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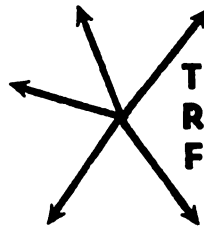
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TRANSPORTATION RESEARCH FORUM

An Exercise in the Management of Traffic Peaks

by G. C. Campbell*

NONE OF YOU will be particularly surprised when I tell you that in common with the experience of all other forms of public transportation, VIA CN passenger traffic is also subject to peaking. That is to say, passenger flows vary by time of day, by day of week and by season of the year. These variations are caused by such factors as:

- 1) Normal sleeping and waking cycles
- 2) Business and work shift cycles
- 3) Statutory and other holidays
- 4) School and university breaks
- 5) Seasonal changes and weather
- 6) Timing of major events or attractions

In virtually every case, tradition or overriding necessity dictate the pattern and rhythm of life. Transportation must respond as best it can. We can do nothing about the weather nor about our tradition of summer vacations. Nor can we change the hours of business or the fact that more people enjoy leisure on Saturdays and Sundays than say on Tuesdays and Wednesdays. Even during wartime emergencies it is virtually impossible to interrupt this ebb and flow to any appreciable extent. Many have tried and few have succeeded. I am not even certain that if we could change some of the more critical influences, as a society we might not lose more than we would gain. I do not count myself amongst those who say that all life must be ordered and regimented so as to optimize the use of passenger transportation equipment, whether railway cars, airplanes or subway cars.

That is not to say that we are not most anxious to level peaks to the extent possible through use of all reasonable methods open to us. These would include the following possibilities.

- (a) Pricing action
- (b) Increased frequency of service
- (c) Scheduling of equipment maintenance.
- (d) Over-utilization of equipment at peaks
- (e) Rentals of equipment from other carriers
- (f) Special traffic routing

In other words, our objective in ideal terms is to come as close as possible to

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evening out the ebb and flow of traffic so that we carry close to an average number of passengers on every train. I am certain that this is the ideal of almost every transportation company. I could also point out that very few if any transportation companies have ever come even close to that ideal. This gives the theorists and planners apoplexy, as well as any who think there is an easy solution to what is really a very complicated problem. Even in regimented societies such as the Soviet Union or China, people still move about in waves, encouraged by customs, life style and even government dictate. In Japan, the crowding of subways at rush hour is legendary, and I don't have to remind any of you of the traffic jams on the Gardiner Expressway in Toronto, any day after 4:00 P.M. CN then is not alone in having this problem of peaking. They are obviously a worldwide phenomenon, as old as history itself. Nevertheless we are not taking the matter lightly, particularly in view of the future need to purchase new rolling stock. Clearly, the more even the flow of traffic, the less capital equipment will be required to do any given amount of work.

Let me now give you a rundown of how we are approaching the problem in one of our most rapidly growing travel markets; Southwestern Ontario. This is one of the most concentrated travel markets in Canada, as well as one of the fastest growing. SWO has enjoyed an average population growth of almost 2% per year for the past decade with similar projections to the end of the century. Average incomes are as high as anywhere in the country and every index shows prosperity; from home and automobile ownership to colour television sets. The market is anchored on one end by Toronto which is the great social and business magnet for the entire area and stretches 228 miles to Windsor. Across from Windsor lies Detroit which, although not an important travel destination in itself, feeds about 150,000 passengers a year into the train service pattern terminating at Windsor. Between Toronto and Detroit are some very large and prosperous communities including Windsor, Sarnia, London, Kitchener/Waterloo, Stratford, Guelph, Brantford, Woodstock and of course Hamilton. Industrial and institutional development is

firmly established and there is an extremely well founded social and economic interdependence amongst virtually all communities. One might even say that social intercourse was rife in the area!

Above and beyond everything, the great anchor and magnet is the 'City.' As London is to Southern England or Paris to Northern France, so Toronto is 'The City' to virtually all of SWO. Going to Toronto for a day's business, or to see the doctor or for an evening of theatre is such an ordinary occurrence as to qualify as a non-event. Now, with all of those automobiles and highways, one might expect the automobile to dominate the travel market? Well it does, but not quite to the extent you might imagine. Also its share is dropping, and of course the longer the trip distance, the less relative importance the automobile has. Now for some illustrative statistics: the population of SWO is approximately 3.2 million, excluding Toronto. The latter adds close to 2.5 million to the total and Detroit about the same. Total passengers handled on all trains in this territory exceeded 1.3 million in 1975 and could approach 1.8 million in 1977. Traffic has about doubled since 1967. SWO traffic represents close to 40% of all inter-city passengers handled by CN in Canada, although average journeys are much shorter than elsewhere. (Also, there is some travel to or from points east of Toronto thus contributing to some statistical duplication.)

Looking close-up at present market shares, CN probably enjoys about 20% of all intercity travel in the area it serves. The automobile is probably about 70% and bus and air share the balance on the routes served. Airline service is really only available at London, Sarnia and Windsor. Between Toronto and London 120 miles, 2 hrs. driving time on highway 401, also served by high frequency rail and bus service and by about a dozen airline flights, automobiles captured 74% of the market in 1975. Trains handled 14%, air and bus 6% each. This year, after rail service improvements in 1976-77, rail expects to capture about 20% of the market, largely at the expense of automobiles. Between Toronto and Windsor, 230 miles, the route is also served by a four lane highway, but is over four hours driving time. It also has five fast trains a day, several express bus services and six airline flights. In 1975 automobiles captured 50% of the travellers. Rail had a respectable 31% while air enjoyed 14% and bus 4%. These figures are from recently completed studies using all available traffic data including provincial government estimates of automobile traffic.

In 1977, CN is aiming for about 35% of the travel market, again assisted by service improvements throughout the area. Toronto-Windsor also happens to be the origin/destination combination which produces the largest number of passengers in the entire territory; 280,000 in 1975 and hopefully over 300,000 in 1977.

Now we have some general appreciation of the market, let us look briefly at some peaking problems in the area. Since Toronto is the largest destination for SWO travellers as well as the largest individual originator of traffic, virtually all trains carry their heaviest loads into and out of Toronto. This creates its own peaking problem since it is impractical to remove or add cars in the course of trips between Windsor/Sarnia and Toronto.

Nevertheless, morning and late evening trains tend to be much lighter than late afternoon trains, in both directions. However within this pattern there is a preponderant flow into Toronto in the morning and outbound in the late afternoon/evening. On weekends and holidays the flow outbound from Toronto reaches monumental proportions reinforcing the normal ebb of traffic which flows in and out of the 'City' each day. Weekends and holidays also see huge flows into Toronto which has become the weekend mecca for virtually all of SWO, as well as for Michigan and upstate New York. During the period of the CNE, morning and evening patterns into and out of Toronto area are greatly augmented while at Christmas, and during winter storms which close highways and airports with distressing regularity, it's standing room only on virtually all trains, regardless of time.

What have we done about these peaks and what do we plan to do? What more might be done? Good questions all. Let us return to the list of possible solutions which I gave you previously. As a reminder they are:

- (a) Pricing action
- (b) Increased frequency of service
- (c) Scheduling of equipment maintenance
- (d) Over-utilization of equipment at peaks
- (e) Rental of equipment from other carriers
- (f) Special traffic routing

The first is pricing action. CN is a pioneer in differential pricing, having introduced its now famous Red, White and Blue Plan as early as 1962. It went into this particular territory in 1963. The original plan differentiated travel by day, dividing the week into peak (Fridays and Sundays) and off-peak (all other days).

It also juggled the three fare levels to achieve two seasonal expressions, Blue alternating with White, during the on-season, and White with Red during the balance, mainly autumn, winter and spring. Interestingly, the plan had its greatest virtue in being self-disciplining. Even when passengers paid blue fares they realized that there were cheaper fares available on other days or in other seasons. In this particular territory however, peaking is more pronounced by time of day than by day of week and so in 1975 CN made a major change in the application of prices. In October of that year, peak and off-peak prices alternated by hour of day rather than by day of week. That is to say, up to 16:00 and after 18:30, the lower fares (of the two applicable that season) applied. In the peak hours, the higher fare was required. By this year the frequency of train service had reached the point where it became practical to go with hourly as opposed to daily fares. For example, there is little value in penalizing late afternoon travellers if there are no alternative trains before or after the peak hours? In the spring and autumn of 1976, train service frequencies were increased, still further improving these options. Toronto-London was now served by nine fast and four slow trains a day. However even more frequent service will be required in order to give hourly fares a full workout. In our view, virtually hourly service or better, is required to make such a system of off-peak hourly fares work to full advantage.

In the autumn of 1976 CN introduced a new incentive pricing plan called one-day, round trip excursions, good between all cities in the Quebec-Windsor corridor. These fares were good only on trains departing during off-peak hours and along with other concessional fares such as 65+, provided added incentives for off-peak travel.

Any pricing plan must work in coordination with services available and must have been in effect long enough to become known. The danger lies in expecting too much or of giving the appearance of being either arbitrary or of price gouging. That is why we in CN almost always speak publicly of off-peak incentives, as opposed to peak-hour penalties. With this group, being largely analytically oriented I am not afraid to speak of peak-hour penalties.

Nevertheless, you cannot do everything with pricing. If the pricing plan is too complicated, as for example with a separate (and presumably changing) price for every departure time, day, direction and season, the public could be so confused it would stop riding altogether. You would solve the peak alright

but not in the manner intended. That is why we shied away from mixing daily and hourly fares. It is not without significance to me that no other mode of public transport in Canada of which I am aware, has differentiated hourly, not to say seasonal, fares. Simplicity of promotion and selling certainly places practical limits on any schemes that might be used. Nevertheless, CN has gone a long way in this direction and we have increasing evidence that given adequate service alternatives, much can be accomplished. Certainly, public understanding and acceptance of Red, White and Blue over the long term has made it possible for us to consider even more sophisticated possibilities for the future.

Now for a look at the second possibility, namely, increased train service frequency. Over the years, train service frequency has improved in SWO beyond recognition. Following RWB in the mid 1960's, traffic began climbing at a very significant rate. As trains were added and schedules improved, traffic continued to increase, necessitating still more trains. Today, as I said, there are 9 fast trains a day Toronto-London and four slightly slower ones via the Stratford line. In addition, intermodal bus services supplement and complement train service to Sarnia and in and out of Hamilton. During 1976 and into 1977 the rate of growth has accelerated and promises to be larger in absolute terms this year than in any year of our history. The essential point about frequency of service in the context of peak levelling is that it provides increasingly attractive alternatives for those who might like to travel off-peak, but who cannot because of choices available.

Stripping the matter down to essentials, if there were only two trains a day for example, chances are they would operate in peak hours to accommodate the maximum number of people. In this case everyone would travel in the peak since no other options would be available. As trains are added, some must inevitably fall into the category of off-peak, if only because of equipment cycling problems. At the present time in this territory, of 13 trains westbound from Toronto to London about 11 are outside of the afternoon peak of 1600-1830 hrs. Another two miss these periods by a few minutes. We have even had a problem of over-loading a train which operates at 15:15 and which was used by people wishing to avoid the higher prices after 16:00. The solution was to schedule a fast train to London right at 16:00 hrs., Fridays and Sundays to relieve the earlier as well as later trains. This is a peak hour operation but so attractive in terms of time and speed that people are

willing to pay the higher fare. Furthermore the train uses equipment which would normally be required on other trains, but which would have to run through to Windsor or Sarnia. Instead, the cars cycle back to Toronto from London at 19:20, thus providing an additional off-peak service in the eastbound direction. This new train called 'Tempo Special' has been in service for about one year and is proving of great value in evening out traffic flows. For example, since hourly fares have been introduced, train earnings of peak hour services have remained constant while services on either side have increased by up to 40%. Another fact of increased frequency is of course the opportunity it provides for greater equipment utilization. Because of current scheduling practices, we obtain an average of about one round trip per day from our active car fleet in SWO. That is, 450 miles for Toronto-Windsor and 360 miles for Toronto-Sarnia. As traffic grows and with an increasingly tight equipment situation it may be necessary to cycle trains back with a minimum of turnaround time. This means shorter intervals between trains and more trains: also higher utilization of existing or new cars. Since the name of the game is to do more work with the same equipment may I offer the suggestion that faster turnarounds, more trips per train set and therefore more trains can contribute equally with pricing, to achieve a more even flow of traffic. We believe also that greater frequency, in conjunction with other measures can also contribute to a levelling of peak requirements.

The third and fourth proposals deal with methods of handling peak traffic—or that which cannot be levelled out by other methods. The proposals include scheduling of heavy maintenance, as well as day-to-day running maintenance, at off-peak times, plus limited over-utilization during peak periods. If all traffic flows were exactly even, we would still require spare cars to cover maintenance and shopping requirements. Since we do have peaks, we plan our back shopping and heavy cleaning programs for times of the year when average traffic is lightest, usually mid winter. Furthermore, running maintenance and cleaning is concentrated in the middle of the day when fewer cars and/or trains are in actual operation. That is why you will see lines of cars in the service area at Bathurst Street in Toronto any day at 1400 hrs., but relatively few three hours later.

Over-utilization can also be programmed for weekends and for periods such as Christmas and Easter. The expression, 'everything available is rolling'

is literally true but implies a level of operation which could not be continued on a day-in, day-out basis. Thus one might schedule additional trains or additional cars to meet anticipated peaks and emergencies in a way which would put an impossible strain on the system if it were not of short duration. As with human beings, adrenal exhaustion sets in very quickly under forced conditions. Furthermore one literally counts on the off-peak to catch up or for maintenance and other servicing.

The fifth proposal we made for handling peak traffic is to rent equipment from other carriers. One interesting possibility for us in the SWO example we have been using, is the renting of 'GO' transit cars after peak hours on Fridays or weekends plus other holidays. This has not been possible heretofore because of the absence of toilet facilities in GO commuter cars. New double-deckers to be delivered soon will overcome this difficulty. But there are of course other problems. Seats, while not uncomfortable for 45 minutes could pose problems over two hours. There are no lounge or snack facilities, and cars may not be available until after 19:00 hours on any weekday. If such cars are to be used, they must be attractive enough to draw customers, or the service/price package must be good enough to do so. Some ideas we have been thinking of with respect to use of GO cars are as follows:

1. Operate such cars in extra scheduled services on peak days.
2. Operate non-stop, say Toronto-London, on a very fast schedule.
3. Provide cart service for coffee and snacks.
4. Schedule the extra train in as key a time slot as possible, to maximize loads and to relieve other trains, possibly at 18:45.
5. Offer a price discount if necessary, or an additional service 'frill' such as reserved seats, in order to attract riders.

The operation of extra service to London would save the operation of cars on other trains through to Windsor and Sarnia, while improving the operation of regular trains. Passengers to London itself account for about 25% of all passengers leaving Toronto on mainline trains. Consequently, it can be seen that diversion of these passengers from other peak trains could make a significant contribution to solution of peaking problems in this area.

The last measure we propose using, and in fact use regularly to spread traffic onto various trains, is the solicitation of group and special traffic which is directed to those trains which are most in

need of support. This often involves taking some traffic away from busier trains as well. Organized groups can often be directed in a way which is impossible with individual travellers. Some examples of special groups would be school groups, senior citizen outings, sporting matches and so on. The ability to provide a better price as well as amenities such as exclusive occupancy coaches can greatly simplify the problem of directing traffic from heavier to lighter trains.

The one means of smoothing traffic which we have not mentioned in connection with this exercise, is one which probably occurs to most people. It is seat reservations. Interestingly with the present state of the art, we are against reserving coach seats on these trains, just as the TTC would be against reserving seats on the Yonge St. subway! Reservations systems are very very expensive to start with, and to reserve seats on these trains between all points would effectively double our total reservations requirements and add significantly to our costs. Our present system will not handle any such load and a future system would have to be just that much bigger. Reservations also exact a penalty from the passenger, particularly when customers treat these trains as street cars and reserve the right to travel by whichever train is most convenient at the time, as well as to change their minds at will. Reserved tickets take three or four times as long to sell and passengers must be checked onto trains much more carefully. With an average sale valued at perhaps \$10 you may well understand our reluctance to spend \$5 or more of that on reservations cost. With 26 stations in this territory alone, and many hundreds of on-line points in Canada at which sales can be made, you will

understand our dilemma. By contrast, Air Canada, with almost a world-wide service link, has only 59 cities on-line.

What I have not been able to give you is any definitive historical data related to our success in coping with traffic peaks through the measures I have outlined. We have had hourly fares only since October 1975, and the existing service pattern since the autumn of 1976. Evidence is accumulating that passengers are being lured to off-peak trains and that the difference between average peak and off-peak handlings is declining. Frankly, however, we have not had sufficient experience to prove out existing measures. Furthermore, the plans I have outlined will find their full implementation only in future months and years. Our statistics consequently leave much to be desired. For the same reasons I gave you concerning reservations, a \$5 unreserved ticket, good on any train, does not justify the keeping of traffic data in the detail that a \$100 airline fare might justify. For example, an unreserved coach ticket. The answer of course lies in better systems for ticketing, reservations and traffic handling. These in turn presuppose that trains are going to be around long enough for someone to put up the necessary capital. Just like rolling stock, new ticketing and reservations systems cost money and while I can tell you what I believe we ought to be doing, it is quite another for us to obtain the means for putting it all into effect. Nevertheless we are aware of the needs as well as the possibilities. This time next year and later, we should be able to document our real progress in meeting what is undoubtedly one of the most intriguing and certainly the most complicated problem which faces virtually every transportation company.