was operated in the community sometime prior to the introduction of the dial-a-bus, it is interesting to compare the operating characteristics of the 2 types of transit service. It should, however, be noted that the fixed-route service was limited to peak service only. The route system was a 1-way loop typical of that provided in many low-density subdivisions. The fare was initially 10 cents

Figure 1. Weekday patronage.



but was raised to 20 cents, and both use of fixed stops and flagging of the bus were encouraged. A survey done at the time showed that 60 percent of the riders could be classed as captive to the system. When a comparison is made between the trip productivity per bus mile of the 2 services, it is apparent that dial-a-bus often exceeds the productivity of the fixed-route system.

Figure 2 shows probably the most significant result of the Bay Ridges experiment, which is the change in the use of the 3 modes used to reach the GO station. Seven months after implementation, dial-a-bus had become the most popular means of getting to the GO station. The significance of this result is underlined by the situation in Bay Ridges of free parking at the station and an average dial-a-bus fare at the time of the survey of 22.5 cents. This same survey showed that some two-thirds of the present dial-a-bus patrons can be considered as noncaptive. Since the data shown in Figure 2 were compiled, there has been a further increase in dial-a-bus riders.

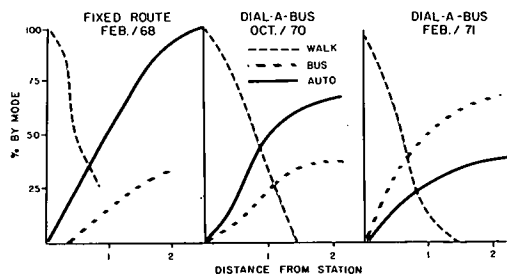
The magnitude of the impact of the dial-a-bus service on trip-making within Bay Ridges may be explained partly by the high level of service offered. As an example, the average trip time on dial-a-bus is 6.7 minutes,

which compares very favorably with that of the private automobile. In terms of coverage, dial-a-bus by its very nature covers 100 percent of any community being served. For a fixed-route system, current thinking suggests that the catchment area extends about $\frac{1}{8}$ mile on either side of a bus route. Applying this parameter to the situation in Bay Ridges shows that the original fixed-route service was within this distance of the majority of the community's residents. The considerable increase in transit riding on dial-a-bus, as compared to that on the fixed-route bus, must, therefore, be largely a function of the door-to-door service provided.

Analysis of the current ridership by time of day and direction shows the very peaked nature of the service demand. Approximately 64 percent of all riding occurs in the morning and evening peak periods. The directional split shows greater riding from the station than to it. The household survey determined that it was the availability of a ride in the 1 direction that accounted for the majority of this imbalance. Only 8 percent of the 1-way riders stated that the inconvenience of making the phone call was the reason for their unequal use of the service. The implication of the directional nature of the trip-making and also of the fact that 80 percent of the trips to the station during the morning peak are actually prebooked on a weekly basis is that there is considerable spare dispatching capacity within the existing system.

We have analyzed the dispatching demand and have determined that the practical limit for a 1-man system is about 50 calls per hour. This means that the present Bay Ridges dispatcher could handle a 50 percent increase in trip-making before a significant increase in dispatching manpower was required. Incidentally, our analysis of the dis-

Figure 2. Access mode to station.



patching demand also showed that even after several months of service about 4 or 5 information calls on the average per hour are still made.

The analysis of annual costs and revenues showed that about 50 percent of the costs are now being covered by revenue. The pertinent data are summarized below.

| | |
|--------------|----------|
| Costs | |
| Fixed | \$ 2,000 |
| Semivariable | 13,000 |
| Variable | |
| Drivers | 42,000 |
| Dispatcher | 18,000 |
| Vehicle | 8,000 |
| | <hr/> |
| | 83,000 |
| Revenue | 41,000 |
| | <hr/> |
| | \$42,000 |

The current deficit of \$42,000 is for a 6-day-a-week, 20-hour-a-day service, which is significantly more service than communities of the size of Bay Ridges usually have. If evening service were curtailed after 8 p. m., the deficit could be reduced to about \$30,000, which is not out of line with the deficits of many of the smaller transit operations in Ontario. These figures must be viewed with some caution, however. The driver's wage rate of \$3.64 per hour is below that of many public systems, and the impact of increasing this rate may be judged from the fact that 72 percent of all costs are attributable to the driver's wage rate. Further examination of the trip-making and associated costs by time of day shows that, if all capital and other fixed costs are charged to the peak-period trips, the cost per trip varies from 50 cents for the peak to \$1.36 for trips made on a Sunday; the average is 55 cents. Better dispatcher utilization could reduce this figure, for

some 31 percent of off-peak costs are attributable to the dispatcher. Costs average 80 cents per bus mile of which 24 percent is dispatching cost.

Unfortunately the homogeneous nature of the Bay Ridges community has precluded any investigation of the influence of socioeconomic factors on dial-a-bus ridership. The only factor of any significance that was determined from the household survey was the predominance of 1 car/2 driving license households among the population using dial-a-bus as compared to the total community population.

As a result of an evaluation of the dial-a-bus system that was carried out in July and August 1971, certain operational and service changes were recommended. These changes included the elimination of Sunday service, the curtailing of evening dispatching and its replacement with an answering service, and the raising of the fares from 25 cents cash and 20 cents ticket to 30 cents cash and 25 cents ticket. The changes were all implemented in May 1972. Since then, costs have obviously been reduced by the elimination of the Sunday service and the reduction of evening dispatching. Our initial impression of the changed dispatching system suggests that its effect on evening ridership is minimal. The evaluation of the fare increase impact on the other hand is complicated by the larger influence of seasonal ridership variations. A comparison of the ridership since the fare increase with that during the same period last year shows no decrease in the dial-a-bus patronage. Further analysis is required to determine what impact the fare increase might have had on the overall growth in patronage.

The following initial conclusions can be drawn from the Bay Ridges experiment.

1. Dial-a-bus can compete successfully with the private automobile for work trips in low-density areas;

2. Dial-a-bus is a premium service that will tolerate a premium fare in middle-income areas; and

3. For line-haul transit, dial-a-bus must be considered as an alternative or supplement to park-and-ride service.

For the Bay Ridges design, the minimum average trip cost is about 50 cents.

INFORMAL DISCUSSION

Question: Is weather a significant factor in dial-a-bus ridership?

Answer: The winter of '71 made people start using the dial-a-bus system. But the important point is that once people used it they stayed with it. Two-thirds of the people who use it say that they are not captive to the system but have alternative transportation. Nearly 70 percent of the people who used the old fixed-route system were captive to it; that is, they had no car. Why has this happened? One factor is trip time. The average trip time on dial-a-bus is about 6 minutes and on the fixed-route bus was about 12 minutes. The latter time did not include access time. That 6 minutes compares quite favorably to the time it would take you to get into your car and drive it from the station to your home.

Question: Is that the time in the vehicle?

Answer: That is the time from getting off the train to getting off the vehicle at your home.

Question: Is any of that time spent waiting for the vehicle?

Answer: No, the vehicles are there. You get off the train, walk a few yards, and get on the bus.

Question: What happens if you do not use the train?

Answer: The time is slightly longer, but you wait in your own home. And, if you are a regular user, you, of course, design your schedule around the regular vehicle-arrival time.

Question: What is the average wait per passenger?

Answer: We require a 1-hour calling time, but on the local service we reduce that to $\frac{1}{2}$ hour. We do not advertise that we will accept people on a shorter calling time than that; but, if there is capacity on the bus and it is in the right place, we can pick up people within a few minutes of the call-in time.

Question: What is the average trip time to the train station in the morning?

Answer: About 2 or 3 minutes for those who have booked regular service to meet the train.

Question: Do the buses, then, essentially pick up the same people every day and carry them to the same place?

Answer: During the morning peak, 80 percent of our riders are regular riders who are booked by the week.

Question: How many hours is each bus driver on duty?

Answer: We use some part-time drivers for the peaks, but those who are full time work for 8 hours.

Question: What share of the households have used dial-a-bus at any time?

Answer: Our household survey indicated that about 70 percent of the households have tried the dial-a-ride system.

Question: Has any consideration been given to a subscription service to eliminate the dispatcher?

Answer: We have discussed this but feel that there is enough work for the dispatcher because there are enough trips

being made that are not on a regular basis.

Question: When the weather is bad and there is an extra heavy load of people so that the driver cannot make his rounds in time to catch the train, what happens?

Answer: The dispatcher has the final say in controlling the buses, and he can, in those circumstances, reallocate his own boundary. For instance, a zone 1 bus might pick up some people in zone 2 if there is a heavy demand. If there is a heavy demand throughout the community, we do have a standby bus that we can use if necessary.

Question: How many dispatchers do you have?

Answer: We have 3; 2 are on duty during the day.

Question: What is the average fare?

Answer: Before the increase, the average fare was $22\frac{1}{2}$ cents. Now it is about $26\frac{1}{2}$ cents.