CANADIAN TRANSPORTATION RESEARCH FORUM
LE GROUPE DE RECHERCHES SUR LES TRANSPORTS AU CANADA

PROCEEDINGS OF

SEVENTEENTH ANNUAL MEETING

CANADIAN TRANSPORTATION RESEARCH FORUM

Volume 1

MONTREAL, QUEBEC

MAY 26, 27 & 28, 1982

Compiled by: R. Lande
&
K. Tansey

GOOD INFORMATION
TRANSLATES INTO
FUEL CONSERVATION

By

Mary S. Whelan, M.A.
Head, Public Information
OC Transpo

Presented to
Canadian Transportation Research Forum
May 26-28, 1982

INTRODUCTION

Energy conservation is one of the principal themes of the 1980's and we in the Transit Industry are conscious of the rôle that we can play in energy conservation. However, it is both timely and wise to recognize that the direct approach to the subject which is used by conservation groups and governments in influencing public attitudes is not the only -- and probably not the best -- approach for transit operators. That species of public appeal must be coupled with a provision of transit service which will be far more effective in changing people's habits than the glossiest advertising package.

The transit industry in Canada consumes roughly one billion litres of petroleum fuel annually. That is only 3% of the energy for the total Road Transportation sector, whereas passenger cars consume an estimated 80% of the Road Transportation energy which is consumed in the form of oil.[1] An estimated 18 billion litres are consumed by private-use automobiles each year, with half of that used for work trips alone. Figures like those make it imperative that the public transportation sector participate in every way it can in educating the Canadian public to the available means of Energy Conservation and, more importantly, in weaning individual Canadians from the private automobile for trips that can more efficiently and more economically be made on a public transit vehicle.

In Ottawa-Carleton, the average trip made within the Regional Municipality is 8.5 kilometres in length.[2] If an individual were to take half of those trips on a Regional Transit Commission bus, rather than in the "average" car, he would save 500 litres of fuel in a year. With a population of roughly one half million, the potential for conservation is great.

OC Transpo is Ottawa-Carleton's Regional Transit Commission. It provides transit service, 18 to 21 hours a day, throughout the urbanized portions of Ottawa-Carleton, including five cities, one village, and portions of the surrounding townships. The Transit Commission takes every "promotional" opportunity to remind individuals living in its service area that the significant potential for fuel conservation can be realized with greater use of transit service; but the Commission also recognizes that promotion alone will not effect the desired change of habit.

It is a happy fact of the Canadian reality that our standard of living allows us the option to use public or private transportation. It is, therefore, imperative that transit operators tempt their public with service, not words.

---

[1]Based on unofficial figures from data gathered by Statistics Canada and the Department of Energy, Mines and Resources.

[2]From data collected by the Regional Municipality of Ottawa-Carleton.

Since the regionalization of transit service in Ottawa-Carleton in 1972, OC Transpo has increased its ridership by 125% and its trips per capita by 62% in a service area less densely populated than the urban core served prior to Regionalization. Residents of Ottawa-Carleton averaged 160 trips per person in 1981, as compared to the Ottawa Transportation Commission's 99 per capita trips in 1971. That translates into an additional saving of 90 litres of fuel per person in 1981; or 60 million litres in Ottawa-Carleton, while adding only 15 million litres to the fuel consumption of OC Transpo.[3]

SERVICE GROWTH

The rapid growth in transit service experienced in Ottawa-Carleton since 1971 has resulted from the expansion of the service area from 142 km^2 to 380 km^2; a growth in population served from 360,000 to 493,000; and an increase in service kilometrage from 14 million to 45 million. It has also been aided by a favourable political climate which has set out in the Region's Official Plan as one of its major transportation policies to favour transit improvements over new road construction. In 1973, for example, the Region spent $21.8 million on roads and $1.6 million to support transit; whereas in 1980, it spent $35 million on roads and $26.2 million on transit.

During the same period, transit's share of the weekday 24-hour travel within the Region's urban area increased from 13% to 27% and in the peak hour from 25% to over 40%.[4]

Some of the transit measures implemented over the past several years to reach these ridership levels include --

1) the introduction of new service types (Express, dial-a-bus)

2) the introduction of priority measures (exclusive bus lanes, bus malls, express lanes, bus priority ramps)

3) the implementation of flexible working hours and parking charges by the Region's major employer

4) and the adoption by the Transit Commission of corporate policies and objectives which recognize the importance of service availability and reliability in attaining the Region's transportation goals as described in the Official Plan.

The success of these measures is apparent in the appraised results:

More than 70% of all people working in the downtown core now use transit to travel to and from work with the result that the number of automobiles parked downtown is now less than it was in 1971, despite an increase in the total number of people entering and leaving the area...[5] (Exhibit 1)

---

[3]Calculated on fuel consumption of 18.5 litres/100km for an average automobile in city driving.

[4]Transportation 81, Transportation Department, Regional Municipality of Ottawa-Carleton, December 1980, p. 12.

[5]Ibid.

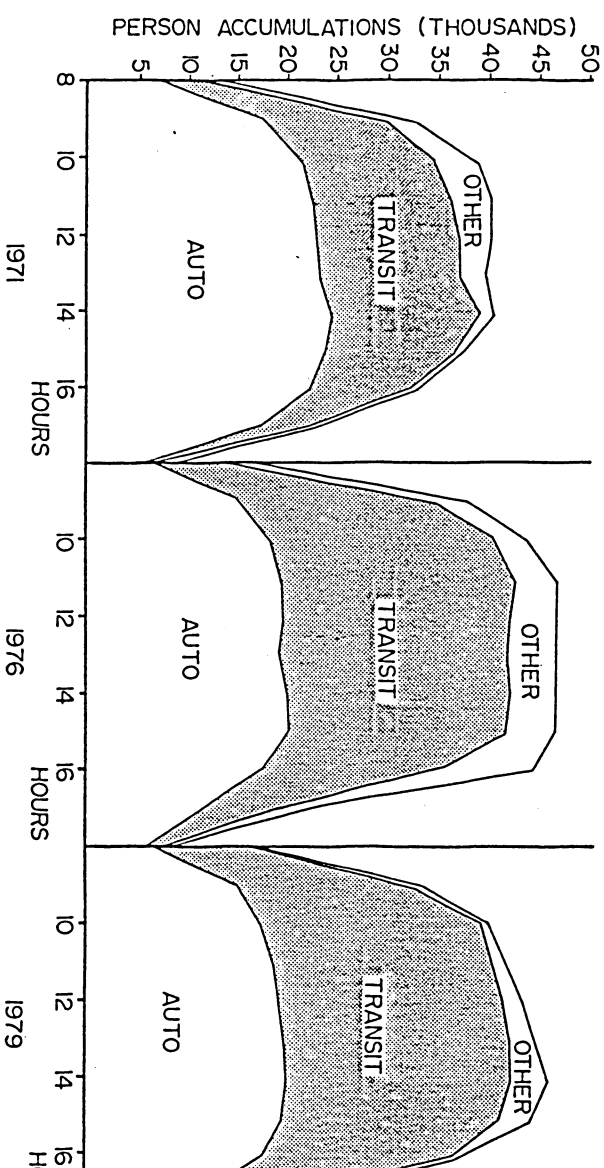

EXHIBIT 1 - PERSON TRIP ACCUMULATION IN CENTRAL AREA BY MODE

On a national basis the fuel saving potential is proportionally greater.

> . . . a shift of only 5% of the urban travellers to public transit so that 21% of all trips would be made by transit compared to 79% by automobile would reduce the overall national requirement for petroleum energy in the urban travel sector by about 4%. This would occur because while the growth in transit travel would increase this sector's 5% share of petroleum by 31%, there would be a corresponding reduction of 6% in the present 95% share of petroleum consumed by the automobile.[6]

Clearly, this makes transit a much more important means of fuel conservation than is sometimes recognized. Whatever the transit industry can do internally to improve the efficiency of its own energy use represents only a very small proportion of the industry's potential to reduce national consumption. The industry is, of course, experimenting with and testing and implementing a variety of internal conservation methods but its real instrumentality in fuel conservation lies in its ability to provide an alternate to the private-use automobile.

In recent years, slowed regional population growth in Ottawa-Carleton, combined with a more urgent need for Energy Conservation and a less prosperous economy, has made transit officials conscious of their responsibility to continue to increase transit ridership through means other than service expansion. Service efficiencies have been given a very high priority; so, too, has the attraction of increased ridership to the least well utilized service -- principally, the off-peak service.

INFORMATION TRANSLATES INTO RIDERS

In 1981, one million of OC Transpo's 2.1 million vehicle hours were expended during peak periods. In a given week, 48% of its bus hours were used up in 30 hours of peak operations (3 hours of a.m. peak and 3 hours of p.m. peak operation each weekday), while the remaining 110 service hours (including mid-day, evening, and Saturday and Sunday service) shared 52% of the bus hours. The roughly 700 peak-hour buses carried an average of 45 passengers per vehicle hour and had an estimated 0-5% spare capacity; whereas the smaller off-peak fleet of 85 (on Sunday) to 300 (weekday mid-day) buses carried 28 passengers per vehicle hour, with a spare capacity of roughly 60%. Because of the small spare seat capacity and maximum fleet utilization during the peaks, any significant increase in ridership during those hours is costly, at an estimated 71.7¢ per passenger in 1981. In contrast, the spare capacity in scheduled vehicles in off-peak service means that additional passengers are carried at no additional cost to the Commission (in fuel, vehicles or man-hours). In consequence, every effort is made to attract new off-peak passengers, and to shift passengers from peak to off-peak use, thus freeing up space for new peak-hour passengers.

---

[6] OC Transpo, "Computerized Transit Schedule Information: Preliminary results from the Ottawa-Carleton installation," Study performed for the Ontario Ministry of Energy, July, 1981.

It is manifest that, in order to attract off-peak passengers, the Transit Commission must provide an off-peak service which is more than adequate to meet the demand. It is in the off-peak that choice tends more towards the family car than towards transit because of more favourable driving conditions (the availability of the car, less traffic congestion, etc.) and less favourable transit service conditions (less frequent service, less direct service, more transfers with poorer connections). To alter the service conditions by increasing service far beyond the need would be inefficient and costly and would produce some of the ill effects (traffic congestion, pollution, increased fuel consumption) whose absence are off-peak travel's greatest attraction. The solution must be found in elements which make off-peak transit use more attractive, without increasing the level of the service itself.

OC Transpo has as one of its corporate objectives,

> To provide public information services that continually increase the passenger's certainty and confidence in his use of the transit service by providing schedule, route and use of system information on a system wide and at bus stop level of detail.

In keeping with that objective, the Transit Commission has, over the past two years, embarked on a new comprehensive programme for the provision of transit information; has measured the results of the earliest components; and, based on those measurements and on the recommendations of a separate study, has expanded the programme and made commitments to further improvements and expenditures in the area of Transit Information.

The components of the information package were designed to provide as complete information as possible to the transit user in order to minimize his uncertainty about the system and his inconvenience in using it. One of the main objections to the use of off-peak service is the uncertain and uncomfortable wait at the bus stop. The passenger can, of course, with reference to a printed schedule, time his departure so as to avoid or minimize that wait; however, that assumes

- that he has a printed schedule in his possession
- that the schedule he has is up-to-date and that he knows it is up-to-date
- and that the schedule adherence of the buses is somewhere in the range of good to perfect.

The probability of all those factors being present is not high. Urban growth, population shifts, an extreme climate and myriad other factors dictate the necessity for frequent service review. Furthermore, service reviews allow the introduction of service efficiencies. All of which lead to frequent schedule change. In the case of OC Transpo, routes and schedules are reviewed quarterly, with major route adjustments made in the summer months, and schedule and minor route changes made at the beginning of each new season. One deleterious consequence of the frequency of change is a distinct lack of public confidence in printed transit information.

The situation is further complicated by the interlining and intralining of many routes resulting, from the Commission's point of view, in an operating cost saving of roughly a million dollars annually, and from the passenger's point of view, in irregular headways which make bus schedules impossible to predict and difficult to remember.

A major component of the information package implemented by OC Transpo in 1980 answers precisely this problem. An automated schedule information system, always up-to-date and accessible to the passenger from his home, was introduced in one-third of OC Transpo's service area. The system provides information to the bus stop level of detail and, in case of poor schedule adherence, provides status information to the caller. Measurements were taken before and after implementation of the system to determine its effect on ridership and on the existing overload in the conventional Information Centre.

"560" Automated Schedule Information[7]

The automated schedule information system, called "560," simply requires that the passenger dial 560 plus the four digits of his bus stop number (which was mailed to his home and posted on his bus stop) to access up-to-minute schedule and status information, precise to his bus stop. The system is simple to use; is very popular with and highly utilized by OC Transpo's passengers; and has had an almost immediately measureable effect on ridership.

Because it is difficult to attribute any increase in ridership to a specific cause in a situation where there are many external stimuli, particular care was taken to ensure as clear a picture as possible of the effects of the "560" system on ridership.

The impact on ridership was measured in two ways: a comparison of ridership growth in an east-end test area (Exhibit 2) of Blackburn Hamlet with that in a similar west-end control area of Beaverbrook in Kanata; and a comparison of ridership growth on routes wholly within the "560" area with ridership on similar routes wholly outside the "560" area.

While OC Transpo was committed to improving its public information as a means of increasing ridership, the Province of Ontario also recognized the "560" project as a potential energy saver and totally funded not only its implementation but also subsequent ridership studies. While the Ontario Ministry of Transportation and Communications was interested in "560's" usefulness in improving information and ridership, the Ontario Ministry of Energy funded a study of its impact, underwriting the costs for OC Transpo to modify its passenger counting software and to analyse the ridership counts. The Ministry of Energy was interested particularly in its potential to save energy by diverting automobile users into the transit system.

This could only be determined by very careful counts of ridership so that both the portion of growth attributable to "560" and the association between calls to a particular "560" bus stop number and boardings at that stop could be identified. This level of precision required adjustments to OC Transpo's automatic passenger counting system to allow the imputation of data for missing bus runs and the isolation of passenger boardings and alightings within pre-determined areas and route sections.

---

[7]More detailed descriptions of "560" and of its early effects on ridership have previously been published. See specifically, "Better Information Equals More Riders," presented by John A. Bonsall, at CUTA, Quebec, Quebec, June, 1981; and "Automated Passenger Information, Implementation and Early Results," presented by Mary S. Whelan, at APTA, Sacramento, California, April, 1981.

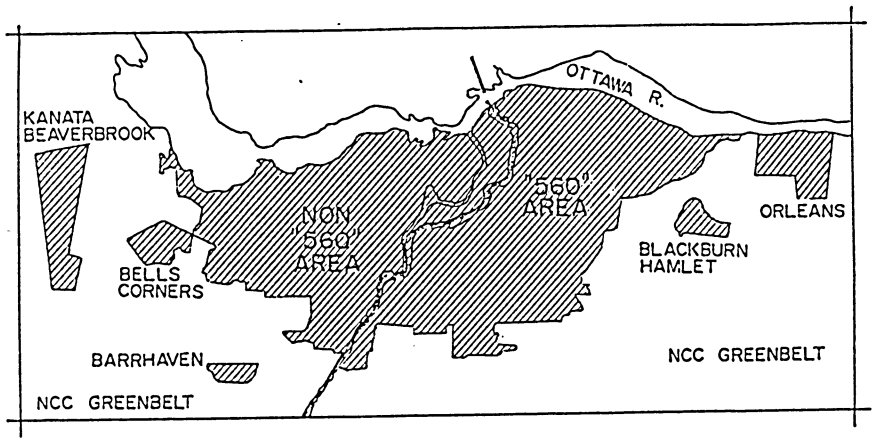

EXHIBIT 2

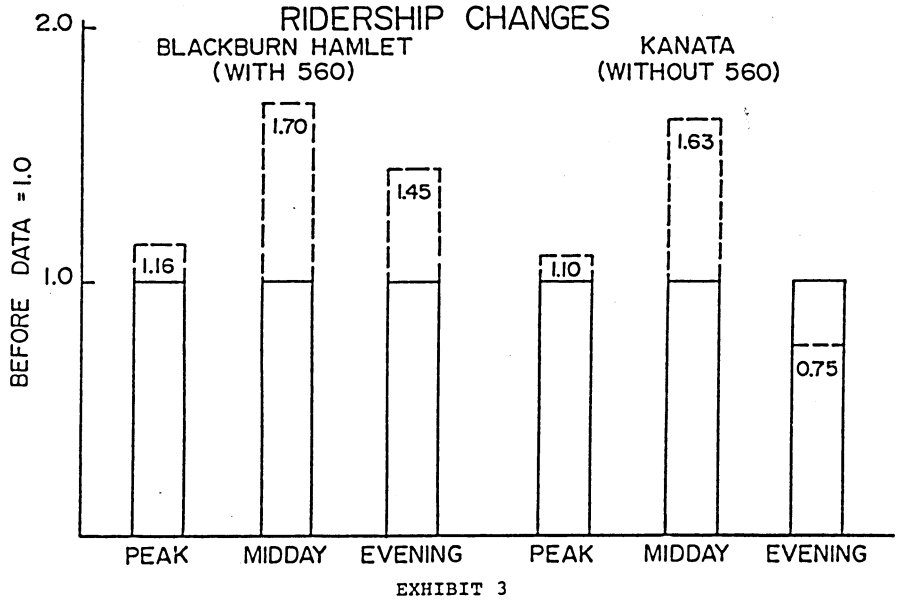

EXHIBIT 3

OC Transpo has forty-seven of its 750 buses equipped with automatic passenger counters which are rotated through the service so that a count is attempted for every trip once during each three-month booking period. The passenger counters identify the total number of persons on the vehicle at any point along the route, determined by counting individuals boarding and alighting and recording those figures in association with actual time and the kilometrage which the bus has accumulated since leaving the garage that day. This information, coupled with fare counts, pass surveys and spot-counts, provides a fairly accurate picture of ridership totals and of trends in unlinked trip patterns.

For the ridership comparison in the two test areas, passengers boarding in each community were carefully counted both visually and automatically and information calls originating from those communities were recorded for two weeks in the spring and two weeks in the summer. "560" was implemented in September and counts were taken again in early winter and in mid-winter.

Those two communities also received special mailings from OC Transpo: the eastern community was mailed advance information about "560"; and the western community received a general invitation to use transit, designed to off-set any unfair advantage to the eastern community which might result from the introduction of transit literature into the home.

Between April 1980 and January 1981, the increase in ridership in the "560" test area was greater in all time periods than that in the control area without "560" (Exhibit 3). In fact, evening ridership in the control area actually decreased 25% as is usual during a Canadian winter, whereas evening ridership in Blackburn Hamlet (with "560") increased by 45%. Midday trips in Blackburn Hamlet increased by 70% as compared with 62.9% in the control area; and peak-hour trips by 15.9% as compared with 10.3%.

There is, of course, the danger that the percentage increase may be distorted by the small size of the sample. The total ridership sample for a typical January day originating in the test area of Blackburn Hamlet was 1639 and in the control area of Kanata was 786. On the other hand, it is certainly significant that the greater growth was attained in a neighbourhood which already had a considerably better market penetration than its similar control neighbourhood. The daily ridership in the eastern community increased in those months from 457 passengers per 1000 households to 568 passengers per 1000 households; during the same period Kanata's daily ridership increased from 232 passengers per 1000 households to 269 passengers per 1000 households.

For the comparison of ridership on routes wholly within and without the 560 service area, data was collected by the on-vehicle passenger counters in the September to November period in 1980 and in February and March 1981. In the 560 area, approximately 24,000 daily riders were measured and in the non-560 area, about 19,000 daily riders were measured.

The results (Exhibit 4) show that overall ridership declined on the non-560 area routes by 2.1% compared to an increase of 2.2% on the 560 area routes. Stratification of the data by peak and off-peak periods shows that in the peak periods, the ridership changes were +3.3% in the non-560 area and -2.8% in the 560 area. These changes can be contrasted with the off-peak results that show a decline of 7.9% in non-560 and an increase of 11.8% in the 560 area. On the basis of these figures, the minimum ridership increase attributable to the 560 system is 2.8% overall and 8.2% in the off-peak periods.

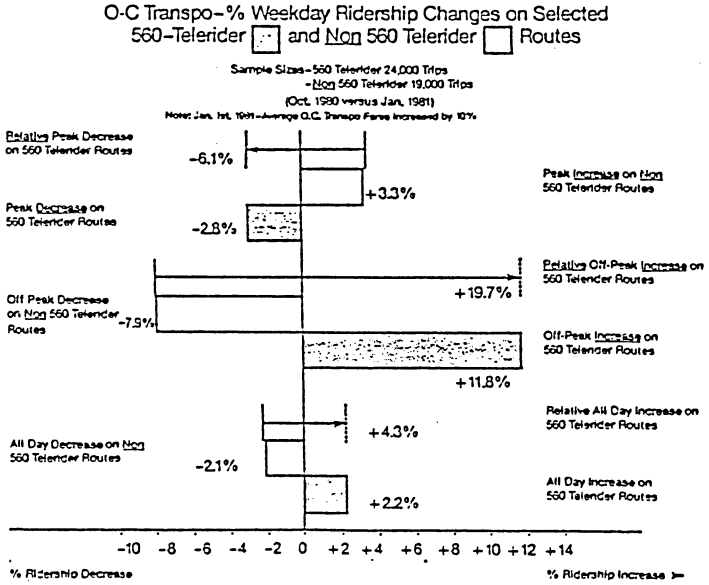

EXHIBIT 4

Armed with such striking evidence of "560's" impact on ridership, and cognizant of the fact that this is a far less costly way of providing transit information than with human operators, the Commission expanded the system region-wide late in 1981. A second marketing campaign was mounted, including the use of the media and of householder mailings with the result that over a period of three months, calls into "560" increased sixfold. Before the system's expansion, "560" was handling approximately 80,000 calls per month; in November of 1981, when the expansion was complete, but before any marketing was attempted in the expansion area, calls increased to 129,000; with marketing in December and January, the calling rates jumped to 279,000 and 527,000. Even if we speculate that as many as 25% of the new calls resulted from first time "experimenters," the system still handled a third of a million legitimate information calls during the month of January.

At an average rate of 65 seconds per simple schedule call into OC Transpo's Conventional Information Centre and allowing an additional 43 seconds of idle time between calls,[8] with a steady stream of evenly spread calls, a third of a million calls would have required over 10,000 man-hours, or an additional 6 operators. Furthermore, February's experience indicates that the calling rates for December and January were not greatly inflated by the marketing programme associated with the expansion of the system. A total of 433,462 calls were logged by the system in February, with weekday averages of 15,527, Saturday averages of 17,519, and Sunday averages of 10,998 calls. As indicated earlier, the highest calling rates per rider are for the periods of least frequent service. The Sunday rate for February, for example, represents one call to "560" for every four riders, and, assuming two trips per passenger, one call to "560" for every two persons using the transit service.

CONVENTIONAL INFORMATION CENTRE

An overloaded Conventional Information Centre was yet another factor in OC Transpo's determination to improve public access to transit information. A study of the Centre, conducted in 1981, resulted in a consultant's recommendation for increased staff, improvements to the telephone equipment, access to automated schedule and route information for the staff, and a transfer of groups of information calls to automatic systems.

The recommendations for improvements in Information Services were based on evidence of a significant capacity problem (Exhibit 5) and on a $4 estimated "value" of a successfully handled information call.[9] Although in the busiest hour of a normal day, only 10% of calls were being blocked out, 62% of all calls received a long recorded wait message; and on the worst day studied (Easter Monday, with holiday bus service), almost 8000 calls were attempted, with less than half of them answered, and only 19% of them answered with a less than 20-second delay.

---

[8]These average times are based on a 1981 study of OC Transpo's Information Service carried out by Teleride Corporation.

[9]Based on the finding that "for 26% of the telephone enquiries OC Transpo provides an essential service which has little influence on transit volumes, revenues and costs; for 74% . . . builds or . . . retains off-peak volumes; 37% of enquiries should result in significant net revenue increases . . . while 37% of enquiries will stimulate off-peak travel without corresponding revenue increases.
"Assuming that only the 37% of enquiries for off-peak information who pay by cash or ticket generate (or maintain) additional revenues (while the other 63% are neutral) and assuming that each such enquiry results in 25 additional (or maintained) trips spread over 5 years . . ." from OC Transpo Tele-Information Study, September 1981, p.10.16.

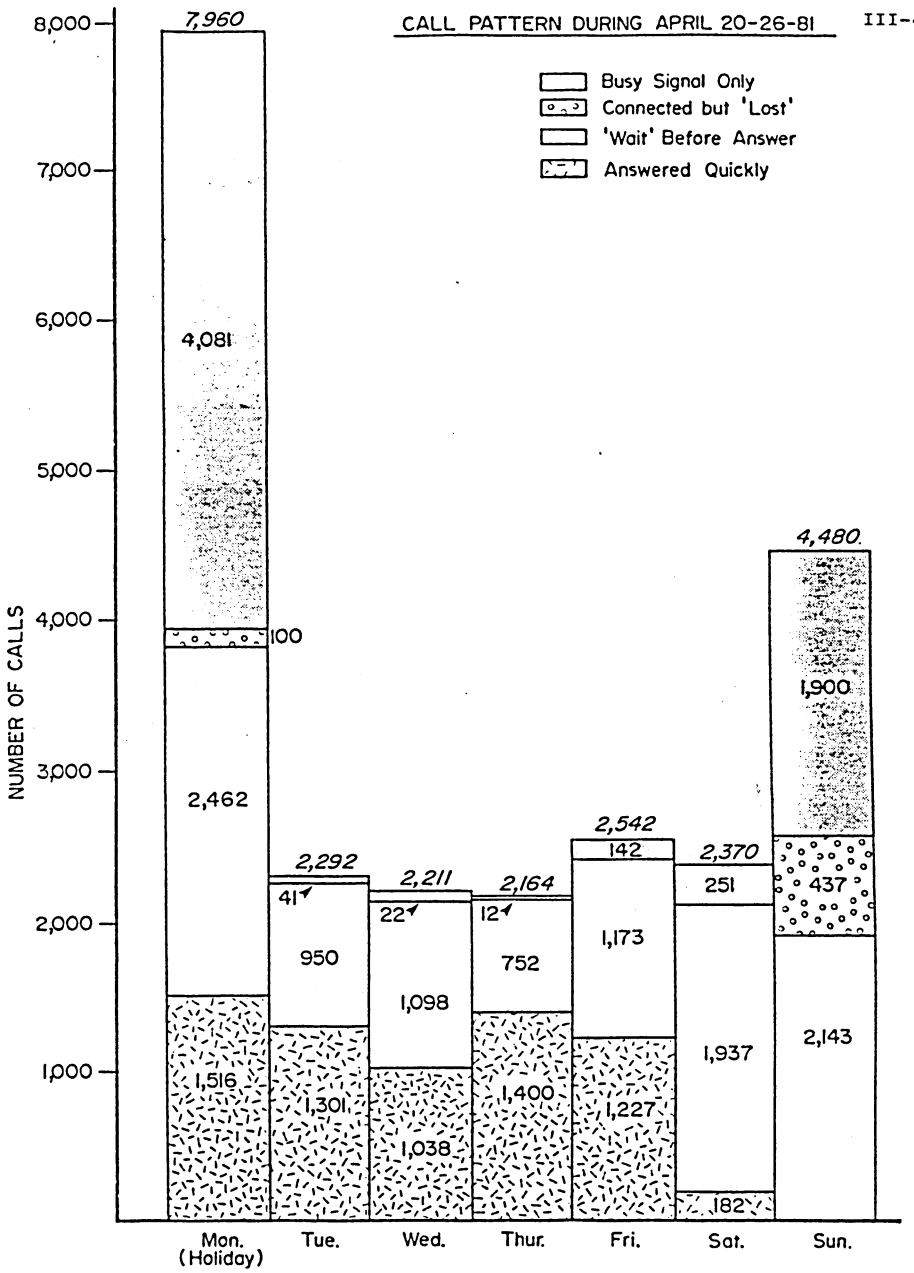

EXHIBIT 5

Even prior to the completion of that study, it was apparent that the introduction of the "560" was having some effect on the nature of the calls going into the Information Centre, and hence on the overall load. In the year prior to the introduction of "560" to the eastern portion of the region, OC Transpo's Information Centre handled over 650,000 calls, an estimated 40% of those for schedule information. Six months after the introduction of the automated system east of the Rideau River, counts showed that, whereas complex calls (that is, calls for route information or information about more than one service) were about equal from the area east of the river and the area west of the river (28% and 27% of all calls respectively), schedule calls from the area without "560" were received at twice the rate of schedule calls from the area with "560" (24% and 12% of all calls respectively). It is apparent that even in the very early months, the introduction of "560" did relieve the Conventional Information Centre of a number of calls which did not require a human response.

The expansion of the automated schedule information system throughout the transit service area resulted in a further, measureable change in the type of calls into the Conventional Centre. In January and February of 1981, with "560" operational in approximately one third of OC Transpo's service area, 37.6 and 36.7 per cent of the calls into the Conventional Information Centre were simple requests for schedule information. In those same two months this year, immediately following the expansion of "560" throughout the service area, schedule calls accounted for only 33.75 and 33.08 per cent of the calls into that Centre. The real test of "560's" ability to relieve the Information Clerks of schedule calls will come with the first service change after the system's expansion.

The Conventional Information Centre has undergone some other changes as well, and will, within the next few months, see several more. Staff increases have allowed the Centre to better cover the busiest calling hours, and the amalgamation of the Centre with another clerical group has allowed a diversification of tasks and has provided a back-up group to help handle the seasonal peaks in information calls. Within this calendar year, Information Clerks, who already have monitors showing the "560" status messages on their desks, will have computer terminal access to schedules and route information. Within the next five years, as part of OC Transpo's TICCS -- Transit Information Communications and Control System -- Information Clerks will have access to real-time schedule information, as will members of the public who dial "560" and their bus stop number.

During this calendar year, Information Services will also benefit from the installation of computerized telephone switching equipment which will immediately provide management reports, call sequencing and a variety of overload telephone strategies. This equipment will also, ultimately, allow Information Clerks to transfer calls directly to a computerized response, using the automated voice response system associated with "560" and, of course, using the "560" database and programming to select the appropriate response for the question asked by the caller. With this system, the Clerks will be able to receive the request for information, call up the appropriate response and have the voice response system vocalize the reply while the Clerk goes on to the next call.

The combination of improvements being introduced into OC Transpo's Conventional Information Centre during 1982 are expected to add as many as 19,000 man-hours to the service and increase its capacity by 60%. That total is comprised of an additional 9,870 man-hours due to hirings and an estimated 9,100 hours which can be gained by the addition of other clerical functions to the Information Centre's work-load in combination with back-up for Information calls from another clerical group. In addition, by automatically relieving the Service of even 10% of its simple calls, some 525 man-hours are made available for the more valuable complex calls.

If all the elements of the improvement package are implemented in Information Services, the entire package is expected to be worth as much as one million dollars per year to the Commission in newly generated revenue.[10]

INCREASED INFORMATION = REDUCED FUEL CONSUMPTION

In 1982, with an increased 60% capacity in the Conventional Information Service, the potential is there for an additional half million information calls. Assuming that the current 57% ratio of route information calls to total information calls is maintained, and assuming that each route information call generates 5 trips per year according to the formula used earlier (footnote 8), those calls will generate 1,425,000 trips.

Even if the majority of the 26% of the peak-hour enquiries are for existing commuters changing their trip patterns, the balance of the new calls, 1,073,000, still have the potential to replace 1.1 million litres of fuel which would have been consumed had the trips been made by private automobile with an average occupancy of 1.5 passengers. It is conceivable that these extra trips could be made by passengers using the spare capacity in OC Transpo's off-peak services, hence requiring no additional expenditure to the Commission and no additional fuel consumption. But even if every additional passenger required an increase in service to maintain the current average occupancy of 14 passengers, the fuel saving would still be 830,000 litres.

CONCLUSION

In a position paper addressed to the Federal Government, the Canadian Urban Transit Association, in June of 1981, urged support for the transit industry and pointed out that

> Over 40 percent of the transportation sector's petroleum consumption, . . . is consumed by automobiles travelling within the boundaries of Canada's urban municipalities. Since some three quarters of Canada's urban population is also served by public transit, . . . public transit provides an opportunity to influence between 15 and 29% of the total petroleum consumed in Canada . . . . .
> . . . . . .
>
> Today, Canadian urban public transit systems are carrying approximately 1.2 billion trips annually or about 15% of all the vehicle-person trips, 24 hours a day, in the areas they serve. In the larger municipalities, this market share ranges from 27 to 30% and it reaches almost 50% in peak hours. Furthermore, while carrying 16% of all trips, public transit consumes less than 5% of the petroleum used in urban person travel.
>
> Clearly public transit is several times more energy-efficient than its competitor, the private car. Because of this greater fuel efficiency, a shift of only 5% of the urban travellers to public transit would reduce the overall national requirements for petroleum energy in the urban travel sector by about 4%.[11]

---

[10] Ibid., p. 16.2

[11] "Urban Public Transit," An Opportunity for the Government of Canada, Canadian Urban Transit Association, Quebec City, 1981, p. 3.

The transit industry is a significant contributor to fuel conservation in Canada, and has the potential to provide even greater savings. Its great potential will only be realized, however, with public support at all levels, from governments and from the individual. The industry's greatest likelihood of winning the private individual's support lies in its realized ability to provide him with a useful service -- a service which furnishes the trips he wishes to make, with as little inconvenience as possible, and with readily available information about the service, so that he knows of its existence, knows its details, and recognizes its benefits to himself.

BIBLIOGRAPHY

Bonsall, John A. and Mary S. Whelan. "Better Information Equals More Riders." June, 1981. Pp. 1-54.

Canadian Urban Transit Association. " 'Urban Public Transit,' An Opportunity for the Government of Canada." Quebec: July, 1981. Pp. 1-9.

OC Transpo. "Computerized Transit Schedule Information: Preliminary results from the Ottawa-Carleton installation." Study performed for the Ontario Ministry of Energy. July, 1981. Pp. 1-44.

Teleride Corporation. OC Transpo Tele-Information Study. September, 1981. Pp. IV. - 16.10.

Transportation Department, Regional Municipality of Ottawa-Carleton. Transportation 81. December, 1980. Pp. 1-104.

Whelan, Mary S. "Automated Passenger Information, Implementation and Early Results." April, 1981. Pp. 1-32.