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TRAFFIC GROWTH AND MARKET PENETRATION – THE APPLICATION OF DIFFERENTIAL FARE STRUCTURES

By

Alan F. Cornish

Evanston, Illinois
August, 1971

RESEARCH REPORT

NORTHWESTERN UNIVERSITY EVANSTON • ILLINOIS

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List of Figures

List of Diagrams

ABSTRACT

The problem of achieving the highest level of utilisation conducive with profitability is one that is continually arising in the field of public passenger transportation. Presently, with the United States domestic airline industry, the Department of Transportation is urging the introduction of differential fare structures, so that fares paid by peak time travellers reflect more closely the higher capacity requirements and costs they impose upon a system. At the same time, it is hoped that lower off-peak fares will lead to development of broader markets, thereby utilising the enormous excesses of capacity which are now frequently available. It seems appropriate then, to attempt to establish some of the requirements and likely consequences of differential fare structures, drawing from instances where these have actually been applied.

The theoretical case for making passenger transportation prices responsive to the law of supply and demand is covered in the literature. Practical instances are virtually non-existent, particularly in the civil aviation industry, apparently due to the pattern of regulation. Accordingly, two cases from other fields are analysed: one rail service with a three-tier fare structure varying by the day of travel; one hovercraft service with a two-tier fare structure varying by the hour and direction of travel.

From these cases, some indications are drawn about the type of data requirements and analysis necessary for the development of differential fare structures, the techniques and importance of their presentation, their impact upon traffic growth, revenue and profitability of the carrier concerned, and their relevance to competitive market penetration and growth.

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CHAPTER I

The Problem and Some of Its Constraints

It is a facet of economic theory that in order to maximise economic welfare, resources should be allocated efficiently. In terms of a "perfect" market situation, including particularly free entry, etc., this occurs when prices are as closely in alignment as possible with average and marginal costs (such costs including a reasonable return on investment). In transportation, this means that price structures should conform to the structure of carrier costs. It is not proposed in this study to enter into the theoretical proof of this argument, since the literature on transportation pricing is already extensive. See for instance, (1) and the further references therein cited.

However, transportation costs are affected by a great number of factors, including for instance, the effects of distance and terminal expenses, peak demands and congestion (2). It is therefore, one thing to decided in theory that price structures should be in alignment with cost structures, but an entirely different matter in practise to achieve such a condition. At least two factors complicate the step:

a. Costs vary both between operators, and from day-to-day and hour-to-hour, such that their precise composition and total may be difficult to determine at any particular moment in time.

b. Even if it is possible to overcome point (a) above, the production of a tariff structure which both reflects these variations and remains capable of comprehension by the general travelling public is a major task. Sophisticated tariff structures will defeat their own purpose if they confuse the average traveller to the extent that he either does not travel, or chooses some other (and less complicated) method of travelling. The importance of the timetable as a primary channel by which operators tell their customers about timings, quality and cost of services on offer, has often been noted as calling for the devotion of all the skills of communication and marketing (3). Timetables must be made to look both inviting and easy to understand.

In short then, one must not allow the best solution to become the enemy of a good solution practical considerations must temper the dictates of the theoretical ideal.

One of the most obvious ways in which transportation costs vary is in response to fluctuations in demand over time. The number of passengers using a particular transport service normally fluctuates in this way quite considerably. The simultaneity of transport production and consumption imposes certain losses of potential traffic potential and revenue potential - which are virtually inevitable and which have to be accepted as a basic fact. Supply cannot be adapted easily to variations in demand because it cannot be stocked in advance of requirement. Capital is invested in a transport system, which has a potential to produce capacity over distance, i.e., seat- or ton-miles, virtually continuously (apart from maintenance and service breaks, etc.). Halting production at times of slack demand does not free the invested capital for alternative use, but merely saves direct operating costs. In addition, supply is inflexible, in that increments of 5, 10, 20 or 30 seats on a given route can rarely be made. It is not possible to "fine tune" supply as demand itself varies. Instead, operators must deal with incremental steps of 100 or 125 seats, depending upon the size of vehicle or aircraft in question. As a result, the operator normally must choose at some time between losing a substantial volume of traffic in peak periods, or investing in sufficient capacity to handle at least a proportion of the peak demand, knowing that this investment will be underemployed at most times outside the peaks.

The latter choice tends more often to be made, in spite of the stated drawback. This is largely because the particular operator is likely to suffer a disproportionately large fall in market share if he attempts to cater only for the standard level of demand, rather than moving in some way to accommodate the peak. This is particularly the case in a competitive situation (4). Most transport undertakings, even regulated "monopolies" including airlines (5), are in some form of competition, if only with the private car.

Thus costs fluctuate on a short term basis, according to demand (amongst other things), and ideally prices should reflect these fluctuations. Night coach air fares are one example of transport operators attempting to reconcile these two points, as are also special seasonal discounts. However, the opportunities for carriers to innovate radically in these directions are generally limited by the nature of national and international regulation. For instance, it has been suggested on a number of occasions (e.g., [6]), that aircraft landing dues should be varied according to the hour of aircraft movement. By such means airport congestion would, in theory, be relieved as airlines sought to minimize these costs. Two points can be made about this proposal. In the first instance, the Federal Aviation Agency (FAA), and the Department of Transportation (DOT), require that fees be non-discriminatory. Whether a congestion fee would, prima facie, be considered discriminatory, is open to some doubt. Secondly, it is the air passengers, rather than the airlines, who are the real architects of airport congestion (but see below). As outlined previously, the airlines themselves are just as much the victims of traffic fluctuations as are the airport administrations. It would seem to be ethically questionable to impose such a congestion tax upon the airlines in these circumstances without giving them in turn, the means of influencing the true origin of the problem: the passenger. However, it seems reasonable to suppose that such a congestion tax would be unnecessary if airlines were aware of effective means of causing demand to spread more evenly, and were given the flexibility to implement such procedures.*

In the international context, all scheduled international services of the International Air Transport Association (IATA) airlines have fares established on the basis of the unanimity rule, and are the same for a given service, whatever airline provides it. Thus here too, the airlines lack the flexibility to innovate widely with their fare structure.

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*Nevertheless the idea of a congestion tax may have some relevance to system users who do not, at present themselves, suffer from peaked passenger loadings, but who contribute significantly to airport congestion. These users include much general aviation, air taxi and charter activity, which place a heavy burden upon movement control at peak times. The form of such a proposed tax, however, should clearly reflect the way in which this cost is felt by the airport administration and movement control system, e.g., according to movement itself, and not necessarily according to aircraft size unless the size introduces additional problems as in the case of separation to offset turbulence from the 747.

At present, it appears that both the data base essential to the development of effective means of influencing demand, as well as the flexibility, are lacking. To take one further example, Continental Airlines introduced a peak/off-peak tariff system which varied according to the day of travel, on its United States mainland - Hawaii service, filed 3 February 1969. Due to lack of records of daily traffic distribution in adequate detail prior to the time of beginning the service to Hawaii, Continental soon discovered that the number of off-peak days might better be three instead of four, as contained in the initial tariff. For this reason, Continental sought to narrow the spread slightly and eliminate one of the off-peak days. However, to do this, it was necessary to file a tariff revision (15 April 1970) with the CAB (7). Lack of information of the desired type caused a mistake which it was expensive to correct both in terms of time and administrative procedures. Even now, Continental would like to have daily traffic information from all the other Hawaiian carriers, both before and after the introduction of their off-peak fare, in order to be able to measure the real results.

It will be seen that to introduce a tariff structure which varies according to demand and cost variations on an hourly basis is likely to be considerably more complicated. Information is rarely collated in this form, and often classified as proprietory information where it is so collated. Yet this type of information is essential, particularly for a "pleasure oriented" market, which is the one where demand is likely to be more responsive to price variations (see [5], page 18).

The analysis of data of this type itself constitutes a significant methodological problem. Few references of the appropriate sort can be located, probably because the opportunities to initiate fare structures of this type are so rare, as previously noted. At first sight, variation of demand with the price mechanism is a simple question of price elasticity. This is the standard solution applied in many other fields, i.e., to make prices dependent upon the law of supply and demand. The practical difficulties associated with the construction of a varying price structure to suit the characteristics of a transportation service whilst remaining an effective market instrument have already been touched upon. One must first determine when peaks occur:

> "In peak as in trough periods, there are substantial differences from one day to another, from one hour to another, and from one direction to another, and these differences are not brought out by the monthly or quarterly indices that can be calculated. The existence of such imbalances in peak periods greatly limits the advantages associated with these periods. It prevents average load factors from rising far above the level they reach in other periods of the year." (8)

Having done this, one must devise an appropriate charge structure, as noted. Finally, one must measure the results, and try to quantify their impact, which also contains its particular difficulties (9).

In his paper to the Institut du Transport Arien International Symposium of November 1964, Professor Bjorkman (10) lists some of the problems inherent in an elasticity analysis, which seems to have some common ground with the subject here under discussion. However, it is important to note that a charge structure designed to influence travel demand by differentiation according to time and direction of travel, is not dependent entirely upon the theory of elasticity of demand.

To measure the price elasticity of demand it is essential that the product in question is homogeneous. Transport capacity is not homogeneous - a given journey at one time is not the same product as that journey made at a different time. The consumer normally places utility upon the particular and unique combination of time and place. Identical movements between point A and point B made at different times may have different elasticities. For instance, dealing with transit riders within New York City, it has been estimated that the mid-day travellers have nearly twice as much price elasticity of demand as the rush-hour riders (11). Price differentiation according to time is an attempt to make some consumers forego consumption of one unique product - a certain journey at a certain time - in favour of a different product: the same journey at a different time. This is substitution - one is being substituted for the other. Only where the availability of an off-peak fare attracts into the market at that time a consumer who would otherwise not have travelled at all given a prevailing standard fare, or where some increase of fare drives a consumer entirely out of the market, can it be said that some measure of true elasticity of demand might be made. Further examples of the price differential implications of time variance have been given by Troxel.[12]

It therefore follows that to construct a model of the demand for a transport service where a significant element of price differentiation by time is present, is likely to be an immensely complicated task. Most research of that type tends to cover a long time span, e.g., a year for which statistics are usually more readily available - and includes the implicit assumption that in such a long run average, minor short run time variations in demand and/or price have an insignificant impact. It is then relatively simple to undertake a regression study of the market over a number of such periods, determine by graphical or mathematical analysis the existing correlations, and thus build suitable mathematical or econometric models.

Although for some purposes, the above mentioned approach may be satisfactory, the inherent generalisation involved should never be overlooked. If one stands far enough from a picture, much of the "distracting" detail may disappear. On the other hand, if a transport company is to function on a satisfactory basis, it should be appreciated that the total financial picture is in fact entirely composed of minor financial detail - flight by flight or schedule by schedule - which it would be unwise to overlook simply for the lack of a convenient methodology.

Finally there is the question that an off-peak pricing strategy can only be effective in situations of high demand elasticity, i.e., if demand is inelastic then little additional traffic will be induced to travel, and carrier earnings will simply be reduced for that element which would have travelled in any case. This argument overlooks three important points, namely:

a. Substitution.

b. Competition.

c. Expansion.

Substitution. The benefit of a differential pricing regime in the sense of substitution of a journey at one (off-peak) time for the same journey at another (peak) time is overlooked. The same number of journeys may take place, and the carrier's gross receipts are in fact less, because some journeys will be at the reduced fare. However, if the policy is effective then the carrier's net profitability in the long term should be improved, since the disproportionate costs inherent in the long term provision of extra capacity which is excessive at all times other than the peaks, will be reduced by a greater amount than is "lost" on discounted off-peak fares.

Competition. Most market situations are not monopolistic. In the more normal competitive environment, where each transport operator enjoys only a share of the market, an effective varying charge structure will secure a greater market share at off-peak times, thereby "deepening" the troughs for competitors. It will also maximise the rate per passenger for the differential priced operator at peak times, whilst limiting the pressure upon him to provide extra capacity at those times.

Expansion. Normally demand situations are not static. Most operators are faced with a situation where demand is expanding - that is demand for transport, not necessarily for any one particular mode, etc. This expansion may be temporarily retarded by economic recessions and the like, but in the long term GNP, disposable income, and demand for transport tend to rise. To handle the same number of passengers each year means to handle a declining market share: to stand still means slipping backwards. The declining role of the U.S. railroad industry in the field of passenger transportation in part illustrates this point. Whilst operators generally seek increased traffic volume it is essential to be able to see how annual traffic progress is produced. Growth can come from a uniform increase throughout the year; from an increase in peak periods alone; or through an extension of peaks into the marginal "shoulder" periods between peak and trough (see below). The value of expansion and development will vary considerably in each case, as will the resulting cost to the operator. In fact, it has been estimated that many of the new promotional fares which were encouraged by the Civil Aeronautics Board in the mid-1960's intensified some of the peaking characteristics of air travel demand. In recent years, for example, air travel has increased sharply in relative importance in July, August and December, partly in response to special discounts as promotional air fares (13).

At first sight, it would seem that a large amount of traffic could be spread out more evenly in terms of time than a smaller volume. However, there are indications that a relationship often exists between the volume of passenger traffic and traffic peaks. In fact, although no systematic study can be traced on this point, there are good reasons for thinking that reductions in fares encourage an increase in seasonal peaks. For instance, Mr. W. Deswarte, Director General of Sabena (Belgium) Airline, has noted (14) that experience shows that fare reductions attract above all tourists, who of course, travel most in summer. In such circumstances, carriers find it necessary to avoid causing a demand which might endanger their economy by obliging them to use aircraft and staff which, for the remaining eight months of the year, remain idle. Nevertheless, if expansion is to occur, it is this type of marginal customer who must be attracted into the market. It is obviously better if he is confined to a holiday in August, for instance, that he travels on a Wednesday or some off-peak time, rather than on a Friday evening, or some peak time.

CHAPTER II

Price Differentiation as a Potential Solution

The concept of using the price mechanism to achieve better utilisation of capacity has been discussed many times before, e.g.:

> "Dynamic promotional fares to compensate for inconvenience in time...may apply to the season (out of season or slack season), to the traffic slow-down on some days of the week, or to slack periods during the day. (1)

However, the practical consequences of this kind of fare strategy are only slightly known. It seems essential to fill this gap. Increasing aircraft size and passenger capacity produces a capability to deposit huge numbers of people into bottleneck areas, e.g., airport terminals, at certain critical times, particularly if simultaneous or closely consecutive arrivals and departures occur. Segmentation of the market by passenger category alone, e.g., youth/student fares, cannot offset this tendency, and may in fact lead to mis-allocation of recourses (2). Designation of off-peak flights as total units on the other hand, will both expand the travel market by encouraging a demand for this huge capacity which could otherswise be standing idle at slack times, and also help offset congestion by offering a cheaper substitute to those whose need to travel in the peak is not so great.

The high price, and the waste, attached to trying to "solve" congestion by physical construction and hardware, and alternatively the high price paid in terms of congestion and disruption of life if we choose to try and live with the problem, are both prohibitive: that is unless this latter cost is minimised by giving individuals the opportunity to choose the "least cost alternative" to them.

Other courses seem less attractive and have their related problems. For instance, to what extent should traffic peaks otherwise be accepted as a modern social phenomenon, and to what extent would it be in the general interest to cut down peaks and limit their cost? To both of these questions, the concept of differential price structures offers a possible line of solution. By bringing charges broadly into alignment with the inherent costs of such peaks, operators place this decision much more into the hands of the consumer.

> "...if peak period users are quite prepared to pay for the advantage of being able to leave on the day and at the time they prefer, there is no reason why other users should be penalised, or why operators should not agree to making exceptional efforts, since they would receive immediate renumeration from the beneficiaries." (3)

If there remains a real demand for heavily peaking movements in these circumstances, then at least those creating the demand are bearing a more substantial proportion of the true cost, and those for whom time is not the absolute criterion may take advantage of additional capacity created for other purposes.

By this means also, it is possible to avoid the thorny question of just who should decide upon the "general interest," using what criteria, if peaks are to be cut and their cost arbitrarily limited. If it can be shown that catering for demand patterns of this nature is the most effcient means of allocating resources since a sound return on investment is earned, then it must appear to be in the public interest to maintain, rather than limit, this cost.

No arbitrary decision can equal the efficiency of this kind of solution. Outlooks and attitudes with respect to the value of fare differentials and the usefulness of them will vary widely between consumers. They will not be the same for a bachelor, a married couple or a large family; for a student or a passenger either free to travel when he chooses or bound to a certain time by his studies or the requirements of his business. The loss in convenience the traveller will accept varies among the many different categories of users. Each case occupies a place of its own in the ideal scale of fare differentiation. The optimum solution is to provide a framework with the inherent flexibility to permit each passenger to select his journey at the lowest cost which suits his own case.

If air passenger traffic is to increase in accordance with the various predictions that have been made (e.g., [4]), it will become increasingly more essential to ensure that a spread of traffic is achieved, rather than encourage heavy peaks of conflicting leisure, general and business traffic to compound existing congestion. To maintain a sound financial balance, airlines must find ways of influencing demand to more acceptable patterns.

It was for this reason,,amongst others, that the Department of Transportation recently urged upon the Civil Aeronautics Board the proposal that:

> "...the Board declare reasonable any fares falling within a certain percentage deviation from a simple (though unavoidably somewhat arbitrary) distance formula like the one presently in use. That is, within this "band," or "zone of reasonableness," any carrier may raise or lower fares unilaterally and still be within the reasonable limits set by the Board. While undoubtedly such a system would lead to new problems not present under a uniform,

> explicit fare formula, there would be advantages in the form of increased price competition among carriers, increases in product variation, and opportunities for carriers to adjust fares as the level or structure of costs changed without having to incur the traditional "regulatory lag." In short, the Department believes that the advantages of a band of reasonable fares as opposed to a specific fare formula require the Board's movement in the direction of fare flexibility." (5)

The percentage deviation suggested initially was to allow fares to vary plus or minus 15 percent from a stated distance formula.

Some of the goals, problems and peculiarities of the concept of differential price structures aimed at influencing demand to spread more evenly have been noted in the preceding chapter. It has been established that it is essential to:

a. Acquire a detailed knowledge of the time pattern and extent of existing demand fluctuations, and the impact of these fluctuations upon costs.

b. Develop a price structure which bears some reflection of demand (and hence cost) fluctuations, subject to the proviso that it must be an effective market tool which the average customer can easily comprehend.

c. Develop some kind of methodology which is capable of identifying the impact of (b) upon (a) above, and which should not be confused with any model of the elasticity of demand.

In the following sections, two cases are examined where considerable steps were taken in these directions. Whilst the two cases are from widely divergent areas of the transportation industry, it seems reasonable to suggest that many of their features could have a very much wider application.

In May 1962, Canadian National Railways introduced a completely new fare structure in its Eastern Region, initially applicable in the Maritime Provinces. Three different levels of fare were available, depending upon which day any particular journey was made. The three fares were labelled "Red, White and Blue" respectively, and an operating calendar was published which showed every day designated by its appropriate colour, according to the previous experience of CN on whether the day was peak, medium or off-peak so far as demand was concerned. The case is of particular interest because it shows how a long-established operator can constructively reverse a long-established decline in traffic, and so re-invigorate its service.

The second case illustrates what can happen when an entirely new company, with constraints which force an appraisal of pricing policy from first principles, enters into competition in an entirely unregulated market. In April 1969, Hoverlloyd began car and passenger ferry services across the English Channel from Ramsgate, England to Calais, France, using two hovercraft. The Hoverlloyd fare structure for vehicles and vehicle occupants varied according to the hour of the journey and the direction of travel. All flights of the hovercraft were indicated on the timetable by the letters "A" or "B" according to an analysis by Hoverlloyd of whether movements at these times were subject to high or low levels of demand. The tariff listed two prices for each category of vehicle - the "A" fare and the "B" fare - into both of which was automatically included the price of up to seven vehicle occupants.

One immediate and common feature of both schemes is the obvious effort at presenting the price variations in the simplest possible manner, so that they may be understood by any average customer. The Canadian National "Red, White and Blue" scheme has one more level of fares than the Hoverlloyd "A/B" scheme. However, it should be noted that the Hoverlloyd scheme varies by the hour and direction of travel, whereas the Canadian National system is applied only on a daily basis, and irrespective of the direction of travel. To acquire a proper understanding of all other factors at play, however, it is essential to examine each scheme in its own particular market context.

CHAPTER III

Canadian National Railways

In 1961, the Canadian National Railway management was faced with three basic problems:

a. The net results from passenger operations were showing an unfavourable trend.

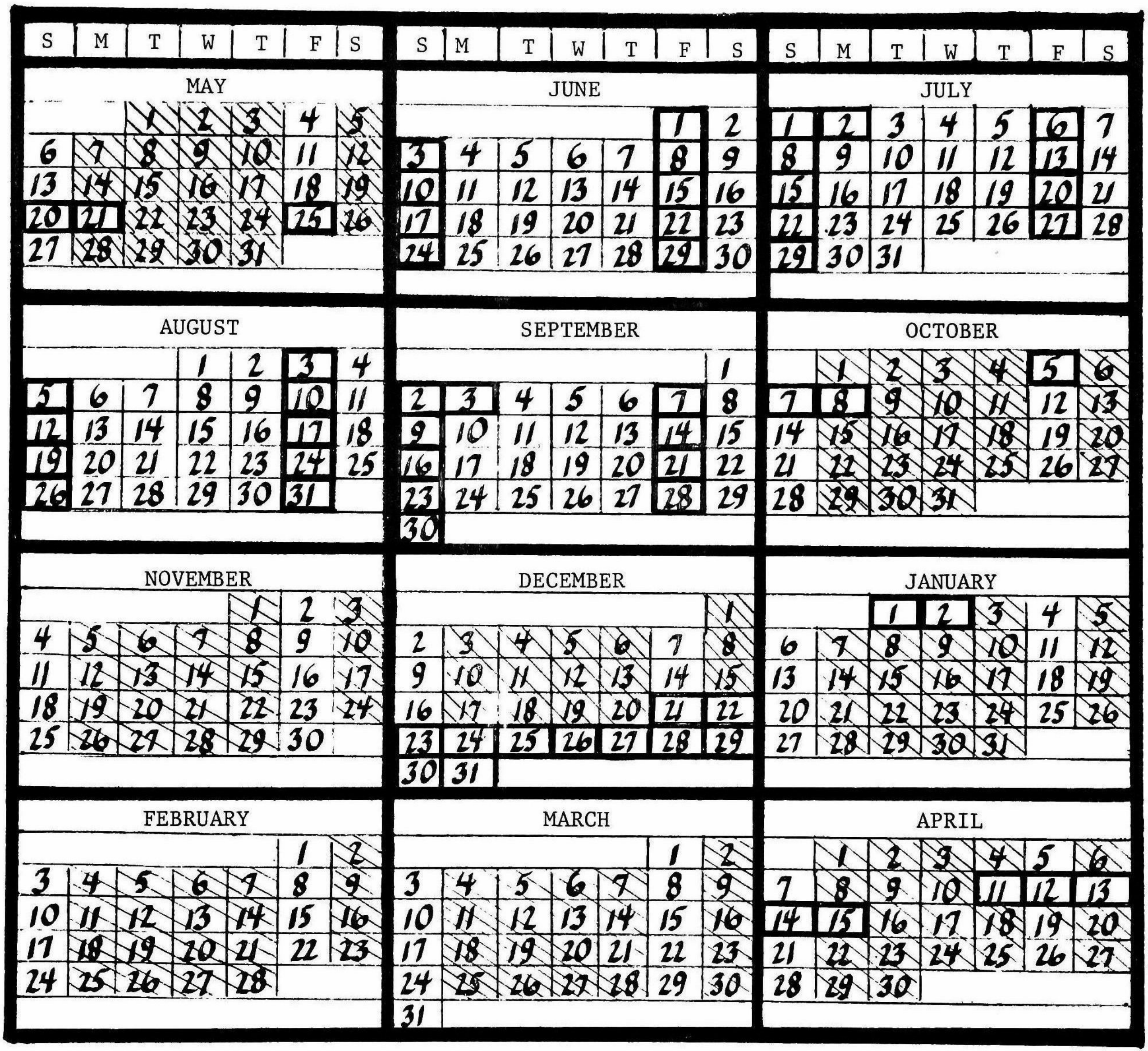
b. Serious traffic peaks and troughs were evident on a seasonal and daily basis.

c. The rate structure was complex and difficult to administer, with many exceptional fares (1). It was noted that the several dozen types of complicated ticket forms were confusing to clerks and customers alike (2).

In order to find some solution to these problems, it was decided to conduct a major experiment in fare structures, commencing 1 May 1962 initially in the Montreal Maritimes region of operation. The success of the experiment subsequently led to its extension throughout the passenger services network of Canadian National Railways.

As a first step, an operating calendar was drawn up and published, which showed every day designated by colour: either Red, White or Blue, (see Diagram 1). This operating calendar was applicable for travel between all stations in the Provinces of Quebec (Montreal and east via the main line through Drummondsville), New Brunswick, Nova Scotia and Prince Edward Island (see map at Diagram 2). Newfoundland was not included.

Red, White & Blue Days
1962-1963



RED — TICKETS ARE VALID FOR TRAVEL COMMENCING ON RED DAYS ONLY.

WHITE — TICKETS ARE VALID FOR TRAVEL COMMENCING ON RED AND WHITE DAYS.

BLUE — TICKETS ARE VALID ANY DAY.

Diagram 1

Canadian National "Red, White and Blue"
Operating Calendar

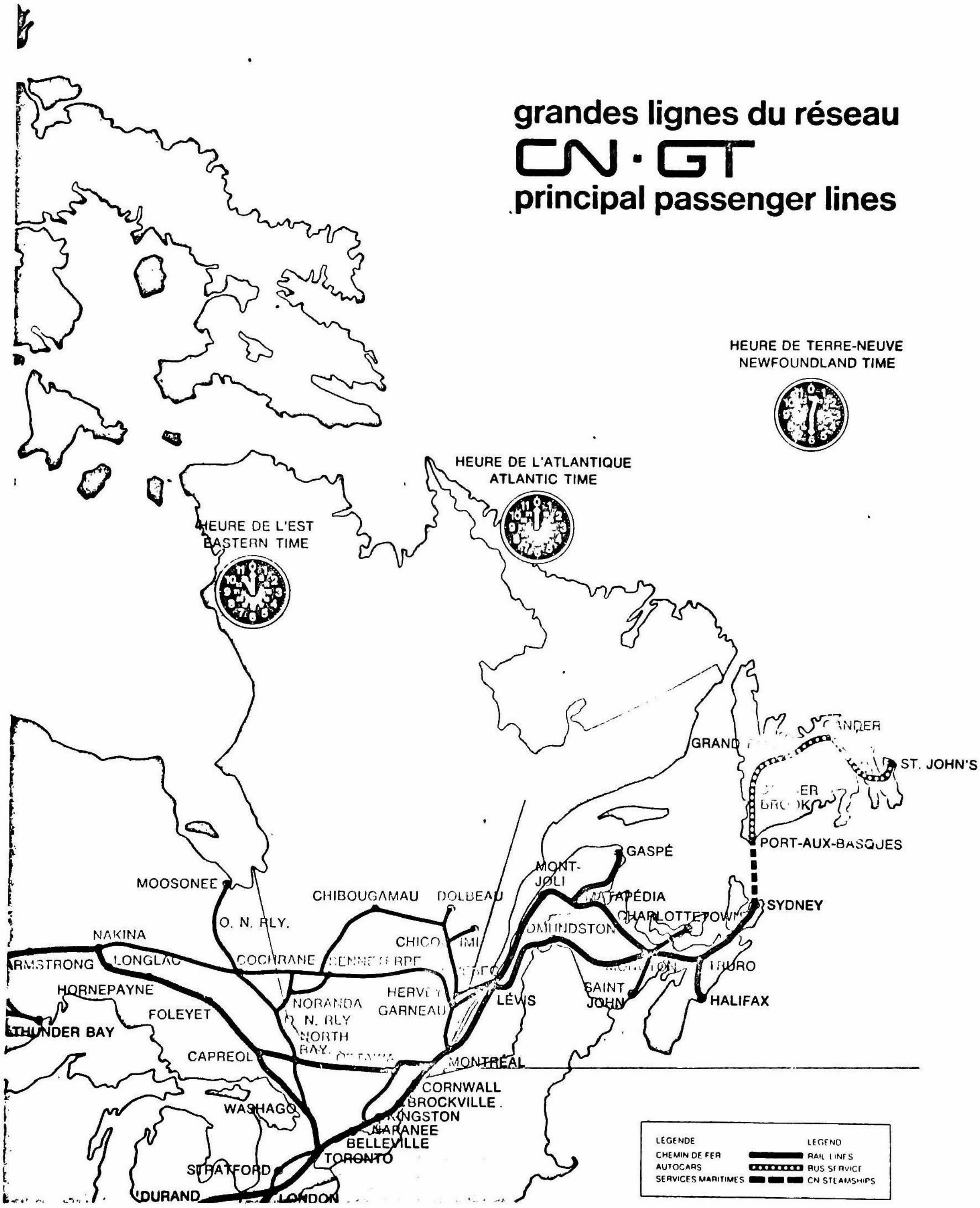


Diagram 2

Canadian National Railway Network (East)

The basic Red, White and Blue plan was designed with the following characteristics:

a. Lower fares than previously available.

b. One basic transportation charge for coach, club or sleeping car travel (service criterion).

c. Three levels of basic transportation charges, i.e., Red, White and Blue, reflecting demand by season and day of departure (time criterion).

d. Declining charge per mile as trip distance increased.

e. Club and sleeping car accommodation charges designed to reflect the cost and value of service.

f. Complimentary meals for sleeping car passengers.

g. Low accommodation charges for additional persons sharing accommodation.

This fare philosophy was applied to, and raised revenues on twelve trains (24 in two directions), including the crack "Ocean Limited." In the first six months of the experiment - May to October inclusive - there was a rise in revenues of about $450,000 over the corresponding period of 1961 and an improvement in the net deficit portion of these trains of approximately $300,000. These revenue increases were attained despite a reduction of 12 percent in train miles compared with the same period in the preceding year (2).

Attention will be paid in this study to the effect of these changes upon the "Ocean Limited," which runs daily from Montreal through to Halifax, Nova Scotia, a distance of 840 miles covered in 19 hours 45 minutes.

Fares for the overall journey were adjusted as follows:

Before 1 May 1962:	$29.45	(Regular Coach)	
From 1 May 1962:	$13.00	(Red Fare)	Bargain
	$17.00	(White Fare)	Economy
	$21.00	(Blue Fare)	Standard

The increase in revenue of $450,000 noted above appears to have been achieved even though the new peak (Blue) fare represented a 28.7 percent drop from the former regular coach fare, with even larger reductions in the other two colours. This factor indicates a very considerable degree of elasticity of demand, before any question arises of substitution of a journey at one (off-peak) time for a journey at another (peak) time.

A limited analysis is possible of the traffic pattern changes behind the revenue shift, since Canadian National Railway has made available records of the number of passengers leaving and arriving Montreal (Central Station) on the Ocean Limited each day. It is thus possible to draw a comparison between corresponding days in 1961/62 and 1962/63, i.e., before and after the Red, White and Blue scheme was introduced, and calculate the increase in passenger volumes achieved with the three different fares. This is the basis of Figures 1 - 3. These same percentage increases by day are also depicted graphically at Diagram 3..

In order to draw a further comparison of the respective increases under these fares, each week may be examined in turn, and the average percentage increase for that week calculated for each tariff. This is the basis of Diagram 4. It will be noted that for most weeks only two of the three fares were available - White and Blue in the summer, and Red and White in the winter. There are relatively few weeks when all three tariffs were available.

Ocean Limited Daily Passenger Loadings, 1961/62

DAILY PASSENGER LOADINGS BEFORE SCHEME
NOTE-FIRST WEEK COMMENCES MONDAY 5 JUNE 1961

WEEK	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
1	228	212	222	329	275	303	328
2	206	244	275	396	309	303	282
3	247	311	298	297	453	362	378
4	347	382	434	437	565	825	692
5	693	500	496	396	730	574	532
6	512	320	324	440	960	860	698
7	760	391	350	368	608	684	585
8	576	313	336	452	950	770	780
9	767	426	409	420	935	690	680
10	586	429	369	392	470	950	678
11	606	424	331	423	550	615	682
12	541	390	415	478	526	620	630
13	479	413	400	392	560	580	515
14	710	519	443	305	340	366	372
15	342	320	262	290	360	418	350
16	355	238	263	245	405	413	308
17	277	245	227	270	310	350	294
18	289	258	255	425	292	218	323
19	331	208	239	246	309	304	298
20	254	205	225	244	238	263	215
21	164	158	270	260	245	260	266
22	192	205	215	255	315	384	264
23	174	178	208	216	268	258	226
24	165	205	215	209	217	288	274
25	195	159	210	214	249	276	260
26	175	173	199	219	265	345	390
27	197	197	264	272	250	288	261
28	192	196	249	405	338	349	290
29	304	583	864	2329	1060	275	226
30	644	1105	938	973	889	444	576
31	1078	[illegible]	452	619	705	1010	438
32	268	290	244	378	295	359	260
33	220	222	219	318	291	325	246
34	181	223	240	340	315	378	198
35	217	271	219	370	280	350	266
36	208	215	275	370	290	310	250
37	210	257	308	434	314	339	240
38	176	205	245	298	270	344	309
39	195	245	219	408	314	362	264
40	265	249	303	245	450	266	345
41	220	205	285	238	320	255	308
42	257	199	205	199	330	270	372
43	227	174	239	237	309	275	283
44	224	186	264	183	266	365	248
45	182	212	260	248	350	245	227
46	330	270	457	436	462	211	576
47	410	349	299	265	359	375	382

FIGURE 1

Ocean Limited Daily Passenger Loadings, 1962/63

SCHEME COMMENCED TUESDAY 1 MAY 1962.
FIRST FIVE WEEKS EXCLUDED AS UNREPRESENTATIVE.
DAILY PASSENGER LOADINGS AFTER SCHEME
NOTE-FIRST WEEK COMMENCES MONDAY 4 JUNE 1962

WEEK	MONDAY		TUESDAY		WEDNESDAY		THURSDAY		FRIDAY		SATURDAY		SUNDAY	
1	382	W	403	W	357	W	370	W	410	R	554	W	467	R
2	368	W	352	W	368	W	445	W	450	R	527	W	490	R
3	407	W	323	W	414	W	557	W	454	R	563	W	555	R
4	689	W	605	W	599	W	560	W	920	R	510	W	590	R
5	590	R	1080	W	950	W	920	W	798	R	825	W	683	R
6	791	W	718	W	643	W	723	W	1190	R	1190	W	780	R
7	915	W	890	W	632	W	800	W	885	R	1048	W	893	R
8	690	W	714	W	625	W	760	W	952	R	1060	W	1308	R
9	765	W	910	W	728	W	858	W	1030	R	1100	W	1198	R
10	1060	W	842	W	701	W	760	W	957	R	865	W	978	R
11	900	W	811	W	770	W	890	W	915	R	1090	W	950	R
12	920	W	1025	W	715	W	808	W	969	R	864	W	948	R
13	679	W	850	W	790	W	967	W	1207	R	946	W	1125	R
14	789	R	855	W	790	W	632	W	550	R	547	W	679	R
15	485	W	575	W	484	W	595	W	493	R	521	W	763	R
16	588	W	518	W	473	W	437	W	475	R	499	W	495	R
17	330	W	466	W	360	W	508	W	550	R	479	W	439	R
18	450	R	480	R	519	R	462	R	600	R	490	R	480	R
19	345	R	530	R	510	R	505	R	421	W	446	R	466	W
20	395	R	458	R	494	R	550	R	470	W	358	R	397	W
21	348	R	425	R	400	R	397	R	382	W	407	R	445	W
22	414	R	390	R	457	R	498	R	450	W	448	R	450	W
23	469	R	408	R	427	R	377	R	460	W	358	R	379	W
24	408	R	357	R	351	R	412	R	396	W	384	R	505	W
25	397	R	385	R	328	R	396	R	404	W	435	R	400	W
26	359	R	335	R	282	R	338	R	444	W	455	R	483	W
27	380	R	446	R	425	R	418	R	343	W	408	R	362	W
28	383	R	397	R	393	R	436	R	447	W	550	R	497	W
29	452	R	658	R	738	R	1645	R	3358	R	1577	R	745	R
30	342	R	351	R	912	R	970	R	1299	R	1046	R	850	R
31	760	R	720	R	910	R	2217	R	680	W	2064	R	875	W
32	910	R	548	R	423	R	515	R	350	W	555	R	410	W
33	518	R	455	R	514	R	512	R	320	W	510	R	508	W
34	510	R	363	R	439	R	358	R	508	W	545	R	430	W
35	450	R	398	R	365	R	540	R	430	W	570	R	352	W
36	435	R	395	R	423	R	470	R	432	W	598	R	410	W
37	486	R	418	R	398	R	604	R	460	W	517	R	418	W
38	550	R	349	R	352	R	518	R	520	W	522	R	440	W
39	518	R	340	R	400	R	444	R	350	W	772	R	362	W
40	530	R	418	R	436	R	507	R	386	W	574	R	322	W
41	505	R	381	R	366	R	522	R	352	W	510	R	446	W
42	570	R	390	R	434	R	550	R	440	W	500	R	340	W
43	550	R	385	R	305	R	440	R	359	W	590	R	300	W
44	580	R	435	R	385	R	430	R	350	W	498	R	384	W
45	417	R	523	R	1265	R	950	R	452	R	1100	R	697	R
46	660	R	930	R	596	R	628	R	405	W	906	R	404	W
47	635	R	425	R	438	R	508	R	411	W	726	R	360	W

FIGURE 2

Ocean Limited Daily Traffic Increment Percentage, 1961/2-1962/3

PERCENT TRAFFIC INCREMENT AFTER SCHEME BY CORRESPONDING DAY IN PRECEDING YEAR

WEEK	MONDAY		TUESDAY		WEDNESDAY		THURSDAY		FRIDAY		SATURDAY		SUNDAY	
1	67.5	W	90.1	W	60.8	W	12.5	W	49.1	R	92.8	W	42.4	R
2	78.6	W	44.3	W	33.8	W	12.4	W	45.6	R	73.9	W	73.8	R
3	64.8	W	3.9	W	43.8	W	87.5	W	.2	R	55.5	W	46.8	R
4	98.6	W	58.4	W	38.0	W	28.1	W	62.8	R	-38.2	W	-14.7	R
5	-14.9	R	116.0	W	134.0	W	132.3	W	9.3	R	43.7	W	23.4	R
6	54.5	W	124.4	W	97.2	W	64.3	W	24.0	R	38.4	W	11.7	R
7	20.4	W	127.6	W	80.6	W	117.4	W	45.6	R	53.2	W	52.6	R
8	19.8	W	128.1	W	86.0	W	68.1	W	.2	R	37.7	W	67.7	R
9	.3	W	113.6	W	78.4	W	104.3	W	10.2	R	61.8	W	76.2	R
10	80.9	W	100.5	W	90.5	W	93.9	W	42.8	R	-8.9	W	44.2	R
11	48.5	W	91.3	W	132.6	W	110.4	W	66.4	R	77.2	W	39.3	R
12	70.1	W	162.8	W	72.3	W	69.0	W	84.2	R	39.4	W	50.5	R
13	41.8	W	105.8	W	97.5	W	146.7	W	115.5	R	63.1	W	118.4	R
14	11.1	R	67.6	W	78.3	W	107.2	W	61.8	R	49.5	W	92.5	R
15	41.8	W	79.7	W	84.7	W	105.2	W	36.9	R	24.6	W	118.0	R
16	65.1	W	117.6	W	79.8	W	78.4	W	17.3	R	20.8	W	60.7	R
17	19.1	W	90.2	W	58.6	W	88.1	W	77.4	R	36.9	W	49.3	R
18	60.7	R	86.0	R	103.1	R	8.7	R	105.5	R	124.8	R	48.6	R
19	4.2	R	154.8	R	114.3	R	105.3	R	36.7	W	46.7	R	56.4	W
20	55.5	R	123.4	R	119.6	R	125.4	R	97.5	W	36.1	R	84.7	W
21	112.2	R	169.0	R	48.1	R	52.7	R	55.9	W	56.5	R	67.3	W
22	115.6	R	90.2	R	112.6	R	95.3	R	42.9	W	16.7	R	70.5	W
23	169.5	R	129.2	R	105.3	R	74.5	R	71.6	W	38.8	R	67.7	W
24	147.3	R	74.1	R	63.3	R	97.1	R	82.5	W	33.3	R	115.8	W
25	103.6	R	156.7	R	56.2	R	85.0	R	62.2	W	57.6	R	53.8	W
26	105.1	R	93.6	R	49.2	R	54.3	R	67.5	W	31.9	R	27.1	W
27	92.9	R	126.4	R	61.0	R	53.7	R	37.2	W	41.7	R	38.7	W
28	99.5	R	102.6	R	58.5	R	7.7	R	32.2	W	41.4	R	71.4	W
29	48.7	R	12.9	R	-16.6	R	-29.4	R	216.8	R	473.5	R	229.6	R
30	-46.9	R	-68.2	R	-.6	R	-.3	R	46.1	R	135.6	R	47.6	R
31	-29.5	R	14.3	R	106.7	R	258.7	R	-3.5	W	104.4	R	99.8	W
32	239.6	R	89.0	R	73.4	R	36.2	R	18.6	W	54.6	R	57.7	W
33	135.5	R	105.0	R	135.8	R	61.0	R	10.0	W	56.9	R	106.5	W
34	181.8	R	62.8	R	82.9	R	5.3	R	61.3	W	44.2	R	117.2	W
35	107.4	R	46.9	R	66.7	R	45.9	R	53.6	W	62.9	R	32.3	W
36	109.1	R	83.7	R	53.8	R	27.0	R	49.0	W	92.9	R	64.0	W
37	131.4	R	62.6	R	29.2	R	39.2	R	46.5	W	52.5	R	74.2	W
38	212.5	R	70.2	R	43.7	R	73.8	R	92.6	W	51.7	R	42.9	W
39	165.6	R	38.8	R	83.5	R	8.8	R	11.5	W	113.3	R	37.1	W
40	100.0	R	68.5	R	45.3	R	106.9	R	-14.2	W	115.8	R	-6.7	W
41	129.5	R	85.9	R	28.4	R	119.3	R	10.0	W	100.0	R	44.8	W
42	121.8	R	107.4	R	111.7	R	189.5	R	33.3	W	85.2	R	-8.6	W
43	147.7	R	118.8	R	27.6	R	85.7	R	15.9	W	114.5	R	6.0	W
44	158.9	R	133.9	R	45.8	R	135.0	R	31.6	W	36.4	R	54.8	W
45	129.1	R	146.7	R	386.5	R	283.1	R	29.1	R	349.0	R	207.0	R
46	100.0	R	244.4	R	30.4	R	44.0	R	-12.3	W	329.4	R	-29.9	W
47	54.9	R	25.0	R	51.8	R	91.7	R	17.4	W	93.6	R	-5.8	W

FIGURE 3

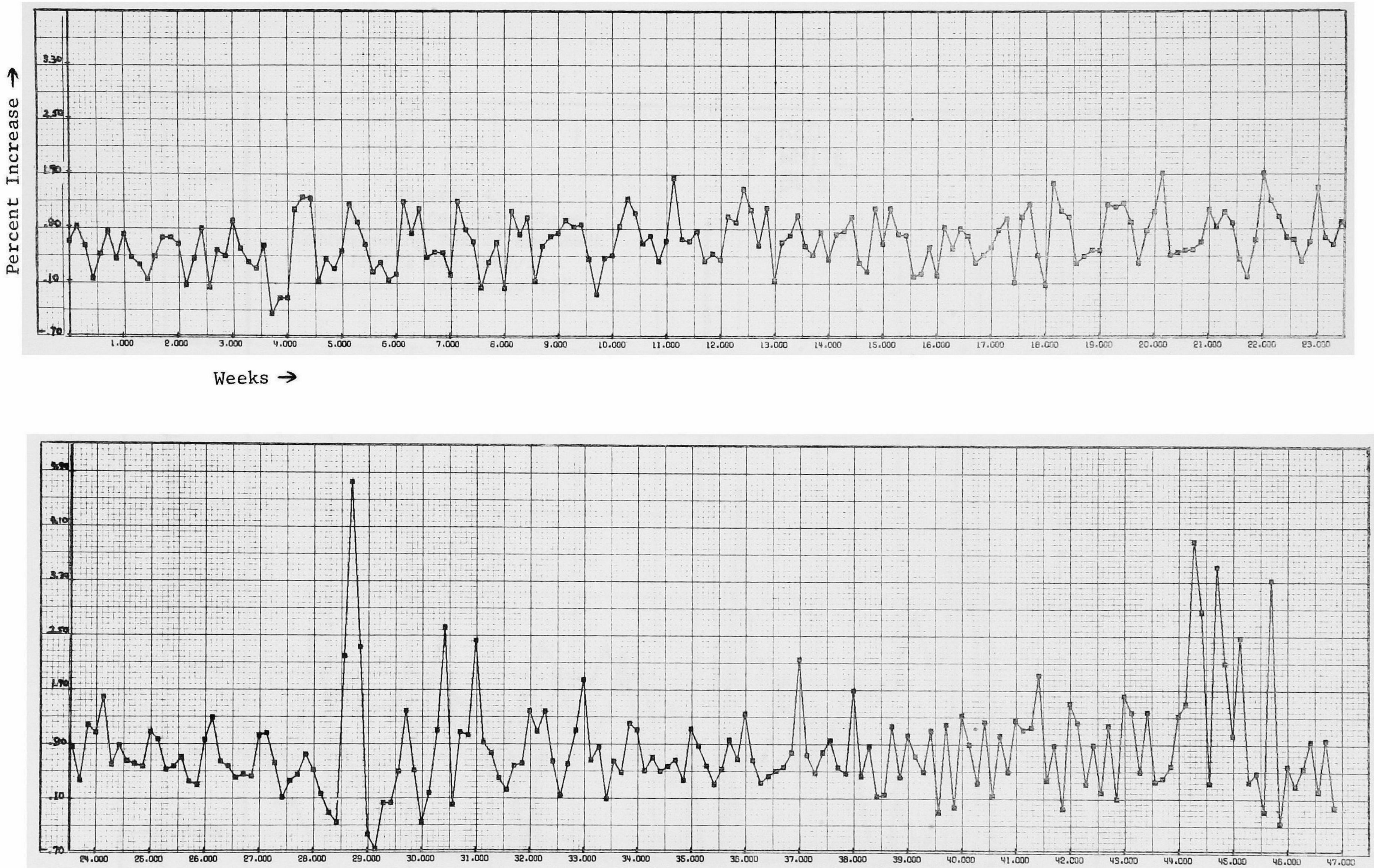


Diagram 3

Ocean Limited Percentage Increases by Day
1961/2 and 1962/3

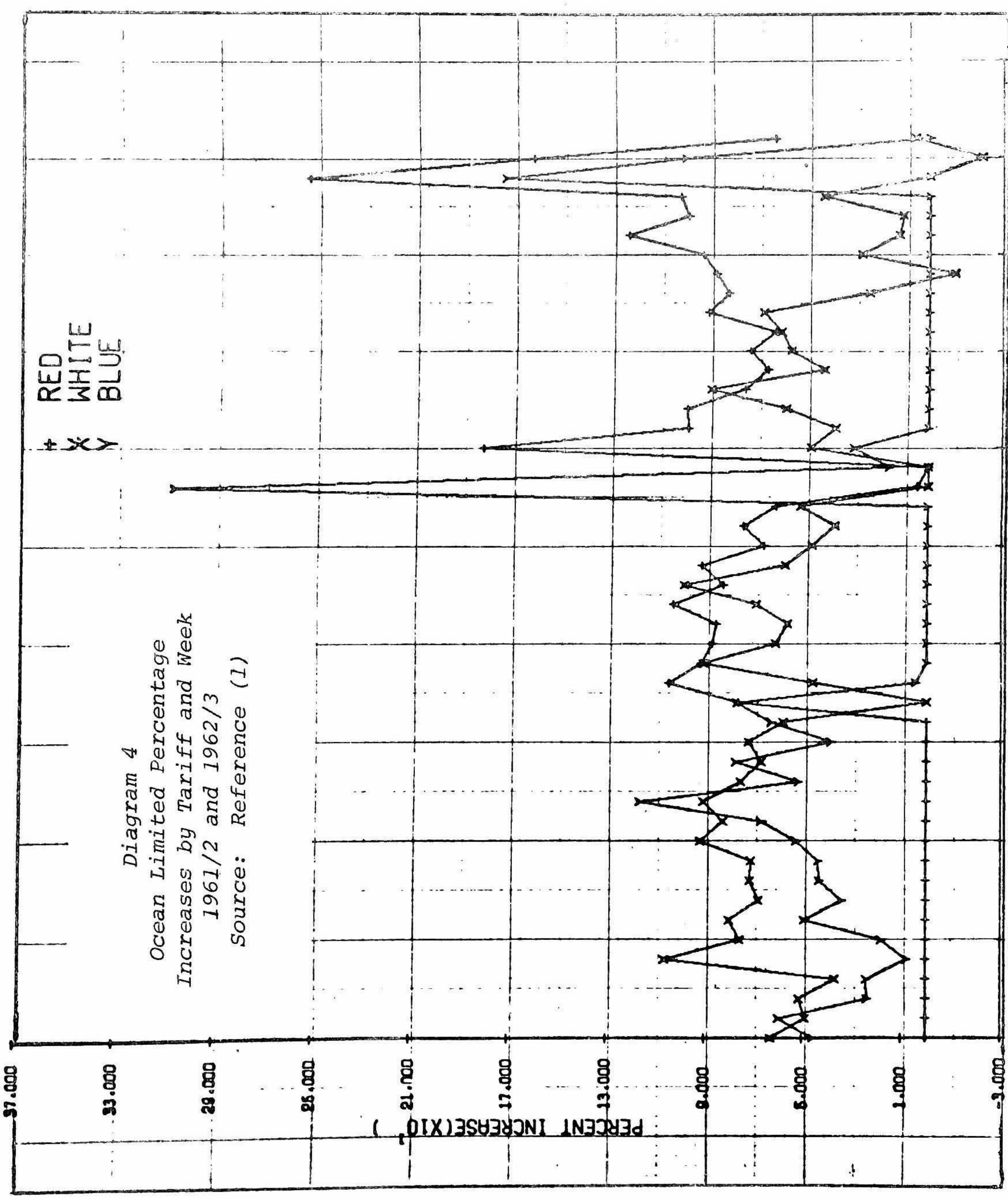


Diagram 4
Ocean Limited Percentage
Increases by Tariff and Week
1961/2 and 1962/3
Source: Reference (1)

The immediate conclusion from these figures is that there were clearly significant increases in traffic volume throughout the period, with the exception of a few isolated days. However, the largest increase of all (473.5 percent), occurred on a day when the peak tariff was in effect. This apparent reversal of the theory of demand elasticity brings to mind the remarks of Mr. Deswarte, of Sabena (Belgian) Airline, mentioned in Chapter I, i.e., that low fares lead to higher peaks. Certainly, it would appear that the development of new traffic by the offering of cheap rates in the off-peak periods, in the long run seems to build up a kind of reservior of people accustomed or newly accustomed to the particular type of service in question - in this case, rail (the Ocean Limited). These are the marginal customers attracted into the market by reduced tariffs. This reservior is unleashed at certain times, e.g., national holidays like Christmas, even though standard or even peak rates may be in effect at these peak times.

To some extent, this will aggravate the peak burden. However, as long as the phenomenon is recognised for what it is - an extremely isolated occurrence - and is not allowed to dominate investment policy, it is not totally disadvantageous. Heavy traffic at peak rates is highly profitable. Also the high demand seems likely to extend for several days (at least) beyond the particular holiday. On the other hand, mistiming of the application of the higher tariff, or an attempt to blanket a holiday period too extensively, can cause an absolute decline in traffic volume. This is apparent in weeks 29/30, before and after the Christmas weekend. Several explanations are conceivable:

a. Traffic in the short periods on either side of and adjacent to a holiday period, (i.e., the "shoulders" of the peak, see Diagram 5), could have a much greater elasticity, so that a peak tariff causes a disproportionate decline in traffic volume.

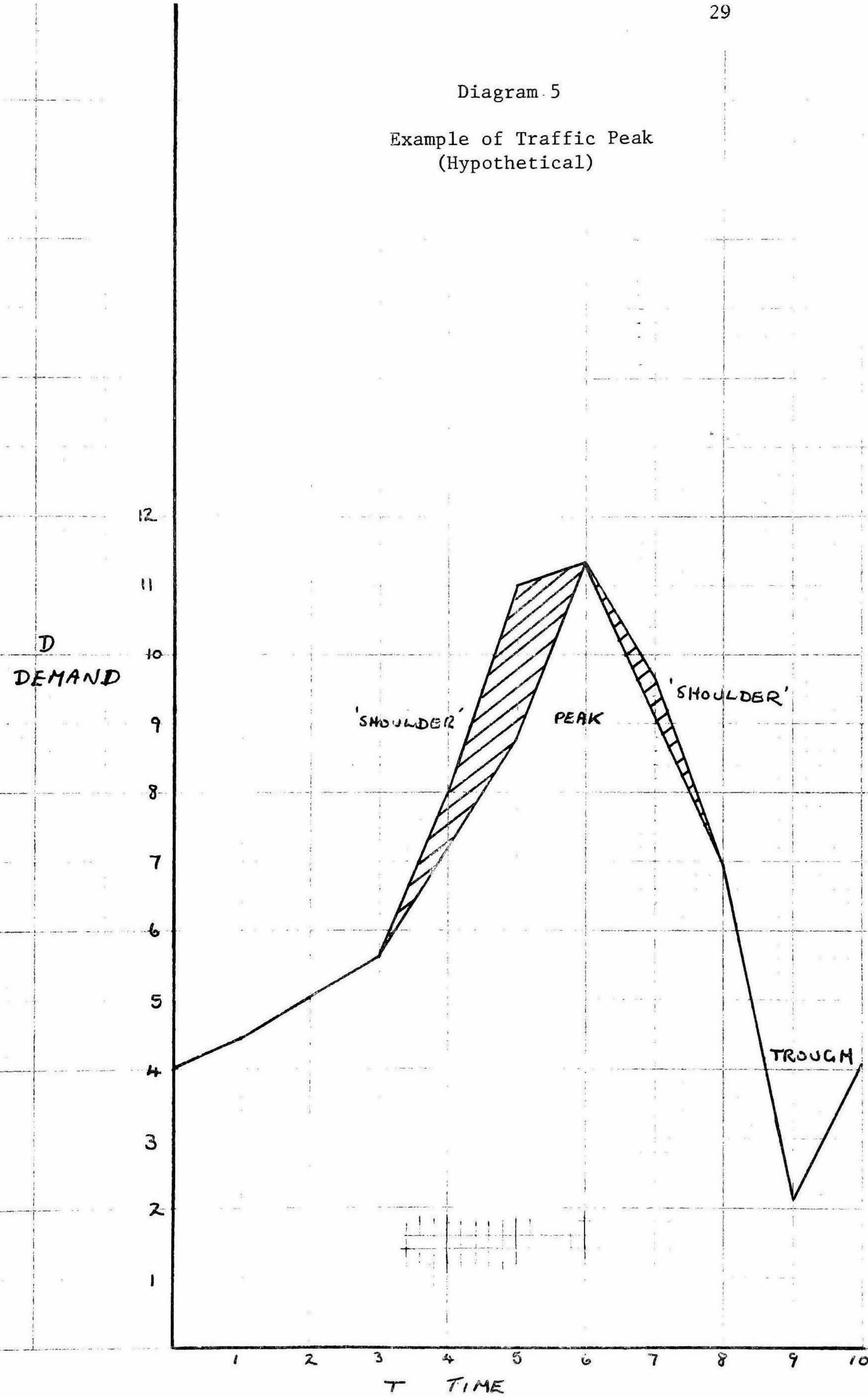
b. When peak tariffs are applied throughout a holiday period, there is little incentive for substitution to take place, except on days considerably outside the holiday period. If the customer is more or less obliged to pay the peak fare at all times during the holiday period, he will be more likely to travel at his own immediate convenience. The generation of major peaks at these times occurs as a direct consequence.

c. A combination of the above two points could also account for the phenomenon.

From the operator's viewpoint, there are very few ways of augmenting capacity in the short term, i.e., without major capital investment, to meet this kind of short term peak. Normally, the reason for the sudden rise in demand is common to a wide geographic area e.g., holidays like Christmas or general events. This means that all operators in a given locality face the same problem simultaneously and thus cannot charter equipment, one from the other to gain more flexibility. Airlines are perhaps in the most advantageous position, since their equipment can normally be moved over great distances very quickly, enabling them to augment or reduce capacity in the short term to some extent by switching even between continents. They have also shown a willingness to purchase "Quick Change" (QC) aircraft. These can be operated in the passenger mode during the day, and as freighters by night, since their

Diagram 5

Example of Traffic Peak
(Hypothetical)



seating can be removed quickly. However, this "QC" capability is more aimed at achieving a higher level of utilisation in general, than meeting the short term peak, except to the extent that every day is its own such peak, and every night a trough.

Even if it is possible to identify different and complementary market patterns, it is important to ensure that operating equipment is economically and physically compatible with both, before any advantage can be realised. For instance, with regard to the Hoverlloyd service detailed below at Chapter IV, two factors combine to curtail flexibility:

a. Equipment is unique to its terminal, which is two miles from the sea at low tide and has only 18 inches of water in the approaches at high tide. Therefore, no conventional ship can be used to augment capacity.

b. Extensive specialised engineering and stores in the terminal complex, including lifting equipment, make it technically impossible for the craft to operate away from the home base for more than a few hours, except at prohibitive cost.

It is possible to find instances where markets are complementary and equipment is compatible to both. For example, the same ship which operates between Newcastle (England) and Bergen (Norway) as a roll on roll off ferry each summer, switches to a similar role between Southhampton (England) and the Canary Islands each winter. In the shorter term, Northwest Airlines fly a 707 service from Minneapolis to Detroit, which immediately becomes a Pan American flight from Detroit to Europe. Similarly, Pan American 747 flight from Frankfurt and London to Washington, currently goes on from Washington to Atlanta as a Delta flight and then continues in the service of Delta on flights from Atlanta to Los Angeles and return, and Miami and return, before reverting to Pan American via Washington on another European service. This level of flexibility amongst international and domestic airlines is probably as much directed at overcoming licensing difficulties as it is to achieving greater equipment utilisation however, and is of marginal value in the meeting of a major short term peak such as a Christmas season.

Elasticity of Demand: Ocean Limited

In the case of the CN "Ocean Limited" service, as well as the question of trip time substitution previously mentioned, a number of additional factors make any calculation of the elasticity of demand of doubtful value. Independent factors such as service changes, the activities of competitors (including private car), etc., are virtually impossible to quantify. In addition, there is no means of assigning fares to passenger numbers using the Ocean Limited at Montreal (Central Station), since this would involve the assumption that all were travelling to or from Halifax, which is certainly not the case as there are a number of stops en route, the first of which is over 100 miles from Montreal.

Canadian National has noted however (1), that the degree of response to price action varies geographically, as well as by trip distance. To take advantage of this situation, in 1968 the CN services were divided into pricing zones, in order to give more recognition to the economic and competitive characteristics of each territory. It seems that in order to maximise the potential of a variable fare structure, this kind of continual re-evaluation of services, prices and marketing programmes is more essential to a commercial enterprise than ever.

Impact on Profit

One of the stated objectives of the Red, White and Blue scheme was to combat the unfavourable trend being shown by CN passenger operations. Figure 4 shows a comparison of passengers carried on Canadian National and Canadian Pacific rail services for the years 1958 - 68, together with indices setting 1958 = 100 in both cases. These indices are illustrated at Diagram 6 . The most significant period is that from 1962 to 1966, when the Red, White and Blue scheme was being extended through the whole CN system. The exceptional circumstances of Expo'67 make it advisable to disregard that year. Clearly, over the period 1961 65 there was a major reversal of the CN passenger trend. Figure 5 is a comparison of operating revenues from passenger services of Canadian National and Canadian Pacific over the same period, once again with indices setting 1958 = 100. The indices are illustrated at Diagram 7, and show even more clearly the reversal of the downward trend in CN passenger revenues, commencing 1962 63, compared with Canadian Pacific.

These trend reversals are not an indication of profitability, however, since costs must also be taken into account. There is room for more than one philosophy when it comes to cost allocation within a major enterprise like a railway company (see e.g., [3]). This is because of the high proportion of fixed costs which must be shared by the various types of operation and service using the same lines and facilities. This kind of division of opinion appears to have run through Canadian National. The current management has stated that in spite of the fact that there was a very significant volume increase and shift in traffic patterns,

> "...there has not been the overall net financial improvement anticipated, mainly because of the

FIGURE 4

Comparative Passengers Carried

Year	Canadian National '000	Canadian National Index	Canadian Pacific '000	Canadian Pacific Index
1958	11,625	(100.0)	7,746	(100.0)
1959	11,627	100.0	7,740	100.0
1960	11,016	94.8	7,059	91.1
1961	11,236	96.7	6,275	81.0
1962	11,621	100.0	6,440	83.1
1963	12,750	109.7	6,749	87.1
1964	14,826	127.5	6,997	90.3
1965	16,761	144.2	6,868	88.7
1966	16,266	139.9	6,019	77.7
1967	17,621	151.6	6,139	79.3
1968	13,925	119.8	5,288	68.3

Source: Dominian Bureau of Statistics
Railway Transport Operating and Traffic Statistics
(Part IV) Table 2
Catalogue No. 52-210 Annually 1958-69

Diagram 6

Comparative Indices of
Passengers Carried
1958=100

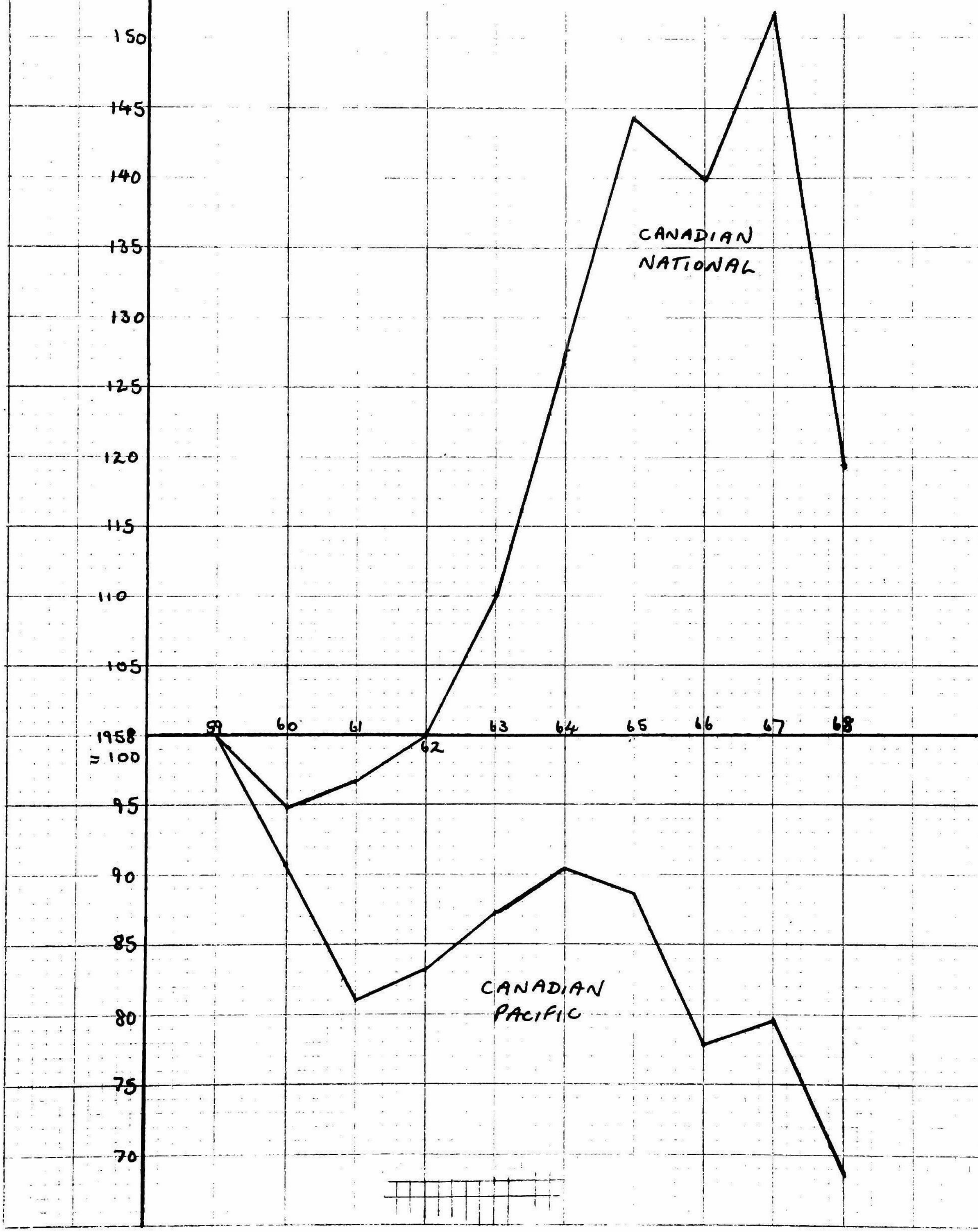


FIGURE 5

Comparative Operating Revenues Passenger Services

Year	Canadian National $'000	Canadian National Index	Canadian Pacific $'000	Canadian Pacific Index
1958	38,006	100.0	35,394	100.0
1959	36,827	96.9	33,212	93.8
1960	35,021	92.1	30,516	86.2
1961	31,752	83.5	26,258	74.2
1962	31,220	83.1	26,081	73.7
1963	31,434	82.7	24,968	70.5
1964	35,792	94.2	24,997	70.6
1965	39,077	102.8	23,947	67.7
1966	44,365	116.7	16,059	45.4
1967	57,430	151.1	19,133	54.1
1968	48,553	127.8	13,422	37.9

Source: Dominian Bureau of Statistics
Railway Transport Financial Statistics (Part II) Table 2
Catalogue No. 52-208 Annually 1958-69

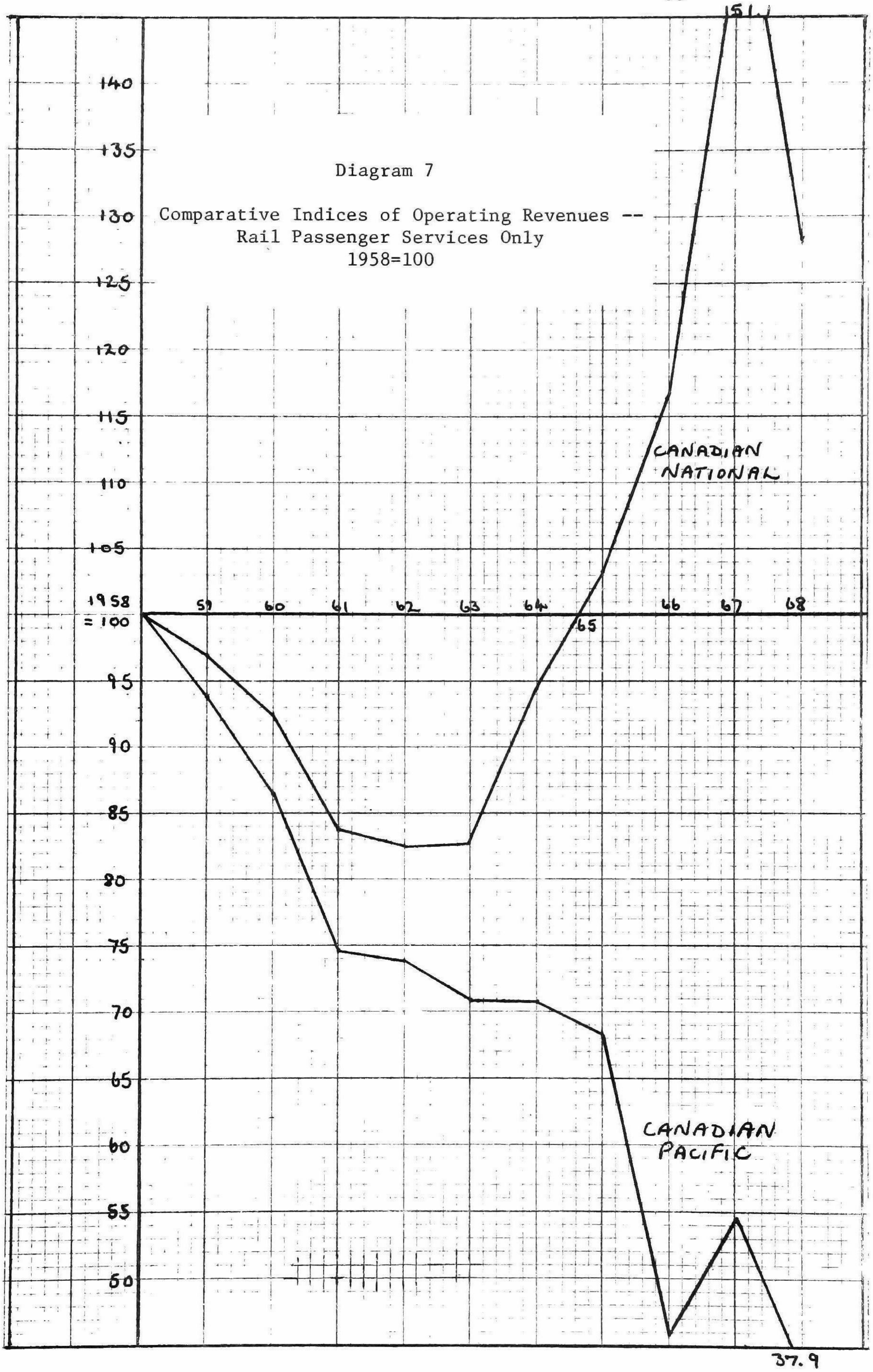


Diagram 7
Comparative Indices of Operating Revenues --
Rail Passenger Services Only
1958=100
140
135
130
125
120
115
110
105
1958
= 100
95
90
85
80
75
70
65
60
55
50
59
60
61
62
63
64
65
66
67
68
151.1
37.9
CANADIAN
NATIONAL
CANADIAN
PACIFIC

> exceptional rise in service costs and the expansion of competitive services in recent years." (1)

On the other hand, the former General Manager of Passenger Services for CN clearly sees the result in a different light, disputing the cost estimate of $150 million as indefinite:

> "...there are no ultimate measures of such costs which can satisfy everyone. Our costing system was designed to represent a fair apportionment of what were termed 'long term variable costs' including depreciation and interest. The cash saving represented by immediate and complete withdrawal of all service was estimated to be considerably less than half the loss as calculated. Nevertheless, an indicated $65 million loss was at least one measure of the financial and psychological burden which the passenger business imposed on Canadian National. The burden was to prove an insuperable barrier to the continuing development of positive passenger policies by the Railroad." (4)

Thus, in the latter half of the 1960's Canadian National eased the vigour of their approach to passenger transportation, although the actual Red, White and Blue fare structure has been maintained to date. It is not possible to arrive at any more positive assessment of the real impact of the fare structure upon profit, in view of the disagreement even apparently within CN, on cost allocation. The likelihood must remain also, that CN would have been obliged to face many cost rises irrespective of their fare structure, since this has been a fairly general trend amongst all railroads. The competitive position of CN in the passenger transportation market appears to have been improved by the implementation of this kind of scheme.

CHAPTER IV

Hoverlloyd

The principal ferry routes across the English Channel are illustrated at Diagram 8. It will be seen that the shortest crossing is via the French port of Calais, through which passes a substantial proportion of the market: approximately a quarter of a million cars (25 percent) and over 1½ million passengers (25 percent) annually. The Channel traffic may be broken down into a number of separately identifiable categories (1), as follows:

a. Day Return passengers - people on foot completing a return journey within a 24 hour period. There are normally concessional fares available for such journeys, which take place almost entirely in the summer holiday season.

b. Full fare/Standard foot passengers - passengers travelling on foot who buy a single or period return ticket.

c. Passengers accompanying cars - self explanatory. Sometimes the passenger fare for such people is included in the vehicle fare, and sometimes it is charged separately at the standard rate, according to which service is used.

It has been estimated (1) that the latter category accounts for about 70 percent of the gross revenue of the ferry operators, and is the only one where any significant growth is occurring.

All of the ferry services provide drive on, drive off facilities, i.e., there is no loading or unloading by sling or cranes of any passenger accompanied cars.

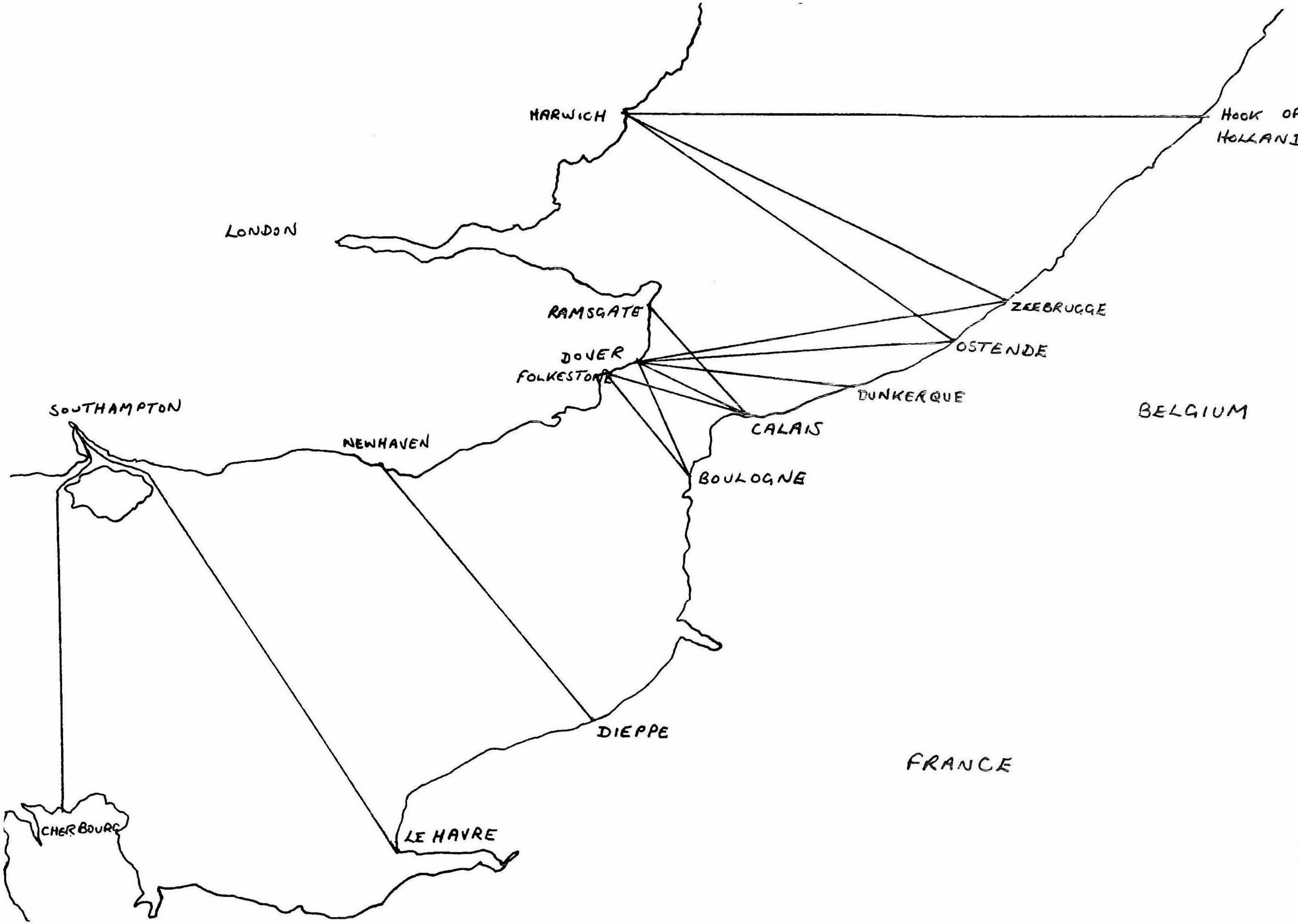


Diagram 8

English Channel Ferry Services

The movement of cars across the Channel is strongly weighted according to the season. Diagram 9 shows clearly the predominance of the summer season, and particularly of August. Figure 6 compares the monthly breakdown of car and passenger movements of the three principal Channel ports - Ostend, Calais, and Boulogne. The concentration of traffic into the summer season is most marked in the case of the French ports of Calais and Boulogne, where about 30 percent of the entire year's vehicle traffic moves in the month of August alone. However, an analysis by month does not properly bring out the true significance of this peak problem. As is shown by Diagram 10, Saturdays seem to stand out strongly throughout the main summer period. Diagrams 11 and 12 also show clearly the dominance of Saturday as the favourite day of travel, when up to 25 percent according to direction, of the week's movements take place. The port of Calais appears to be very typical of the Channel ports' holiday traffic in this respect. Hourly distributions of Calais traffic by direction for 1967 are shown at Figures 7 and 8, followed by listings from busiest to slackest hour according to direction, at Figures 9 and 10. Diagrams 13 and 14 illustrate the range of traffic volume variation through the month of August, according to direction.

The ship operators serving these Channel routes are listed at Figure 11. The services provided are subject to no kind of official rate regulation whatever. However, all operators belong to a "conference" or trade cartel, and charge identical rates for the crossing via Calais, Boulogne or Ostend. These rates have been maintained at a standard level throughout each year - i.e., fares are identical for a crossing on Wednesday in February or Saturday in August.

Diagram 9
English Channel Car Traffic
Monthly Distribution
(1968)
Source: Reference (1)

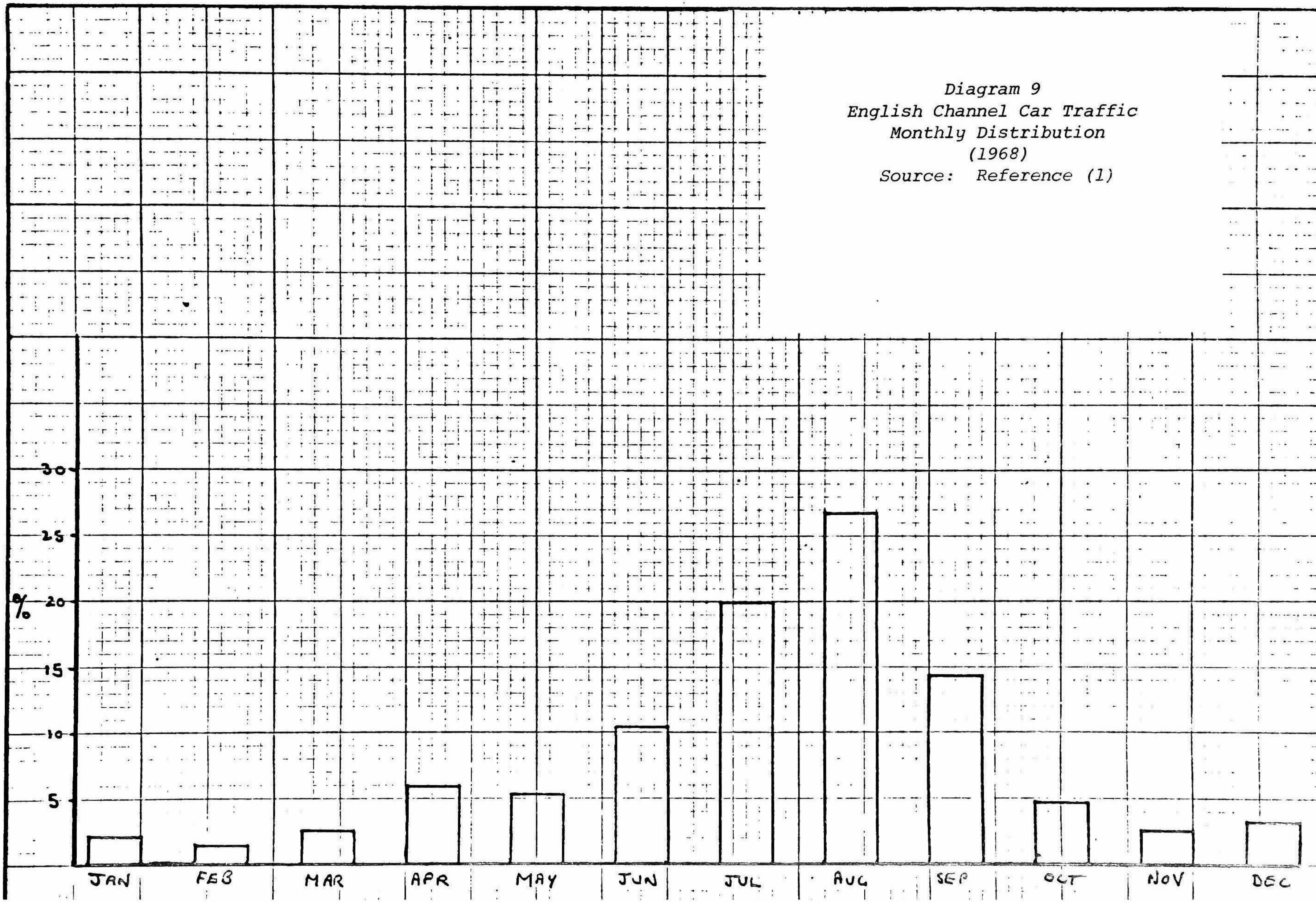


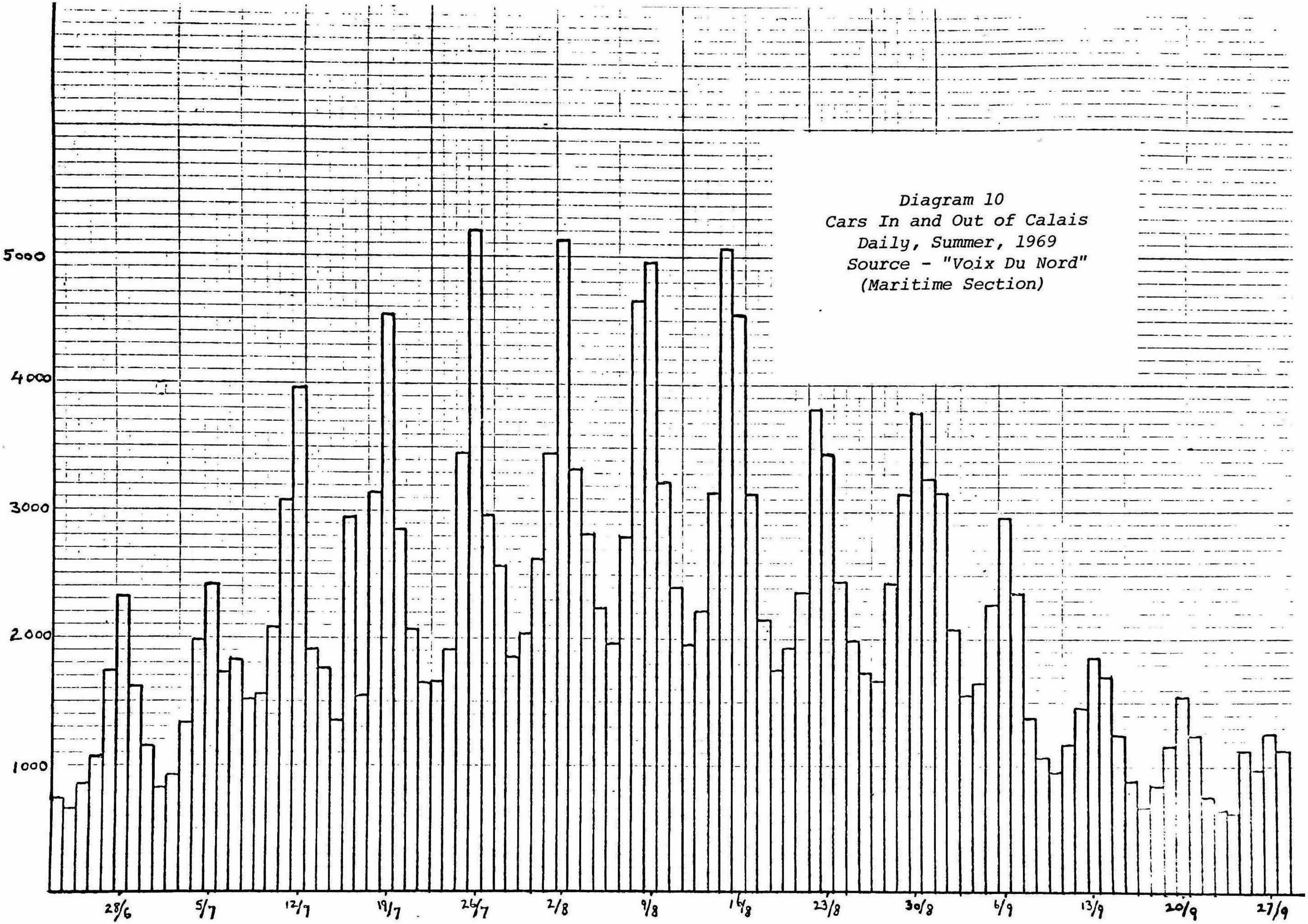
FIGURE 6

English Channel - Principal Ports Percentage Breakdown of Traffic by Months (1968)

CARS - Month	Ostend	Calais	Boulogne
January	3.5	1.3	1.3
February	2.2	1.2	0.8
March	3.4	1.9	1.7
April	7.1	5.5	5.2
May	6.9	2.9	6.0
June	12.9	8.5	11.1
July	18.6	23.7	19.9
August	21.5	31.9	29.6
September	11.4	15.0	17.0
October	4.8	4.0	3.7
November	2.9	2.0	1.7
December	4.8	2.1	2.0
	100.0	100.0	100.0

PASSENGERS - Month	Ostend	Calais	Boulogne
January	2.6	4.2	0.7
February	1.7	2.2	0.4
March	2.5	2.9	1.0
April	11.0	11.7	4.8
May	7.2	4.1	5.1
June	12.6	7.2	11.6
July	19.6	19.8	24.0
August	22.6	24.8	32.0
September	10.9	12.9	16.3
October	3.6	4.2	2.0
November	2.1	2.3	0.8
December	3.6	3.7	1.3
	100.0	100.0	100.0

Source: Reference (1)



Single days-Saturdays-marked by date

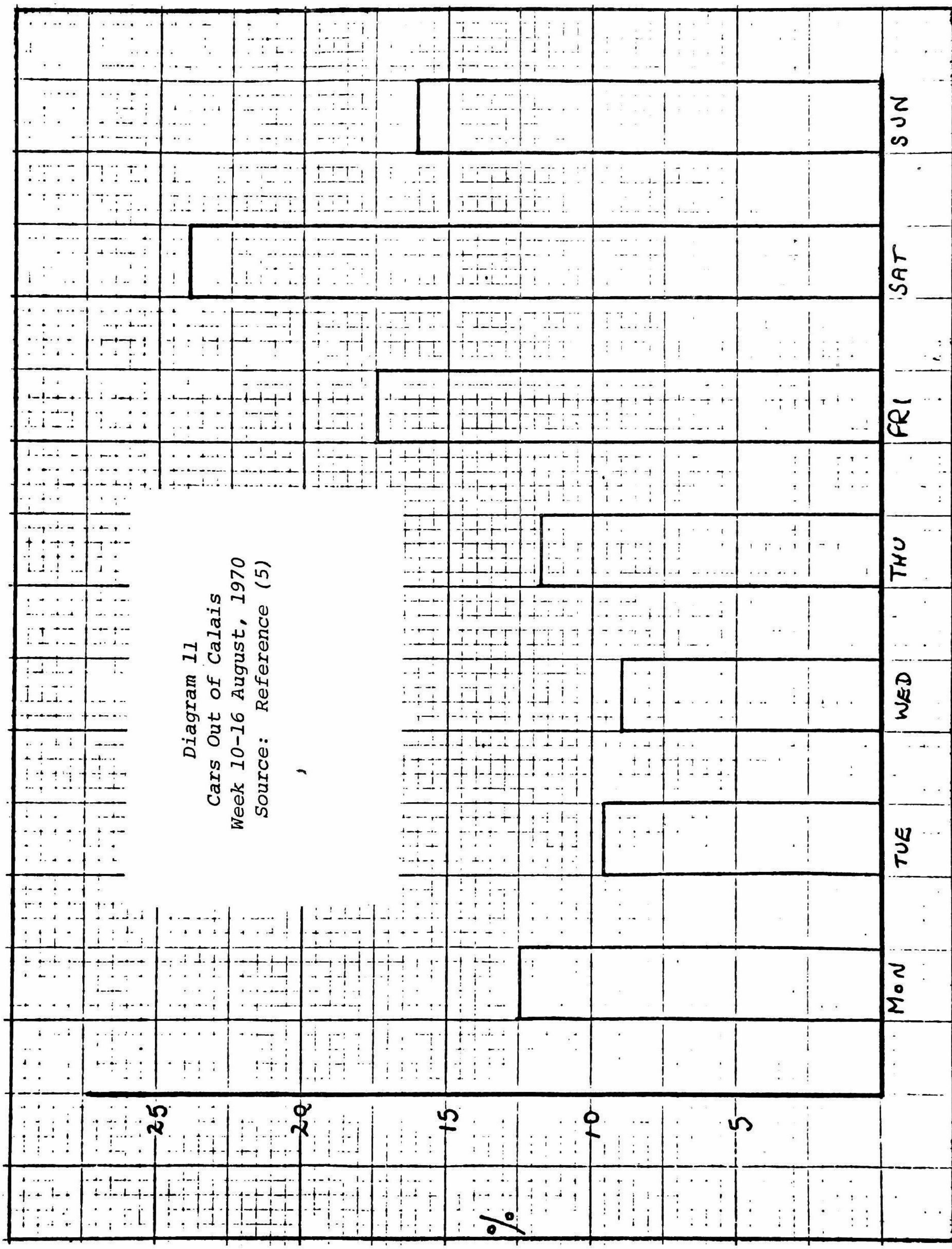


Diagram 11
Cars Out of Calais
Week 10-16 August, 1970
Source: Reference (5)
MON
TUE
WED
THU
FRI
SAT
SUN
5
10
15
20
25
%

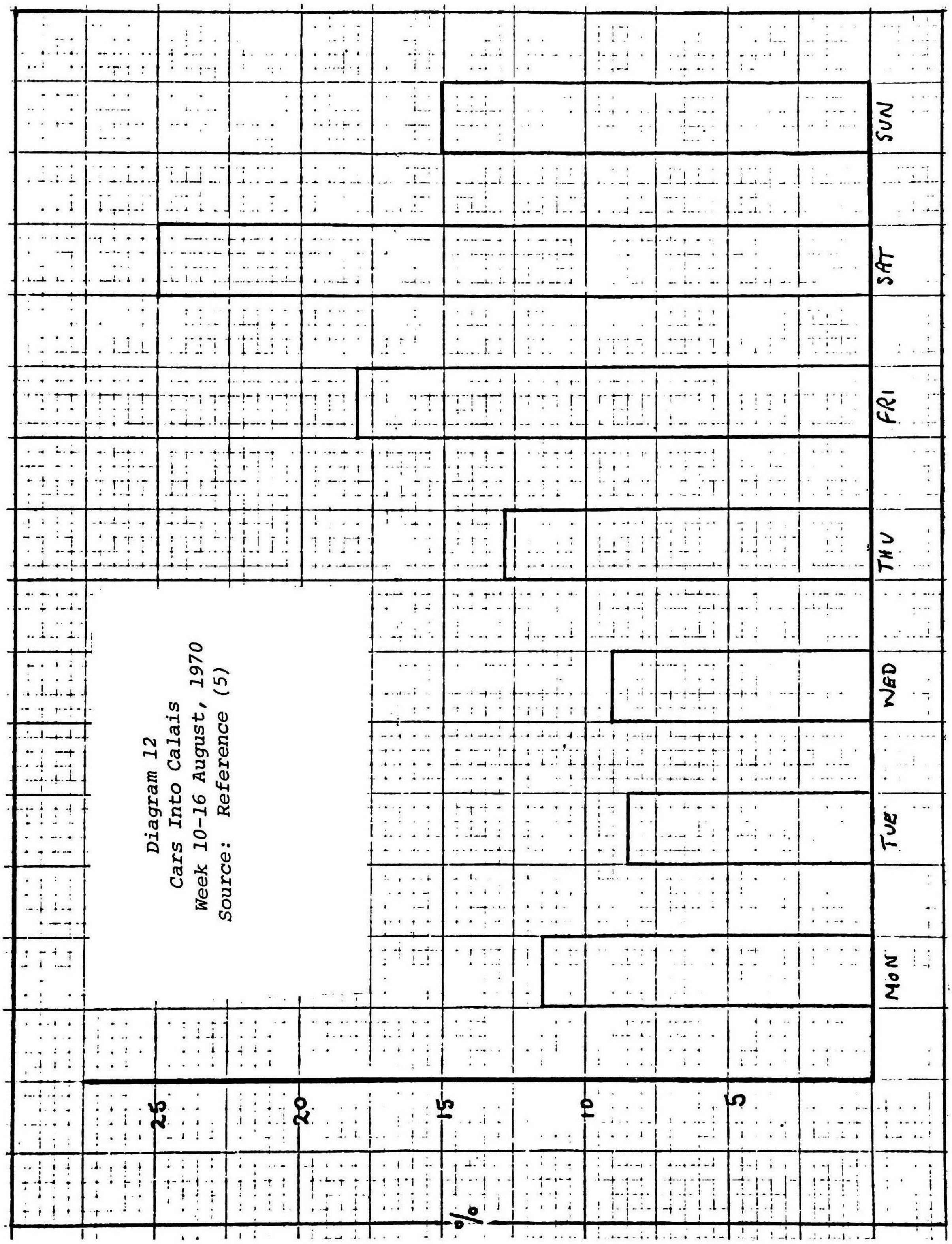


Diagram 12
Cars Into Calais
Week 10-16 August, 1970
Source: Reference (5)

HOURLY CAR LOADINGS AUGUST 1967

CALAIS TO UK

NOTE- CAR RATE INDICATES NUMBER OF CARS IN THE HOUR UP TO HOUR AT COLUMN HEAD.

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	19	34	0	0	0	0	86	94	0	0	0	112	50	48	48	0	0	85	14	4	14	0	0	49
2	22	29	0	0	0	0	84	81	0	0	0	110	45	62	53	0	0	96	15	9	18	0	0	63
3	14	0	40	0	0	0	77	115	0	0	0	156	57	78	65	0	0	143	16	14	32	0	0	60
4	14	47	0	0	0	12	107	175	14	0	0	172	98	147	105	135	0	191	31	54	68	70	0	76
5	25	104	11	0	0	23	101	196	39	0	0	200	106	206	165	217	0	198	44	30	112	105	0	91
6	20	114	15	0	0	24	110	174	76	0	0	206	60	0	173	141	0	136	21	32	34	41	0	48
7	0	51	9	0	0	0	97	107	0	0	0	130	80	84	41	0	0	141	14	10	25	0	0	74
8	25	47	0	0	0	0	76	99	0	0	0	133	60	88	46	0	0	110	18	9	23	0	0	62
9	19	38	0	0	0	0	79	133	0	0	0	112	75	84	19	0	0	109	7	19	36	0	0	49
10	27	43	0	0	0	0	98	168	0	0	0	146	78	0	186	0	0	176	28	0	71	0	0	94
11	14	57	0	0	0	16	104	187	28	0	0	187	105	148	115	172	0	194	63	54	132	153	0	86
12	57	135	10	0	0	34	102	186	31	0	0	192	107	0	349	208	0	205	106	0	248	212	0	205
13	26	112	17	0	0	32	98	197	77	0	0	194	66	89	143	164	0	191	19	24	44	56	0	48
14	20	56	6	0	0	0	93	168	0	0	0	134	90	106	46	0	0	127	27	24	29	0	0	93
15	20	27	0	0	0	0	71	105	0	0	0	104	78	68	35	0	0	119	11	19	25	0	0	51
16	15	35	0	0	0	0	89	101	0	0	0	104	66	85	47	0	0	132	15	15	36	0	0	47
17	23	36	0	0	0	0	98	132	0	0	0	105	84	96	65	0	0	149	34	12	29	0	0	64
18	13	49	0	0	0	24	91	163	17	0	0	141	98	136	90	129	0	157	33	34	96	69	0	78
19	18	93	14	0	0	27	104	189	24	0	0	201	102	0	368	168	0	206	38	23	138	82	0	72
20	21	76	5	0	0	33	107	175	61	0	0	161	80	78	81	103	0	121	25	23	22	42	0	56
21	22	56	11	0	0	0	86	110	0	0	0	123	81	88	49	0	0	137	17	4	26	0	0	57
22	12	37	0	0	0	0	60	71	0	0	0	87	57	72	41	0	0	114	15	0	41	0	0	39
23	22	39	0	0	0	0	90	116	0	0	0	92	55	85	44	0	0	121	11	17	25	0	0	55
24	24	39	0	0	0	0	95	146	0	0	0	95	63	88	42	0	0	136	23	12	32	0	0	50
25	19	50	0	0	0	14	85	131	14	0	0	129	81	101	42	96	0	136	37	28	69	46	0	50
26	19	38	5	0	0	22	93	180	18	0	0	149	101	125	123	133	0	178	0	48	38	52	0	60
27	0	64	9	0	0	25	0	185	48	0	0	183	110	161	154	150	0	167	82	80	83	82	0	87
28	0	90	9	0	0	0	0	0	0	156	0	175	110	0	242	0	0	174	93	39	140	0	0	96
29	0	94	0	0	0	0	0	169	0	0	0	140	92	116	65	0	0	178	91	0	70	0	0	55
30	0	66	0	0	0	0	0	121	0	0	0	128	100	85	79	0	0	171	67	29	62	0	0	60
31	0	77	0	0	0	0	0	185	0	0	0	168	0	114	127	0	0	185	80	103	53	0	0	0

Source: Reference (5)

FIGURE 7

HOURLY CAR LOADINGS AUGUST 1967

UK TO CALAIS

NOTE- CAR RATE INDICATES NUMBER OF CARS IN THE HOUR UP TO HOUR AT COLUMN HEAD.

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	0	0	0	56	145	0	0	0	103	97	44	137	0	0	145	80	35	42	0	0	49	34	62	0
2	0	0	0	49	101	0	0	0	85	85	35	82	0	0	82	51	33	36	0	0	45	46	38	0
3	0	0	0	71	128	0	0	0	73	81	47	86	0	0	93	69	51	42	0	0	41	61	25	0
4	0	0	33	66	92	31	0	0	64	105	55	98	85	0	122	67	127	51	57	0	66	64	172	123
5	0	0	109	121	184	85	0	0	137	112	64	139	174	0	127	98	28	49	27	0	32	47	48	26
6	0	0	38	71	140	29	0	0	97	95	45	86	80	0	88	51	22	24	37	0	41	37	26	18
7	0	0	0	48	157	0	0	0	81	95	43	127	0	0	103	93	17	36	0	0	62	48	15	0
8	0	0	0	34	80	0	0	0	55	62	28	90	0	0	95	66	25	23	0	0	45	40	35	0
9	0	0	0	36	92	0	0	0	59	76	41	76	0	0	94	68	32	32	0	0	50	41	26	0
10	0	0	0	74	128	0	0	0	82	93	45	88	0	0	94	85	57	42	0	0	45	67	34	0
11	0	0	31	65	115	41	0	0	70	101	70	97	85	0	128	85	117	35	49	0	61	99	143	108
12	0	0	132	102	187	93	0	0	168	96	103	130	160	0	183	109	34	51	40	0	56	47	54	22
13	0	0	48	67	181	24	0	0	87	109	47	93	108	0	97	80	22	27	48	0	45	20	28	21
14	0	0	0	63	163	0	0	0	83	99	50	99	0	0	121	86	30	53	0	0	67	45	26	0
15	0	0	0	39	113	0	0	0	69	75	50	89	0	0	97	76	34	42	0	0	85	50	30	0
16	0	0	0	46	104	0	0	0	72	99	47	104	0	0	113	80	47	52	0	0	64	47	44	0
17	0	0	0	57	117	0	0	0	76	104	48	111	0	0	109	87	55	47	0	0	58	74	48	0
18	0	0	43	69	146	35	0	0	89	109	59	117	92	0	170	89	82	53	57	0	78	77	108	100
19	0	0	115	112	191	67	0	0	171	116	51	124	152	0	138	95	25	55	61	0	40	46	46	28
20	0	0	20	60	132	13	0	0	63	109	36	87	73	0	90	75	18	45	27	0	44	23	20	23
21	0	0	0	39	112	0	0	0	71	79	43	96	0	0	111	79	19	27	0	0	55	26	8	0
22	0	0	0	31	75	0	0	0	32	58	39	64	0	0	74	45	22	32	0	0	47	23	15	0
23	0	0	0	38	69	0	0	0	50	50	34	58	0	0	84	66	26	27	0	0	47	37	31	0
24	0	0	0	34	116	0	0	0	89	101	54	73	0	0	110	80	61	43	0	0	57	67	44	0
25	0	0	31	64	99	32	0	0	58	106	49	88	84	0	133	82	80	45	37	0	57	65	54	110
26	0	0	67	104	189	30	0	0	131	110	44	130	93	0	88	79	44	35	37	0	39	0	60	24
27	0	0	30	0	85	17	0	0	80	98	35	78	63	0	71	63	29	25	37	0	28	0	33	11
28	0	0	0	0	65	0	0	0	91	0	0	68	0	0	69	38	15	23	0	0	24	0	23	0
29	0	0	0	0	72	0	0	0	29	38	43	69	0	0	70	55	41	19	0	0	32	0	32	0
30	0	0	0	0	54	0	0	0	48	55	31	51	0	0	74	52	39	22	0	0	33	0	53	0
31	0	0	0	0	95	0	0	0	69	0	39	60	0	0	72	44	63	29	0	0	33	0	0	0

Source: Reference (5)

FIGURE 8

HOURLY CAR LOADINGS AUGUST 1967 CALAIS TO UK

READ HORIZONTALLY HIGHEST CAR RATE PER HOUR, HOUR OF DAY, DATE IN AUGUST.

368	15	19	349	15	12	248	21	12	242	15	28	217	16	5	212	22	12	208	16	12	206	14	5	206	12	6	206	18	19	205	18	12
205	24	12	201	12	19	200	12	5	198	18	5	197	8	13	196	8	5	194	18	11	194	12	13	192	12	12	191	18	4	191	18	13
189	8	19	187	8	11	187	12	11	187	18	27	186	15	10	186	8	12	185	8	27	185	8	31	185	18	31	183	12	27	180	8	26
178	18	26	178	18	29	176	18	10	175	8	4	175	8	20	175	12	28	174	8	6	174	18	28	173	15	6	172	12	4	172	16	11
171	18	30	169	8	29	168	8	10	168	8	14	168	16	19	168	12	31	165	15	5	164	16	13	163	8	18	161	12	20	161	14	27
157	18	18	156	12	3	156	10	28	154	15	27	153	22	11	150	16	27	149	18	17	149	12	26	148	14	11	147	14	4	146	12	10
146	8	24	143	18	3	143	15	13	141	16	6	141	18	7	141	12	18	140	21	28	140	12	29	138	21	19	137	18	21	136	18	6
136	14	18	136	18	24	136	18	25	135	16	4	135	2	12	134	12	14	133	12	8	133	8	9	133	16	26	132	21	11	132	16	16
132	8	17	131	8	25	130	12	7	129	16	18	129	12	25	128	12	30	127	18	14	127	15	31	125	14	26	123	12	21	123	15	26
121	18	20	121	18	23	121	8	30	119	18	15	116	8	23	116	14	29	115	8	3	115	15	11	114	2	6	114	18	22	114	14	31
112	12	1	112	21	5	112	12	9	112	2	13	110	12	2	110	7	6	110	18	8	110	8	21	110	13	27	110	13	28	109	18	9
107	7	4	107	8	7	107	13	12	107	7	20	106	13	5	106	19	12	106	14	14	105	15	4	105	22	5	105	13	11	105	8	15
105	12	17	104	2	5	104	7	11	104	12	15	104	12	16	104	7	19	103	16	20	103	20	31	102	7	12	102	13	19	101	7	5
101	8	16	101	14	25	101	13	26	100	13	30	99	8	8	98	13	4	98	7	10	98	7	13	98	7	17	98	13	18	97	7	7
96	18	2	96	14	17	96	21	18	96	16	25	96	24	28	95	7	24	95	12	24	94	8	1	94	24	10	94	2	29	93	7	14
93	24	14	93	2	19	93	7	26	93	19	28	92	12	23	92	13	29	91	24	5	91	7	18	91	19	29	90	13	14	90	15	18
90	7	23	90	2	28	89	14	13	89	7	16	89	21	25	88	14	8	88	14	21	88	14	24	87	12	22	87	24	27	86	7	1
86	24	11	86	7	21	85	18	1	85	14	16	85	14	23	85	7	25	85	14	30	84	7	2	84	14	7	84	14	9	84	13	17
83	21	27	82	22	19	82	19	27	82	22	27	81	8	2	81	15	20	81	13	21	81	13	25	80	13	7	80	13	20	80	20	27
80	19	31	79	7	9	79	15	30	78	14	3	78	13	10	78	13	15	78	24	18	78	14	20	77	7	3	77	9	13	77	2	31
76	24	4	76	9	6	76	7	8	76	2	20	75	13	9	74	24	7	72	24	19	72	14	22	71	21	10	71	7	15	71	8	22
70	22	4	70	21	29	69	22	18	68	21	4	68	14	15	67	19	30	66	13	13	66	13	16	66	2	30	65	15	3	65	15	17
65	15	29	64	24	17	64	2	27	63	24	2	63	19	11	63	13	24	62	14	2	62	24	8	62	21	30	61	9	20	60	24	3
60	13	6	60	13	8	60	7	22	60	24	26	60	24	30	57	13	3	57	2	11	57	1	12	57	24	21	57	13	22	56	22	13
56	2	14	56	24	20	56	2	21	55	13	23	55	24	23	55	24	29	54	20	4	54	20	11	53	15	2	53	21	31	52	22	26
51	2	7	51	24	15	50	13	1	50	24	24	50	2	25	50	24	25	49	24	1	49	24	9	49	2	18	49	15	21	48	14	1
48	15	1	48	24	6	48	24	13	48	20	26	48	9	27	47	2	4	47	2	8	47	15	16	47	24	16	46	15	8	46	15	14
46	22	25	45	13	2	44	19	5	44	21	13	44	15	23	43	2	10	42	22	20	42	15	24	42	15	25	41	22	6	41	15	7
41	15	22	41	21	22	40	3	3	39	9	5	39	24	22	39	2	23	39	2	24	39	20	28	38	2	9	38	19	19	38	2	26
38	21	26	37	2	22	37	19	25	36	21	9	36	21	16	36	2	17	35	15	15	35	2	16	34	2	1	34	21	6	34	6	12
34	19	17	34	20	18	33	19	18	33	6	20	32	21	3	32	20	6	32	6	13	32	21	24	31	19	4	31	9	12	30	20	5
29	2	2	29	21	14	29	21	17	29	20	30	28	19	10	28	9	11	28	20	25	27	1	10	27	19	14	27	2	15	27	6	19
26	1	13	26	21	21	25	1	5	25	21	7	25	1	8	25	21	15	25	19	20	25	21	23	25	6	27	24	6	6	24	20	13
24	20	14	24	6	18	24	9	19	24	1	24	23	6	5	23	21	8	23	1	17	23	20	19	23	20	20	23	19	24	22	1	2
22	21	20	22	1	21	22	1	23	22	6	26	21	19	6	21	1	20	20	1	6	20	1	14	20	1	15	19	1	1	19	1	9
19	15	9	19	20	9	19	19	13	19	20	15	19	1	25	19	1	26	18	21	2	18	19	8	18	1	19	18	9	26	17	3	13
17	9	18	17	19	21	17	20	23	16	19	3	16	6	11	15	19	2	15	3	6	15	1	16	15	19	16	15	20	16	15	19	22
14	19	1	14	21	1	14	1	3	14	20	3	14	1	4	14	9	4	14	19	7	14	1	11	14	3	19	14	6	25	14	9	25
13	1	18	12	6	4	12	20	17	12	1	22	12	20	24	11	3	5	11	19	15	11	3	21	11	19	23	10	20	7	10	3	12
9	20	2	9	3	7	9	20	8	9	3	27	9	3	28	7	19	9	6	3	14	5	3	20	5	3	26	4	20	1	4	20	21
0	3	1	0	4	1	0	5	1	0	6	1	0	9	1	0	10	1	0	11	1	0	16	1	0	17	1	0	22	1	0	23	1
0	3	2	0	4	2	0	5	2	0	6	2	0	9	2	0	10	2	0	11	2	0	16	2	0	17	2	0	22	2	0	23	2
0	2	3	0	4	3	0	5	3	0	6	3	0	9	3	0	10	3	0	11	3	0	16	3	0	17	3	0	22	3	0	23	3
0	3	4	0	4	4	0	5	4	0	10	4	0	11	4	0	17	4	0	23	4	0	4	5	0	5	5	0	10	5	0	11	5
0	17	5	0	23	5	0	4	6	0	5	6	0	10	6	0	11	6	0	14	6	0	17	6	0	23	6	0	1	7	0	4	7
0	5	7	0	6	7	0	9	7	0	10	7	0	11	7																		

Source: Reference (5)

FIGURE 9

HOURLY CAR LOADINGS AUGUST 1967 UK TO CALAIS

READ HORIZONTALLY HIGHEST CAR RATE PER HOUR, HOUR OF DAY, DATE IN AUGUST.

191	5	19	189	5	26	187	5	12	184	5	5	183	15	12	181	5	13	174	13	5	172	23	4	171	9	19	170	15	18	168	9	12
163	5	14	160	13	12	157	5	7	152	13	19	146	5	18	145	5	1	145	15	1	143	23	11	140	5	6	139	12	5	138	15	19
137	12	1	137	9	5	133	15	25	132	3	12	132	5	20	131	9	26	130	12	12	130	12	26	128	5	3	128	5	10	128	15	11
127	17	4	127	15	5	127	12	7	124	12	19	123	24	4	122	15	4	121	4	5	121	15	14	117	17	11	117	5	17	117	12	18
116	10	19	116	5	24	115	5	11	115	3	19	113	5	15	113	15	16	112	10	5	112	4	19	112	5	21	111	12	17	111	15	21
110	15	24	110	24	25	110	10	26	109	3	5	109	16	12	109	10	13	109	10	18	109	10	20	108	24	11	108	13	13	108	23	18
106	10	25	105	10	4	104	5	16	104	12	16	104	10	17	104	4	26	103	9	1	103	15	7	103	11	12	102	4	12	101	5	2
101	10	11	101	10	24	100	15	17	100	24	18	99	22	11	99	10	14	99	12	14	99	10	16	99	5	25	98	12	4	98	16	5
98	10	27	97	10	1	97	9	6	97	12	11	97	15	13	97	15	15	96	10	12	96	12	21	95	10	6	95	10	7	95	15	8
95	16	19	95	5	31	94	15	9	94	15	10	93	15	3	93	16	7	93	10	10	93	6	12	93	12	13	93	13	26	92	5	4
92	5	9	92	13	18	91	9	28	90	12	8	90	15	20	89	12	15	89	9	18	89	16	18	89	9	24	88	15	6	88	12	10
88	12	25	88	15	26	87	9	13	87	16	17	87	12	20	86	12	3	86	12	6	86	16	14	85	9	2	85	10	2	85	13	4
85	6	5	85	16	10	85	13	11	85	16	11	85	21	15	85	5	27	84	15	23	84	13	25	83	9	14	82	12	2	82	15	2
82	9	10	82	17	18	82	16	25	81	10	3	81	9	7	81	21	11	80	16	1	80	13	6	80	5	8	80	16	13	80	16	16
80	16	24	80	17	25	80	9	27	79	10	21	79	16	21	79	16	26	78	21	18	78	12	27	77	22	18	76	10	9	76	12	9
76	16	15	76	9	17	75	10	15	75	16	20	75	5	22	74	4	10	74	22	17	74	15	22	74	15	30	73	9	3	73	13	20
73	12	24	72	9	16	72	5	29	72	15	31	71	4	3	71	4	6	71	9	21	71	15	27	70	9	11	70	11	11	70	15	29
69	16	3	69	9	15	69	4	18	69	5	23	69	15	28	69	12	29	69	9	31	68	16	9	68	12	28	67	16	4	67	22	10
67	4	13	67	21	14	67	6	19	67	22	24	67	3	26	66	4	4	66	21	4	66	16	8	66	16	23	65	4	11	65	22	25
65	5	28	64	9	4	64	22	4	64	11	5	64	21	16	64	12	22	64	4	25	63	4	14	63	9	20	63	13	27	63	16	27
63	17	31	62	23	1	62	21	7	62	10	8	61	22	3	61	19	19	61	17	24	60	4	20	60	23	26	60	12	31	59	9	9
59	11	18	58	21	17	58	10	22	58	12	23	58	9	25	57	19	4	57	17	10	57	4	17	57	19	18	57	21	24	57	21	25
56	4	1	56	21	12	55	11	4	55	9	8	55	17	17	55	18	19	55	21	21	55	16	29	55	10	30	54	23	12	54	11	24
54	23	25	54	5	30	53	18	14	53	18	18	53	23	30	52	18	16	52	16	30	51	16	2	51	17	3	51	18	4	51	16	6
51	18	12	51	11	19	51	12	30	50	21	9	50	11	14	50	11	15	50	22	15	50	9	23	50	10	23	49	21	1	49	4	2
49	18	5	49	19	11	49	11	25	48	23	5	48	4	7	48	22	7	48	3	13	48	19	13	48	11	17	48	23	17	48	9	30
47	11	3	47	22	5	47	22	12	47	11	13	47	11	16	47	17	16	47	22	16	47	18	17	47	21	22	47	21	23	46	22	2
46	4	16	46	22	19	46	23	19	45	21	2	45	11	6	45	21	8	45	11	10	45	21	10	45	21	13	45	22	14	45	18	20
45	16	22	45	18	25	44	11	1	44	23	16	44	21	20	44	23	24	44	11	26	44	17	26	44	16	31	43	11	7	43	3	18
43	11	21	43	18	24	43	11	29	42	18	1	42	18	3	42	18	10	42	18	15	41	21	3	41	21	6	41	11	9	41	22	9
41	6	11	41	17	29	40	22	8	40	19	12	40	21	19	39	4	15	39	4	21	39	11	22	39	21	26	39	17	30	39	11	31
38	23	2	38	3	6	38	4	23	38	16	28	38	10	29	37	19	6	37	22	6	37	22	23	37	19	25	37	19	26	37	19	27
36	18	2	36	18	7	36	4	9	36	11	20	35	17	1	35	11	2	35	23	8	35	18	11	35	6	18	35	18	26	35	11	27
34	22	1	34	4	8	34	23	10	34	17	12	34	17	15	34	11	23	34	4	24	33	17	2	33	3	4	33	23	27	33	21	30
33	21	31	32	21	5	32	17	9	32	18	9	32	9	22	32	18	22	32	6	25	32	21	29	32	23	29	31	6	4	31	3	11
31	4	22	31	23	23	31	3	25	31	11	30	30	17	14	30	23	15	30	6	26	30	3	27	29	6	6	29	17	27	29	9	29
29	18	31	28	17	5	28	11	8	28	23	13	28	24	19	28	21	27	27	19	5	27	18	13	27	19	20	27	18	21	27	18	23
26	24	5	26	23	6	26	23	9	26	23	14	26	22	21	26	17	23	25	23	3	25	17	8	25	17	19	25	18	27	24	18	6
24	6	13	24	24	26	24	21	28	23	18	8	23	22	20	23	24	20	23	22	22	23	18	28	23	23	28	22	17	6	22	24	12
22	17	13	22	17	22	22	18	30	21	24	13	20	22	13	20	3	20	20	23	20	19	17	21	19	18	29	18	24	6	18	17	20
17	17	7	17	6	27	15	23	7	15	23	22	15	17	28	13	6	20	11	24	27	8	23	21	0	1	1	0	2	1	0	3	1
0	6	1	0	7	1	0	8	1	0	13	1	0	14	1	0	19	1	0	20	1	0	24	1	0	1	2	0	2	2	0	3	2
0	6	2	0	7	2	0	8	2	0	13	2	0	14	2	0	19	2	0	20	2	0	24	2	0	1	3	0	2	3	0	3	3
0	6	3	0	7	3	0	8	3	0	13	3	0	14	3	0	19	3	0	20	3	0	24	3	0	1	4	0	2	4	0	7	4
0	8	4	0	14	4	0	20	4	0	1	5	0	2	5	0	7	5	0	8	5	0	14	5	0	20	5	0	1	6	0	2	6
0	7	6	0	8	6	0	14	6	0	20	6	0	1	7																		

Source: Reference (5)

FIGURE 10

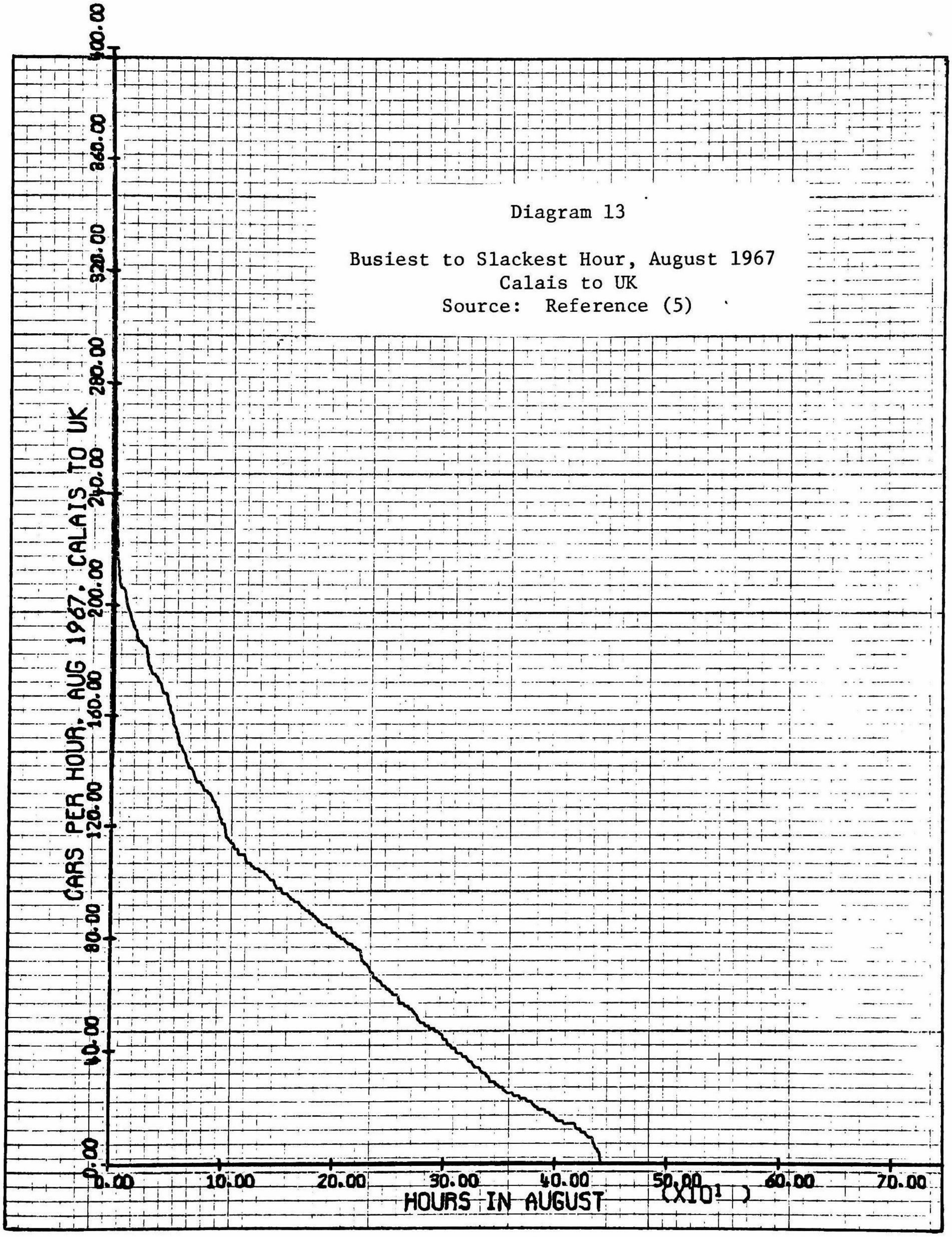


Diagram 13
Busiest to Slackest Hour, August 1967
Calais to UK
Source: Reference (5)
CARS PER HOUR, AUG 1967, CALAIS TO UK
HOURS IN AUGUST (X10¹)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00

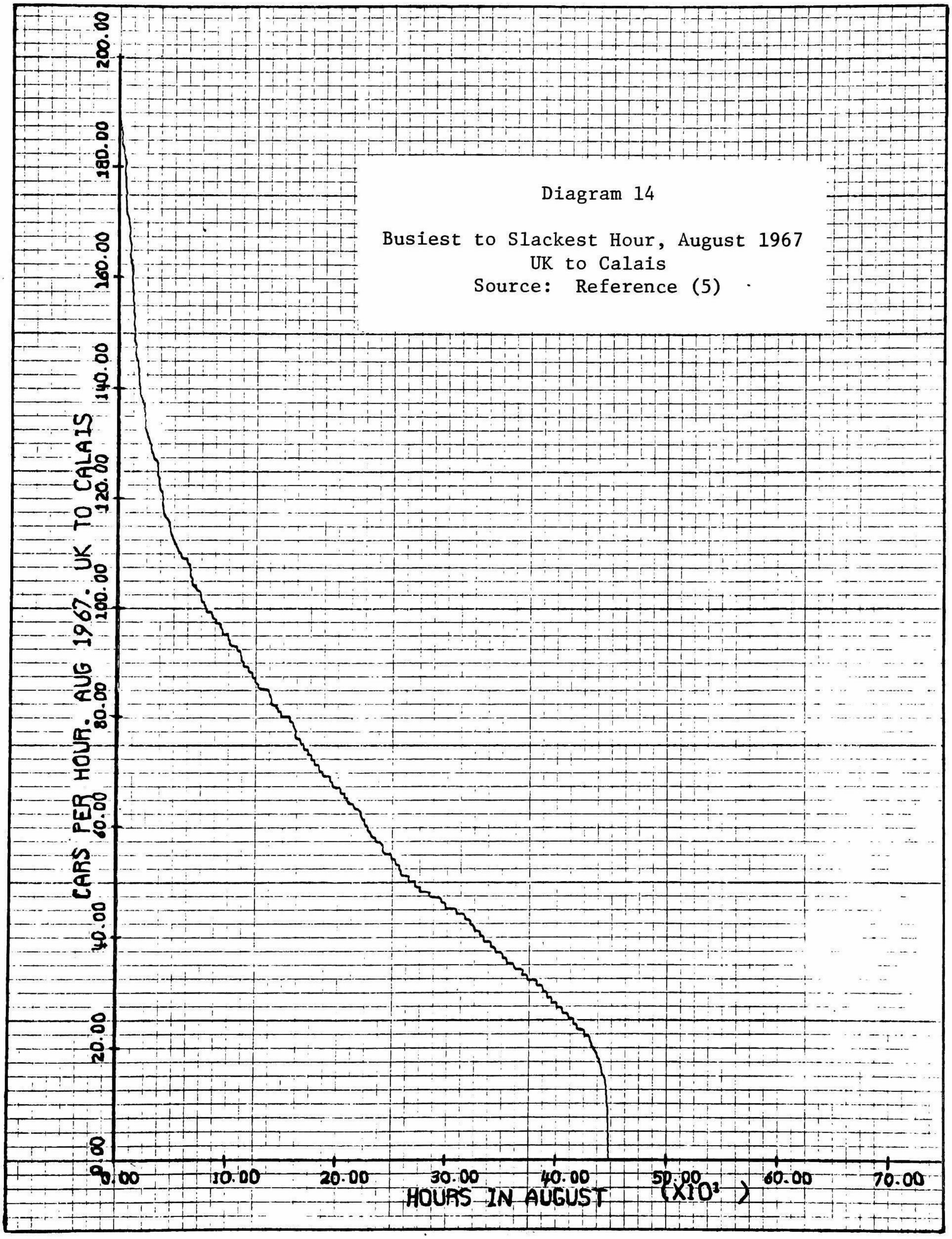


Diagram 14
Busiest to Slackest Hour, August 1967
UK to Calais
Source: Reference (5)
CARS PER HOUR. AUG 1967. UK TO CALAIS
HOURS IN AUGUST (X10¹)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00

FIGURE 11

English Channel Ferry Operators

Southampton - Cherbourg	Thoresen Ferries
Southampton - Le Havre	Thoresen, Normandy Ferries
Newhaven - Dieppe	British Rail, French Rail
Folkestone - Boulogne	British Rail, French Rail
Folkestone - Calais	British Rail, French Rail
Dover - Boulogne	British Rail
Dover - Calais	French Rail, Townsend
Dover-Dunkirk	British Rail, French Rail
Dover-Ostend	Belgian Marine
Dover - Zeebrugge	Townsend
Ramsgate - Calais	Hoverlloyd
Harwich - Ostend	Belgian Marine
Harwich - Hook of Holland	British Rail, Zeeland Shipping
Harwich - Zeebrugge	British Rail

In 1969 a new company entered the Channel car ferry market: Hoverlloyd. However, in the case of Hoverlloyd, the service was not operated by conventional ships, but by two SRN 4 Mountbatten class hovercraft, each capable of carrying 250 passengers and 30 cars at speeds up to 65 knots. These craft reduced the minimum crossing time from 90 minutes (ships) to 40 minutes. Hoverlloyd operated into the port of Calais, but from Ramsgate on the English coast, rather than from the more traditional English Channel port of Dover, (see Diagram 8).

Hoverlloyd, operating radically different equipment from the established ferry services, with an entirely different cost structure (2), was forced to reconsider carefully its charge structure from the outset, rather than simply join the local cartel and charge their rates. In the determination of car ferry prices, at least four major considerations had to be taken into account:

a. The journey time was significantly reduced - by over 50 percent - although in real terms the impact of a time saving of this size on an already short journey is difficult to estimate. With motorists driving often hundreds of miles, a saving of 40 to 50 minutes might be of little consequence.

b. The configuration of the craft used by Hoverlloyd - the carrying capacity of which was 30 cars and 250 passengers. If each car were to be accompanied by 3 or 4 passengers, the vehicle occupant element of the total passenger complement would be around 100 - 120, leaving a supplementary capacity of over 130 foot passengers per trip. It has already been noted that the foot passenger market is a comparatively weak market. These are passengers who reach the Channel by train or bus, cross by the ferries as foot passengers, and subsequently continue their journey by public surface transport on the other side. The main reason for travel is summer vacation, and the very strong growth of all-inclusive air charter holidays competing for virtually the same people has led to a lack of growth in Channel foot passenger traffic, and in some years a real decline. Given the frequency of operating schedules (see below), and the weak market state of foot passenger traffic, the attraction of this many additional foot passengers per trip would constitute a major problem if held to that level. It therefore would be valuable to minimise the problem by attempting to ensure at least 3 - 4 passengers per vehicle, which was higher than the known average, (1).

c. The annual distribution of traffic made it essential to schedule the maximum possible capacity during the peak months. However, demand was known to fluctuate significantly by both time and direction during each day, even in the peak months. So long as a strong demand existed, a high intensity of operation could be justified. However, as has been shown above, even during the period of highest demand during the year, i.e., August, fluctuation between weekday and weekend is large. For two SRN 4 hovercraft maintaining an hourly service in each direction from early morning until late at night during August, such fluctuations would have a highly detrimental effect upon average load factors. On the other hand, if operations were restricted to accord with this sort of demand fluctuation in the busiest period of the year, then the overall annual level of utilisation of equipment and resources etc., would be ruinously low.

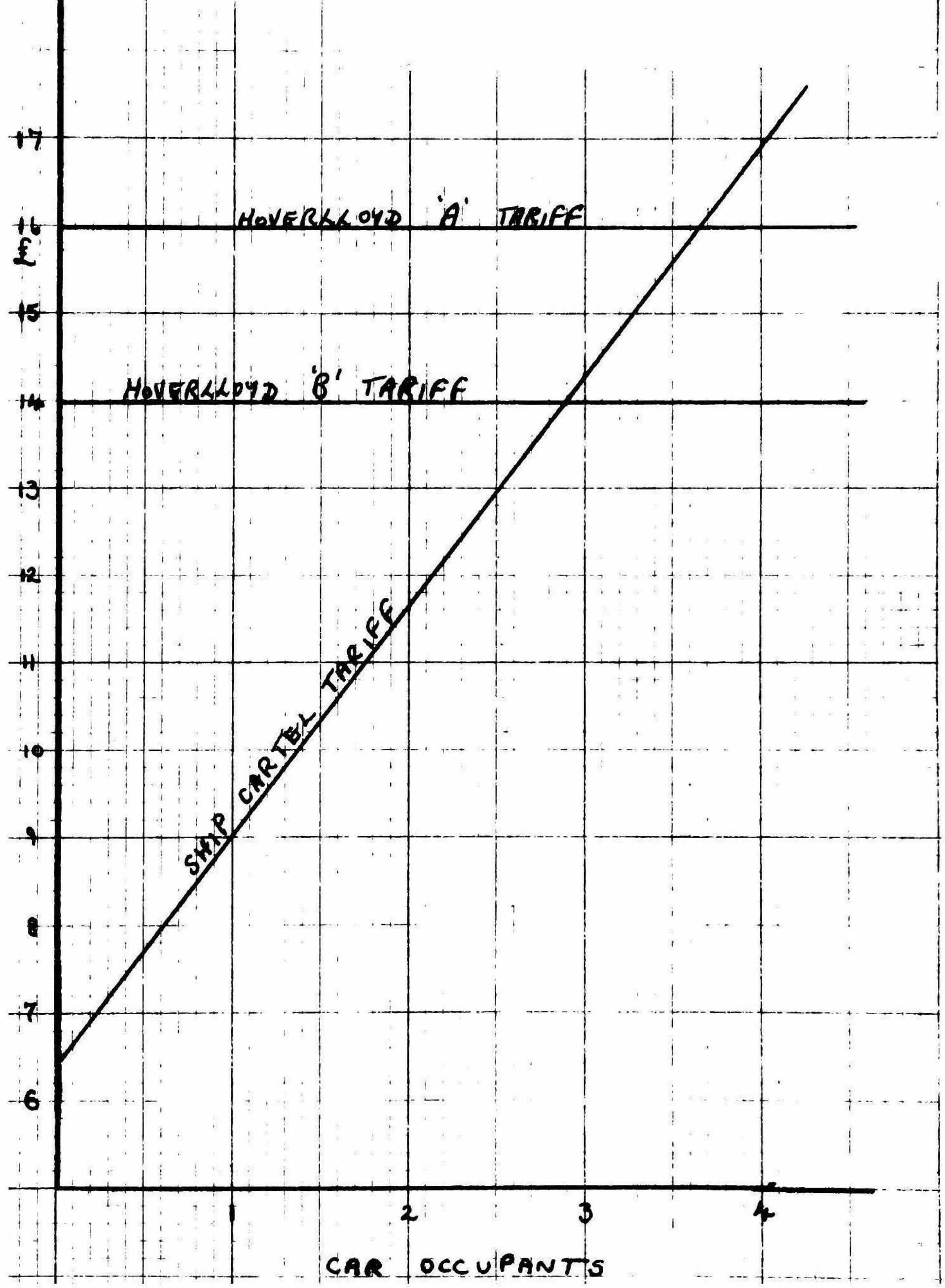
d. Finally Ramsgate was not an established car ferry port as was Dover. It would therefore be necessary to attract traffic away from an established pattern. Prices would need to be competitive with the existing ship operators in order to maintain an attractive market posture.

None of the above mentioned problems alone is in any way unique, but their simultaneous conjunction for Hoverlloyd necessitated a radical approach to charge structures. In the context of a comparatively short journey especially, where the speed of a vehicle or ferry increases and reliance is placed upon that speed to provide a certain capacity through the day, so is its vulnerability increased to demand fluctiations. The cost structure of a high speed marine ferry such as the SRN 4 dictated an attempt to maintain a high average load factor, whereas its capacity was spread in penny packets all around the clock.

The first step taken was to ensure as far as possible that each car was accompanied by an above average number of passengers (see sub-paragraph b above). To achieve this, a high rate was charged per car, with occupants included in this price rather than charged separately, as is the case of the ship cartel price structure. The effect of this measure is illustrated at Diagram 15.

However, as is also shown by this diagram, Hoverlloyd was offering two prices - "A" and "B" - for the "same" ferry crossing. In economic terms, these could not be described as identical journeys however, since they did not occur at one unique combination of time and direction. In fact, they are alternative products which the customer may substitute one for the other (see Chapter I above). Diagram 16 shows how the two tariffs were applied in accordance with time and direction of the journey. All departures are indicated by the letters "A" or "B", which are also differently coloured. These letters also indicate the particular tariff

Diagram 15
Comparative Fare Structures
(14 Foot Car)



FLIGHTS

Departures are indicated by an "A" or "B" which also indicates the tariff applicable to car bookings. Passenger fares are standard for all departures – see under "Fares" for full details. Connecting express coach services are shown overleaf. Also see East Kent Road Car Co and British Rail timetables for other connections or ask your travel agent.

3rd November 1969—18th March 1970

RAMSGATE TO CALAIS / CALAIS TO RAMSGATE

Flight No.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Flight No.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
306 0900	—	—	—	—	—	B	—	307 1000	—	—	—	—	—	B	—
310 1000	B	B	B	B[1]	B	—	—	311 1100	B	B	B	B[1]	B	—	—
314 1100	—	—	—	—	—	B	B	315 1200	—	—	—	—	—	B	B
318 1200	B	B	B	B[1]	B	—	—	319 1300	B	B	B	B[1]	B	—	—
322 1300	—	—	—	—	—	—	B	323 1400	—	—	—	—	—	—	B
330 1500	—	—	—	—	—	B	—	331 1600	—	—	—	—	—	B	—
334 1600	B	B	B	B[1]	B	—	—	335 1700	B	B	B	B[1]	B	—	—
338 1700	—	—	—	—	—	—	B	339 1800	—	—	—	—	—	—	B

(1) Not on 25th December

19th March—31st May 1970

RAMSGATE TO CALAIS / CALAIS TO RAMSGATE

Flight No.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Flight No.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
306 0900	—	—	—	—	—	B	B	307 1000	—	—	—	—	—	B	B
310 1000	B[2]	B[1,2]	B[2]	B[1,2]	B[1,2]	—	—	311 1100	B	B	B	B	B	—	—
314 1100	—	—	—	—	—	B[1,2]	B[1,2]	315 1200	—	—	—	—	—	B	B
318 1200	B[2]	B[1,2]	B[2]	B[1,2]	B[1,2]	—	—	319 1300	B	B	B	B	B	—	—
322 1300	—	—	—	—	—	B[1,2]	B[1]	323 1400	—	—	—	—	—	B	B
330 1500	—	—	—	—	—	B	B	331 1600	—	—	—	—	—	B[3,2]	B[3,2]
334 1600	B	B[1]	B	B[1]	B[1]	—	—	335 1700	B	B	B	B	B	—	—
338 1700	—	—	—	—	—	B	B	339 1800	—	—	—	—	—	B[3,2]	B[3,2]
342 1800	B	B	—	B[1]	B[1]	—	—	343 1900	B	B	—	B	B	—	—
346 1900	—	—	—	—	—	—	B	347 2000	—	—	—	—	—	—	B

(1) Tariff A 19th – 24th March (2) Tariff A from 21st May (3) Tariff A on 4th and 5th April

1st June—30th September 1970

RAMSGATE TO CALAIS / CALAIS TO RAMSGATE

Flight No.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Flight No.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
298 0700	—	—	—	—	B	B	B	299 0800	—	—	—	—	B	B	B
302 0800	B	B	B	B	B	A	A	303 0900	B	B	B	B	B	B	A
306 0900	B[1]	B[1]	—	A[1]	A	A	A	307 1000	A[1]	B[1]	—	B[1]	B	B	A
310 1000	B	B	B	A	A	A	A	311 1100	B	B	B	B	B	A	A
314 1100	A[1]	B[1]	—	A[1]	A	A	A	315 1200	B[1]	B[1]	—	B[1]	A	A	A
318 1200	A	B	B	A	A	A	A	319 1300	B	B	B	B	A	A	A
326 1400	B	B	B	B	B	B	B	327 1500	B	B	B	B	A	A	A
334 1600	B[1]	B[1]	—	B[1]	A	A	A	335 1700	B[1]	B[1]	—	B[1]	B	B	B
338 1700	A	B	B	A	A	A	B	339 1800	B	B	B	B	A	A	A
342 1800	A[1]	B[1]	—	A[1]	A	B	B	343 1900	B[1]	B[1]	—	B[1]	A	A	A
346 1900	B	B	B	B	B	B	B	347 2000	B	B	B	B	B	A	B
350 2000	—	—	—	B[1]	B	B	B	351 2100	—	—	—	B[1]	B	A	B

(1) 10th July – 18th September only

FARES

VEHICLES Simply consult the timetable for the flights you require, indicated by the letters "A" or "B", and read off the fares under Tariff "A" or "B" below.
All fares are single. Return fares are the total of the appropriate single fares.

	Tariff "A" £	Tariff "B" £
(Cars, caravans, baggage trailers, empty coaches, etc.)		
up to 11' 0" (3.35 m)	12	10
up to 12' 6" (3.80 m)	13	11
up to 14' 0" (4.25 m)	16	14
up to 15' 6" (4.70 m)	19	17
up to 18' 0" (5.45 m)	23	21
up to 20' 0" (6.10 m)	25	23
up to 25' 0" (7.60 m)	27	25
up to 30' 0" (9.10 m)	31	28
over 30' 0" (9.10 m)	31	28
plus £2 for each foot or part thereof in excess of 30 ft (9.10 m)		
Motor cycles and rider(s)		
combination	11	9
solo	8	7
Bicycles and rider(s)	5	4
Coaches (accompanied) if with 30 or more standard fare-paying passengers	free	free

VEHICLE PASSENGERS
All passengers with private vehicles (1 driver and maximum of 6 passengers) — free

FOOT PASSENGERS	Standard Fare (all flights) £
Standard Single (double for period return)	
Adult	2 10 0.
Children (under 17)	1 10 0.
Children (under 4 not occupying a seat)	free
DAY RETURN (out and back same day)	£
Adult	3 0 0
Children (under 17)	2 0 0
Children (under 4 not occupying a seat)	free
MINI-TRIP (out and back within three days)	£
Adult	4 0 0
Children (under 17)	3 0 0
Children (under 4 not occupying a seat)	free

GROUP TRAVEL A discount of 10% is obtainable for groups of 10 or more full fare paying passengers booked in advance and travelling as a party. In addition for each group of 30 fare paying passengers one additional ticket will be provided free of charge for use by a courier, group leader or organiser if required. Where a group crosses with a coach, special conditions apply – details on request.

FORCES FARES If you are a member of the armed forces of any NATO country or Eire, please ask for details of concessional fares.

STUDENT FARES Students may apply for 10/– reduction on all single fares on hovercraft flights and coach services (see over).

Diagram 16

Hoverlloyd Timetable and Tariff

applicable to a car reservation on that flight. In the table of fares, two columns are shown, headed respectively "A" and "B." Each vehicle size thus has two corresponding fares, the "A" fare and the "B" fare. The motorist simply consults the timetable for the flight timing required, indicated by the letters "A" or "B", and reads off the appropriate fare from the fare table. In such a case, it may be assumed that either he has little flexibility in the time he wishes to travel, and/or little desire for economy, or a willingness to buy a "superior" service (based on price). Alternatively, he selects from the timetable the "B" flight most convenient to his plans. In this case, he may have more flexibility in choice of time and/or a stronger desire for economy. All fares are single, the return fare being the sum of the appropriate single fares, so that it is not necessary to travel by the same flight designation in both directions.

In both of the above options, an improved utilisation of total resources is potentially available. This is because all customers (vehicles and their occupants) are able to select a time and cost combination which reflects much more than could a normal type of fare, the value they each individually place upon their own time. Cross-subsidisation of passengers and vehicles travelling at peak times, by those travelling at off-peak times, is reduced. Peak travellers are voluntarily electing to make a premium payment to reflect some of the extra cost inherent in the provision of an excess of year-round potential capacity for their use during a few short peak periods. This seems a desirable result whether one or all operators in a market incorporate this type of flexibility into their charge structures.

Prior to these decisions, however, the motorist will have been faced with a choice between Hoverlloyd and the ship cartel, on the basis of:

(i) Number of passengers per car - directly, easily and accurately quantifiable by each customer.

(ii) Predisposition towards speedier travel - not normally directly quantified by the customer in practise, although generally accepted through the literature of transportation economics as having a considerable bearing upon modal choice see e.g., (3) and the references therein.

(iii) Other factors, e.g., service, advertising, etc., - again not normally directly quantified by the customer in practise, but subject to extensive study in the literature of marketing in search of methods of general quantification see e.g., (4).

In terms of this particular market, it seems likely that the application of a differential price structure gives the operator concerned a very considerable advantage, particularly so long as competitors adhere to their standard fare policy. During periods of high demand, and according to direction, Hoverlloyd can enjoy a higher rate per vehicle/passenger unit than the ship operators. Since the hovercraft has a comparatively limited vehicle capacity just one twelfth the highest demand hour (see Figures 9 and 10) - to have each vehicle-passenger unit pay a higher than average rate is one of the few ways available to Hoverlloyd of maximising revenue within the peak period. It is simply not possible for instance, for Hoverlloyd to go beyond a vehicle market share of about 8 percent at the highest peak hour during August in either direction, due to capacity limitations being reached.

In periods of low demand, when the "B" tariff is available, Hoverlloyd can compete much more effectively in a broadened market, due to a lowering of prices. This is particularly relevant when seen from the viewpoint of the driver of a car with less than three occupants (see Diagram 15), who now finds Hoverlloyd competing directly on price for his custom, as well as offering the faster crossing. Accordingly, during this period, Hoverlloyd can increase its market share significantly beyond the level suggested by a direct comparison of deployed capacity. In fact as shown by Figure 12, on most weekdays Hoverlloyd is securing a market share double the size of its share of deployed capacity. For example, on Monday 10 August, Hoverlloyd deployed 8 percent of the ferry capacity for automobiles which was available in either direction through Calais, but took a 19.2 percent market share into Calais and a 17.3 percent market share out of Calais. For the week overall, Hoverlloyd deployed 9.4 percent of the total capacity available, and seized 18.1 percent of the market in one direction, and 15.3 percent in the other direction.

During some periods when the "A" tariff is available, it is likely that the Hoverlloyd service was sometimes selected on account of the exceptionally high number of passengers in a particular car, i.e., 5 6 or 7 passengers. In these cases, even the peak tariff would appear a bargain compared with the ship charges. However, ticket analysis has revealed that this is rarely the case. European cars are smaller than United States cars: the average overall length of car handled is less

FIGURE 12

Hoverlloyd: Market Penetration
Week 8/14 August

	UK → Calais			Calais → UK		
	Capacity Share %	Market Share %	+/(-)	Capacity Share %	Market Share %	+/(-)
Sat	9.1	15.7	+6.6	9.1	12.9	+3.8
Sun	10.1	22.8	+12.7	10.1	13.0	+2.9
Mon	8.1	19.2	+11.1	8.1	17.3	+9.2
Tue	10.3	24.0	+13.7	10.3	19.7	+9.4
Wed	6.5	13.5	+7.0	6.5	12.6	+6.1
Thu	11.3	19.4	+8.1	11.3	20.6	+9.3
Fri	10.7	15.2	+4.5	10.7	15.1	+4.4
Week	9.4	18.1	+8.7	9.4	15.3	+5.9

than 14 feet. Most are going on journeys measured in days rather than hours, together with considerable luggage, camping gear, etc., so that the number of heavily laden cars tends to be limited for reasons of simple comfort to the occupants. In addition, and as previously noted, cars and car occupants account for an estimated 70 percent of gross revenue. The attraction of an occasional heavily laden car does not result in any loss so long as other passenger seats are available on the hovercraft to accommodate all available ordinary fare-paying foot passengers, who account for the balance of gross revenue.

Figure 12 gives some indication of the impact of this kind of differential fare structure in terms of market penetration. Further insight can be gained by a comparison of average load factors of Hoverlloyd and its competitors, the ships, as under:

Average Load Factor Comparison - Week 8/14 August 1970	UK Calais	Calais - UK
Hoverlloyd	84.4%	85.3%
Ships	39.8%	49.4%

These statistics are for a week in which Hoverlloyd operated 146 single services in or out of Calais, and the ships operated 210 services in or out of Calais. Load factors for this number of services, averaged over the week, give a fairly clear indication of the sustained high load of Hoverlloyd throughout the period, and are broadly representative of the main summer season.

The distribution of traffic through the year is exceptionally varied as previously outlined. This means that the selection for analysis of any week in the main summer period, mid-July to early September, is of much greater significance in the context of the year's operations than is at first apparent. In fact, the above mentioned week accounts for almost 8 percent of the entire year's car ferry traffic through Calais. During most the winter and spring (November end of May) it will be seen from Diagram 16 that hardly any attempt is made to apply a varying charge structure, since traffic is so slight that no benefit is to be gained by spreading demand through any day or week. Minor short run exceptions occur at Christmas and Easter, but these are of no significance compared with the summer season. During the winter, a "skeleton service" is maintained, with the principal commercial target of covering direct costs. Capacity exceeds demand on most days by about 10:1 (2).

The methodology adopted by Hoverlloyd to determine which flights should be designated peak and which designated off-peak has been described elsewhere (2). The essential prerequisite to planning of this type is full data on the traffic numbers of cars carried on each ship, hour by hour and according to direction, for the most up-to-date corresponding period. This information is necessary to build up a representative picture of the pattern of demand for car ferry places across the Channel, for instance during a week in August.

In a time span such as this, several problems have to be overcome. First, the ships sail at irregular intervals from 30 minutes to 4 hours between departures. Second, the ships almost invariably manage to clear the accumulation of vehicles which has built up since the preceding departure, ranging from four or five to almost 200 cars. In these circumstances, it is difficult to identify periods of high or at least above average, demand. The most obvious method, consisting of a direct plot of vehicles carried, takes inadequate account of time lapsed between departures. Clearly 200 cars waiting after only half an hour has passed since the previous departure would indicate a high demand, whereas the same number of cars accumulating over a period of 4 hours may not indicate the same thing. With a number of ships providing up to eighteen departures in each direction daily at staggered intervals, such a plot of vehicles carried does not reveal clearly a pattern of demand even equivalent to that shown in Diagrams 11 and 12.

The methodology adopted to identify the pattern of demand is outlined in detail at Appendix A. Briefly, for each direction flow it involves:

a. Calculating the average rate per minute at which cars have accumulated at the quayside, for the time period in question (here, one week).

b. Checking the time between departures (in minutes), and multiplying this by the average found at (a) above.

This gives a theoretical prediction of the traffic which should be on each given departure, if demand is standard, i.e., not fluctuating. Where the actual traffic on a departure is higher than this prediction, demand must have been above average for the period immediately preceding that departure. Conversely, where the actual traffic on a departure is lower than this prediction, demand must have been below average for the period immediately preceding that departure.

The impact of the tariff system may therefore be considered in a number of different market conditions:

	Market Demand Condition: Above Average	Market Demand Condition: Below Average
Hoverlloyd Peak Tariff Flights (52)		
i. In above average demand	17 (32.7%)	15 (28.8%)
ii. In below average demand	1 (1.9%)	2 (3.8%)
iii. Discounted : 16 (30.8%) (plus one peak flight actually as predicted and therefore on the 'X' axis but not discounted)		
Hoverlloyd Off-Peak Tariff Flights (94)		
i. In above average demand	17 (18.1%)	27 (28.7%)
ii. In below average demand	4 (4.3%)	15 (16.0%)
iii. Discounted : 30 (32%) (plus one off-peak flight actually as predicted and therefore on the 'X' axis but not discounted)		

More detailed breakdown of the above figures, by day and direction, are shown at Figures 13 and 14.

A number of points stand out from these results:

Peak Tariff Applications

a. With 32.7 percent of flights where a peak tariff was applied, this application did not appear to deter demand for those flights, which remained in the "above average demand" category. Therefore, the operator maximised revenue by imposing a peak tariff under favourable circumstances.

b. With 1.9 percent of flights where a peak tariff was applied, the operator suffered a below average demand, even though the overall market demand was above average at those times. This was probably detrimental to the interests of the operator, in that an adverse reaction was apparently precipitated.

c. With 28.8 percent of flights where a peak tariff was applied in spite of the fact that the general market demand was below average, the operator enjoyed an above average demand and therefore maximised revenue. In some of these cases, a peak tariff was applied on the basis of a predicted above average demand for 1970, i.e., following the 1967 pattern, when in practice the overall market demand switched from above to below average between 1967 and 1970, with the exception of the Hoverlloyd traffic. This illustrates to some extent the desirability of having information as comprehensive and up-to-date as possible on market trends - the use of 1967 data to predict 1970 patterns was too great a gap. In the remaining cases, the reason for imposing a peak tariff in a period of below average demand is unclear from the analysis of only one week's figures (see below). In any event, the result for the carrier was beneficial for all 28.8 percent of these flights.

d. With 3.8 percent of flights where a peak tariff was applied in the face of an apparent below average demand (but see sub-paragraph c. above), the operator suffered a decline which could possibly have been reversed had an off-peak tariff been applied.

e. With one flight where a peak tariff was applied, the operator had an exactly average level of demand, whilst the overall market level of demand was below average.

Off-Peak Tariff Application

f. With 18.1 percent of flights where an off-peak tariff was applied, the operator was subject to an above average demand

Figure 13

IMPACT OF DIFFERENTIAL TARIFF STRUCTURE - CALAIS TO UK

HOVERLLOYD

	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Tot	Total both Directions
Peak Tariff Flights									
a. Gain in strong market	3	2	-	-	-	-	3	8	17
b. Loss in strong market	-	-	-	-	-	-	-	-	1
c. Flights discounted	3	4	-	-	-	-	1	8	16 (+1)
d. Gain in weak market	2	2	-	-	-	-	1	5	15
e. Loss in weak market	-	-	1	-	-	-	-	1	2
Total	8	8	1	-	-	-	5	22	52
Off-Peak Tariff Flights									
a. Gain in strong market	1	-	1	2	-	2	2	8	17
b. Loss in strong market	-	-	1	-	-	-	1	2	4
c. Flights discounted	2	2	2	2(+1)	5	3	1	17 (+1)	30 (+1)
d. Gain in weak market	1	2	4	1	1	5	2	16	27
e. Loss in weak market	-	-	1	4	-	1	1	7	15
Total	4	4	9	10	6	11	7	51	94
TOTAL SERVICES OPERATED	12	12	10	10	6	11	12	73	146

Figure 14

IMPACT OF DIFFERENTIAL TARIFF STRUCTURE - UK TO CALAIS

HOVERLLOYD

	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Tot
Peak Tariff Flights								
a. Gain in strong market	2	1	-	-	-	3	3	9
b. Loss in strong market	-	-	1	-	-	-	-	1
c. Flights discounted	3	3(+1)	1	-	-	-	1	8(+1)
d. Gain in weak market	2	1	2	-	-	2	3	10
e. Loss in weak market	-	-	-	-	-	1	-	1
Total	7	6	4	-	-	6	7	30
Off-Peak Tariff Flights								
a. Gain in strong market	3	1	1	1	-	-	3	9
b. Loss in strong market	-	-	-	1	-	-	1	2
c. Flights discounted	1	-	2	2	5	2	1	13
d. Gain in weak market	-	2	3	3	1	2	-	11
e. Loss in weak market	1	3	-	3	6	1	-	8
Total	5	6	6	10	6	5	5	43
TOTAL SERVICES OPERATED	12	12	10	10	6	11	12	73

when the market demand was also above average. The operator could therefore have possibly improved receipts had a peak tariff been applied. However, almost half of these instances were due to overall market changes between 1967, the base year for tariff prediction, and 1970, tending to confirm the need for a base year as close as possible to the predicted year.

g. With 4.3 percent of flights where an off-peak tariff was applied, the operator nevertheless suffered a decline in demand even though demand remained above average for the overall market. No explanation is readily apparent for this phenomenon.

h. With 28.7 percent of flights where an off-peak tariff was applied, the operator enjoyed an above average demand even though the overall market demand was below average. This appears to be a significant improvement.

i. With 16.0 percent of flights where an off-peak tariff was applied, demand for Hoverlloyd flights remained below average, in conformity with the overall market condition.

j. Finally, with one flight where an off-peak tariff was applied, the operator had an exactly average level of demand, whilst the overall market level of demand was below average.

Summary

It is quite apparent from the above analysis that this type of peak/off-peak tariff system has had an impact upon the pattern of demand, and that in general this impact has been to the overall benefit of the operator. Hoverlloyd has been able to seize a significant market share, which is greater at off-peak times, whilst also maximising revenue at peak times.

On a small number of occasions, it was noted that the peak/off-peak tariff system appears to have created an adverse result. This is in part attributable to the way in which the overall market pattern had changed in the period 1967-1970, when 1967 was the data base for Hoverlloyd's 1970 tariff designation. A requirement for the most up-to-date information was noted. However, one other factor also probably accounted for some proportion of the small number of adverse results.

As is shown by Diagram 10, the main summer season for car ferry traffic across the Channel extends from about the second week in July through to early September. This period coincides with the British school vacation period. From Diagram 16, it will be seen that Hoverlloyd issued a timetable with a standard weekly schedule running through the period 1 June-30 September. Even then, as will be seen by footnote (1) to that panel in the timetable, 26 of the 146 scheduled services each week were operated only during the period 10 July-18 September, i.e., within the main summer peak identified at Diagram 10. This is a ten week cycle, of which only one week has been examined. Marginal variations of demand from week to week within this key period could not be reflected in published timetables, which were based on average weekly fluctuations for the period, unless a separate weekly panel was printed for every week. This would cause a great escalation of printing costs, and would add to the complexity of the presentation, which has already been noted as undesirable. Accordingly, within any one week, some minor discrepancies such as those noted are almost bound to occur, as that week differs from the average covered by the timetable.

The one week examined gives a general indication of the impact of the tariff system in the ten week period. To this extent, the sample size is probably too small for any but the most tentative conclusions to be drawn. However, it should be borne in mind that the ten week cycle of which this is a part, is the period in which over 50 percent of the entire year's car traffic crosses the Channel. Therefore, an analysis which covered the full ten week period would be likely to give a very sound basis for conclusions on the impact of an hourly and directional varying charge structure upon demand patterns in this market. The extension of such an analysis to determine the impact upon profit, however, is not likely to be possible. This would require at least, the hourly distribution of vehicles according to size, for which charges vary throughout the market, and data is simply not compiled on this basis. Nevertheless, even without direct profitability informationk it seems likely that Hoverlloyd has benefited by seizing a much greater market share than its size justifies, and this point is reinforced by the fact that the operator has now used this type of charge structure for four successive years.

CHAPTER V

Summary and Conclusions of the Study

Summary of the Study

An important problem in the area of passenger transportation arises from the wide fluctuations in demand which occur through time, particularly in the short term. These often occur in conjunction with various forces which encourage operators to have sufficient transport capacity to meet peak demands. This results in a much heavier allocation of resources than would be necessary if demand were more even and stable. Furthermore, whilst it would appear desirable in theory to bring prices broadly into alignment with costs, in order that those who cause these heavy investments bear a proportionately large share of the additional expense, in practise, this is rarely done. Numerous recommendations for policy changes to permit this kind of flexibility are contained in the literature. However, studies of the results of such policies are almost unknown.

The purpose of this study was to assist the passenger transport management field by identifying some common factors in two cases where differential charge structures were introduced in attempts to promote more even growth and penetrate markets on a selective basis. In order to accomplish this purpose, two hypotheses were tested initially by analyses of traffic pattern variations. These hypotheses state that:

1. A differential price structure enabled Canadian National Railways to reverse a decline in passenger volume and revenue, to the financial benefit of the undertaking.

2. A differential price structure enabled Hoverlloyd to seize and hold a disproportionately greater market share in a peak period than the capacity of the company would suggest, to the financial benefit of the company.

Data for testing these hypotheses came from the Passenger Services Division of Canadian National Railways, and from the Chamber of Commerce of Calais. In each case, examination was made of the amount of change detected in traffic patterns following the introduction of a different fare structure and the probable value of this change to the operator concerned.

In the case of Hoverlloyd, a methodology for identifying short run (i.e., hourly), variations in demand was developed and tested by practical application, in conjunction with the differential fare structure.

Both hypotheses were generally supported by the analysis, in that significant changes in the patterns of demand were detected of a nature favourable to the operators concerned. However, the determination of the impact upon profitability of these changes was impossible to estimate. In the case of Canadian National Railways, the problem of assignment of the cost of shared facilities, depreciation, etc., led to argument even within the enterprise itself. Whilst it was apparent that a very considerable improvement in gross revenue had been made, there was disagreement on whether or not this was at too high a cost in the long term. As a consequence, CN continues to use a differential fare structure, but appears to have reduced its initial enthusiasm.

In the case of Hoverlloyd, measurement of the financial impact of the charge structure was precluded because of inadequacy of the data on each category of traffic carried, particularly car size which was another determinant of price. Nevertheless, the disproportionately large market share held by Hoverlloyd on most days in the period studied, compared with Hoverlloyd's share of the total car capacity available, made it very probable that considerable financial benefit was being enjoyed. In addition, the company has continued to exploit its position using the same type of differential fare structure for the third successive year.

Conclusions of the Study

A number of conclusions for management and analysts can be made from the results of these analyses, bearing in mind the limitations in the scope of the study and the individual characteristics of different passenger markets. One rail service was examined over 22 months, where daily price differentials were introduced, and this was on an comparatively lengthy journey (about 20 hours). One car ferry operator was examined over one week, where hourly and directional price differentials were introduced with a short journey (40 minutes), and where a wide range of competitors maintained a standard non-varying fare structure.

1. A statistical base up-to-date as possible is essential to a proper understanding of the existing pattern of demand for travel. If variation on an hourly and directional level is to be attempted, then knowledge must be focussed at this level of detail.

2. Any fare differential systems devised must be easy to understand and use, particularly since if they are to be successful, they

must be used by customers who may not have travelled either by this mode, or at all on this route, before, i.e., the marginal customers attracted into the market.

3. Differential systems which vary on a daily or seasonal basis may generate considerable peaks on isolated occasions, e.g., public holidays, particularly if a peak fare is applied throughout the holiday period extensively, thus giving the customer no real choice or substitute for his peak journey.

4. Hourly and directional tariff differentiation permits an operator to turn a period of short term high/low demand fluctuation into one continuous "plateau" of high demand.

5. Hourly tariff differentiation is obviously much more relevant to short, rather than long journeys (measured in time), and to a high frequency service. There would have been little point in Canadian National developing an hourly tariff differential for a once daily service taking almost 20 hours to reach its destination, even allowing for the fact that not all passengers would be travelling the full distance. The CN situation with regard to direction imbalances is not known.

6. Fare differentiation can be an extremely effective means of market penetration, especially where applied by only one operator whilst others hold to a more conventional system.

Suggestions for Further Research

This study approached only two relatively obscure areas where differential fare structures have been used in attempts to influence demand. The importance of further and more general applications of fare structures with this kind of capability has been outlined, both with reference to the individual company, and to the optimum allocation of total resources within a free economy.

If such applications are to be made in the future, it seems desirable to develop means of tieing together the variations of demand and their financial impact upon:

a. The operator or operators concerned.

b. The overall efficient allocation of resources within the economy.

Additionally, and once further knowledge from more real applications of differential fare structures is available, one further field should reward study. This covers the effect upon demand of varying the difference between peak and off-peak fares, to achieve optimum results. In the case of Hoverlloyd for instance, the gap between peak and off-peak fares was about $4.80 per vehicle (see Diagram 15) in 1970. In 1969, this gap was about $7.20, i.e., the operator altered the gap between peak and off-peak fares, by reducing the peak tariff.

Finally, there is an obvious need for analysis of results in a situation where more than one carrier applies differential charges, and where all carriers in a particular market apply such charges.

Recommendations for Action

Two areas spring to mind where there would appear to be great merit in conducting further controlled experiments to determine the applicability of differential fare structures. The U.S. airline industry is currently suffering the impact of an economic recession, whilst new and much larger aircraft are coming into service. These two factors have led to a great excess of capacity, and poor financial results for the airlines. At the same time, the rise of personal discretionary income levels suggests the existence of a great potential, provided airline fare structures are more market oriented. The Department of Transportation has been urging the Civil Aeronautics Board to permit airlines more flexibility in this field (Chapter I, reference [2]). Given the approval of the CAB, interested carriers should be permitted to undertake "demonstration project" type experiments with differential fare structures on suitable selected routes, to determine their wider applicability. Certainly, they appear less likely to have the adverse effects previously noted (Chapter I, reference [13]) with earlier fare experiments sanctioned by the CAB.

In the rail passenger transport industry, the establishment of AMTRAK which is not subject to stringent ICC regulatory control, provides a unique opportunity. In the Northeast Corridor area, various experiments are planned on different features of the rail operation; e.g., standard of service, frequency, etc., for which funds have already been approved. There seems good reason to include experimentation with differential fare structures.

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APPENDIX A

Appendix A

The methodology adopted to identify the demand pattern involves noting the actual variation from a predicted number of cars/sailing, based on an average figure for the given period of operation. Hence, if the total number of cars carried in a week was 10,080, the average rate of vehicle accumulation would be $\frac{10,080}{7 \times 24 \times 60}$, or one car per minute. This average figure is then multiplied by the number of minutes lapsed since the preceding sailing, to give a predicted number of cars for the given departure. A span of two hours between departures would therefore lead to a prediction of 120 cars which should be waiting at the quayside. If in this hypothetical case, there were in fact 150 cars at the quayside, a "plus" of 30 cars is given. This constitutes 0.2976 percent of 10,080, the week's traffic in that direction.

This may be written as:

$$V_i = \frac{[A_i \quad m_i (\frac{T}{PO})]}{T} \times 100$$

where:

A = Actual number of cars at departure

m = Number of minutes since previous departure

T = Total number of cars carried in the period of operation, by direction

i = Departure time

PO = Period of operation in minutes

V = Variation from mean as percentage of total weekly traffic

A time span of one week is chosen for the period of operation in this study because this appears to be the appropriate natural traffic "rhythm" or cycle at this time of the year. As previously mentioned, most traffic is holiday related and vacations are normally multiples of one or more weeks. However, it should be noted that the period of operation may include gaps, which need to be discounted if a comparison of results is required between different types of operation. For example, the ships are operated round the clock, seven days a week. The maximum gap between departures was about four hours in 1967 and 1970, and this gap was a reflection of the demand - it came at an off-peak period each day. The average rate of vehicle accumulation for the ships, even over a period as long as four hours, could not have resulted in there being more cars than any one ship could handle. Consequently, a full week span of 10,080 minutes is used for the value PO. In the case of the hovercraft, however, services stopped for a much longer period each night, so that the period of operation is taken to be from one hour prior to first departure in the morning, until last departure at night each day over the weekly cycle. This gives a total Hoverlloyd PO value of 5,090 minutes UK to Calais and 5,164 minutes Calais to UK.

The above mentioned outline has been used as the basis for the composition of the 14 graphs attached. Periods of above average demand are indicated by variation (V) points above the 'X' axis, which represents the mean for the period of operation in question. Similarly, variation (V) points below the 'X' axis indicate periods of below average demand. At the time of departure of each service, (ship or hovercraft), the plot line reverts to the 'X' axis and then moves away from the line according to the degree of demand over the appropriate lapsed time.

Three plots are shown:

a. Ships 1967 (dotted line)
b. Ships 1970 (solid black line without symbols at V points)
c. Hoverlloyd 1970 (solid black line with symbols at V points to indicate tariff applicable to that flight)

In the latter case, a number of Hoverlloyd (V) points have been marked actually on the 'X' axis as a means of nullifying their significance. This is necessary due to the low car capacity of the hovercraft (maximum 30 cars), which can cause misleading results when the lapsed time between departures (m_i) exceeds a certain amount. For instance, the Hoverlloyd total cars (T) for the week 8-14 August in the direction Calais to UK was 1,856 and the period of operation (PO) was 5,164 minutes. In such a case:

$$\frac{T}{PO} = 0.35941$$

and m_i cannot exceed 83.5 minutes without having:

$$m_i(\frac{T}{PO}) > 30 \text{ cars}$$

- i.e., exceeding the maximum carrying capacity of the vehicle. In fact, m_i exceeds 83.5 minutes in the direction Calais to UK for 25 out of 73 services.

In the direction UK to Calais,

$$\frac{T}{PO} = 0.36267$$

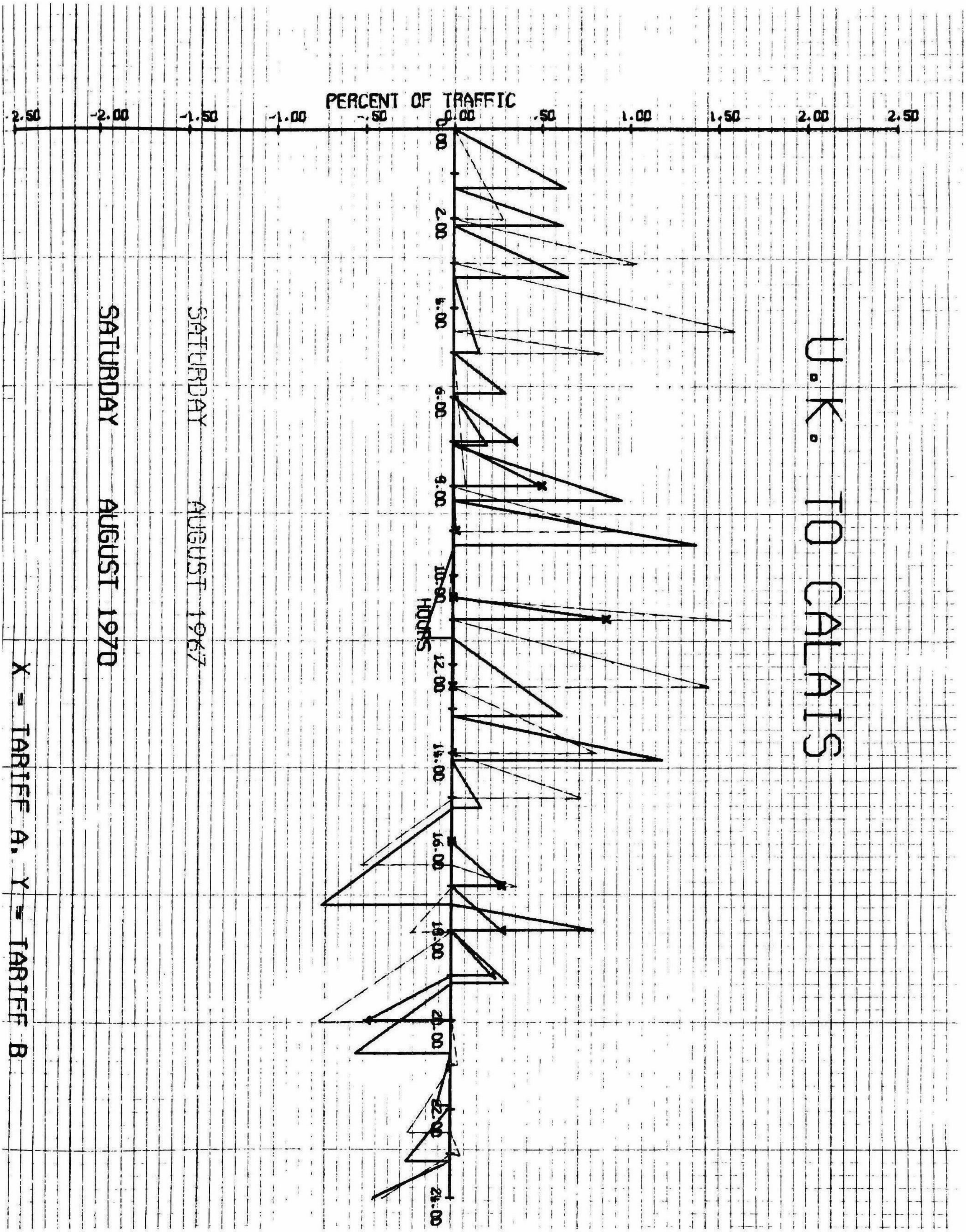
and m_i cannot exceed 82.7 minutes without having:

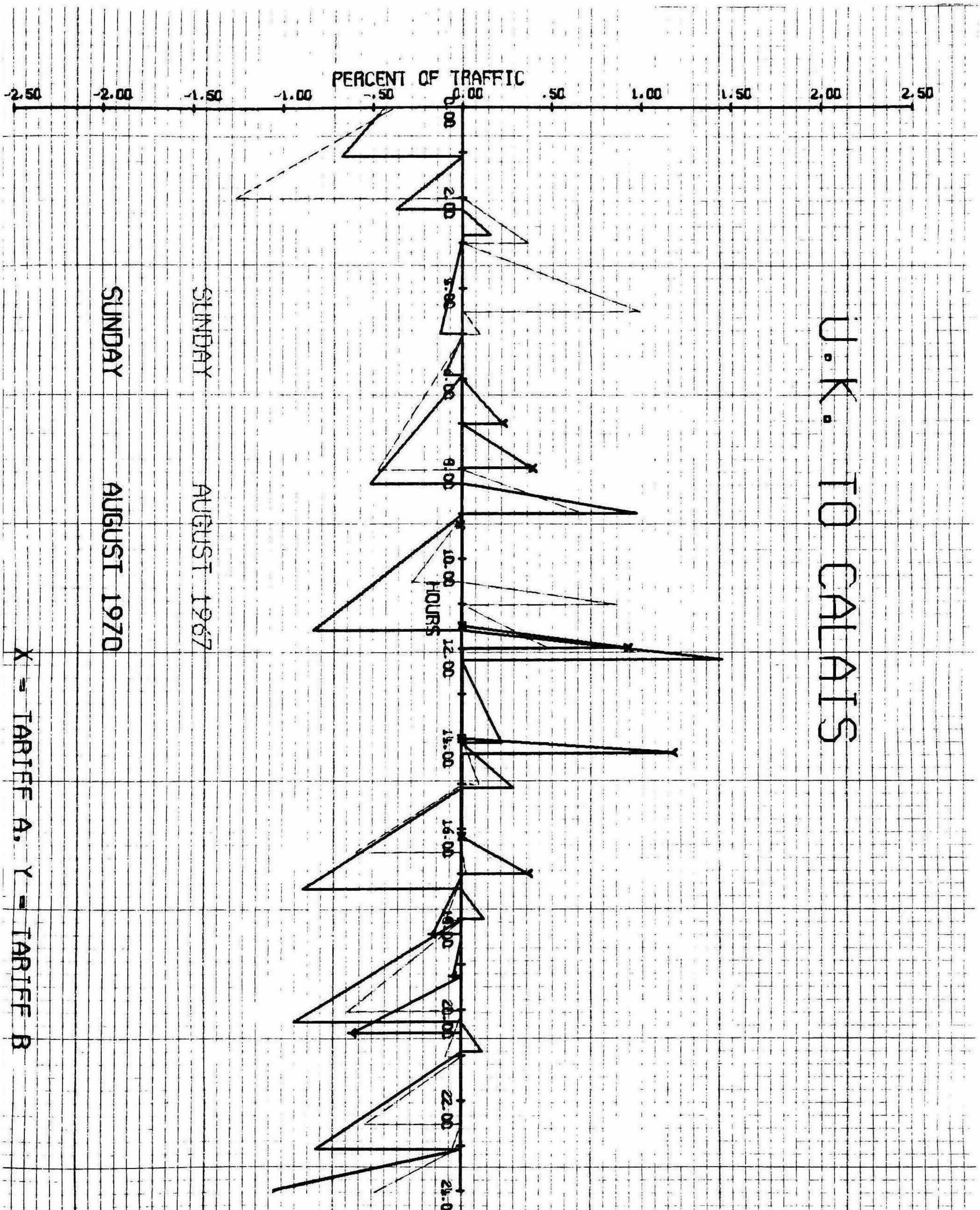
$$m_i(\frac{T}{PO}) > 30 \text{ cars}$$

In fact, m_i exceeds 82.7 minutes 21 out of 73 services. This "loss" of readings is not really surprising, in that gaps of 120 or more minutes are scheduled 17 times in each direction during the period of operation (see Diagram 16). This discounting of services is not considered likely to have any detrimental effect upon the following analyses. The Hoverlloyd reservations department would simply have "shut out" bookings from these services if and when they became full, and so the full impact of the tariff structure is obscured and therefore discounted. The balance of twelve services are discounted due to unscheduled operational delays for various reasons. The average load factors on graphically discounted services have been included in the statistics for the week, however, and show high values similar to the other services where $m_i < 83.5$ minutes or < 82.7 minutes according to direction:

Average Vehicle Load Factors - Discounted Flights

Calais to UK	ALF	UK to Calais	ALF
17 scheduled	82.2%	17 scheduled	83.7%
8 unscheduled	90.8%	4 unscheduled	95%


U.K. TO CALAIS
SATURDAY AUGUST 1970
SATURDAY AUGUST 1967
X = TARIFF A, Y = TARIFF B
PERCENT OF TRAFFIC
-2.50
-2.00
-1.50
-1.00
-.50
0.00
.50
1.00
1.50
2.00
2.50
HOURS
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00



PERCENT OF TRAFFIC
-2.50
-2.00
-1.50
-1.00
-.50
0.00
.50
1.00
1.50
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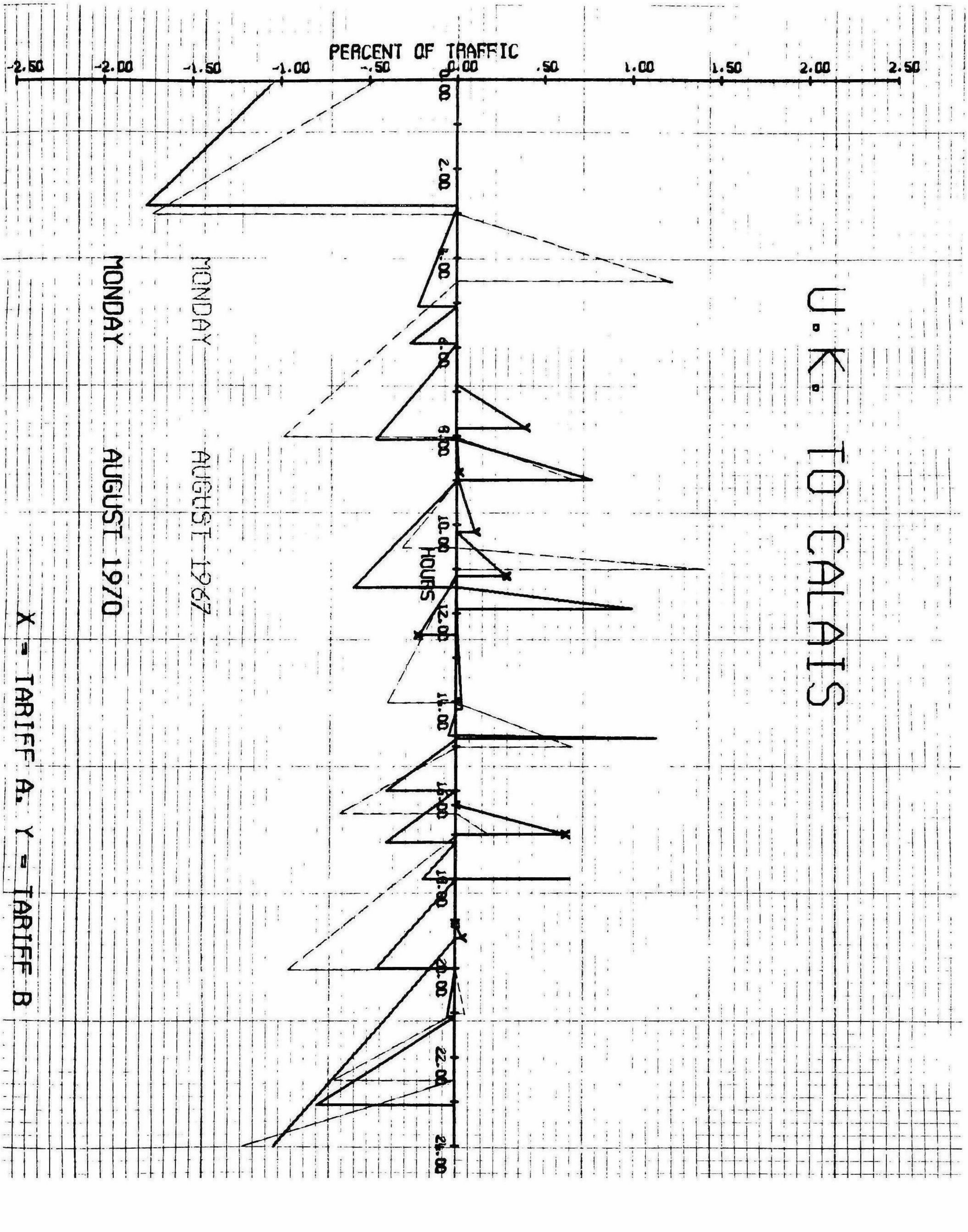
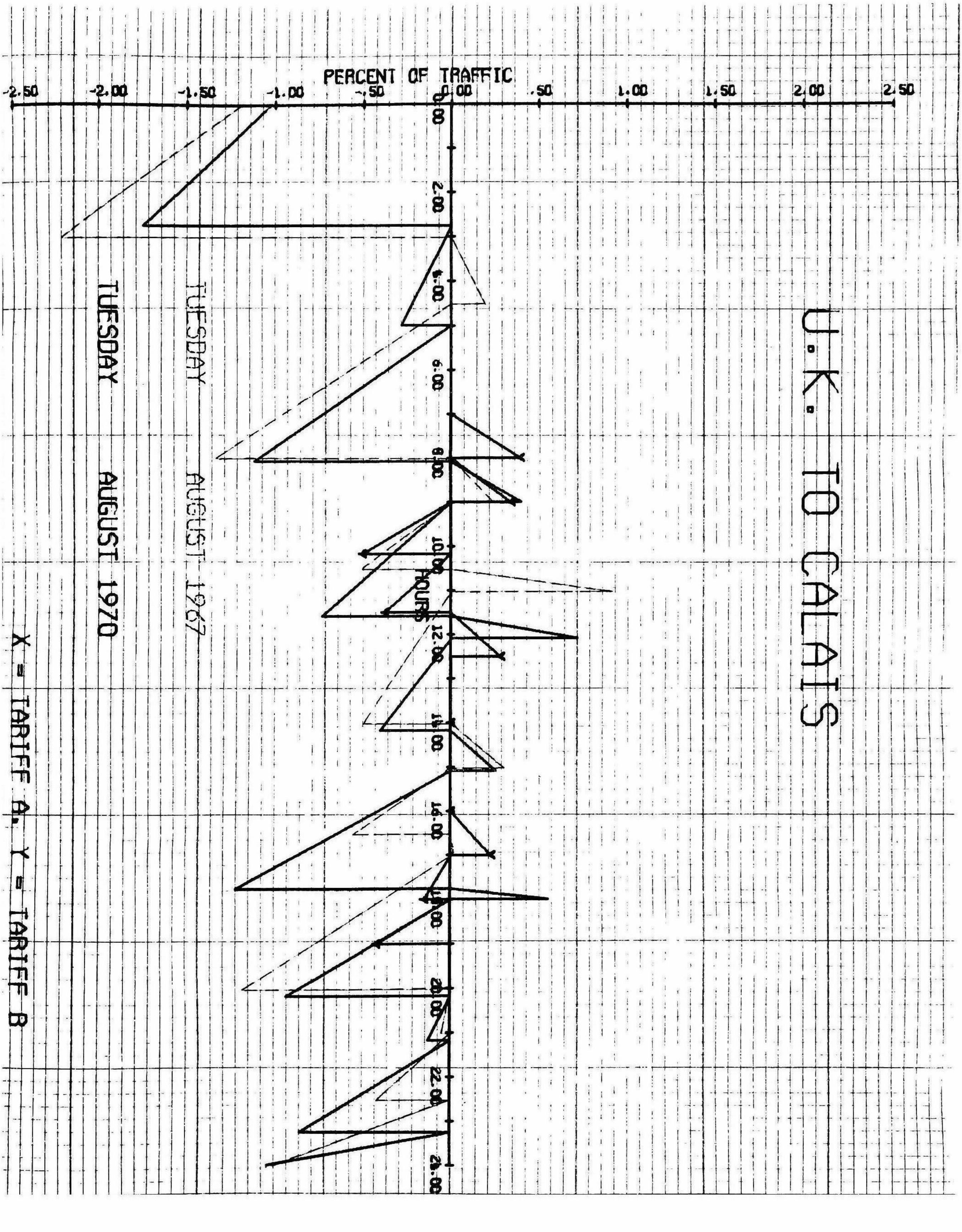
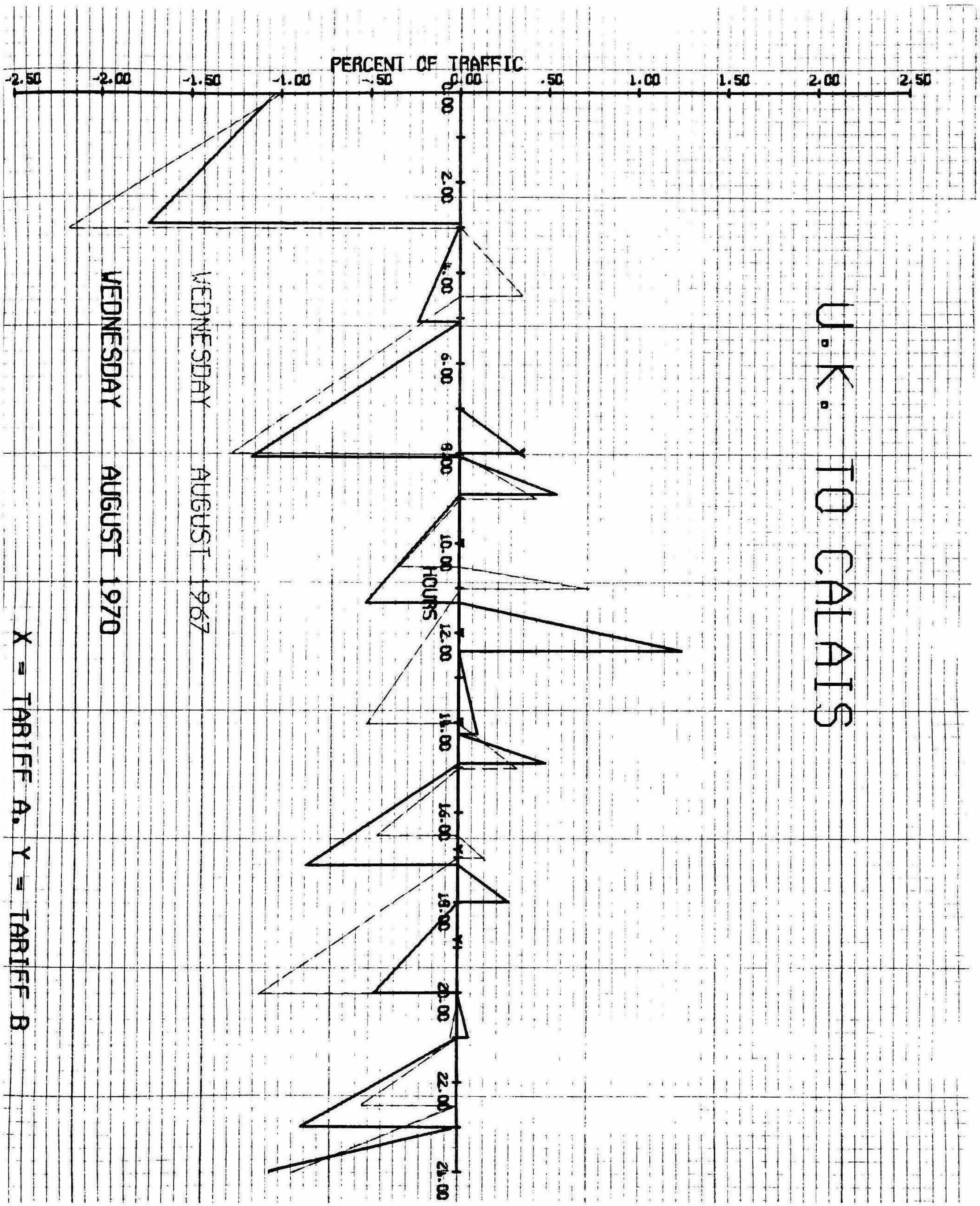
2.50
HOURS
U.K. TO CALAIS
SUNDAY AUGUST 1967
SUNDAY AUGUST 1970
X = TARIFF A, Y = TARIFF B


U.K. TO CALAIS
PERCENT OF TRAFFIC
-2.50
-2.00
-1.50
-1.00
-.50
0.00
.50
1.00
1.50
2.00
2.50
HOURS
MONDAY AUGUST 1967
MONDAY AUGUST 1970
X = TARIFF A, Y = TARIFF B


U.K. TO CALAIS
PERCENT OF TRAFFIC
-2.50 -2.00 -1.50 -1.00 -.50 0.00 .50 1.00 1.50 2.00 2.50
HOURS
0.00 2.00 4.00 6.00 8.00 10.00 12.00 14.00 16.00 18.00 20.00 22.00 24.00
TUESDAY AUGUST 1970
TUESDAY AUGUST 1967
X = TARIFF A, Y = TARIFF B


PERCENT OF TRAFFIC
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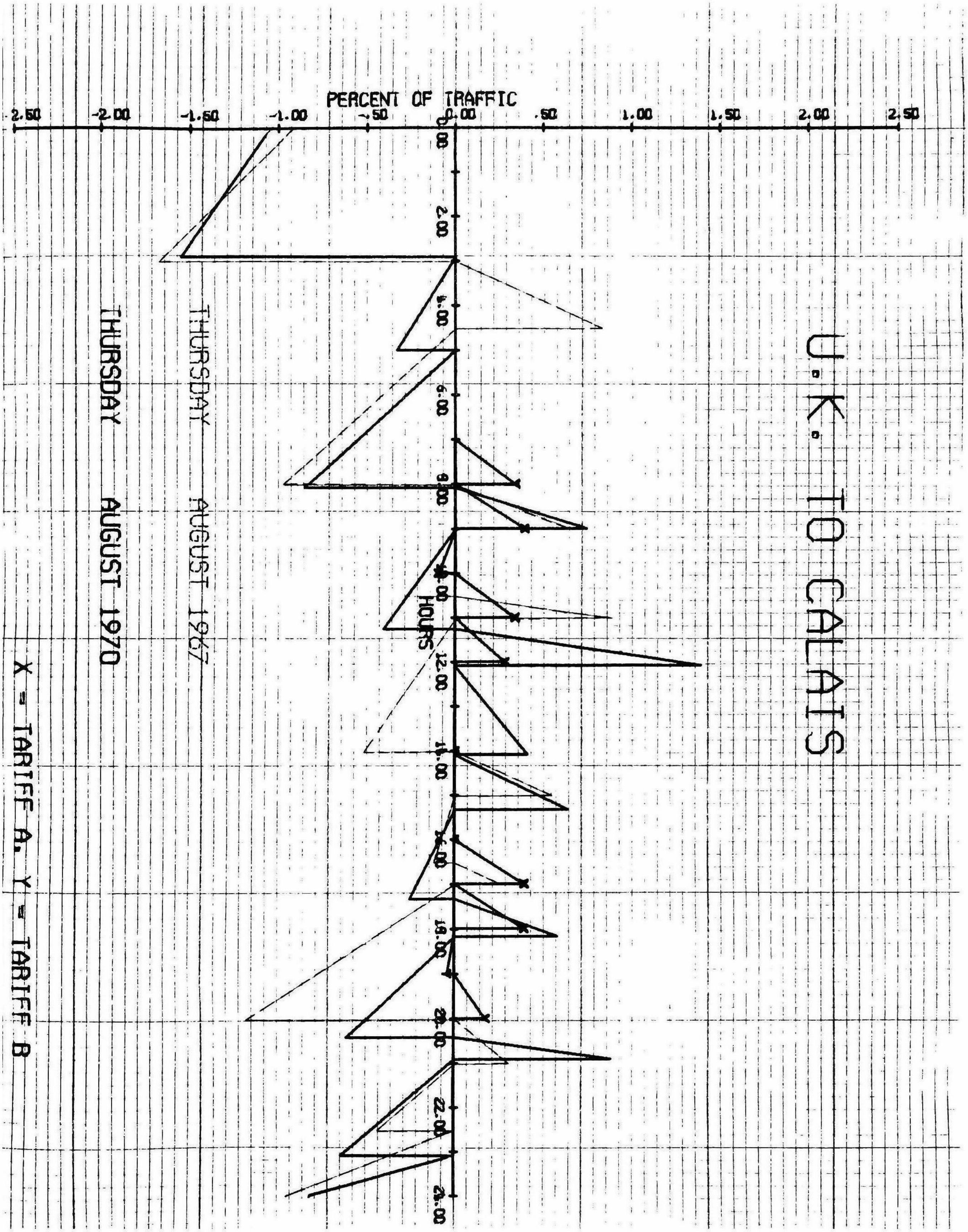
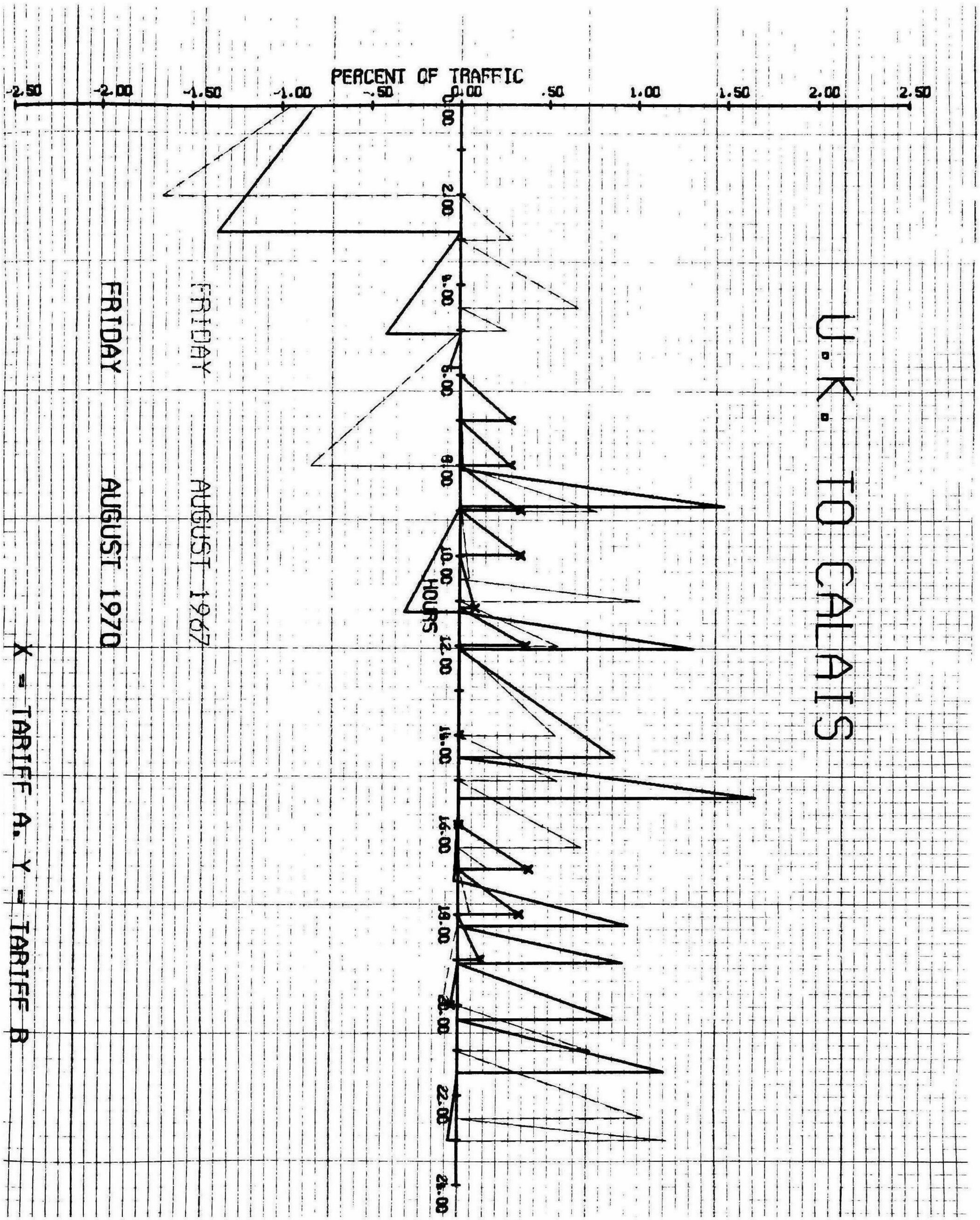
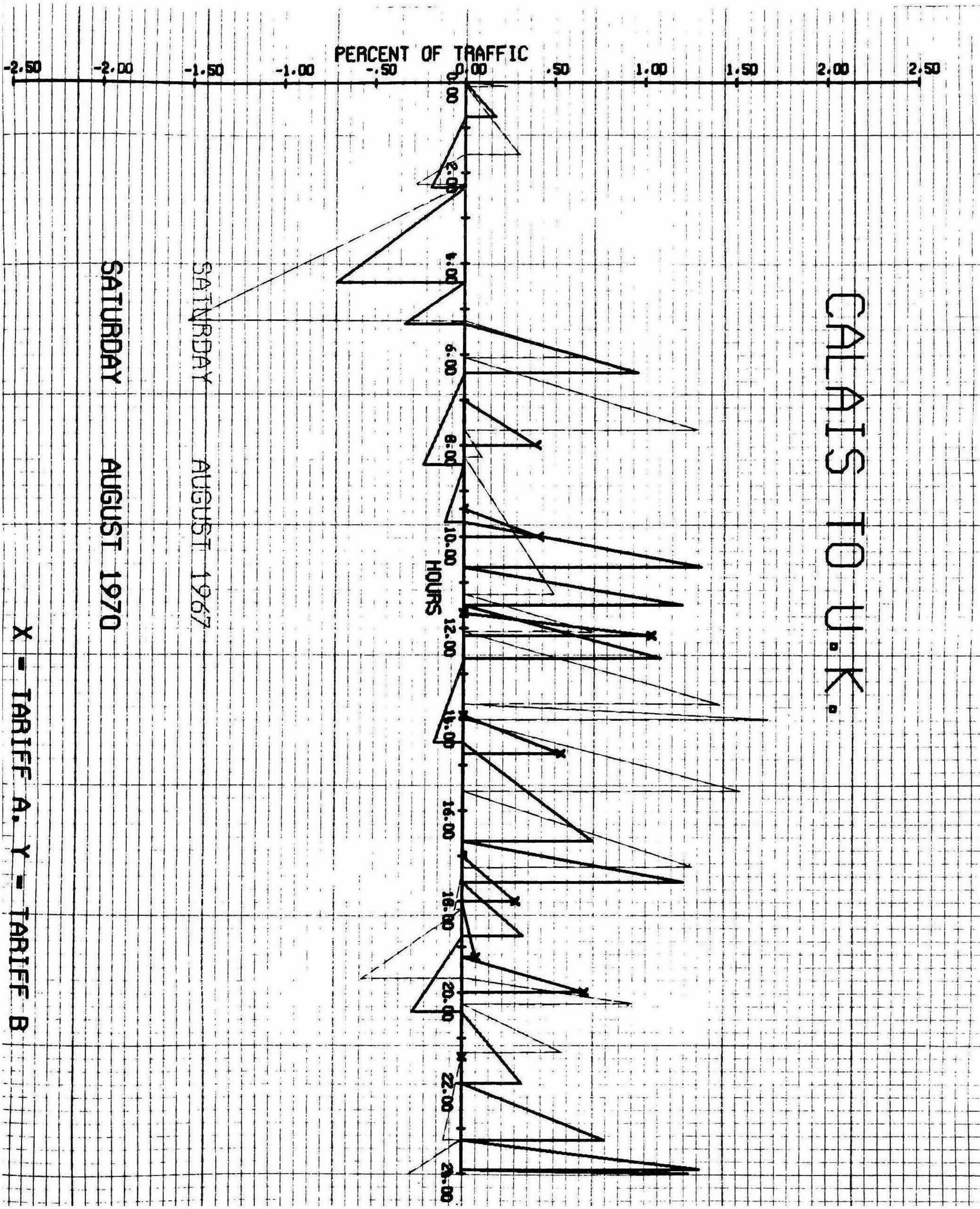
HOURS
0.00 2.00 4.00 6.00 8.00 10.00 12.00 14.00 16.00 18.00 20.00 22.00 24.00
U.K. TO CALAIS
WEDNESDAY AUGUST 1967
WEDNESDAY AUGUST 1970
X = TARIFF A, Y = TARIFF B


U.K. TO CALAIS
PERCENT OF TRAFFIC
-2.50 -2.00 -1.50 -1.00 -.50 0.00 .50 1.00 1.50 2.00 2.50
HOURS
0.00 2.00 4.00 6.00 8.00 10.00 12.00 14.00 16.00 18.00 20.00 22.00 24.00
THURSDAY AUGUST 1967
THURSDAY AUGUST 1970
X = TARIFF A, Y = TARIFF B


U.K. TO CALAIS
PERCENT OF TRAFFIC
-2.50 -2.00 -1.50 -1.00 -.50 0.00 .50 1.00 1.50 2.00 2.50
HOURS
0.00 2.00 4.00 6.00 8.00 10.00 12.00 14.00 16.00 18.00 20.00 22.00 24.00
FRIDAY
AUGUST 1967
FRIDAY
AUGUST 1970
X = TARIFF A. Y = TARIFF B


CALAIS TO U.K.
PERCENT OF TRAFFIC
-2.50
-2.00
-1.50
-1.00
-.50
0.00
.50
1.00
1.50
2.00
2.50
HOURS
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4.00
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16.00
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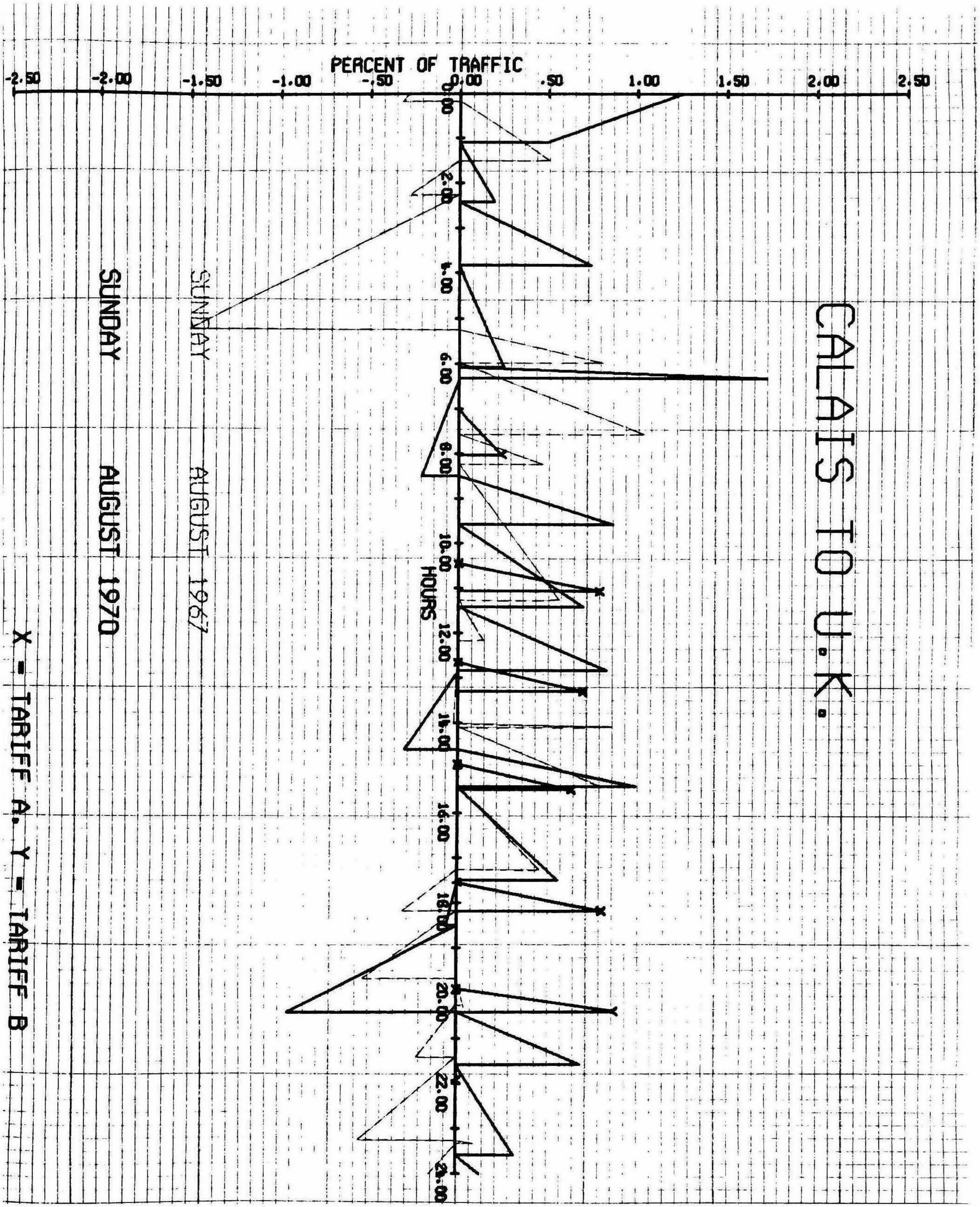
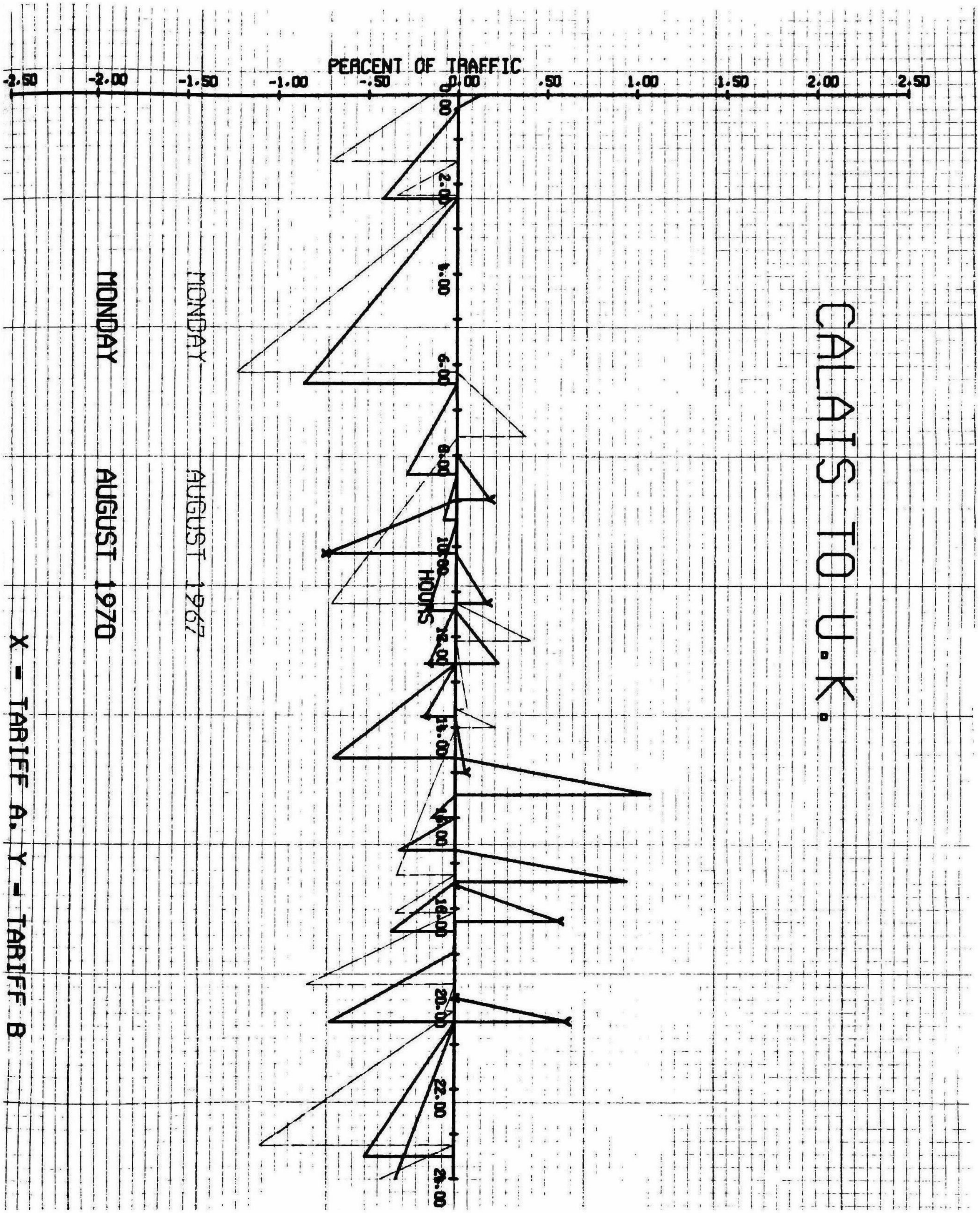
20.00
22.00
24.00
SATURDAY AUGUST 1967
SATURDAY AUGUST 1970
X = TARIFF A, Y = TARIFF B


CALAIS TO U.K.
PERCENT OF TRAFFIC
-2.50 -2.00 -1.50 -1.00 -.50 0.00 .50 1.00 1.50 2.00 2.50
HOURS
0.00 2.00 4.00 6.00 8.00 10.00 12.00 14.00 16.00 18.00 20.00 22.00 24.00
SUNDAY AUGUST 1970
SUNDAY AUGUST 1967
X = TARIFF A. Y = TARIFF B


CALAIS TO U.K.
PERCENT OF TRAFFIC
HOURS
MONDAY AUGUST 1970
MONDAY AUGUST 1967
X - TARIFF A. Y - TARIFF B
-2.50
-2.00
-1.50
-1.00
-.50
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1.00
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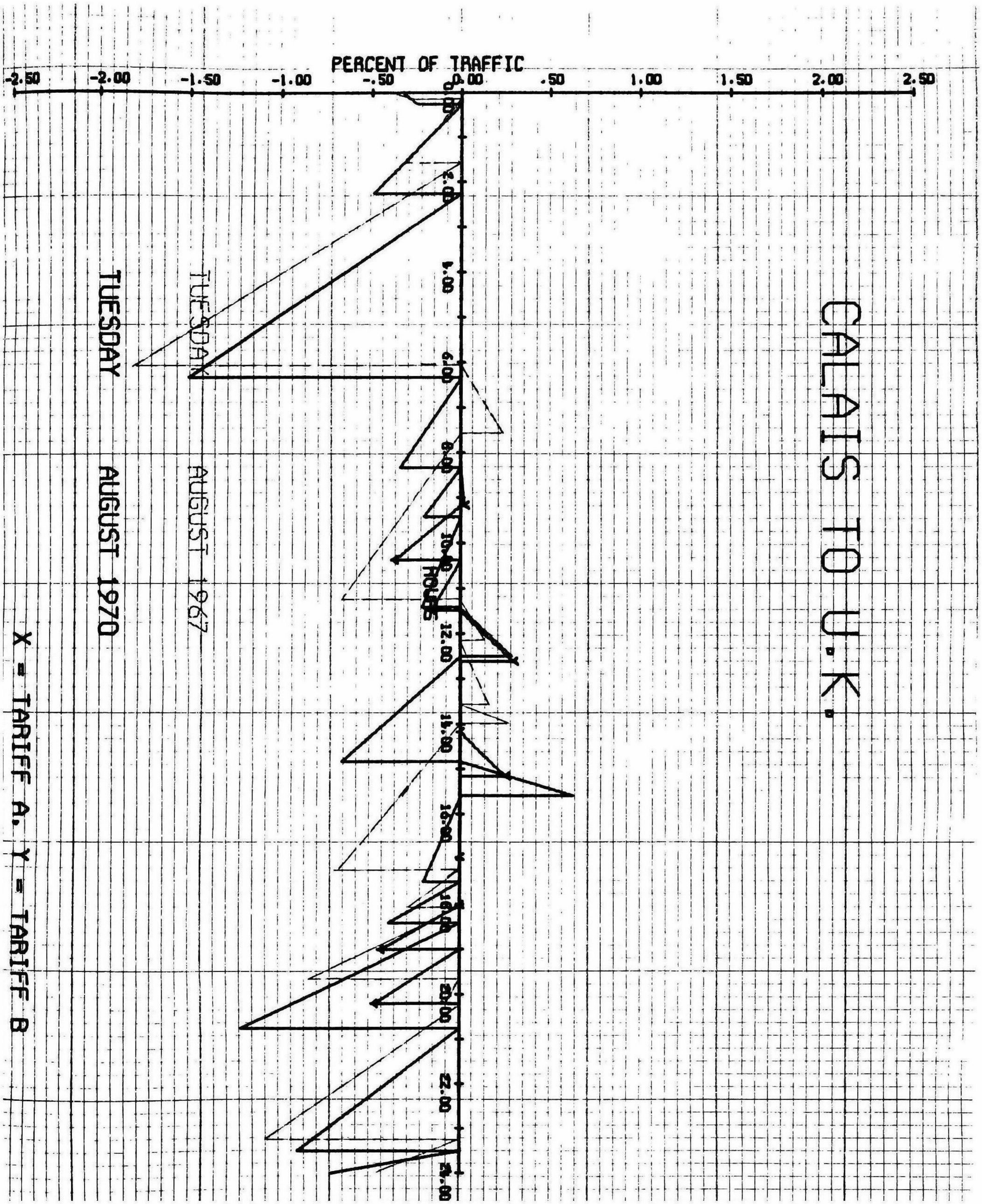
CALAIS TO U.K.
PERCENT OF TRAFFIC
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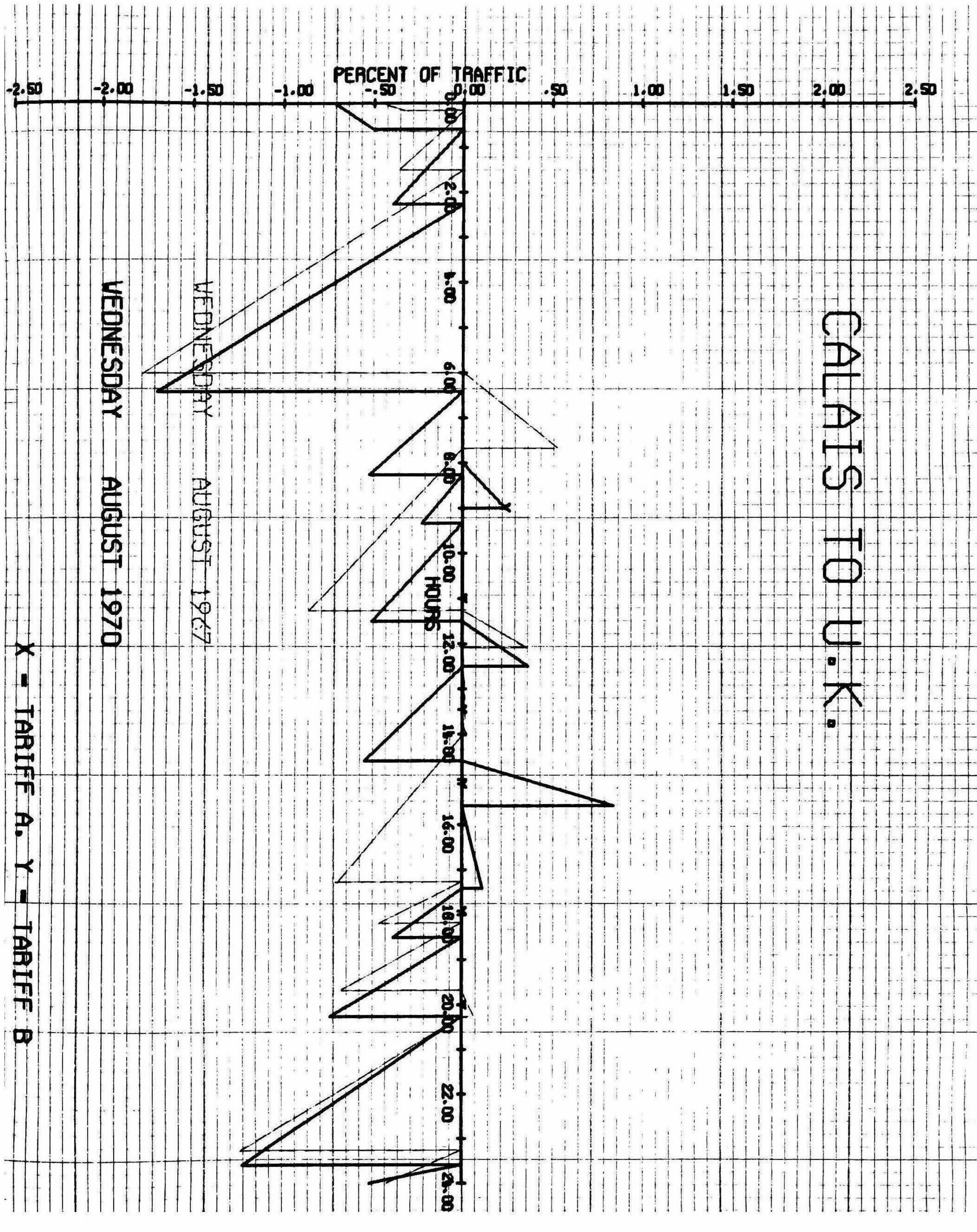
HOURS
0.00 2.00 4.00 6.00 8.00 10.00 12.00 14.00 16.00 18.00 20.00 22.00 24.00
TUESDAY AUGUST 1970
TUESDAY AUGUST 1967
X = TARIFF A, Y = TARIFF B


CALAIS TO U.K.
WEDNESDAY AUGUST 1970
WEDNESDAY AUGUST 1967
X - TARIFF A. Y - TARIFF B
PERCENT OF TRAFFIC
-2.50 -2.00 -1.50 -1.00 -.50 0.00 .50 1.00 1.50 2.00 2.50
HOURS
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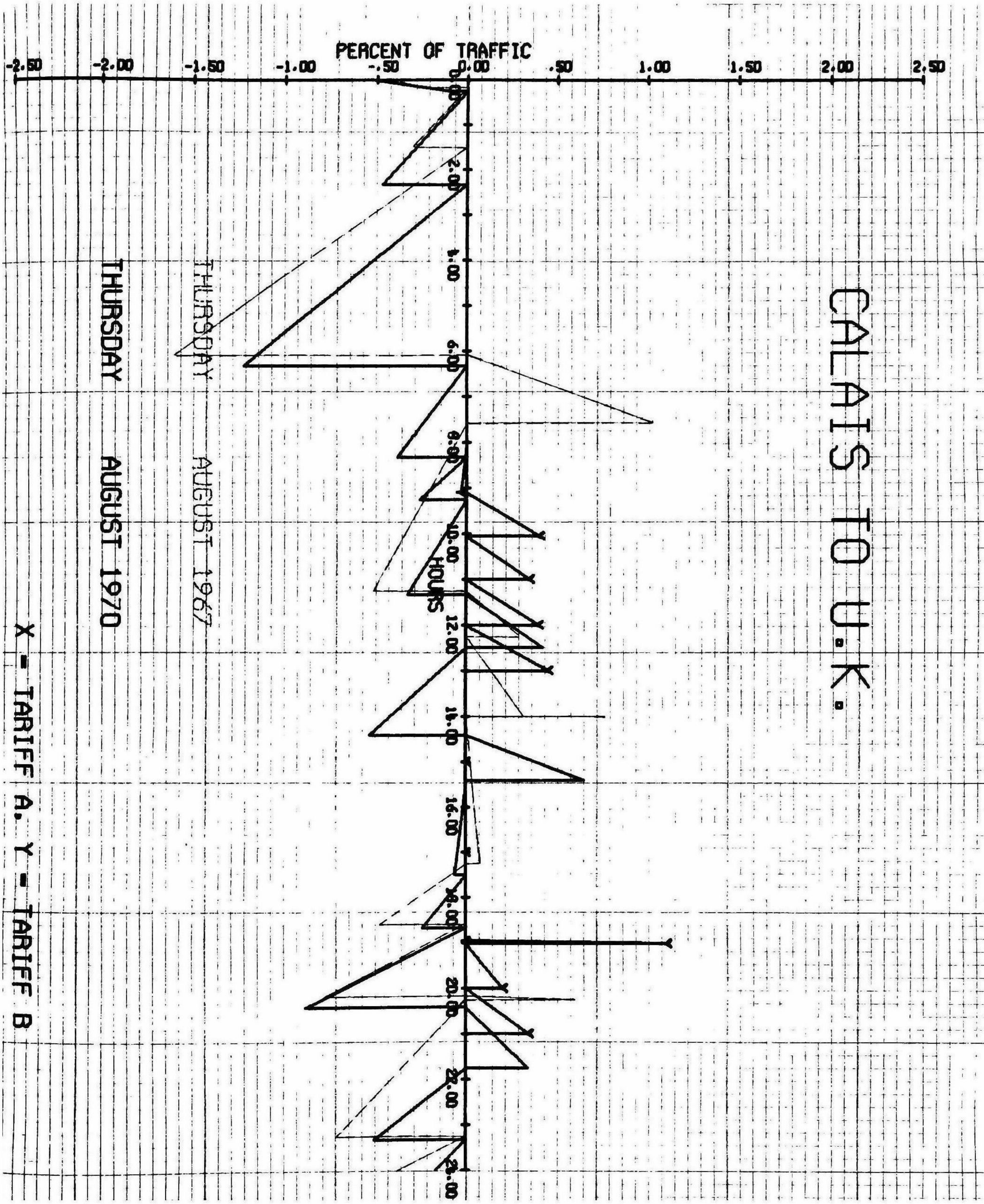
PERCENT OF TRAFFIC
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HOURS
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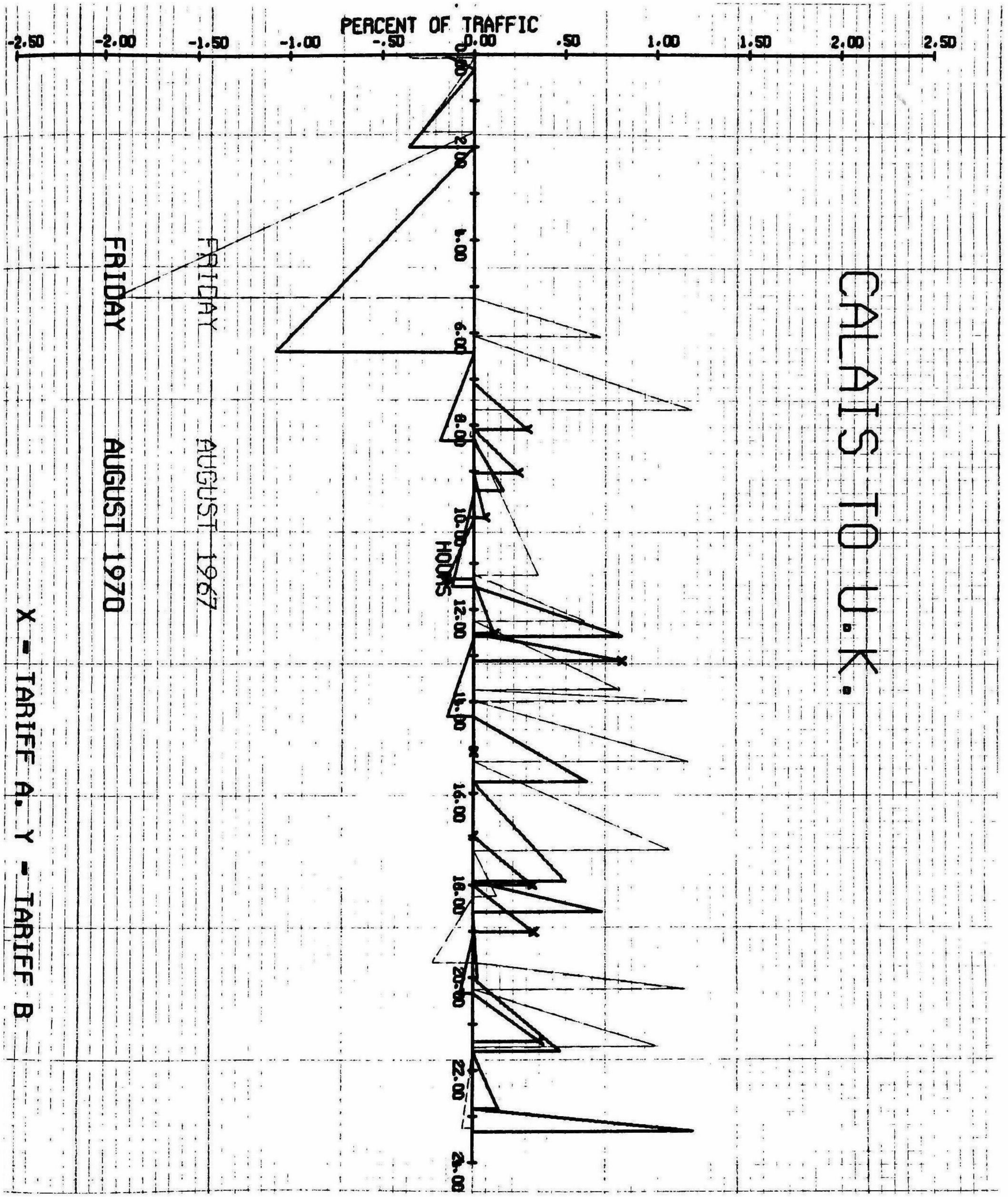
CALAIS TO U.K.
THURSDAY AUGUST 1967
THURSDAY AUGUST 1970
X - TARIFF A. Y - TARIFF B


CALAIS TO U.K.
PERCENT OF TRAFFIC
-2.50
-2.00
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-.50
0.00
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HOURS
FRIDAY
AUGUST 1967
FRIDAY
AUGUST 1970
X - TARIFF A. Y - TARIFF B