Market Response to Discount Domestic Air Fares

Occasional Paper

The introduction by East-West Airlines of low-cost fares on the Sydney-Melbourne and Sydney-Brisbane routes in the first half of 1983 generated considerable debate within the aviation industry. The early stages of this debate were characterised by a lack of data on the passenger response to these innovative fares. In this Paper the results of a series of four surveys and an analysis of trunk network patronage designed to assess passenger response to discount air fares are described. The work was not restricted to the response of East-West Airlines' passengers but also included the response of passengers who travelled with Ansett Airlines of Australia and Trans Australia Airlines. One of the implications from this analysis is that a policy of minimising spillage of full fare passengers may be inconsistent with profit maximisation in the short term. Another implication is that optimal seat reservation procedures require data on the unsatisfied demand for full and discount fares.

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FOREWORD

The introduction by East-West Airlines of low-cost fares on the Sydney-Melbourne and Sydney-Brisbane routes in the first half of 1983 generated considerable debate within the aviation industry. The early stages of this debate were characterised by a lack of data on the passenger response to these innovative fares and, in recognition of this, the Chairman of the Independent Air Fares Committee wrote to the Bureau in June 1983 suggesting that there might be scope for research in this area. In this Paper the results of a series of four surveys and an analysis of trunk network patronage designed to assess passenger response to discount air fares are described. The work was not restricted to the response of East-West Airlines' passengers but also included the response of passengers who travelled with Ansett Airlines of Australia and Trans Australia Airlines.

Although the general topic of this work was formally suggested by the Independent Air Fares Committee, the study itself was undertaken independently by the Bureau to assist the domestic aviation industry in general. The work could not, however, have been undertaken without assistance from the Independent Air Fares Committee secretariat and the three airlines concerned. This assistance is gratefully acknowledged.

This work was undertaken by Dr H.B. Milloy, Ms L. Douglas, Mr S.M. Sullivan and Dr F. Poldy with valuable assistance from Dr E.M. Casling, Ms F. Talbot and Ms K. Roberts.

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SUMMARY

This study of the market response to discount air fares on selected domestic trunk routes was largely based on a series of three surveys of airline passengers, a survey of interstate coach passengers and trunk network passenger traffic statistics. Two of the airline passenger surveys (in July 1983 and February 1984) were restricted to East-West Airlines (EWA) passengers and were designed mainly to determine the alternative travel arrangements which EWA passengers would have made if their low-cost fares were not available. The third survey of airline passengers (in November 1983) was designed to collect data on the characteristics of Ansett Airlines of Australia (AAA), Trans Australia Airlines (TAA) and EWA passengers, passengers' attitudes to fare increases and the alternative travel arrangements which would have been made by discount fare passengers if their discount fares were not available[1].

A survey of Ansett Pioneer coach passengers (in January and February 1984) was undertaken mainly to estimate the potential for diversion of interstate coach passengers to air travel.

Three main features emerged from the data collected on the travel and personal characteristics of air passengers. The first was that the characteristics of passengers on the Sydney-Melbourne route were only slightly different from their Sydney-Brisbane counterparts. The main differences were in the duration of stay data: the mean duration of stay for passengers on the Sydney-Melbourne and Sydney-Brisbane route was six and 10 nights respectively. In terms of purpose of travel, gender, household income and decision time characteristics, there were no significant differences between passengers on either route.

The second feature of the data was that there were very few differences between the characteristics of AAA and TAA passengers but that the characteristics of EWA passengers were markedly different

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1. Airlines of New South Wales' passengers were not included in this survey.

from AAA and TAA passengers. Compared with AAA and TAA passengers, EWA passengers were less business oriented, came from households in lower income groups, made the decision to travel further in advance and stayed away longer. In addition, many more EWA passengers purchased their own tickets and there was a 1:1 male to female ratio on EWA flights, whereas there was a 4:1 male to female ratio on AAA and TAA flights.

The third main feature of the air passenger characteristics data was that AAA and TAA discount fare passengers had very similar characteristics to EWA passengers.

From the travel frequency data collected it was found that only about 27 per cent of passenger trips were made by passengers who travelled for both business and non-business reasons in the same year. This indicated that to a large extent the markets for business and non-business travel were independent. The average numbers of business and non-business return trips per passenger per annum were 7.3 and 1.3 respectively. If it is assumed that the passengers on the Sydney-Melbourne and Sydney-Brisbane routes were representative of total network traffic, then it is estimated that air travel was restricted to between 2 and 3 per cent of the total population. It was also concluded that about 60 per cent of trips were undertaken by about 0.5 per cent of the national population.

Large differences were observed between the attitudes of business and non-business air travellers to fare increases: the survey results indicated that the price elasticities of demand (and 95 per cent confidence limits) for business and non-business travel were -1.1 ± 0.3 and -3.2 ± 0.6 respectively. Differences of the same order were observed when the data were categorised in terms of fare type: the price elasticities of demand for first class, economy and discount fare travel were estimated to be -0.6 ± 0.4, -1.3 ± 0.2 and -4.2 ± 0.5 respectively. (The confidence limits for these elasticity results reflect the survey sample sizes and do not account for possible systematic bias in the survey technique.) The price elasticity of demand for first class travel was also estimated from an econometric analysis of ticket sales from 1977-83 and found to be -0.5 ± 0.2. The elasticity estimates derived in this work describe the effect of price increases on demand. Different price elasticities may apply with respect to price decreases.

Three surveys were used to determine the alternative travel arrangements which discount fare passengers would have made if their discount fares had not been available. Passengers' responses were

categorised in terms of dilution (would have bought a more expensive fare with same airline), diversion (would have travelled by another airline) and generation (would have travelled by land transport or would not have travelled at all). Large and statistically significant variations between surveys were observed in the diversion and generation characteristics of EWA passengers on both the Sydney-Melbourne and Sydney-Brisbane routes. For example, the fractions of EWA passengers on the Sydney-Melbourne route who had diverted from AAA and TAA increased from 30 ± 4 per cent in July 1983 to 52 ± 7 per cent in November 1983 and then decreased to 36 ± 9 per cent in February 1984. This rise and fall in passenger diversion was also observed on the Sydney-Brisbane route. There was no straightforward explanation for these variations in terms of passengers' purpose of travel and further work would have to be undertaken to identify their causes. The differences in the dilution, generation and diversion results between surveys highlight the difficulty of establishing accurate average figures or long-term trends.

From the responses of AAA and TAA Apex, Excursion 45/Flexi-Fare and Standby passengers, it was found that about 9 per cent of these passengers would have stayed at home if their discount fares had not been available. The overall ratio of traffic dilution to traffic generation was about 3:1 in the case of Apex passengers and about 1:1 in the case of Excursion 45/Flexi-Fare and Standby passengers.

The survey of interstate coach passengers was undertaken to investigate their attitudes to air and coach fare changes and to investigate the factors which determined their choice of mode. Large differences were found between the characteristics of interstate coach and intercity air passengers. Some of these differences were:

- most air travel was undertaken for business reasons, whereas most coach travel was undertaken for non-business reasons;
- there were many more male than female airline passengers but more female than male coach passengers;
- many more air than coach passengers came from high income households; and
- less than 20 per cent of air trips were of more than one week's duration, whereas over 60 per cent of interstate coach trips were of more than one week's duration.

The price elasticity of demand for interstate coach travel was estimated to be -1.1 ± 0.3 and the cross elasticity of demand for coach travel with respect to the price of air travel was estimated to

be 0.7 ± 0.2. The overall conclusion from the results of the coach survey was that a large decrease in the difference between coach and air fares would be required to induce coach travellers to travel by air. It was also found that about 20 per cent of interstate coach passengers chose to travel by coach for non-price reasons, which included a dislike of air travel and a desire to see the countryside.

Only about 10 per cent of coach passengers tried to book a discount air fare for their journey.

A study of the dependence of airline revenue on the reservation of seats for full and discount fare passengers was also undertaken. This analysis was based on the principle that if too many seats are reserved for discount fare passengers there is the risk that there may not be seats available for full fare passengers, and if too few seats are reserved for discount fare passengers the aircraft may fly with empty seats which could have been occupied by discount fare passengers. Two scenarios were considered in this analysis, one in which there was no advance booking requirement for discount fare passengers and another in which an advance booking requirement made it possible to sell additional seats to full fare passengers if discount fare demand did not meet the original seat reservation.

One of the implications from this analysis is that a policy of minimising spillage of full fare passengers may be inconsistent with profit maximisation in the short term. Another implication is that optimal seat reservation procedures require data on the *unsatisfied* demand for full and discount fares.

CHAPTER 1-INTRODUCTION

BACKGROUND

Before the establishment of the Independent Air Fares Committee (IAFC) the responsibility for determining domestic passenger air fares fell within the (then) Commonwealth Department of Transport. This situation changed on 18 June 1981 when assent was given to the *Independent Air Fares Committee Act 1981*, which established a committee to 'review the basis on which certain domestic passenger air fares are determined and to determine those domestic passenger air fares'. The IAFC consists of a chairman and two other members, each of whom holds office for a period not exceeding five years, but is eligible for reappointment.

The IAFC Act lists three conditions which, if satisfied, require the Committee to approve a proposed discount air fare. These are:

(a) the introduction of that proposed discount air fare is likely to improve the profitability of the operations of that passenger operator in relation to the provision of air services;

(b) the introduction of that proposed discount air fare is unlikely to result in economy air fares in respect of air services provided by any trunk route operator over trunk routes being increased; and

(c) the conditions (if any) under which that proposed discount air fare is to be available are reasonable and will be applied without discrimination between persons or classes of persons who can comply with the conditions.

Conditions (a) and (b) above provide the background to this work as their interpretation clearly relies on an understanding of the market response to different types and levels of air fares. The basic aim of this work was to gain further understanding of the discount air fares market in Australia, and so to assist the IAFC and the aviation industry as a whole.

The study timing was determined largely by the controversy which surrounded the introduction by East-West Airlines (EWA) of excursion fares on the Sydney-Melbourne, Sydney-Brisbane, Sydney-Canberra, and Melbourne-Adelaide routes in the first six months of 1983. The start of the study also coincided with the introduction by Ansett Airlines of Australia (AAA) and Trans Australia Airlines (TAA) of a 45 per cent discount fare which was designed to 'top-up' demand for flights with low load factors.

DEFINITIONS

The measures of market response used in this work are those commonly used within the aviation industry, namely passenger dilution, diversion and generation.

Passenger *dilution* refers to the response of discount air fare passengers who would have been prepared to pay any higher yielding fare with the same airline if their discount fare had not been available. Passenger dilution does not include those passengers who unsuccessfully tried to book a discount fare.

Diversion describes the response of passengers who would have travelled by another airline if their discount fare had not been available. In this work three surveys were carried out to measure the diversion of passengers from AAA and TAA to EWA excursion fares.

Generation describes the response of passengers who would not have made their journey by air if their discount fare had not been available. There are two sources of passenger generation, those passengers who would otherwise have travelled by land transport modes such as bus, car or train and those who would otherwise not have made the journey, that is those who would have stayed at home. *Mode diversion* is used to describe the former response and *stimulation* is used to describe the latter response. Thus generation includes both mode diversion and stimulation.

One other term requires definition. It is necessary in the aviation industry to distinguish between ticket sales and ticket avails (occupied seats) because a signficant fraction of pre-booked passengers do not turn up for their flight. Full fare passengers who do this are entitled to a full refund if they choose not to reschedule their air travel plans.

METHODOLOGY

The market response to discount air fares could, in principle, be assessed either by analysing the aggregate passenger response (measured in terms of ticket avails) or by using questionnaires to study the response of a large number of individual travellers.

In an analysis of ticket avails the aim would be to explain the historical demand for different types of air fares in terms of internal industry factors such as fare changes and the introduction of new fares, and also in terms of external economic factors such as the prices of competing products. In this way it would, in principle, be possible to categorise the demand for each fare type in terms of passenger dilution, diversion and generation, although it would not be possible to distinguish between mode diversion and stimulation. The main difficulty with this econometric approach is that the changes in demand may be dominated by macro-economic factors and as a result it may become impossible to accurately assess the effects of changes internal to the industry. Put another way, the effects under investigation may be hidden in the 'noise'. This technique does, however, have the advantage that it is relatively inexpensive to apply, given that the necessary expertise and data are available. The application of econometric techniques to network-wide ticket avails is described in Chapter 4.

Survey methods have the advantage that they are direct and thus it is possible to filter out the influence of external factors. It is also possible to collect a wide range of data on the personal characteristics of passengers and so develop a better understanding of their responses.

The main disadvantages of survey techniques are that they tend to be expensive and are subject to several sources of error, including ambiguity in the survey design, the choice of the sample population and non-response bias. Survey results are also sometimes subject to errors caused by differences between respondents' expressed attitudes and actual behaviour.

Four surveys were undertaken for this study, three of airline passengers and one of interstate coach passengers. Two of the airline passenger surveys (in July 1983 and February 1984) were restricted to EWA passengers and were designed mainly to determine the alternative travel arrangements which EWA passengers would have made if their low-price fares were not available. The third survey of airline passengers (in November 1983) was designed to collect data on the

characteristics of AAA, TAA and EWA passengers, passengers' attitudes to fare increases and the alternative travel arrangements which would have been made by discount fare passengers if their discount fares were not available. The airline passenger survey forms are shown in Appendixes I and II.

The survey of Ansett Pioneer coach passengers (in January and February 1983) was undertaken to estimate the potential for diversion of interstate coach passengers to air travel. The coach passenger survey form is shown in Appendix III.

DESIGN AND MANAGEMENT OF DISCOUNT AIR FARES

From the definitions of passenger dilution, diversion and generation it follows that a discount fare is financially viable only if the net revenue gained from passenger generation and diversion exceeds the net revenue lost from passenger dilution. It is necessary to express fare viability in terms of net revenue because the costs of flying discount fare and normal economy fare passengers may differ due to the costs of discount fare promotion and administration. The art of designing a successful discount fare is to introduce restrictions which limit dilution but not generation or diversion (Pina, Hunt and Fox 1981, Boeing Commercial Airplane Company 1982, Bennett 1984). Perhaps the most common restrictions used to limit dilution are pre-booking periods and minimum stay requirements. In the design of a discount fare it is also necessary to ensure that the fare is inexpensive to administer and that the fare conditions can be readily understood by travel agents and the general public.

Under circumstances where the total demand for aircraft seats is always less than aircraft capacity, it is not necessary to reserve seats for full fare or discount fare passengers as revenue is maximised with a first-come-first-served seat allocation system. The situation becomes more complex when total demand exceeds capacity, as average net revenue then depends on the number of seats reserved for different fare types. In practice it is necessary to compromise between the situation where there are not seats available for late-booking full fare passengers and the situation where aircraft fly with empty seats which could have been filled with discount fare passengers. These situations are analysed in detail in Appendix IV where it is shown that the solution to the problem of maximising profit when demand exceeds supply requires data on the level of unsatisfied demand for discount fares, that is, data on the number of passengers who unsuccessfully attempted to buy discount fares. It appears that at the present time the domestic airlines do not collect

data of this type and therefore do not make a calculated trade-off between the spillage of full fare passengers and the allocation of unfilled seats to discount fare passengers. The financial gains which might be achieved by a quantitative analysis of this trade-off are discussed in Appendix IV.

DISCOUNT AIR FARES

Subsequent chapters of this paper focus on the response of AAA and TAA passengers travelling on Apex, Standby and Excursion 45/Flexi-Fare fares, and EWA passengers on excursion fares. The levels of discount and the conditions which applied to these fares at the time of the main survey (November 1983) are given below and summarised in Table 1.1. It must be remembered that, in addition to the fares discussed, there was a wide range of other discount fares available at the time. The details of these other fares are not discussed either because they represented only small fractions of the total discount air fare market or because they were only available to passengers making combined travel and accommodation arrangements.

In November 1983, Apex (or Super-Apex) fares were available in limited numbers for return travel on jet routes[1]. These fares were 35 per cent cheaper than the return economy fare. Passengers were required to book and pay for both the forward and return legs of their journey at least 30 days before the forward journey and to stay away at least seven nights. A 50 per cent refund was available for tickets cancelled within 30 days prior to travel. Apex fares were not available for students, children, or group concessions.

The AAA Flexi-Fare and the TAA Excursion 45 fares were first introduced on 1 July 1983. These fares, which only differ in name, were sold at a discount of 45 per cent off the normal economy return air fares. They were available in limited numbers on nominated jet routes. Passengers were required to register for travel between four and 14 days before the desired date of forward travel and to stay away a minimum of one night and a maximum of 21 nights. Once the registration process had been completed, passengers were able to obtain flight numbers and times of travel after 12 noon on the day prior to forward travel, and again on the day prior to the nominated return journey. On high frequency routes (as defined by the airlines)

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1. Apex fares were first introduced on selected routes in November 1977. Since then the level of discount, fare conditions and availability have been changed on a number of occasions.

registered passengers were guaranteed a seat on the nominated day of travel and on lower frequency routes travel was guaranteed on the nominated day or the next operating day. No other discounts were available for these fares. However, a child or student travelling at 50 per cent discount off the normal economy fare was able to register at the same time as an accompanying adult. Passengers were advised not to register for more than one nominated sector per day as the airlines were unable to guarantee connections between sectors on a

TABLE 1.1-MAJOR CHARACTERISTICS OF COMMON DISCOUNT AIR FARES IN NOVEMBER 1983

Fare type	*Characteristics*
AAA/TAA Apex	35 per cent discount off the economy fare Available in limited numbers on jet routes Return tickets only Bookings had to be made at least 30 days in advance Minimum stay of seven nights
AAA Flexi-Fare/ TAA Excursion 45	45 per cent discount off the economy fare Available in limited numbers on jet routes Return tickets only Bookings had to be made 4-14 days in advance Minimum stay of one night Maximum stay of 21 nights Only the day of travel could be specified: flight details were issued day before travel
AAA/TAA Standby	20 per cent discount off the economy fare Availability depended on the number of unoccupied seats when the flight closed Tickets only issued at airports on a first-come-first-served basis
EWA Excursion	Approximately 47 per cent off the AAA/TAA economy fare Available on limited routes Return tickets only Minimum stay of two days Ticket valid for a maximum of 30 days

Source: Airlines fares brochures.

given day. If the entire journey was altered or cancelled prior to the commencement of the forward journey a 50 per cent cancellation fee applied. If the return journey was cancelled after completion of the forward journey, passengers were charged the full economy fare for the forward journey and refunded 50 per cent of the remaining fare.

In November 1983, Standby fares, at 20 per cent discount, were available for economy class travel[1]. Tickets were only issued at airports and no advance reservations were accepted. The allocation of seats was subject to seat availability immediately before aircraft departure. Child, student and group concessions were not applicable.

Excursion fares were first officially introduced by EWA on the Sydney-Melbourne route in March 1983 and on the Sydney-Brisbane route in May 1983. At the time of their introduction, these fares, which were available on a return basis only, were $120 for the Sydney-Melbourne route and $130 for the Sydney-Brisbane route. In an attempt to reduce diversion of traffic from other trunk route operators, EWA introduced a two day minimum stay condition for excursion fares on 20 July 1983. On 11 November 1983 the IAFC approved $20 fare increases on both routes. At the time of the main survey in November 1983 EWA excursion fares were approximately 47 per cent cheaper than AAA and TAA return economy fares. No refund was available for an unused flight coupon and tickets were valid for a maximum of 30 days. No other discounts were applicable.

The Sydney-Melbourne and Sydney-Brisbane EWA flights took about 2.5 and 3 hours respectively. These flight times were at least twice as long as the AAA and TAA flights because intermediate stops were made and because slower aircraft were used[2].

REPORT FORMAT

The characteristics of airline passengers on the Sydney-Melbourne and Sydney-Brisbane routes are described in Chapter 2 and in Chapter 3

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1. Standby fares were first introduced on selected routes in September 1978. The discount available to Standby passengers was reduced from 25 to 20 per cent on 1 July 1983.
2. Both Sydney to Melbourne and Melbourne to Sydney passengers travelled via Albury. Sydney to Brisbane passengers travelled via Newcastle and Brisbane to Sydney passengers travelled via Coolangatta in the morning and via Coolangatta and Newcastle in the afternoon. All flights on the Sydney-Brisbane route were with F27 aircraft and both F27 and F28 aircraft were used on the Sydney-Melbourne route.

details are given of passenger response to air fare changes and the alternative travel arrangements which discount fare passengers would have made if their discount fares were not available. Chapter 4 contains a description of the analysis of trunk network patronage. The results of the work on the latent demand for air travel are detailed in Chapter 5.

CHAPTER 2-CHARACTERISTICS OF AIRLINE PASSENGERS

SURVEY DESIGN AND ADMINISTRATION

The travel choice characteristics of passengers travelling on the Sydney-Melbourne and Sydney-Brisbane routes were measured with a self-administered survey conducted in departure lounges. This type of survey was chosen because of its administrative simplicity, limited survey staff requirements and, more importantly, because of the straightforward nature of the survey questions. The survey forms were developed in conjunction with airlines' staff and a pilot survey was carried out at Canberra airport in mid-November 1983. Some questions were deleted and small changes were made to the wording of some others as a result of follow-up interviews and subsequent analysis of the pilot results.

The full survey was carried out at Kingsford-Smith airport in Sydney from 28 November to 1 December 1983. The duration of the survey was determined by the time required to collect the required data for the smallest carrier (EWA). For the same reason, a high fraction (14 out of 15) of EWA flights were included in the survey. The fractions of AAA and TAA flights included in the survey were much lower due to the larger number of flights available and higher carrying capacities of the aircraft used: 17 out of 57 AAA flights and 16 out of 55 TAA flights were included in the survey. Of the 47 flights included in the survey, 10 TAA, 10 AAA and nine EWA flights were to Melbourne and six TAA, seven AAA and five EWA flights were to Brisbane.

To select AAA and TAA flights it was first assumed that, in terms of passenger characteristics and response, there were no differences between the morning and evening peaks. The same fractions of peak and off-peak flights were then included in the survey. Corresponding AAA and TAA flights were surveyed concurrently to assist comparison between the airlines. Within these limitations individual flights were then selected on a nearly random basis. Simple random sampling was not possible because of the need to give priority to EWA flights and because of the limited staff resources available. The survey was administered by a staff of four. Table 2.1 gives the number of usable

TABLE 2.1-NUMBER OF PASSENGERS ON EACH AIRLINE AND ROUTE INCLUDED IN THE NOVEMBER 1983 SURVEY

	Airline							
	AAA		*TAA*		*EWA*		*Total*	
Route	*Sample*	*Total*	*Sample*	*Total*	*Sample*	*Total*	*Sample*	*Total*
Sydney-Melbourne	505	1 497	326	1 394	167	305	998	3 196
Sydney-Brisbane	233	715	179	746	65	125	477	1 586
Total	738	2 212	505	2 140	232	430	1475	4 782

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

responses and the total patronage (on the flights surveyed) for each airline and each route.

Passengers on each of the selected flights were asked to complete a survey form after they had completed check-in and seat allocation procedures and before the aircraft boarding call. The questionnaires used (refer Appendix II) typically took five minutes to complete. Less than 1 per cent of passengers declined to take part in the survey, usually on the grounds of fatigue. Of the questionnaires that were handed out, over 95 per cent were returned with usable responses. This high figure, however, did not represent the overall sampling rates, which were adversely affected by the existence of multiple check-in facilities at Kingsford-Smith airport.

Passengers at Kingsford-Smith airport, as at many large airports, are able to check-in either at the departure lounge for their flight or at baggage handling counters situated near the passenger entrance to the terminal. At Kingsford-Smith there are several baggage handling counters at the AAA and TAA terminals, each of which can be used by passengers travelling to any destination. It would therefore have been necessary, in order to survey all passengers travelling on a particular flight, to position staff not only at the departure lounge but also at each of the baggage handling counters. At Kingsford-Smith this would have required about six staff per flight, each of whom would have had to be in position about an hour before flight departure to ensure that early arrivals were included in the survey. In this

work it was only possible to allocate one member of staff to each flight and in order to maximise response the staff member was positioned at the departure lounge. As a consequence of this procedure it was possible to include in the survey only a few of the passengers who moved from all parts of the terminal to the departure lounge soon after the boarding call (typically 10 minutes before flight closure).

The overall sampling rates, as calculated from the data in Table 2.1, were 33 per cent for AAA, 24 per cent for TAA and 54 per cent for EWA. At first sight it is surprising that the response rate for EWA was not higher because there was only one check-in point for EWA passengers. However, this check-in point was used by passengers travelling to all destinations and it was not possible, even with a staff of two, to identify all the passengers travelling to a particular destination. The differences between the overall response rates for AAA and TAA passengers reflected physical differences in the terminal layouts.

NON-RESPONSE BIAS IN THE SAMPLING TECHNIQUE

Due to the relatively low survey sampling rates it was necessary to assess the degree to which the results were affected by non-response bias. Put more simply, would the characteristics of passengers who did not complete the survey form have been different from those who did? The most reliable method of estimating non-response bias would have been to ensure that on some flights all passengers completed a questionnaire and then to have compared the results from these flights with the results obtained with the normal sampling procedure. In this way it would have been possible to test for non-response bias in all survey questions. In practice this approach was administratively infeasible and a substitute test based on passengers' purpose of travel was developed.

To estimate the degree of non-response bias in the sampling technique the arrival time distributions of business and non-business travellers were measured to determine whether the passengers who arrived in the departure lounge before the boarding call were representative of all passengers on the flight. As passengers entered the departure lounge they were asked whether they were travelling for business or non-business purposes. Their answers were recorded together with their time of arrival at the lounge. As each interview only lasted about five seconds, it was possible to survey all the passengers on a flight. This procedure was carried out for five flights not included in the full survey.

The results from one of these flights are shown in Figure 2.1, which gives the cumulative arrival time distributions for business and non-business travellers. It can be seen that the first passengers arrived in the departure lounge about 27 minutes before the boarding call, which was announced 17 minutes before the flight was closed. To examine the affects of non-response bias, the purpose of travel distributions were examined in the periods before and after the boarding call. The chi-squared test for independence (Conover 1971) was used to determine whether there were statistically significant differences between the purpose of travel distributions before and after the boarding call. For each of the five individual flights, the purpose of travel distributions were statistically the same before and after the boarding call and for this reason it was concluded that there was no need to correct the survey results for non-response bias[1].

RESULTS

The characteristics of passengers who were included in the survey at Kingsford-Smith airport from 28 November to 1 December 1983 are detailed in Tables 2.2 to 2.13 and the standard errors associated with the data in these tables are discussed in Appendix V. The results refer to mid-week travel on the Sydney-Melbourne and Sydney-Brisbane routes in the period before schools and colleges closed for the summer holidays. At the time of the survey there were no industrial or other disruptions to either air or land transport services and there appeared to be no major public events which might have distorted travel patterns.

The data on purpose of travel, fare purchaser, passenger age, gender and household income are tabulated for each airline and for different types of air fares. The data on trip duration and travel decision time (time between decision to travel and departure) are given for each airline but are not disaggregated by fare type as many discount fares have trip duration and pre-booking restrictions. Thus, to aggregate these data over different types of discount fares would be misleading.

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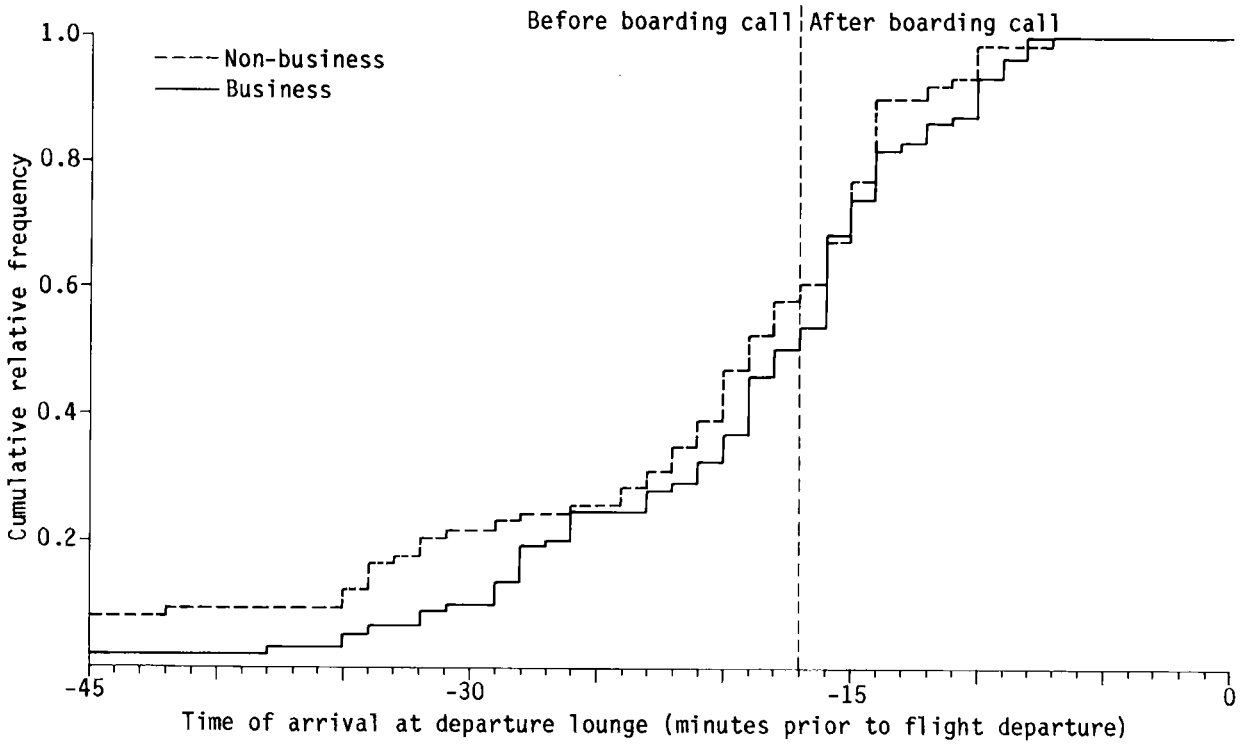
1. For a null hypothesis of independence, the probability of a type I error ranged from 0.2 to 0.9, depending on the flight. These very high levels of significance led to the null hypothesis not being rejected in any case.



Source: BTE survey of TAA flight 461 at Kingsford-Smith airport, 1 December 1983.

Figure 2.1-Cumulative distributions of departure lounge arrival times for business and non-business air travellers

General features

Three general features emerged from the statistical tests performed on the data in Tables 2.2 to 2.13. The first is that the characteristics of passengers on the Sydney-Melbourne and Sydney-Brisbane routes were very similar. There were no significant differences (at the 5 per cent level) between the purpose of travel, gender, household income and decision time distributions for each route. Statistically the largest differences were observed in the distributions of trip duration; trips on the Sydney-Melbourne route tended to be shorter than on the Sydney-Brisbane route, with means of six and 10 nights respectively.

The second main feature was that on the Sydney-Melbourne and Sydney-Brisbane routes the characteristics of AAA and TAA passengers were essentially the same, but markedly different from the characteristics of EWA passengers. Compared with AAA and TAA passengers, EWA passengers were significantly less business oriented, had a more even male to female balance, purchased their own tickets, came from households in lower income groups, booked earlier and stayed away longer. Compared with AAA and TAA passengers, a higher proportion of EWA passengers were either young (<20) or old (>64).

TABLE 2.2-PURPOSE OF TRAVEL BY AIRLINE FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN NOVEMBER 1983

(per cent of passenger trips)

Purpose of travel	*Sydney-Melbourne*				*Sydney-Brisbane*			
	AAA	*TAA*	*EWA*	*Total*[a]	*AAA*	*TAA*	*EWA*	*Total*[a]
Business/work	79	78	23	77	74	71	5	71
Holiday	11	7	24	10	10	11	32	11
Visiting friends or relatives	7	8	35	9	9	12	41	11
Personal business	2	4	13	3	4	5	14	5
Other	1	3	6	2	3	1	8	2
Total	100	100	100	100	100	100	100	100

a. The figures in this column were obtained by weighting the results for each airline by the number of occupied seats in the survey period.

Note: Figures may not all add to totals due to rounding.

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

TABLE 2.3-PURPOSE OF TRAVEL BY FARE TYPE FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN NOVEMBER 1983

(per cent of passenger trips)

Purpose of travel	*Sydney-Melbourne*				*Sydney-Brisbane*			
	AAA-TAA				*AAA-TAA*			
	First[a]	*Economy*	*Discount*[b]	*EWA*	*First*[a]	*Economy*	*Discount*[b]	*EWA*
Business/work	92	86	28	23	89	80	31	5
Holiday	4	6	35	24	5	6	37	32
Visiting friends or relatives	1	4	29	35	7	7	19	41
Personal business	4	2	4	13	-	4	10	14
Other	-	2	3	6	-	3	4	8
Total	100	100	100	100	100	100	100	100

a. First class includes TAA business class.
b. AAA/TAA discount fare passengers are defined to be all passengers who did not travel with first, business or economy class tickets.

\- nil or rounded to zero

Note: Figures may not all add to totals due to rounding.

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

The third general feature of the data in Tables 2.2 to 2.13 is that the characteristics of AAA and TAA discount fare passengers were very similar to EWA passengers. (In this context discount fare passengers were defined to be all passengers who did not travel with first or economy class tickets).

Passengers' frequency of air travel

Details of how often people travel by air can be used in conjunction with ticket sales data to estimate the number of people who travel by air each year. To collect the travel frequency data required for this calculation, passengers were asked how many return journeys by air in Australia they had made for business and non-business reasons in the past year. The results obtained are shown in Figures 2.2, 2.3 and 2.4.

Figure 2.2 shows the relative frequency distributions for annual business, non-business and total return trips. The means of these distributions corresponded to 7.3, 1.3 and 8.6 return air journeys on the domestic network per year respectively. If it is assumed that all

TABLE 2.4-FARE PURCHASER BY AIRLINE FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN NOVEMBER 1983

(per cent of passenger trips)

	Sydney-Melbourne				*Sydney-Brisbane*			
Fare purchaser	*AAA*	*TAA*	*EWA*	*Total*[a]	*AAA*	*TAA*	*EWA*	*Total*[a]
Yourself/spouse	21	21	72	23	21	29	84	27
Government	5	8	3	6	10	14	2	12
Business/work	71	70	14	69	64	53	2	56
Relative/friend	2	1	9	2	6	4	9	5
Other	1	-	2	1	-	1	3	1
Total	100	100	100	100	100	100	100	100

a. The figures in this column were obtained by weighting the results for each airline by the number of occupied seats in the survey period.

\- nil or rounded to zero

Note: Figures may not all add to totals due to rounding.

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

TABLE 2.5-FARE PURCHASER BY FARE TYPE FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN NOVEMBER 1983

(per cent of passenger trips)

	Sydney-Melbourne				*Sydney-Brisbane*			
		AAA-TAA				*AAA-TAA*		
Fare purchaser	*First*[a]	*Economy*	*Discount*[b]	*EWA*	*First*[a]	*Economy*	*Discount*[b]	*EWA*
Yourself/spouse	7	12	78	72	9	18	64	84
Government	8	7	-	3	9	13	6	2
Business/work	84	78	19	14	82	66	19	2
Relative/friend	1	2	3	9	-	4	10	9
Other	1	1	1	2	-	-	2	3
Total	100	100	100	100	100	100	100	100

a. First class includes TAA business class.
b. AAA/TAA discount fare passengers are defined to be all passengers who did not travel with first, business or economy class tickets.

\- nil or rounded to zero

Note: Figures may not all add to totals due to rounding.

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

air passengers make nine return journeys per year, that about four million return journeys are made on the trunk network each year (refer Chapter 4) and that Australia's population is 15 million, then it follows that air travel is restricted to between 2 and 3 per cent of the total population. If it is further assumed that air travel is rarely undertaken by those aged under 20 or over 64 (refer Table 2.6) then it follows that air travel is restricted to about 5 per cent of the population between 20 and 64 (ABS 1983a).

These estimates, however, only tell part of the story because no allowance has been made for the fact that those people who travel frequently account for a disproportionately large fraction of total network patronage. The magnitude of this effect was determined by ranking all passengers in terms of their travel frequency and then plotting, in cumulative form, the proportion of all travel made by the corresponding proportion of passengers. The continuous curve in Figure 2.3 shows the results for all passengers and the other curves show the results for business and non-business passengers. The

TABLE 2.6-PASSENGER AGE BY AIRLINE FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN NOVEMBER 1983

(per cent of passenger trips)

Age (years)	*Sydney-Melbourne*				*Sydney-Brisbane*			
	AAA	*TAA*	*EWA*	*Total*[a]	*AAA*	*TAA*	*EWA*	*Total*[a]
< 15	-	-	1	-	1	-	-	-
15-19	1	2	4	1	4	5	10	5
20-29	15	17	27	16	12	24	29	19
30-39	32	29	23	31	28	25	12	26
40-64	49	49	34	48	54	42	31	47
> 64	3	3	12	3	3	4	19	4
Total	100	100	100	100	100	100	100	100

a. The figures in this column were obtained by weighting the results for each airline by the number of occupied seats in the survey period.

\- nil or rounded to zero

Note: Figures may not all add to totals due to rounding.

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

TABLE 2.7-PASSENGER AGE BY FARE TYPE FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN NOVEMBER 1983

(Per cent of passenger trips)

	Sydney-Melbourne				*Sydney-Brisbane*			
	AAA-TAA				*AAA-TAA*			
Age (years)	*First*[a]	*Economy*	*Discount*[b]	*EWA*	*First*[a]	*Economy*	*Discount*[b]	*EWA*
< 15	-	-	-	1	-	-	-	-
15-19	1	1	3	4	-	3	14	10
20-29	6	15	32	27	7	17	24	29
30-39	23	34	25	23	27	30	14	12
40-64	67	47	34	34	61	47	44	31
> 64	3	2	7	12	5	3	4	19
Total	100	100	100	100	100	100	100	100

a. First class includes TAA business class.
b. AAA/TAA discount fare passengers are defined to be all passengers who did not travel with first, business or economy class tickets.

\- nil or rounded to zero

Note: Figures may not all add to totals due to rounding.

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

TABLE 2.8-PASSENGER GENDER BY AIRLINE FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN NOVEMBER 1983

(per cent of passenger trips)

	Sydney-Melbourne				*Sydney-Brisbane*			
Gender	*AAA*	*TAA*	*EWA*	*Total*[a]	*AAA*	*TAA*	*EWA*	*Total*[a]
Female	20	20	53	21	24	22	51	24
Male	80	80	47	79	76	78	49	76
Total	100	100	100	100	100	100	100	100

a. The figures in this column were obtained by weighting the results for each airline by the number of occupied seats in the survey period.

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

TABLE 2.9-PASSENGER GENDER BY FARE TYPE FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN NOVEMBER 1983

(per cent of passenger trips)

	Sydney-Melbourne				*Sydney-Brisbane*			
	AAA-TAA				*AAA-TAA*			
Gender	*First*[a]	*Economy*	*Discount*[b]	*EWA*	*First*[a]	*Economy*	*Discount*[b]	*EWA*
Female	14	16	48	53	7	21	44	51
Male	86	84	52	47	93	79	56	49
Total	100	100	100	100	100	100	100	100

a. First class includes TAA business class.
b. AAA/TAA discount fare passengers are defined to be all passengers who did not travel with first, business or economy class tickets.

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

TABLE 2.10-PASSENGER HOUSEHOLD INCOME BY AIRLINE FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN NOVEMBER 1983

(per cent of passenger trips)

Household income ($ per week)	*Sydney-Melbourne*				*Sydney-Brisbane*			
	AAA	*TAA*	*EWA*	*Total*[a]	*AAA*	*TAA*	*EWA*	*Total*[a]
< 100	2	1	15	2	3	5	14	5
100-399	14	17	38	16	11	27	49	21
400-649	30	38	30	34	26	30	33	28
> 649	53	43	16	48	61	38	4	47
Total	100	100	100	100	100	100	100	100

a. The figures in this column were obtained by weighting the results for each airline by the number of occupied seats in the survey period.

Note: Figures may not all add to totals due to rounding.

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

results in Figure 2.3 show, for example, that about 60 per cent of all journeys were made by the 20 per cent of people who travelled most frequently. If it is assumed that the Sydney-Melbourne and Sydney-Brisbane routes are representative of the trunk route network, then it follows that about 60 per cent of air passenger trips are made by about 0.5 per cent of the total population.

Figure 2.4 shows the joint relative frequencies for business and non-business travel. It can be seen in general terms that few people made more than one or two non-business trips per year but that it was relatively common for an individual to make several business trips in a year. It can also be seen from this figure that to a large extent the markets for business and non-business travel were independent; only about 27 per cent of trips were made by passengers who travelled for both business and non-business reasons in the same year.

Potential for dilution to discount fares

In the design of discount fares, and particularly the conditions that apply to them, it is useful to know what fraction of passengers would

TABLE 2.11-PASSENGER HOUSEHOLD INCOME BY FARE TYPE FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN NOVEMBER 1983
(per cent of passenger trips)

Household income ($ per week)	*Sydney-Melbourne*				*Sydney-Brisbane*			
		AAA-TAA				*AAA-TAA*		
	First[a]	*Economy*	*Discount*[b]	*EWA*	*First*[a]	*Economy*	*Discount*[b]	*EWA*
< 100	1	1	8	15	-	2	15	14
100-399	5	12	43	38	8	19	21	49
400-649	17	39	30	30	20	26	23	33
> 649	78	48	19	16	73	52	41	4
Total	100	100	100	100	100	100	100	100

a. First class includes TAA business class.
b. AAA/TAA discount fare passengers are defined to be all passengers who did not travel with first, business or economy class tickets.

\- nil or rounded to zero

Note: Figures may not all add to totals due to rounding.

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

meet a given set of restrictions. In other words the airline concerned wants to have some estimate of the potential for dilution to a discount fare before it is introduced. The results of the survey enabled estimates to be made of the potential for dilution to Apex and Excursion 45/Flexi-Fare fares. Similar analyses, based on the technique of set intersection analysis, could be used in the design of new discount air fares or the modification of existing fare conditions.

In the case of Apex fares (35 per cent discount at the time of the survey) passengers were required to book at least 30 days in advance and to stay away at least seven days. It was found that 14 per cent of all passengers (excluding first class) met these two basic Apex fare restrictions and that 10 per cent of passengers met these restrictions and were also travelling for non-business purposes. It was also found that 6 per cent of AAA and TAA economy fare passengers met the basic Apex fare restrictions and 4 per cent of economy fare passengers met these restrictions and were also travelling for non-business purposes. The results of the surveys indicated that Apex passengers filled 5 per cent of occupied seats and that about 24 per cent of Apex passengers were travelling for business purposes.

TABLE 2.12-TRIP DURATION BY AIRLINE FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN NOVEMBER 1983

(per cent of passenger trips)

Trip duration (nights)	*Sydney-Melbourne*				*Sydney-Brisbane*			
	AAA	*TAA*	*EWA*	*Total*[a]	*AAA*	*TAA*	*EWA*	*Total*[a]
0	20	23	4	21	11	13	2	12
1	28	21	12	25	16	24	7	20
2	12	14	8	13	19	13	7	15
3- 7	23	26	46	25	27	19	44	23
8-14	9	5	20	8	12	10	26	11
> 14	7	11	10	9	16	22	15	19
Total	100	100	100	100	100	100	100	100

a. The figures in this column were obtained by weighting results for each airline by the number of occupied seats in the survey period.

Note: Figures may not all add to totals due to rounding.

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

To be eligible for an Excursion 45 (TAA) or Flexi-Fare (AAA) fare, passengers must have decided to travel more than four days in advance and had to stay away for between one and 21 nights. These fares were also targeted more towards non-business travellers as there was some uncertainty about flight time. It was found that 57 per cent of all passengers (excluding first class) included in the survey met the pre-booking and minimum stay requirements and that 17 per cent of passengers met these restrictions and were travelling for non-business purposes. It was also found that 53 per cent of AAA and TAA economy fare passengers met the pre-booking and minimum stay requirements and 9 per cent of economy fare passengers met these requirements and were also travelling for non-business purposes. Only 4 per cent of passengers were travelling with Excursion 45 or Flexi-Fare tickets, and about 20 per cent of these were travelling for business purposes.

In the case of Apex and, more particularly, Excursion 45/Flexi-Fare fares the differences between potential dilution (as estimated from the survey results) and ticket sales may be partly due to the effect of minor fare restrictions not included in this analysis and partly due to lack of public knowledge of discount fare levels and

TABLE 2.13-TRAVEL DECISION TIME BY AIRLINE FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN NOVEMBER 1983

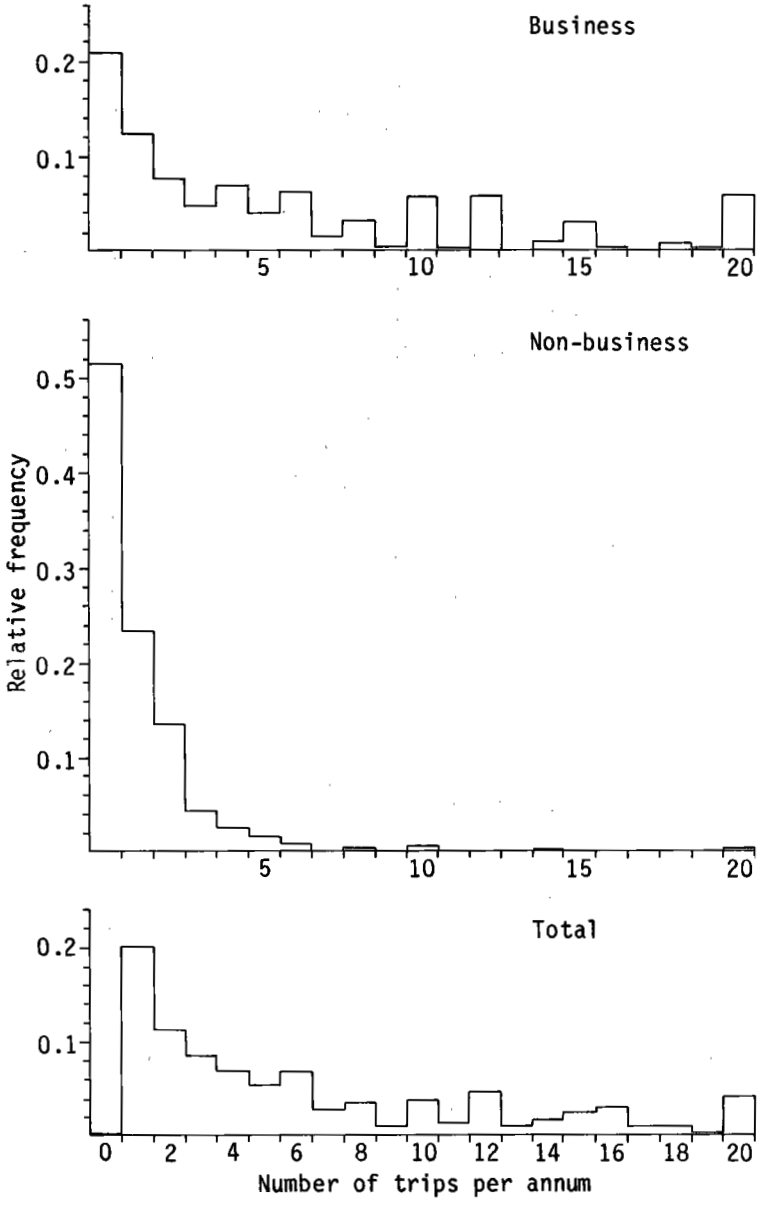
(per cent of passenger trips)

Travel decision time[b] *(days)*	*Sydney-Melbourne*				*Sydney-Brisbane*			
	AAA	*TAA*	*EWA*	*Total*[a]	*AAA*	*TAA*	*EWA*	*Total*[a]
0	3	6	2	4	3	4	3	4
1- 3	26	24	12	25	24	17	16	20
4-14	36	29	31	33	28	37	38	33
15-30	12	15	18	14	10	20	14	16
> 30	23	26	37	25	34	22	29	27
Total	100	100	100	100	100	100	100	100

a. The figures for this column were obtained by weighting the results for each airline by the number of occupied seats in the survey period.
b. Time between decision to travel and departure.

Note: Figures may not all add to totals due to rounding.

Source: BTE survey of passengers at Kingsford-Smith airport, November 1983.



Note: The raw data have been weighted for the partonage of each airline.

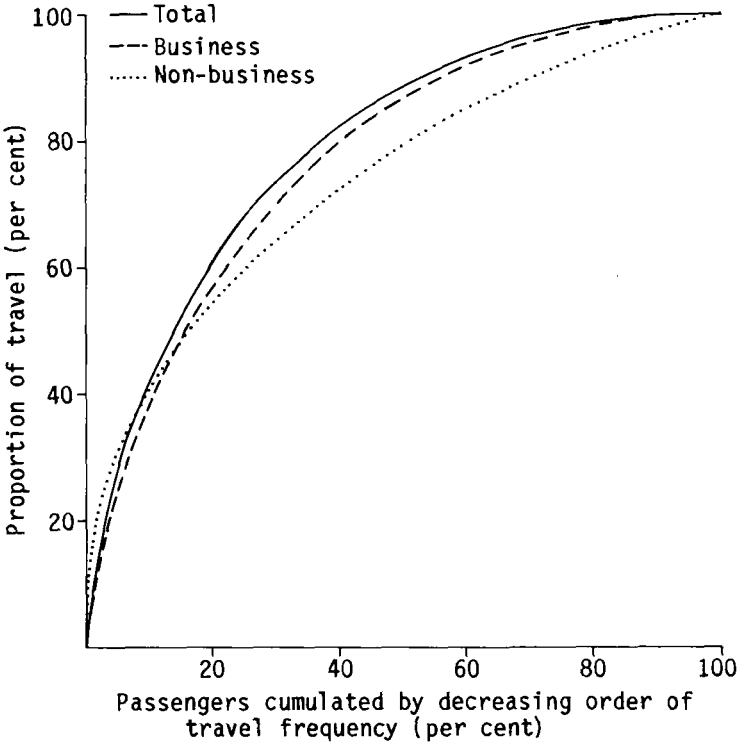
Source: BTE survey of passengers at Kingsford-Smith airport, November 1983.

Figure 2.2-Relative frequencies for business, non-business and total air travel

conditions. It is also important to note that AAA and TAA impose limits on the availability of many discount fares in order to reserve seats for full fare passengers.

CORRIDOR TRAVEL PATTERNS

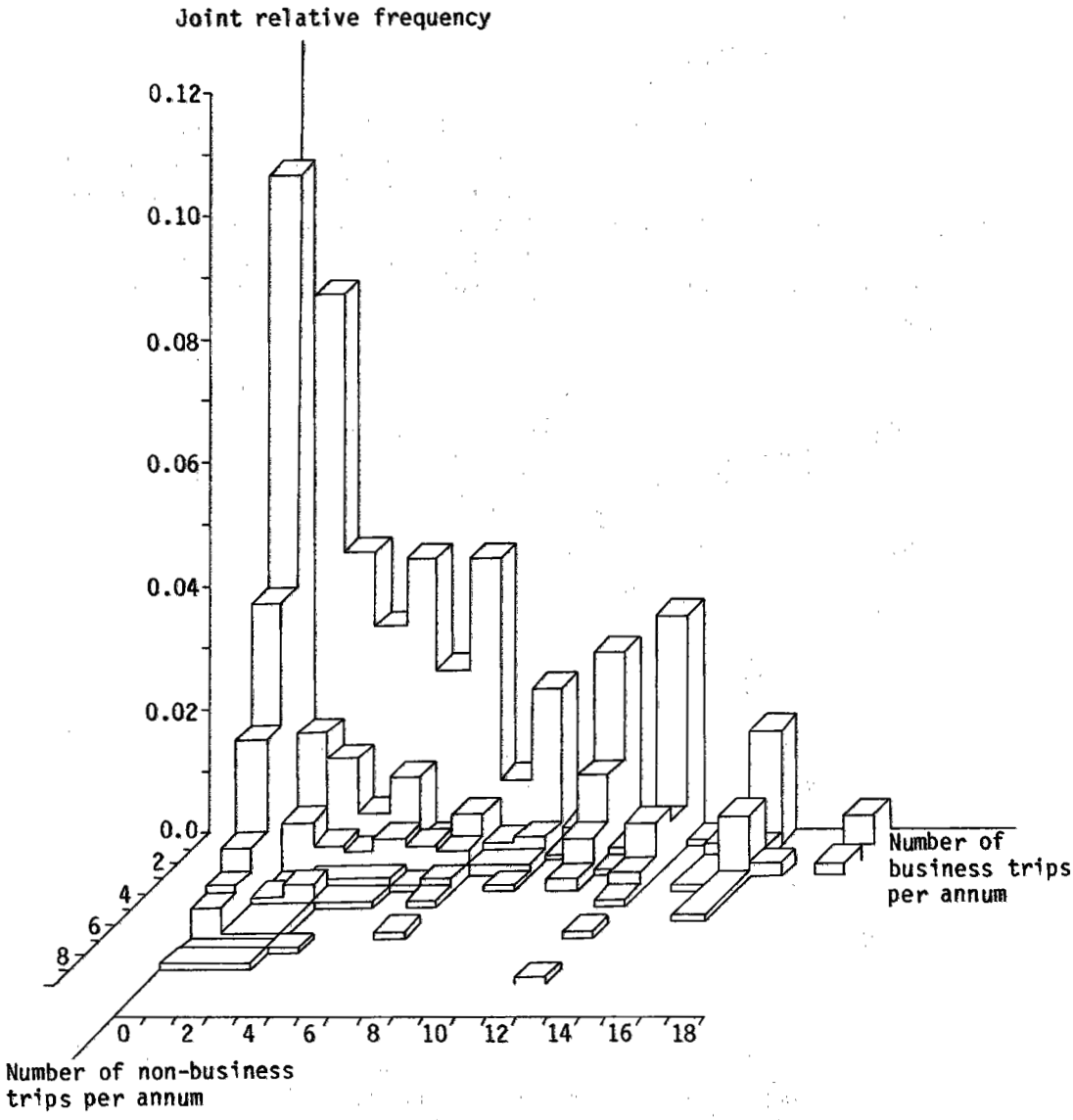
The results of the survey undertaken at Kingsford-Smith airport in November 1983 gave no details of the differences between the characteristics of air passengers on the Sydney-Melbourne and Sydney-Brisbane routes and the characteristics of passengers travelling on these routes by other modes. To gain some insights into these differences the National Travel Survey (NTS) data base was re-analysed.



Note: The raw data have been weighted for the patronage of each airline.

Source: BTE survey of passengers at Kingsford-Smith airport, November 1983.

Figure 2.3-The proportion of travel made by passengers ranked by travel frequency



Note: The raw data have been weighted for the patronage of each airline.

Source: BTE survey of passengers at Kingsford-Smith airport, November 1983.

Figure 2.4-Joint relative frequencies of business and non-business air travel

The NTS was a general survey of non-urban travel in Australia conducted by the BTE over the period July 1977 to June 1978. The survey took the form of a voluntary postal survey in which questionnaires were mailed to approximately 8000 households throughout Australia at the start of each month. These households were selected randomly from a set of geographic regions devised especially for the NTS. A supplementary household interview survey was conducted to gather information from sub-samples of both non-respondents and respondents to the postal survey. This information allowed the overall trip levels obtained from the NTS data to be adjusted for non-response bias in the data obtained from the postal component of the survey. A full description of the NTS is given in BTE (1981).

In the design and execution of the NTS, the main emphasis was placed on obtaining the characteristics of non-urban travel made by the population as a whole and of the populations of individual States and Territories. In contrast little emphasis was placed on the analysis of travel along individual corridors. Thus, at the outset of this work, there were little data available for comparison with the results of the November 1983 survey of air passengers at Kingsford-Smith airport.

The results of the re-analysis of the NTS data base are detailed in Tables 2.14 to 2.19. From Tables 2.14 to 2.17 a comparison can be made between the characteristics of passenger trips by air and car on the Sydney-Melbourne and Sydney-Brisbane routes and on the total network (that is all journeys to destinations 100 km or more from home). Tables 2.18 and 2.19 show in detail the seasonal variations in purpose of air travel and the effect of travel purpose on trip duration for the two routes considered.

From the purpose of travel data given in Table 2.14 it can be seen that the ratio of business to non-business travel was about 3:2 for air travel on the Sydney-Melbourne and Sydney-Brisbane routes but about 2:3 on the total network. Little non-urban car travel was undertaken for business purposes, either on the total network or on the individual routes considered here.

The distributions of trip duration are shown in Table 2.15. Although total network data are included in this table, comparison within individual route data may be misleading because the network data refer to averages over all trip distances. On each of the individual routes, the mean duration of an air trip was about four nights and the mean duration of a car trip was about seven nights.

From the age distributions shown in Table 2.16 it can be seen that few air journeys were undertaken by people under 20 years of age, whereas about one-quarter of passenger trips by car were undertaken by people in this age group. The data in this table also show that relatively few air or car passenger trips were made by people aged over 64.

From Table 2.17 it can be seen that network-wide car travel was at a maximum in the summer months (December, January and February). The fact that network-wide car travel was lower in spring than in autumn may have been due to travel at Easter and the May school holidays. From Table 2.17 it can be seen that air travel on the individual routes and on the total network was at a maximum in the spring and a minimum in the winter months of June, July and August.

As shown in Table 2.18, the ratio of business to non-business travel on both the Sydney-Melbourne and Sydney-Brisbane routes showed pronounced seasonality. On the southern route from Sydney the business to non-business ratio was at a minimum in winter and on the northern route from Sydney the business to non-business ratio was at a maximum in winter.

It can be seen from Table 2.19 that the ratio of business to non-business travel decreased with increasing trip duration.

TABLE 2.14-PURPOSE OF TRAVEL BY AIR AND CAR ON THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES AND THE TOTAL NETWORK IN 1977-78

(per cent of passenger trips)

Purpose of travel	*Sydney-Melbourne*		*Sydney-Brisbane*		*Network total*	
	Air	*Car*	*Air*	*Car*	*Air*	*Car*
Business	56	12	60	8	41	12
Visiting friends	19	39	20	43	21	30
Recreation/holiday	11	41	11	39	23	40
Personal affairs	12	7	7	8	10	14
Other	2	2	3	2	6	5
Total	100	100	100	100	100	100

Note: Figures may not all add to totals due to rounding.

Source: BTE National Travel Survey (1977-78) data base.

TABLE 2.15-TRIP DURATION BY AIR AND CAR ON THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES AND THE TOTAL NETWORK IN 1977-78

(per cent of passenger trips)

Trip duration (nights)	*Sydney-Melbourne*		*Sydney-Brisbane*		*Network total*	
	Air	*Car*	*Air*	*Car*	*Air*	*Car*
0	16	-	9	-	11	34
1	20	2	17	2	13	15
2	14	14	24	11	14	19
3- 7	42	61	39	52	37	22
8-14	7	16	9	30	17	7
> 14	2	7	2	5	9	3
Total	100	100	100	100	100	100

\- nil or rounded to zero

Note: Figures may not all add to totals due to rounding.

Source: BTE National Travel Survey (1977-78) data base.

TABLE 2.16-AGE OF PASSENGERS TRAVELLING BY AIR AND CAR ON THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES AND THE TOTAL NETWORK IN 1977-78

(per cent of passenger trips)

Age (years)	*Sydney-Melbourne*		*Sydney-Brisbane*		*Network total*	
	Air	*Car*	*Air*	*Car*	*Air*	*Car*
< 15	5	20	7	18	9	24
15-19	3	3	7	10	5	7
20-29	15	22	13	21	16	20
30-39	17	19	22	11	21	16
40-64	56	32	44	36	43	29
> 65	3	6	8	5	6	4
Total	100	100	100	100	100	100

Note: Figures may not all add to totals due to rounding.

Source: BTE National Travel Survey (1977-78) data base.

Comparison between the 1983 and 1977-78 results

Comparisons between the results of the Kingsford-Smith airport survey (Tables 2.2 to 2.13) and the results of the NTS survey are difficult to make. The major difficulties are that the 1983 data refer only to week-day travel and include the characteristics of on-going passengers (that is, those passengers whose journeys were not confined to the

TABLE 2.17-SEASONAL VARIATIONS IN TRIPS BY AIR AND CAR ON THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES AND THE TOTAL NETWORK IN 1977-78

(per cent of passenger trips)

	Sydney-Melbourne		*Sydney-Brisbane*		*Network total*	
Season	*Air*	*Car*	*Air*	*Car*	*Air*	*Car*
Summer	27	27	24	29	24	29
Autumn	25	31	24	12	26	26
Winter	20	17	23	35	24	23
Spring	29	25	30	24	26	22
Total	100	100	100	100	100	100

Note: Figures may not all add to totals due to rounding.

Source: BTE National Travel Survey (1977-78) data base.

TABLE 2.18-SEASONAL VARIATIONS IN PURPOSE OF AIR TRAVEL FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN 1977-78

(per cent of passenger trips)

Purpose of travel	*Sydney-Melbourne*				*Sydney-Brisbane*			
	Summer	*Autumn*	*Winter*	*Spring*	*Summer*	*Autumn*	*Winter*	*Spring*
Business	64	74	53	37	65	57	70	49
Non-business	36	26	47	63	35	43	30	51
Total	100	100	100	100	100	100	100	100

Source: BTE National Travel Survey (1977-78) data base.

TABLE 2.19-PURPOSE OF AIR TRAVEL BY TRIP DURATION FOR THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN 1977-78

(per cent of passenger trips)

	Sydney-Melbourne			*Sydney-Brisbane*		
Purpose of travel	*1 days*	*1-7 days*	*7 days*	*0 days*	*1-7 days*	*7 days*
Business	86	54	32	75	65	10
Non-business	14	46	68	25	35	90
Total	100	100	100	100	100	100

Source: BTE National Travel Survey (1977-78) data base.

Sydney-Melbourne and Sydney-Brisbane routes). In addition the NTS results in Tables 2.14 to 2.19 refer to aggregate annual figures whereas the 1983 survey was conducted in a single four-day period.

Despite the difficulty of comparing the results of the 1977-78 and 1983 surveys, it is clear that there was an increase with time in the business component of air travel on the Sydney-Melbourne route, and to a lesser extent on the Sydney-Brisbane route. This change has occurred despite the increased availability of discount fares. There was also an increase in mean trip duration from the NTS value of four nights for both routes to six and 10 nights for Sydney-Melbourne and Sydney-Brisbane passengers in November 1983. The exclusion of weekend travellers from the 1983 survey would probably result in underestimates of trip durations as weekend travellers would be more non-business orientated and would stay away longer. The increase in mean trip durations may be linked with the decrease in full-fare air travel (first class and economy) observed in recent years (refer Chapter 4) and also with the minimum stay conditions which were introduced with many discount fares. Business travellers may now be travelling less frequently but staying longer at their destinations.

CHAPTER 3-AIRLINE PASSENGERS' RESPONSE TO DISCOUNT FARES AND FARE CHANGES

To understand the nature of the demand for discount fares, it was necessary to determine the travel arrangements that passengers would have made if their particular discount fare had not been available and also to determine the dependence of discount fare demand on fare levels. The work undertaken to determine these two features of market response is described in this Chapter.

ALTERNATIVE TRAVEL ARRANGEMENTS FOR DISCOUNT FARE PASSENGERS

East-West Airlines' passengers

In the first months of 1983, the introduction by EWA of excursion fares on the Sydney-Melbourne and Sydney-Brisbane routes was a topic of debate within the aviation industry. In its assessment of these discount air fare initiatives the IAFC was required, under the *Independent Air Fares Committee Act 1981*, to assess whether the introduction of excursion fares by EWA would result in increases in trunk route economy air fares by any trunk route operator. There was therefore debate whether the introduction of excursion fares by EWA would divert passengers from AAA and TAA and whether this would justify an increase in economy air fares by the major trunk route operators. The work described in this section was undertaken to contribute to this debate by quantifying the diversion of passengers from AAA and TAA to the EWA excursion fares introduced on the Sydney-Melbourne and Sydney-Brisbane routes.

Three surveys were carried out to determine what, if any, alternative travel arrangements EWA excursion fare passengers would have made if their discount fares had not been available. Detailed descriptions of the design, administration and results of these surveys have been given in BTE (1983) and BTE (1984). From an analysis of the survey data, excursion fare passengers were categorised in terms of traffic diverted from the major airlines, traffic diverted from other transport modes and generated traffic[1]. The first survey, which was

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1. Passenger diversion and generation are defined in Chapter 1.

carried out at Kingsford-Smith airport in Sydney and Tullamarine airport in Melbourne from Wednesday 6 July to Friday 8 July 1983, was based on the questionnaire shown in Appendix I. Passengers were asked to complete survey forms in the departure lounges as this was administratively more straightforward than asking passengers to complete questionnaires in the aircraft. It took between one and two minutes for most passengers to complete a survey form. It is estimated that over 95 per cent of eligible passengers attempted to complete a survey form and over 95 per cent of all returned forms were usable. Almost all unusable questionnaires suffered from the same fault; both Questions 5 and 6 had been answered, whereas only one of these questions should have been answered. The number of usable questionnaires for the Sydney-Melbourne and Sydney-Brisbane routes were 427 and 165 respectively.

The second survey of EWA passengers was carried out from 28 November to 1 December 1983 at Kingsford-Smith airport. The administration and much of the data collected in this survey, which also included AAA and TAA passengers, have been described in Chapter 2. Copies of the survey forms are shown in Appendix II.

The third survey of EWA passengers was carried out at Kingsford-Smith airport from 10 to 14 February 1984. Only EWA passengers were included in this survey and the July 1983 questionnaire was used, with updated fare values. This third survey was carried out in an attempt to explain the large differences in diversion and generation between the first and second surveys. In the February 1984 survey the number of usable questionnaires for the Sydney-Melbourne and Sydney-Brisbane routes were 117 and 58 respectively out of possible responses of 154 and 68 respectively. The lower response rate for this survey compared with the July survey was probably due to the fact that only one staff member was available to administer the survey.

The purpose of travel data collected in each survey are summarised in Table 3.1 for each route. As was discussed in Chapter 2, EWA patronage on both routes was dominated by non-business travel. Travel to visit friends or relatives was more common on each route than travel for holiday purposes. Apart from these general observations, there were large differences in the purpose of travel distributions from one survey to another. Using chi-squared tests it was found that, at the 5 per cent level of significance, the purpose of travel distributions in each survey were significantly different, both for the Sydney-Melbourne and Sydney-Brisbane routes. There does not seem to be a straightforward explanation for the large variations observed, except in terms of seasonality effects.

TABLE 3.1-PURPOSE OF TRAVEL FOR EXCURSION EWA FARE PASSENGERS ON THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN JULY 1983, NOVEMBER 1983 AND FEBRUARY 1984

(per cent of passenger trips)

Purpose of travel	*Sydney-Melbourne*			*Sydney-Brisbane*		
	Jul 83	*Nov 83*	*Feb 84*	*Jul 83*	*Nov 83*	*Feb 84*
Business/work	26	23	24	13	5	18
Holiday	20	24	32	32	32	13
Visiting friends or relatives	51	35	38	38	41	27
Other[a]	3	19	7	17	22	42
Total	100	100	100	100	100	100

a. Included 'personal business' in November 1983 survey results.

Note: Totals may not all add due to rounding.

Sources: BTE surveys of EWA passengers; July 1983, November 1983 and February 1984.

The alternative travel arrangements which excursion fare EWA passengers would have made are detailed in Table 3.2. This table summarises the results obtained for each route in each of the three surveys. The 95 per cent confidence limits on the data are also shown in the table.

It can be seen from Table 3.2 that large differences were observed in the results of each survey. Using chi-squared tests, it was found that the travel choice alternatives measured in the November and February surveys were statistically different, at the 5 per cent level of significance, both from each other and from those determined in the July 1983 survey. There appears to be no straightforward explanation for the differences in the results of each survey. Almost certainly the changes from one survey to another were not due solely to differences in the purpose of travel distributions. Rather it appears that air and mode diversion, and to a lesser extent passenger generation, were affected by changes in passenger characteristics which were not measured in the July and February surveys. In order to better understand the factors which affect passenger diversion and generation it would be necessary to undertake further survey work. Until this is done it will not be possible to apply the results of Table 3.2 to other routes or even to the same routes at other time

TABLE 3.2-ALTERNATIVE TRAVEL OPTIONS FOR EWA EXCURSION FARE PASSENGERS ON THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN JULY 1983, NOVEMBER 1983 AND FEBRUARY 1984

(per cent of passenger trips)

Alternative travel option	*Sydney-Melbourne*			*Sydney-Brisbane*		
	Jul 83	*Nov 83*	*Feb 84*	*Jul 83*	*Nov 83*	*Feb 84*
Air diversion	30 ± 4	52 ± 7	36 ± 9	44 ± 8	57 ± 12	31 ± 12
Generation						
Mode diversion	47 ± 5	32 ± 7	52 ± 9	46 ± 8	32 ± 11	36 ± 12
Stimulation	20 ± 4	13 ± 5	12 ± 6	7 ± 4	8 ± 7	31 ± 12
Other	3 ± 2	3 ± 2	1 ± 2	3 ± 3	3 ± 4	2 ± 4
Total	100	100	100	100	100	100

Notes: 1. The confidence limits (95 per cent) were based on the uncorrected normal approximation.
2. Figures may not all add to totals due to rounding.

Sources: BTE surveys of EWA passengers; July 1983, November 1983 and February 1984.

periods. The results indicate that air and mode diversion can vary considerably in the space of a few months and this would make it difficult to establish an accurate average figure or a long-term trend for diversion on a particular route.

The data in Table 3.2 give an incomplete picture of the financial implications of diversion for the airlines and the operations of land transport passenger services. Any attempt to accurately assess revenue diversion would be complicated by the fact that EWA passengers would have to be aware of the alternative fare types available from competing airlines and land transport operators. It could not validly be assumed, for example, that EWA excursion fare passengers diverted from AAA and TAA would otherwise have paid the full economy fare. In view of the similarities noted in Chapter 2 between EWA excursion fare passengers and AAA and TAA discount fare passengers it can be argued that many EWA excursion fare passengers would have purchased (or at least attempted to purchase) discount fares with AAA or TAA.

Passenger generation to AAA and TAA

As part of the analysis of market response to the introduction by EWA of excursion fares on the Sydney-Melbourne and Sydney-Brisbane routes, estimates were made of the scope for passenger generation to AAA and TAA on adjoining sectors. If, for example, it was cheaper to travel Cairns-Sydney by splitting the fare into an AAA or TAA Cairns-Brisbane fare plus an EWA Sydney-Brisbane fare rather than flying with AAA or TAA on both sectors, then the EWA Sydney-Brisbane excursion fare might generate traffic for AAA and TAA on the Cairns-Brisbane sector.

The EWA excursion fare plus an AAA or TAA Apex fare was compared with an AAA or TAA full Apex fare on a number of routes that could incorporate Sydney-Melbourne or Sydney-Brisbane as a sector. The Apex fare was chosen because it was the cheapest practical adult fare available. It was unrealistic to use an Excursion 45 or Flexi-Fare fare on adjoining sectors because the airlines are unable to guarantee connections between sectors on a given day (refer Chapter 1).

For all the routes considered, it was cheaper to travel by an AAA or TAA Apex fare than to change airlines. This can be explained in terms of the flag-fall component of the fares: by travelling AAA or TAA the full distance in one day, only one flagfall would be charged but by travelling by a combination of EWA and AAA or TAA flights, two flag-falls would be charged. Accordingly, it was concluded that the introduction of EWA excursion fares would generate little demand for AAA or TAA services on adjoining sectors.

AAA and TAA passengers

The travel arrangements which AAA and TAA Apex, Excursion 45/Flexi-Fare and Standby passengers would have made if their discount fares were not available are summarised in Table 3.3. About 8 per cent of passengers were stimulated to travel by the availability of discount fares. That is, they would have stayed at home if their discount fares had not been available. The overall ratio of traffic dilution to traffic generation was about 3:1 in the case of Apex passengers and about 1:1 in the case of Excursion 45/Flexi-Fare and Standby passengers. It should be noted that in the interpretation of these ratios that passenger dilution refers to the response of discount fare passengers who would have been prepared to pay any higher yielding fare with the same airline if their discount fare had not been available. In other words passenger dilution includes not only passengers who would have paid full fare but also those who would have purchased a more expensive discount fare. It would be very difficult

TABLE 3.3-ALTERNATIVE TRAVEL OPTIONS FOR AAA AND TAA DISCOUNT FARE PASSENGERS ON THE SYDNEY-MELBOURNE AND SYDNEY-BRISBANE ROUTES IN NOVEMBER 1983

(per cent of passenger trips)

Alternative travel option	*Apex*	*Excursion 45/ Flexi-Fare*	*Standby*
Dilution	73 ± 11	54 ± 14	54 ± 14
Generation			
Diversion[a]	19 ± 10	36 ± 14	38 ± 14
Stimulation	8 ± 7	9 ± 8	8 ± 7
Other	-	2 ± 2	-
Total	100	100	100

a. Results include diversion from bus, car and train and from EWA.

\- *nil or rounded to zero*

Notes: 1. The confidence limits (95 per cent) were based on the uncorrected normal approximation.
2. Figures may not all add to totals due to rounding.

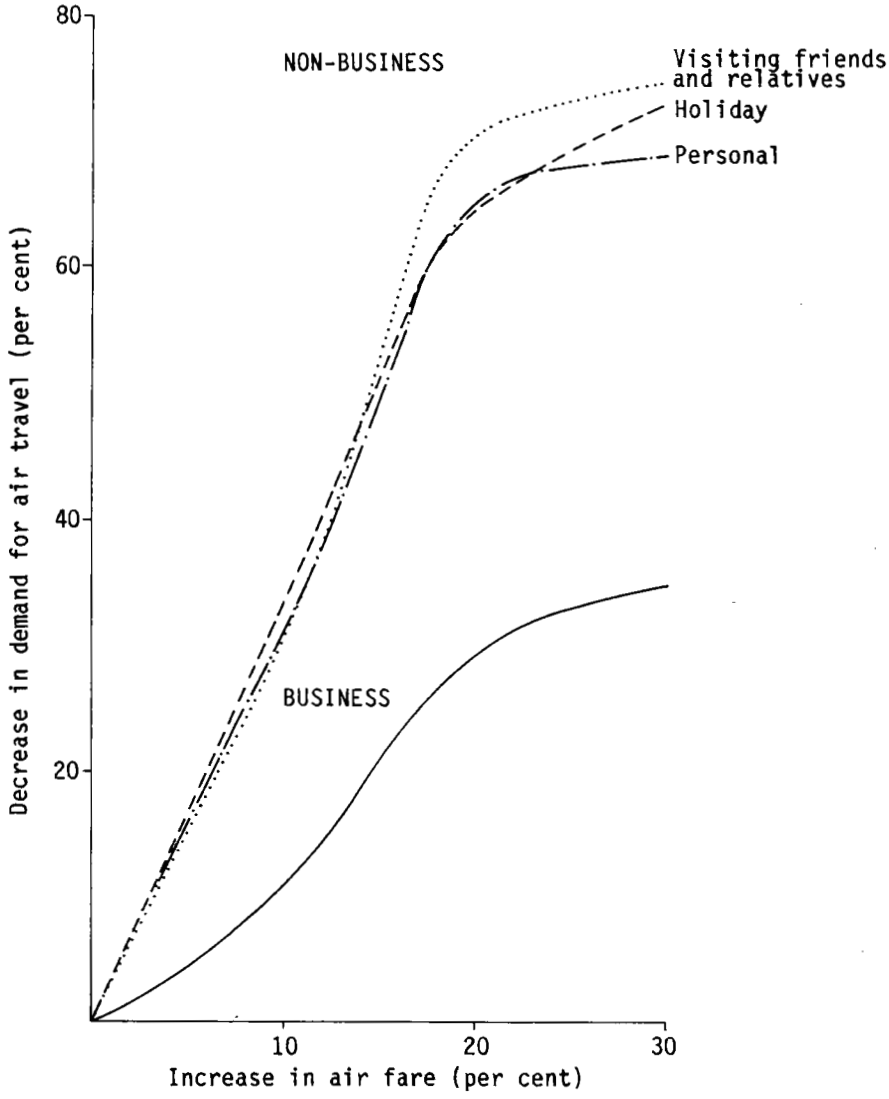
Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

to deduce profit margins for individual discount fares from the results in Table 3.3. A more detailed analysis of the results in Table 3.3 was hampered by the relatively large errors associated with the data. As explained in Chapter 2, airlines make only a limited number of seats available for discount fare passengers and for this reason it was difficult to collect accurate statistics on the characteristics of passengers travelling on each individual discount fare. This difficulty could not easily have been overcome. If a similar survey had been carried out on less business-oriented routes, the relative numbers of discount fare passengers would probably have been higher, but the absolute numbers would probably have been lower due to the lower flight frequencies on non-business routes.

PASSENGERS' RESPONSE TO FARE INCREASES

Passengers' responses to air fare increases were assessed by asking passengers if they would still have made their present journey by air if all air fares were 10 per cent, 20 per cent, or 30 per cent more (refer Question 9 in survey attached at Appendix II). The results obtained from an analysis of the answers to these questions are shown

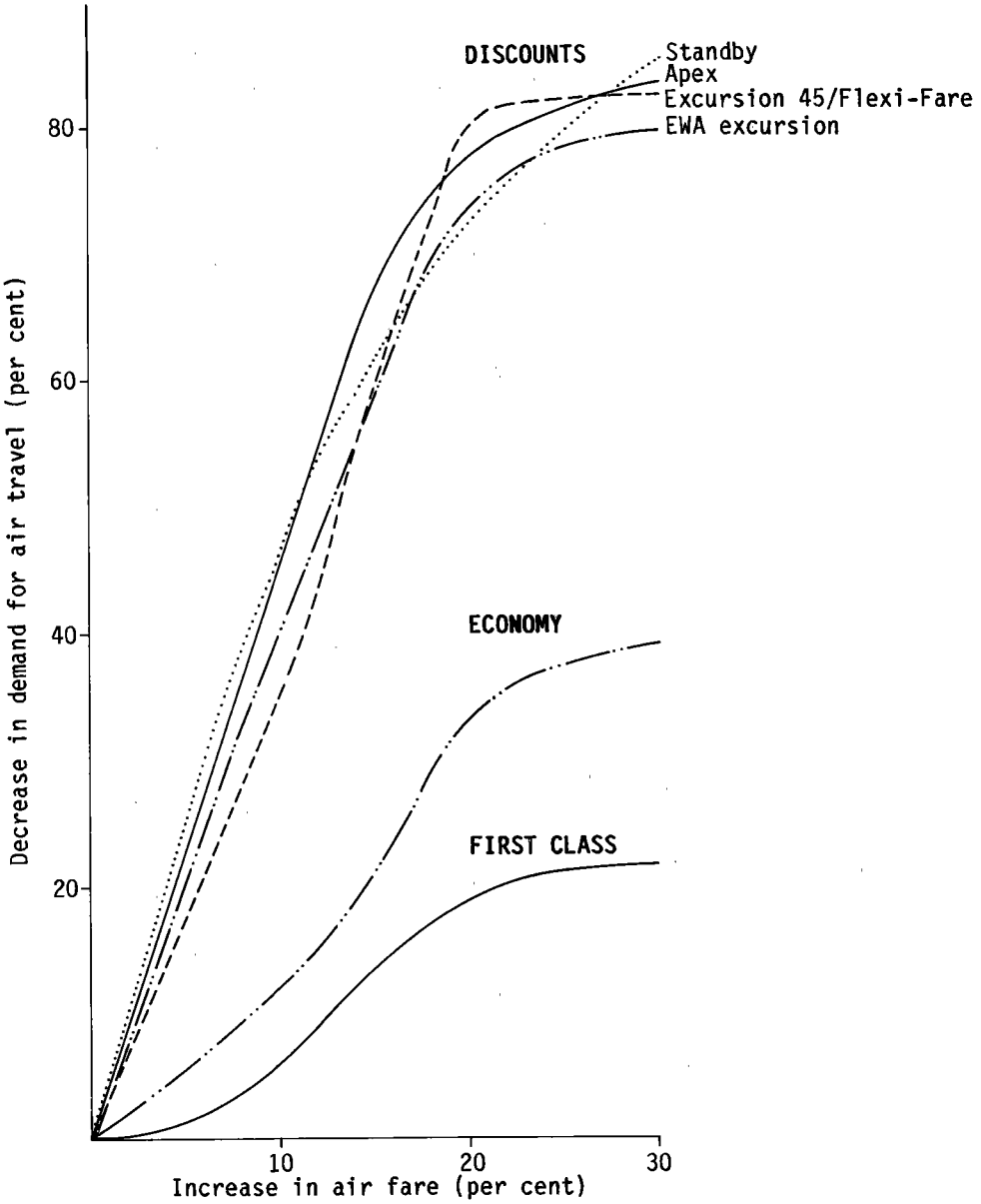
in Figures 3.1 and 3.2, where decrease in demand is plotted as a function of fare increase. The saturation of demand at high fare increases in both Figures 3.1 and 3.2 was observed in previous work on general aviation (BTE 1980). In Figure 3.1 it can be seen that the response of business travellers to hypothetical fare increases was



Note: The raw data have been weighted for the patronage of each airline.

Source: BTE survey of passengers at Kingsford-Smith airport, November 1983.

Figure 3.1-The effect of increasing air fares on demand for different purposes of travel on the Sydney-Melbourne and Sydney-Brisbane routes



Note: The raw data have been weighted for the patronage of each airline.

Source: BTE survey of passengers at Kingsford-Smith airport, November 1983.

Figure 3.2-The effect of increasing air fares on demand for different types of air fares on the Sydney-Melbourne and Sydney-Brisbane routes

quite different from the response of non-business travellers, and that the response of each category of non-business traveller was essentially the same. The price elasticities at the origin were found to be -1.1 ± 0.3 and -3.2 ± 0.6 for business and non-business travel respectively. The bounds on these elasticity estimates refer to 95 per cent confidence limits. The estimates themselves were derived from passengers' attitudes to price increases and may not be applicable in circumstances relating to price decreases.

In Figure 3.2 the results are disaggregated by fare type. It can be seen that first class travellers were less responsive to fare increases than full economy passengers, who in turn were less responsive than discount fare passengers. The responsiveness of discount fare passengers was independent of ticket type. The price elasticities of demand for first class, economy and discount fare travel were estimated to be -0.6 ± 0.4, -1.3 ± 0.2 and -4.2 ± 0.5 respectively. Again the bounds are the 95 per cent confidence limits and the same reservations apply to their use in predicting the effect on demand of price decreases.

The relativities between the results in Figures 3.1 and 3.2 may be more accurate than the absolute values as there is an unavoidable bias in any question about an individual's response to a price increase. Some individuals tend, when asked about their reaction to a price increase, to overestimate their response as they feel this may deter a future price rise. Although the existence of this type of bias is generally accepted, its magnitude is extremely difficult to estimate.

CHAPTER 4-ANALYSIS OF TRUNK NETWORK PATRONAGE

PASSENGER TRAFFIC STATISTICS

There are a number of different measures used in the domestic aviation industry to describe passenger traffic levels. These partly reflect the differences between the airlines' management information systems and partly the differences in the way the data are used. The variety of measures may also be partly due to the difficulty of unambiguously defining the origin and destination of many air journeys which involve more than one flight sector[1]. What, for example, is the destination of a round trip made in a single day between Canberra-Melbourne-Sydney-Canberra to attend appointments in both Sydney and Melbourne? It is partly because there are no unambiguous answers to questions of this type that accurate origin-destination data were not available.

Passenger flag-falls

Passenger flag-fall (PFF) data were the nearest available substitute for origin-destination data. AAA and TAA have adopted the practice of normally allowing passengers who travel an entire outbound or inbound journey on one airline in one day to pay only one flag-fall, irrespective of the number of stages flown (IAFC 1982). Thus a journey from Melbourne to Brisbane via Sydney on the same day would incur one flag-fall even if the passenger spent several hours on business in Sydney. However, if the passenger broke the journey with an overnight stay in Sydney he would be charged two flag-falls. The network ticket avail data provided by TAA for the analysis described later in this chapter were in units of passenger flag-falls.

Uplifts and discharges within flight

The Department of Aviation (DofA) publishes data on 'uplifts and discharges within flight' (UDF) (DofA 1984). These data relate to the transport of revenue passengers between two airports connected by the

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1. Flight sector, flight stage and aircraft movement are all used in the industry to describe a single aircraft journey between take-off and landing.

same flight number. A UDF unit may therefore involve more than one flight sector. In any interpretation of UDF data it must be remembered that, in order to maintain compatibility with the airlines' own statistics, all flights are considered to change flight number when passing through any of the following airports, regardless of whether an actual change of flight number is involved: Adelaide, Brisbane, Cairns, Canberra, Darwin, Gove, Hobart, Melbourne, Perth and Sydney. This factor does not entirely explain the differences between UDF and PFF data because flight numbers can be changed without incurring an additional flag-fall. The term 'embarkations' is also sometimes used to describe UDF data (DofA 1984).

Traffic on-board by stages

The Department of Aviation also publishes data on 'traffic on-board by stages' (TOB), which detail the aggregated movement of revenue traffic on each sector (DofA 1984). These data refer to total passenger movements between two directly connected airports regardless of the ticketed origin and destination of the passengers. The network data provided by AAA for the analysis described later in this chapter were in TOB passenger units.

To further explain the differences between these measures of passenger traffic, it may be useful to consider as an example a journey between Cairns and Melbourne on AAA Flight No 39. The aircraft used for this flight travelled via Townsville, Brisbane and Sydney. If completed on the same day, this four sector journey would have incurred one flag-fall but if it was completed in two days it would have incurred two flag-falls. This same journey represented three UDF units irrespective of the number of days taken.

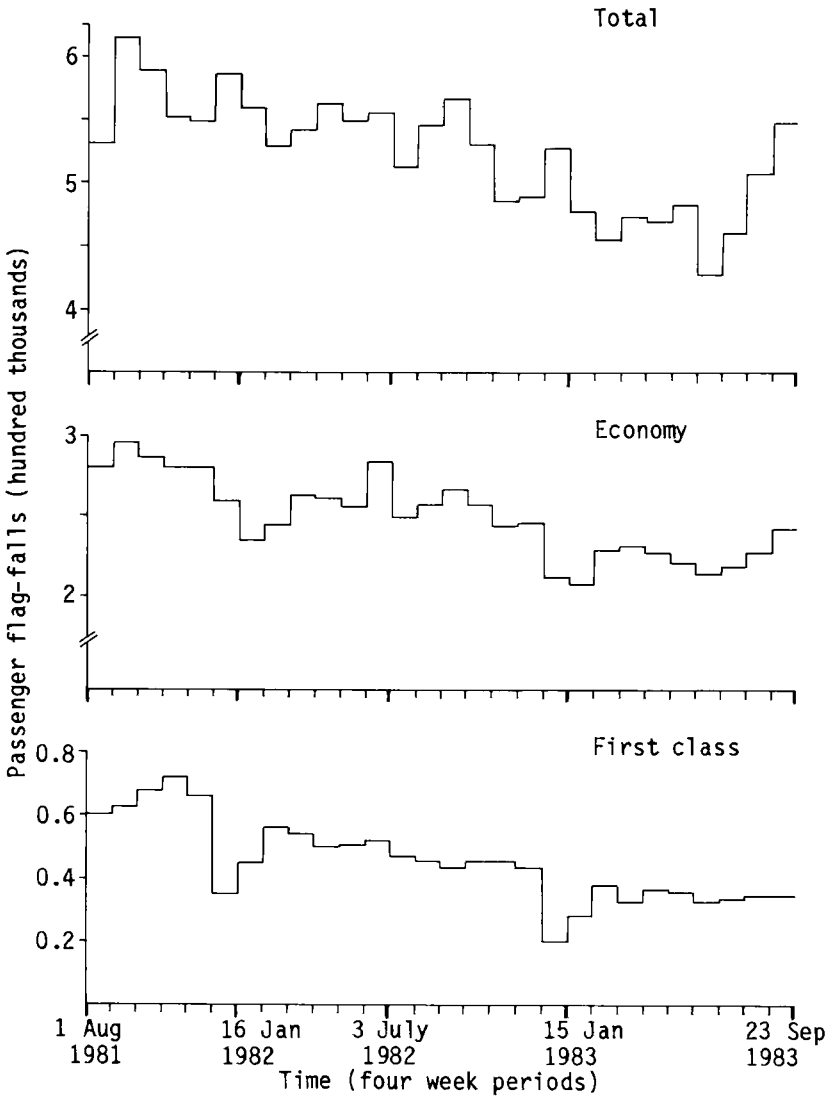
This example is an illustration of a general feature of network-wide statistics, namely

TOBs > UDFs > PFFs > origin-destination pairs.

There are no exact relationships between the different units of passenger traffic which can be applied to network-wide data as the relationships vary with changing traffic patterns. In this work it was necessary to aggregate the PFF data of TAA and the TOB data of AAA and this was done by multiplying the TOB data by 0.8 to convert them into PFF units. It was also necessary to convert Department of Aviation UDF data into PFF data and this was done by multiplying the UDF data by 0.85. These conversion factors were used on advice from sources within the aviation industry.

NETWORK-WIDE TICKET AVAILS

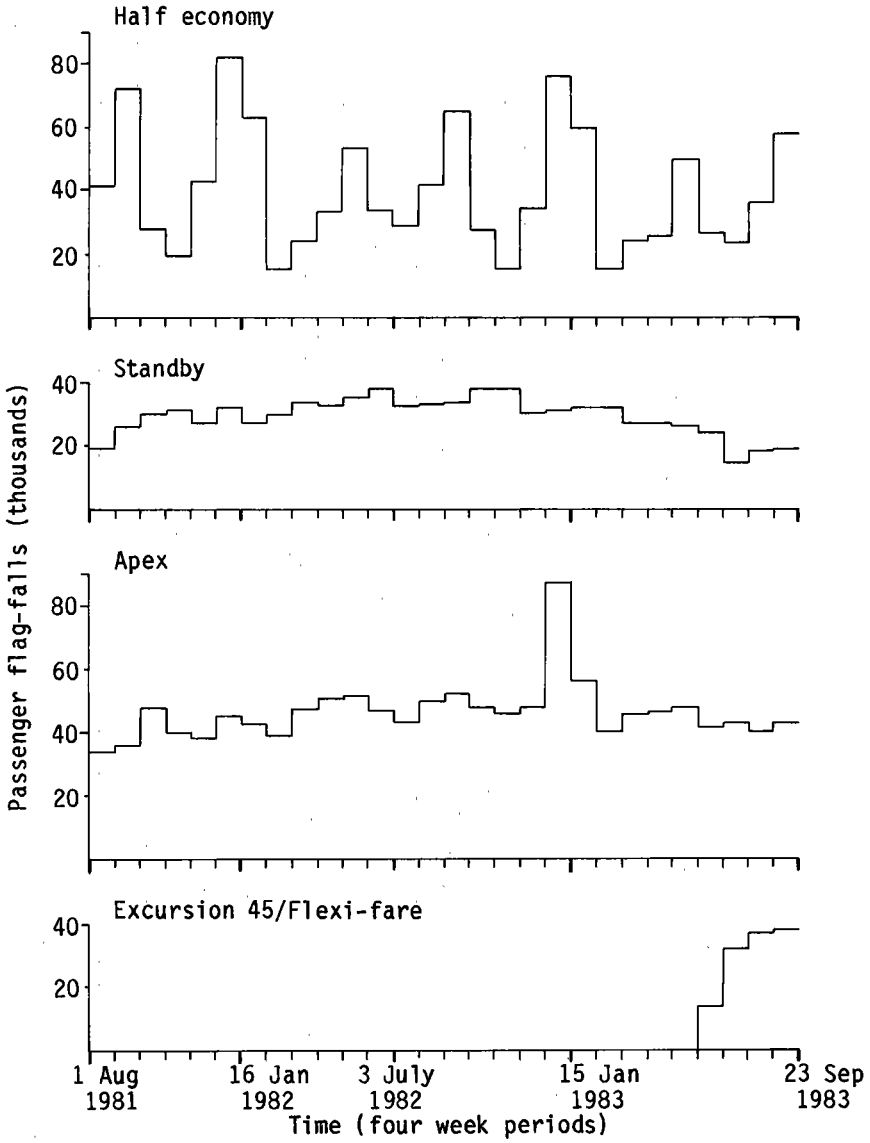
The aggregated AAA and TAA network-wide passenger traffic data for the period August 1981 to September 1983 are shown in Figures 4.1 and 4.2 for different fare types. To aggregate the data it was necessary to correct for differences in units and time intervals. As discussed



Sources: AAA and TAA (unpublished data).

Figure 4.1-Network-wide first class, economy and total passenger flag-falls from August 1981 to September 1983

earlier in this Chapter, the TOB data provided by AAA were multiplied by 0.8 and added to the PFF data provided by TAA. In addition the TAA data were provided in four-week intervals, except for the last interval in the financial year. The AAA data, in comparison, referred



Note: Excursion 45/Flexi-fare was introduced 1 July 1983.

Sources: AAA and TAA (unpublished data).

Figure 4.2-Network-wide half economy, Standby, Apex and Excursion 45/Flexi-fare passenger flag-falls from August 1981 to September 1983

to either four- or five-week intervals corresponding to the company's management calendar. Whereas AAA bases its information systems on a 12 interval year, there are 13 intervals in the TAA financial year. In order to aggregate the TAA and AAA data the AAA data were converted into four-week intervals with the assumption that demand within each interval did not vary from week to week.

The PFF data for economy fares, first class fares and the total of all fare types are shown in Figure 4.1. It can be determined that economy and first class travel represented about 50 and 8 per cent of total travel respectively. Thus discount and concessional travel represented about 42 per cent of the total.

It can also be seen that there were net declines in economy and first class patronage but the decline in total patronage from August 1981 to June 1983 was balanced by a rapid increase in patronage from June 1983 to September 1983. The net declines in economy and first class patronage from August 1981 to September 1983 were 24 and 53 per cent respectively. It can be seen that there were marked reductions in first class travel in the summer months. This feature was observed to a smaller extent for economy travel, but was not evident in the total travel data due to corresponding increases in discount fare travel.

It is not possible to explain the fine details of the data in Figure 4.1 in terms of events such as industrial disputes, advertising campaigns and major public events because the impact of these events was usually restricted to a few routes in the network or to short periods of time.

The PFF data for half economy (available for children between the ages of three and fourteen), Standby, Apex and Excursion 45/ Flexi-Fare fares are shown in Figure 4.2. It can be determined that the demand for half economy fares represented about 17 per cent of the demand for full economy fares, or about 8 per cent of total demand. The highly seasonal nature of demand for half economy fares was due to children travelling in school holidays. Similar, but much smaller seasonal effects were also observed for Apex travel. The relatively large numbers of Apex travellers around Christmas 1982 were due to a relaxation of the quotas imposed by the airlines on the availability of Apex fares. This feature of the data highlighted the imbalance which sometimes existed between the demand and supply of discount fare tickets and raised the question of whether the unsatisfied demand reflected potential passenger generation or dilution. Apex travel on the network represented about 8 per cent of total travel.

The network data for Standby fare travel showed an increase from August 1981 until August 1982 and a subsequent decrease. There was no evident explanation for this rise and fall, which was not observed for any other fare type. However, it was almost certainly not due to changes in the level of discount or fare conditions as these did not change until 1 July 1983 when the Standby discount was reduced from 25 to 20 per cent of the economy fare.

Use of Excursion 45/Flexi-Fare fares grew rapidly after their introduction on 1 July 1983 and by September 1983, 7 per cent of travel was undertaken with these fares. No conclusions can be drawn from the data in Figures 4.1 and 4.2 about the magnitude of passenger dilution to Excursion 45/Flexi-Fare fares. In particular it does not follow from the increase in economy fare patronage in the months following the introduction of Excursion 45/Flexi-Fare fares that dilution from economy fares was not significant. The survey results described in Chapter 3 indicated that about 54 per cent of Excursion 45/Flexi-Fare passengers would still have travelled with AAA or TAA if Excursion 45/Flexi-Fare fares had not been available. In reality dilution to Excursion 45/Flexi-Fare fares from other discount fares (with the exception of Standby fares) was unlikely because most other discount fare types were designed to attract holiday and VFR passengers making journeys of more than one sector. In some respects Standby and Excursion 45/Flexi-Fare fares competed for patronage because they were both attractive to time insensitive passengers travelling on single-sector journeys.

THEORETICAL CONSIDERATIONS

To analyse the sales of any product it is necessary to consider the interaction between the market forces of supply and demand. In the case of air travel on the trunk route network in recent years this interaction was decoupled by assuming that the supply of air services was completely elastic. The justification for this assumption was that the aircraft fleets were not used to capacity and therefore short-term increases in flight frequencies were readily achieved when necessary. By decoupling the supply-demand interaction in this way airline patronage could be taken as an accurate estimate of demand. In other words it was assumed that the demand for trunk network travel was satisfied.

If it is assumed that supply is completely elastic then the elasticities and cross-elasticities for a set of substitutable products can, in principle, be derived from data on the sales and prices of the products. The basic theory is that the quantity Q_i of

product i is a function of prices P_j of all related products and income I,

$$Q_i = f_i(P_1, P_2, \ldots P_i, \ldots P_n, I). \qquad \textbf{4.1}$$

In this formulation it is assumed that all the other factors affecting Q_i either remain constant or have no net effect in the period under study. Any factors which do not meet these criteria must be taken explicitly into account in the expression for Q_i. That is,

$$Q_i = f_i(P_1, P_2, \ldots P_i, \ldots P_n, I, X, Y, Z) \qquad \textbf{4.2}$$

where X, Y and Z are the additional explanatory variables required to explain the variations in Q_i.

It is commonly assumed, to simplify analyses of this type, that the function f_i in equation 4.2 takes the form

$$Q_i = k_i P_1^{e_{i1}} P_2^{e_{i2}} \ldots P_i^{e_{ii}} \ldots P_n^{e_{in}} I^{d_i} X^{x_i} Y^{y_i} Z^{z_i} \qquad \textbf{4.3}$$

where e_{ij} = price elasticity of demand for product i with respect to product j

$$= \frac{\partial Q_i}{\partial P_j} \cdot \frac{P_j}{Q_i}$$

d_i = income elasticity of demand for product i

$$= \frac{\partial Q_i}{\partial I} \cdot \frac{I}{Q_i}$$

x_i = elasticity of demand for product i with respect to factor X

$$= \frac{\partial Q_i}{\partial X} \cdot \frac{X}{Q_i} \cdot$$

In general the 'own price' elasticity, e_{ii}, is negative because an increase in the price of a product results in a decrease in demand for the same product. For similar reasons cross elasticities, $e_{ij} (i \neq j)$, are positive for substitutable products and negative for complementary products.

If inflationary pressures act on incomes and prices in the same way,

that is they all increase by the same percentage, then Q_i remains unchanged and it follows that

$$\sum_{j=1}^{n} e_{ij} + d_i = 0. \qquad 4.4$$

In the particular case where the prices of all products move proportionately, that is

$$P_j = a_j P_1,$$

then

$$Q_i = K_i \, P_1^{\Sigma e_{ij}} \, I^{d_i} \, X^{x_i} \, Y^{y_i} \, Z^{z_i} \qquad 4.5$$

where

$$K_i = k_i a_1^{e_{i1}} \, a_2^{e_{i2}} \ldots a_n^{e_{in}} \qquad 4.6$$

It follows that in these special circumstances, which applied to a large extent in this work because all fares were related to the economy fare, it is only possible to derive the sum of the 'own price' and cross elasticities.

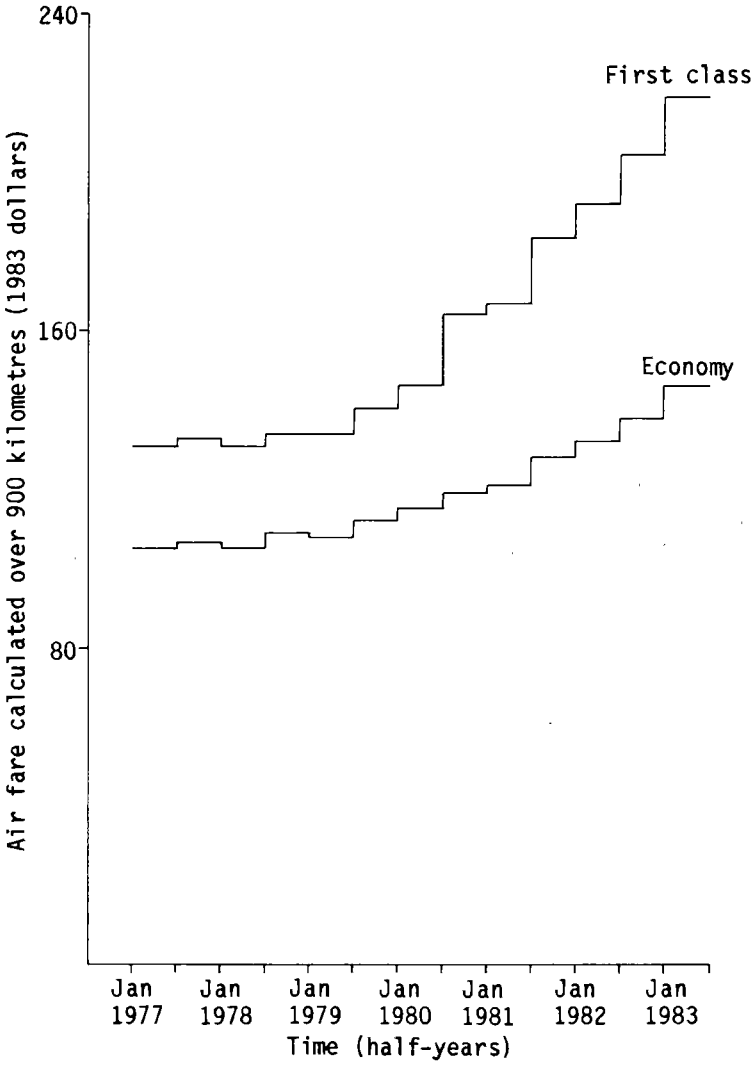
APPLICATION OF THEORY TO TRUNK NETWORK PATRONAGE

The theory outlined in the previous section was applied to the network-wide ticket avail data for first class and economy travel (refer Figure 4.1). It was not applied to data for individual discount fares because the airlines imposed restrictions on the availability of seats for many discount fares and as a result the assumption of elastic supply could not be justified.

Before the analysis, the PFF and TOB data provided by TAA and AAA respectively were first aggregated by the procedure described earlier in this chapter and then normalised to account for population changes (ABS 1983b). An ordinary least squares regression package was then used to relate the changes in travel demand to changes in air fares, petrol prices, non-farm gross domestic product and average weekly earnings. The data for each of these explanatory variables was deflated by the consumer price index (ABS 1983b).

The index of economy air fares, as shown in Figure 4.3, was based on the price of an economy class ticket for a journey of 900 kilometres, which was approximately equal to the average distance travelled per

passenger flag-fall. The procedure used to calculate the index took account not only of the change to the air fares formula in 1981 (Independent Public Inquiry into Domestic Air Fares (1981)) but also of proceeding and subsequent changes to the formulae parameters. The index of first class air fares, also shown in Figure 4.3, followed the same pattern as the index of economy fares except that in June 1980 first class fares were increased from 125 to 137.5 per cent of the



Sources: Independent Public Inquiry into Domestic Air Fares (1981), ABS (1983b).

Figure 4.3-Indexes of first class and economy air air fares from January 1977 to June 1983

economy fare and were subsequently increased to 145 and 150 per cent in August 1981 and September 1982 respectively.

The price of petrol (ABS 1983c) was used as a proxy for the price of alternative modes of transport, as in the work of Saad, Dao, McAndrew and Watt (1983). The average weekly earnings (ABS 1983b) and non-farm gross domestic product (ABS 1983b) were included as proxies for income variables. A set of up to 12 dummy variables was also used to take account of seasonal variations such as the December-January drop in first class and economy travel.

The regression analysis of the first class and economy data shown in Figure 4.1 gave results which, although statistically robust, were implausible[1]. The derived price elasticities were negative in sign but the absolute values were much higher than expected. For both first class and economy travel the results were statistically significant (high F-values) and over 80 per cent of the variations in demand were explained ($R^2 > 0.8$). Thus, from a purely statistical viewpoint, the results of the regression were satisfactory.

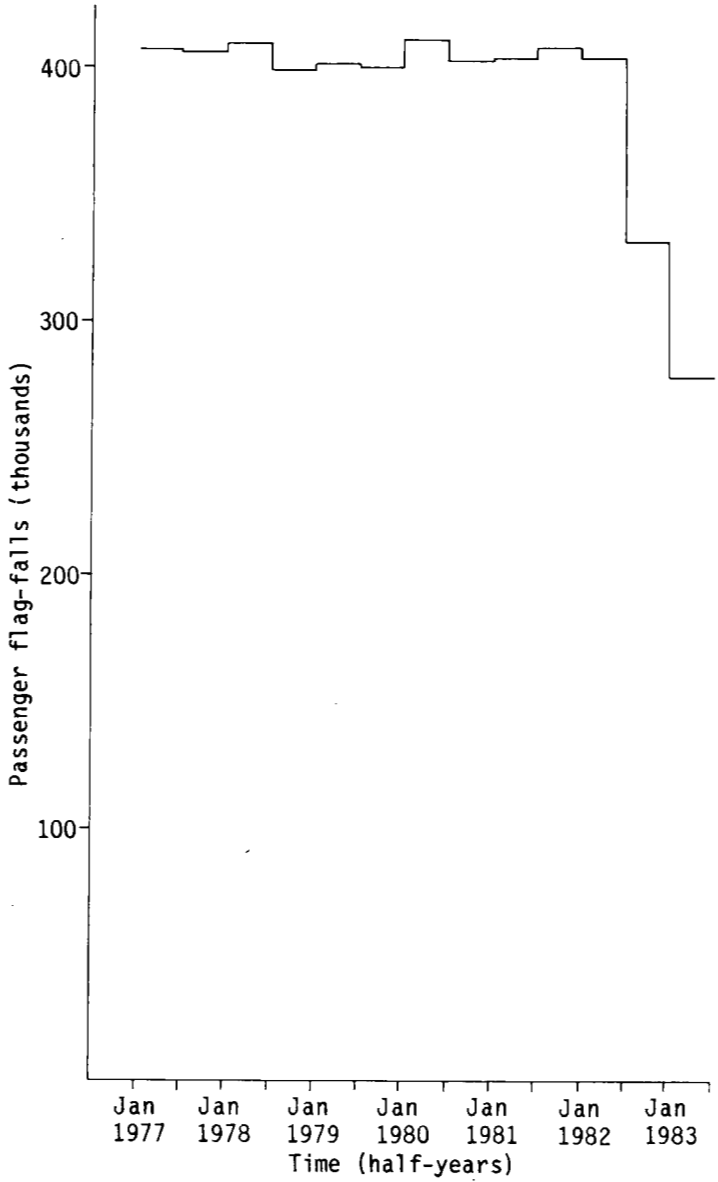
The main reason why the derived elasticities were implausible was that the time-span of the data was too short to ensure that the effects of excluded variables were averaged to zero. A second, although related, factor was that the set of explanatory variables was determined partly by data availability, partly by judgement and partly by precedent. The variables used, although plausible, did not adequately describe the recession in the economy at this time.

In the case of demand for first class travel it was possible to extend the time-span of the data by using Department of Aviation UDF data for the period from 1977 to 1983 (DofA 1984). As explained earlier, a conversion factor of 0.85 was used to convert from UDF to PFF units. The first class data over the extended time period is shown in Figure 4.4, where it can be seen that the decline in demand experienced from about 1982 was preceded by a period of relatively constant demand. A statistically robust fit to the data in Figure 4.4 was obtained by using two explanatory variables, the price of first class travel (refer Figure 4.3) and an index of factory production (Australia and New Zealand Banking Group Limited 1984). From this analysis the price elasticity of demand for first class air travel was estimated to be -0.5 ± 0.2. The confidence limits (95 per cent) were calculated from

1. This conclusion was also reached when, at the suggestion of airline staff, the air fare index was based on a journey of 1200 kilometres.

the t-statistic. About 77 per cent of the variations in demand were explained (R^2 = 0.77).

In view of the substantial collinearity between the variations of first class and economy fares (refer Figure 4.3) and the discussion



Sources: Department of Aviation (1984), AAA and TAA (unpublished data).

Figure 4.4-Network-wide first class passenger flag-falls from January 1977 to June 1983

centred on equation 4.5 it follows that the derived elasticity was the sum of the 'own price' and cross elasticities. It can be argued that the cross elasticities of demand for first class travel with respect to the price of other fare types were very small because first class travel was restricted to a very specialised market segment. It follows from equation 4.4 that if the cross elasticities were small and positive the 'own price' elasticity would have been slightly more negative than -0.5.

There is no guarantee that the first class elasticity derived from the seven-year data in Figure 4.4 was not affected to some extent by the problems which affected the analysis of the two-year data in Figure 4.1. The fact that the elasticity derived from the seven-year data was plausible does not mean that the result should be accepted without question. The agreement between the price elasticity of demand for first class travel derived from the survey data in Chapter 3 (-0.6 ± 0.4) and the elasticity derived from the regression analysis (-0.5 ± 0.2) perhaps overestimates the accuracy of either technique.

It was not possible to analyse the demand for economy travel over an extended time period because Department of Aviation UDF data did not distinguish between economy and discount fare passengers.

In summary this analysis of trunk network patronage was adversely affected by the lack of data for individual fare types over an extended period and by the fact that all fares varied at the same times. Another limitation of the analysis was that it could not be based on a basic understanding of the determinants of air travel demand, as this does not appear to exist. For this reason there would be considerable doubt about the validity of any forecasts of first class air travel demand based only on changes in air fares and factory production.

CHAPTER 5-LATENT DEMAND FOR AIR TRAVEL

SURVEY OF INTERSTATE COACH PASSENGERS

It appears that little, if any, market research has been undertaken in Australia to assess the latent demand for air travel on the domestic trunk route network. At the present time it is therefore not possible to predict the likely response to new discount fare initiatives or to reductions in the real price of air fares[1]. The results in Chapters 2 and 3 of this Paper only partially cover the question of latent demand because they are based on surveys of airline passengers, not on surveys of the total population. It was estimated in Chapter 2, that if the Sydney-Melbourne and Sydney-Brisbane routes are representative of the trunk route network, about 60 per cent of air travel is undertaken by less than 1 per cent of the total population. It is therefore highly unlikely that the attitudes of air travellers to air travel would be representative of the total population.

There are two sources of latent demand for domestic air travel, passenger trips which are presently made by land transport modes and trips people would like to make by air and are not prepared to make by land modes. In terms of the definitions used in this work, the first source of latent demand corresponds to diversion from land transport modes to air and the second source refers to passenger stimulation (defined in Chapter 1). In order to assess the potential for passenger stimulation it would probably be necessary to undertake some form of household survey. This was not done in this work, not because it was not judged important, but because of resource constraints. In order to assess the response of people travelling by one land transport mode, a limited survey of interstate coach passengers was undertaken in conjunction with Ansett Pioneer. Passengers in the departure lounge of the Canberra terminal were asked to complete copies of the questionnaire shown in Appendix III.

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1. Whereas the effect of a fare *increase* can be estimated from the response of air passengers, the response of the non-air passengers must be included in an estimation of the effect of a fare *decrease*.

Emphasis was given to passengers travelling between Canberra and Melbourne, but some data were collected on passengers travelling on other routes. In addition, survey forms were handed out in Melbourne to northbound passengers and the completed forms were collected in Canberra. In all 450 usable questionnaires were collected, 194 for the Canberra-Melbourne route, 55 for the Canberra-Adelaide route, 54 for the Sydney-Melbourne route, and 147 for other routes. It is estimated that the usable response rate on the Canberra-Melbourne route was about 80 per cent. The survey was undertaken between 5 January and 10 February 1984.

The characteristics of the interstate coach passengers are shown in Tables 5.1 to 5.6 and the standard errors associated with the data in these Tables are discussed in Appendix V. Each Table shows the results collected for Canberra-Melbourne passengers together with the results for all passengers.

It can be seen from Table 5.1 that very little coach travel was undertaken for business reasons. Nearly 90 per cent of journeys were undertaken for either holiday reasons or to visit friends or relatives. The majority of passengers were female (refer Table 5.2) and this was apparently due to the fact that many female passengers feel more secure on a coach than on a train. Some of the female passengers included in the survey said that the visible presence of the driver made them feel secure.

TABLE 5.1-PURPOSE OF TRAVEL FOR INTERSTATE COACH PASSENGERS ON ROUTES FROM CANBERRA IN JANUARY-FEBRUARY 1984

(per cent of passenger trips)

Purpose of travel	*Canberra-Melbourne passengers*	*All passengers*
Business/work	2	3
Holiday	42	43
Visiting friends or relatives	47	45
Personal business	5	4
Other	4	5
Total	100	100

Source: BTE survey of Ansett Pioneer passengers, Canberra, 5 January to 10 February 1984.

It can be seen from Table 5.3 that the age distributions have two peaks, with a minimum at the 30 to 39 age group. Table 5.4 shows that 57 per cent of all passengers decided to travel more than two weeks in advance and Table 5.5 shows that 62 per cent of all passengers stayed away for more than a week. It follows from the data in Tables 5.1 to 5.6 that the characteristics of passengers on the Canberra-Melbourne route were very similar to the characteristics of all passengers included in the survey.

TABLE 5.2-GENDER OF INTERSTATE COACH PASSENGERS ON ROUTES FROM CANBERRA IN JANUARY-FEBRUARY 1984

(per cent of passenger trips)

Gender	*Canberra-Melbourne passengers*	*All passengers*
Female	61	61
Male	39	39
Total	100	100

Source: BTE survey of Ansett Pioneer passengers, Canberra, 5 January to 10 February 1984.

TABLE 5.3-AGE OF INTERSTATE COACH PASSENGERS ON ROUTES FROM CANBERRA IN JANUARY-FEBRUARY 1984

(per cent of passenger trips)

Age (years)	*Canberra-Melbourne passengers*	*All passengers*
<15	8	8
15-19	15	17
20-29	21	25
30-39	8	11
40-64	34	27
>64	14	11
Total	100	100

Note: Figures may not all add to totals due to rounding.

Source: BTE survey of Ansett Pioneer passengers, Canberra, 5 January to 10 February 1984.

In many respects the characteristics of the interstate coach passengers were very different from the characteristics of the air passengers described in Chapter 2. The main differences are summarised in Table 5.7. It can be seen from this table that the

TABLE 5.4-TRAVEL DECISION TIME FOR INTERSTATE COACH PASSENGERS ON ROUTES FROM CANBERRA IN JANUARY-FEBRUARY 1984

(per cent of passenger trips)

Travel decision time (days)	*Canberra-Melbourne passengers*	*All passengers*
0	2	2
1- 3	16	16
4-14	28	24
15-30	15	17
>30	39	40
Total	100	100

Note: Figures may not all add to totals due to rounding.

Source: BTE survey of Ansett Pioneer passengers, Canberra, 5 January to 10 February 1984.

TABLE 5.5-TRIP DURATION FOR INTERSTATE COACH PASSENGERS ON ROUTES FROM CANBERRA IN JANUARY-FEBRUARY 1984

(per cent of passenger trips)

Trip duration (nights)	*Canberra-Melbourne passengers*	*All passengers*
0	-	-
1	-	1
2	7	5
3-7	38	32
8-14	29	30
>14	26	32
Total	100	100

- nil or rounded to zero

Source: BTE survey of Ansett Pioneer passengers, Canberra, 5 January to 10 February 1984.

TABLE 5.6-HOUSEHOLD INCOME OF INTERSTATE COACH PASSENGERS ON ROUTES FROM CANBERRA IN JANUARY-FEBRUARY 1984

(per cent of passenger trips)

Household income ($ per week)	*Canberra-Melbourne passengers*	*All passengers*
<116	25	23
116-230	15	17
231-345	17	21
346-423	13	8
424-500	10	9
501-650	9	9
>650	11	13
Total	100	100

Source: BTE survey of Ansett Pioneer passengers, Canberra, 5 January to 10 February 1984.

TABLE 5.7-SUMMARY OF THE MAJOR DIFFERENCES BETWEEN SYDNEY-MELBOURNE AND SYDNEY-BRISBANE AIR PASSENGERS AND INTERSTATE COACH PASSENGERS

Passenger characteristic	*Sydney-Melbourne and Sydney-Brisbane air travel*	*Interstate coach travel*
Purpose of travel business/non-business	78/22	3/97
Gender male/female	79/21	39/61
Age <30 years/>30 years	17/83	50/50
Household income <$650 per week/>$650 per week	52/48	87/13
Trip duration <1 week/>1 week	83/17	38/62

Sources: BTE survey of passengers at Kingsford-Smith airport, November 1983. BTE survey of Ansett Pioneer passengers, Canberra, 5 January to 10 February 1984.

proportion of business to non-business travel and the ratio of male to female passengers were both higher in the case of air travel, that there was a higher proportion of passengers aged less than 30 years in the case of coach travel and that many more air passengers than coach passengers came from high income households. It can also been seen that less than 20 per cent of air trips were of more than one week's duration, whereas over 60 per cent of interstate coach trips were of more than one week's duration.

COACH PASSENGERS' RESPONSE

Coach passengers were asked why they did not travel by air and the most important reasons given are summarised in Table 5.8. The price of air travel was clearly the most important factor. The only other two important factors were a dislike of air travel (6 per cent) and a desire to see the countryside (11 per cent of all coach passengers).

In a separate question (Question 11), coach passengers were asked how much more they would have been prepared to pay to travel by air. An analysis of the responses given by Canberra-Melbourne passengers is shown in Figure 5.1. In this figure the percentage change in coach travel is shown as a function of the percentage change in air fares. The error bands in this figure indicate the extent of the 95 per cent confidence limits. In the analysis of the data presented in Figure 5.1, the full economy fare was used as the basis for calculating the

TABLE 5.8-MAIN REASON INTERSTATE COACH PASSENGERS ON ROUTES FROM CANBERRA DID NOT TRAVEL BY AIR IN JANUARY-FEBRUARY 1984

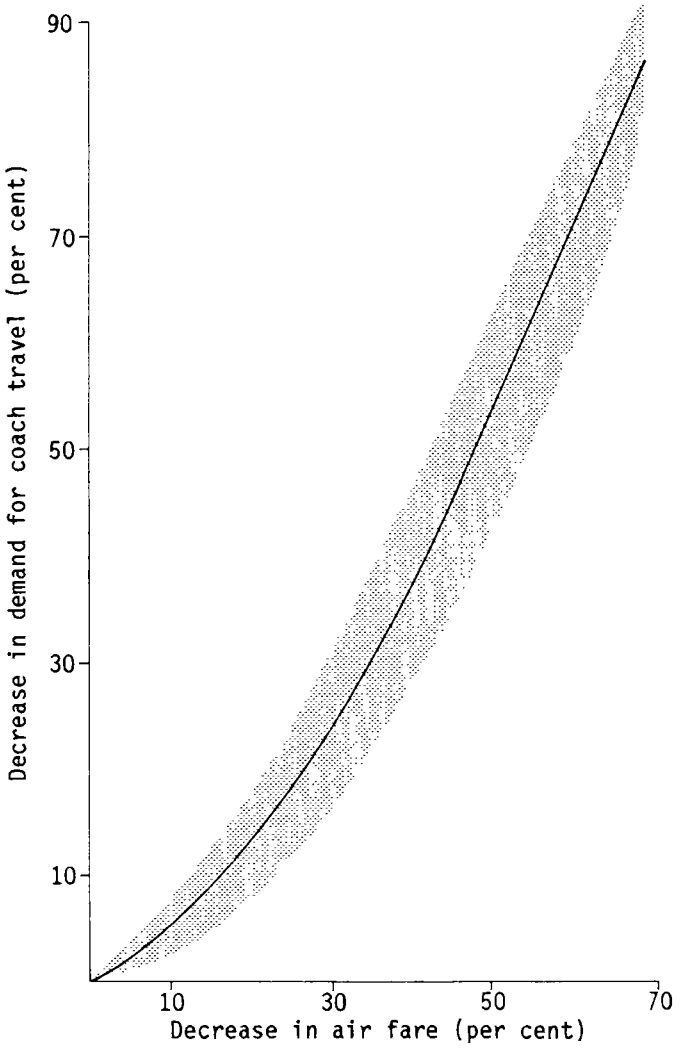
(per cent of passenger trips)

Main reason for not travelling by air	*Canberra-Melbourne passengers*	*All passengers*
Price of air travel	83	78
Dislike of air travel	6	6
No airport near home	-	-
No airport near destination	-	1
Wanted to view country	8	11
Other	3	4
Total	100	100

\- nil or rounded to zero

Source: BTE survey of Ansett Pioneer passengers, Canberra, 5 January to 10 February 1984.

percentage change in air fare. The results for the other routes included in the survey fell within the 95 per cent confidence limits for the Canberra-Melbourne results. From the slope of the response curve at the origin of Figure 5.1 the cross elasticity of demand for coach travel with respect to the price of air travel was estimated to be 0.7 ± 0.2: that is, for a 10 per cent decrease in air fares, coach travel would decrease by about 7 per cent.



Note: The confidence limits (95 per cent) were based on the uncorrected normal approximation.

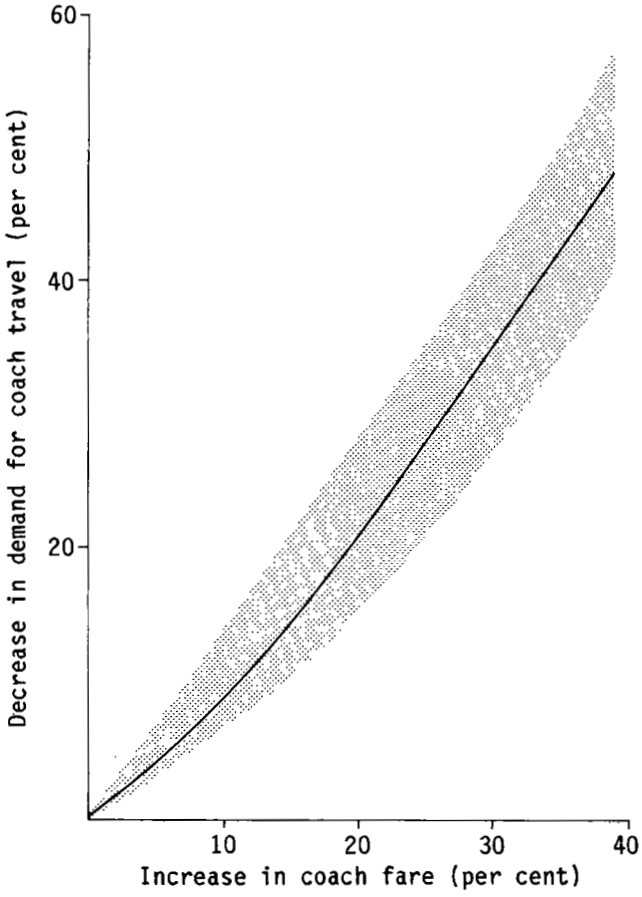
Source: BTE survey of Ansett Pioneer passengers, Canberra, January-February 1984.

Figure 5.1-The effect of decreasing air fares on demand for coach travel on the Canberra-Melbourne route

It can be seen from Figure 5.1 that about 30 per cent of passengers would have been prepared to pay an air fare 35 per cent off the full economy fare (equivalent to an Apex fare) and 40 per cent would have been prepared to pay an air fare 45 per cent off the economy fare (equivalent to an Excursion 45/Flexi-Fare fare). As only about 10 per cent of passengers tried to book a discount air fare (result from Question 12) it would appear that many passengers either could not meet the conditions which applied to discount fares or were unaware of the range and availability of discount fares on offer. The former reason was probably less important than the latter as many coach passengers decided to travel well in advance (Table 5.4) and stayed away for lengthy periods (Table 5.5). This leads to the tentative conclusion that a significant fraction of interstate coach passengers were eligible for and prepared to pay for discount air fares, but were unaware of fare levels and conditions.

In Figure 5.2 the demand for Canberra-Melbourne coach travel is shown as a function of the coach fare, together with the extent of the 95 per cent confidence limits. From the slope of the response curve at the origin the price elasticity of demand was estimated to be -1.1 ± 0.3. The response curves for the other routes fell within the confidence limits associated with the Canberra-Melbourne data.

In any interpretation of the data in Figures 5.1 and 5.2 it must be remembered that there were a number of coach operators on the Canberra-Melbourne route at the time of the survey and that some of these operators offered lower fares than Ansett Pioneer. Thus Ansett Pioneer passengers may have been less price sensitive than average. Evidence to support this argument was obtained from an analysis of the final question in the survey, 'Why did you travel Ansett Pioneer?' Although the price of Ansett Pioneer fares was mentioned by many respondents, the quality of service was judged by the majority of respondents to be a more important factor.



Note: The confidence limits (95 per cent) were based on the uncorrected normal approximation.

Source: BTE survey of Ansett Pioneer passengers, Canberra, January-February 1984.

Figure 5.2-The effect of increasing coach fares on demand for coach travel on the Canberra-Melbourne route

CHAPTER 6-CONCLUDING REMARKS

The main sources of data for this study were a series of three surveys of intercity airline passengers and a survey of interstate coach passengers. The philosophy behind these surveys was to collect timely and reliable data of value both to the public and private sectors of the aviation industry. Three main features emerged from the air passenger survey data. The characteristics of passengers on the Sydney-Melbourne and Sydney-Brisbane routes were very similar; the characteristics of AAA and TAA passengers on these routes were basically the same but very different from the characteristics of EWA passengers; only small differences were observed between the characteristics of AAA and TAA discount fare passengers and EWA passengers. The similarity between the characteristics of AAA and TAA passengers was perhaps surprising in view of the differences in the aircraft types and marketing approaches used by these airlines. In view of the similarity of the characteristics of EWA passengers and discount fare passengers travelling with AAA and TAA, it can be argued that many EWA passengers who were diverted from AAA and TAA would have attempted to buy discount fare tickets if EWA excursion fares had not been available.

From the travel frequency data collected with the surveys it was found that only about 27 per cent of passenger trips were made by passengers who travelled for both business and non-business reasons in the same year, indicating that to a large extent the markets for business and non-business travel were independent. The average numbers of business and non-business return trips per annum were found to be 7.3 and 1.3 respectively. By extrapolating the data for the Sydney-Melbourne and Sydney-Brisbane routes to the total network, it was estimated that about 60 per cent of trips on the trunk network are undertaken by about 0.5 per cent of the national population. The fact that air travel is limited to such a small fraction of the total community would have to be considered in any further work on the latent demand for air travel because many people may be unfamiliar with the fare levels and conditions associated with discount air travel. It would therefore be difficult to assess consumer attitudes to an unfamiliar product.

The latent demand for trunk route air travel from interstate coach passengers was studied by means of a survey of coach passengers travelling on routes through Canberra. The characteristics of the interstate coach passengers were found to be very different from the characteristics of the air passengers. The proportion of business to non-business travel and the ratio of male to female passengers were both higher in the case of air travel, there was a higher proportion of passengers aged less than 30 years in the case of coach travel and many more air passengers than coach passengers came from high income households. It was also found that less than 20 per cent of air trips were of more than one week's duration, whereas over 60 per cent of interstate coach trips were of more than one week's duration. About 20 per cent of interstate coach passengers chose to travel by coach for non-price reasons, which included a dislike of air travel and a desire to see the countryside. The tentative conclusion from the results of the coach passenger survey was that a significant proportion of passengers were eligible for and prepared to pay for discount air fares, but were unaware of fare levels and conditions.

Large differences were observed between the attitudes of business and non-business travellers to air fare increases: the survey results indicated that the price elasticities of demand for business and non-business travel were -1.1 ± 0.3 and -3.2 ± 0.6 respectively. The price elasticities of demand (and 95 per cent confidence limits) for first class, economy and discount fare travel were estimated to be -0.6 ± 0.4, -1.3 ± 0.2 and -4.2 ± 0.5 respectively. The absolute values of these elasticity estimates may be too high because of the tendency of some survey respondents to overestimate their negative response to a price increase.

The econometric analysis of trunk network patronage was hampered by the restricted time-span of the available data. A more positive aspect of this work was that it emphasised the need for caution when interpreting the results of econometric analyses not based on causal models.

In the case of demand for first class travel, data were available for a seven-year period and it was possible to estimate the price elasticity: the value obtained, -0.5 ± 0.2, was consistent with the value determined from the survey results.

APPENDIX I-SURVEY FORM FOR EAST-WEST AIRLINES PASSENGERS, JULY 1983

Bureau of Transport Economics

SURVEY OF AIR PASSENGERS

This survey is part of a research project to assess the reaction of air travellers to different fare types. The project is being undertaken by the Bureau of Transport Economics (BTE) in conjunction with the Independent Air Fares Committee (IAFC). The assistance of East West Airlines is gratefully acknowledged.

The BTE is a Commonwealth research body which undertakes independent studies and investigations to assist the Commonwealth Government in formulating policy relating to all modes of transport.

The IAFC reviews the basis on which certain passenger air fares are determined and determines those fares.

Please complete this survey and hand it to the BTE representative or seat allocation officer as you board your aircraft.

Thank you for your co-operation.

(G.K.R. REID)
Director

Q1. What is the main purpose of your journey? (Please tick one box.)

☐ Business/work ☐ Holiday ☐ Visiting friends or relatives

☐ Other—please specify .....

Q2. In which town or city do you live? .....

The remaining questions should be completed only by passengers using the $130 Sydney/Brisbane return fare or the $120 Sydney/Melbourne return fare.

Q3. Did you cancel an air ticket with another airline before booking with East-West Airlines? (Please tick one box.)

☐ Yes. **Go to Q7.** ☐ No. **Go to Q4.**

Q4. Would you still have made this journey if your current discount return fare was **not** available? (Please tick one box.)

☐ Yes. ☐ Don't know. ☐ No.

Q5. What alternative travel arrangements would you have made? (Please tick one box.)

☐ Travelled both ways by bus, car or train

☐ Travelled both ways by Ansett or TAA

☐ Travelled one way by Ansett or TAA and the other way by bus, car or train

☐ Other--please specify .....

.....

Q6. Instead of making your present journey, would you have: (Please tick one box.)

☐ Stayed at home (not travelled at all)?

☐ Travelled by air to some other destination?

☐ Travelled by bus, car or train to some other destination?

☐ Other—please specify .....

.....

Q7. What is your flight number? .....

Thank You

APPENDIX II-SURVEY FORMS FOR ANSETT, TAA AND EAST-WEST AIRLINES PASSENGERS, NOVEMBER 1983

ANSETT AND TAA SURVEY FORM

Bureau of Transport Economics

SURVEY OF TRUNK ROUTE PASSENGERS, 1983

This survey is part of a research project to assess the reaction of air travellers to different levels and types of air fares. The project is being undertaken by the Bureau of Transport Economics (BTE) in conjunction with the Independent Air Fares Committee (IAFC).

The BTE is a Commonwealth research body which undertakes independent studies and investigations to assist the Commonwealth Government in formulating policy relating to all modes of transport. The IAFC reviews the basis on which certain passenger air fares are determined and determines those fares.

Please complete this questionnaire and hand it to a BTE representative or a seat allocation officer before you board your aircraft.

The assistance of Ansett and TAA in the administration of this survey is gratefully acknowledged. Thank you for your cooperation.

Q1. Which town or city do you live in?.....

Q2. What are, or were, your **MAIN** destinations away from home?

.....

Q3. What is, or was, the **MAIN** purpose of your journey?

(Please tick one box)

- ☐ Business/work
- ☐ Personal business
- ☐ Holiday
- ☐ Visiting friends or relatives
- ☐ Other - please specify

.....

Q4. How many nights will you be, or have you been, away from home on this return journey? .....

Q5. How many days prior to departure did you finally **DECIDE** to travel by air? Please note that your decision date may have occurred before the date you booked your ticket.

(Please tick one box)

- ☐ On day of travel
- ☐ 1-3 days before
- ☐ 4-14 days before
- ☐ 15-30 days before
- ☐ More than 30 days before

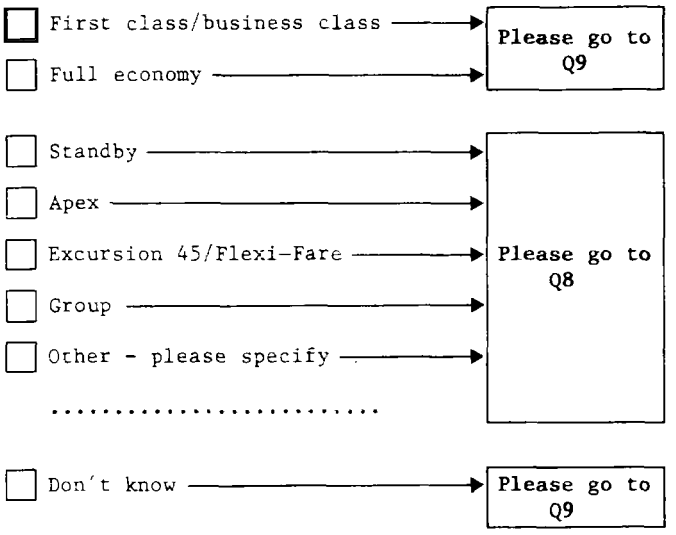
Q6. Who paid for your ticket for this journey?

(Please tick one box)

- ☐ Yourself/spouse
- ☐ Government
- ☐ Business/work
- ☐ Relative/friend
- ☐ Other - please specify

.....

Q7. What is your fare type? **(Please tick one box)**



Q8. If your **discount** fare had not been available for this journey, what would you have done? **(Please tick one box)**

- ☐ Bought a full economy ticket with Ansett or TAA
- ☐ Bought another type of discount fare with Ansett or TAA - please specify fare type

  .....
- ☐ Travelled by another airline (that is, neither Ansett nor TAA)
- ☐ Travelled by bus, car or train - please specify

  .....
- ☐ Stayed at home (not travelled)
- ☐ Other - please specify

  .....
- ☐ Don't know

Q9. Would you still have made your present return journey by **AIR** if **ALL** airfares were

	Yes	No	
30 per cent **more?**	☐	☐	**(Please tick one box for each option)**
20 per cent **more?**	☐	☐	
10 per cent **more?**	☐	☐	

Q10. How many **RETURN** journeys by air in Australia have you made in the past 12 months? **Please include this journey in your answer.**

For business/work	.....	**(Please put a number on each line)**
For non-business purposes (holiday, visiting friends and relatives, etc)	.....	

OPTIONAL QUESTIONS

It would be helpful if you would please complete the following additional questions. Your answers will be used solely for statistical purposes and will be treated confidentially.

Q11. Are you? ☐ Male ☐ Female

Q12. What is your age?

☐ Under 15 years
☐ 15-19
☐ 20-29
☐ 30-39
☐ 40-64
☐ 65 and over

Q13. What is your **household** income before tax and other deductions? (Please include the income of **all** family members.)

☐ $0 to $99 per week / $0 to $5,199 per year
☐ $100 to $399 per week / $5,200 to $20,799 per year
☐ $400 to $649 per week / $20,800 to $33,799 per year
☐ $650 or more per week / $33,800 or more per year

Thank you for completing this questionnaire.

EAST-WEST AIRLINES SURVEY FORM

Bureau of Transport Economics

SURVEY OF TRUNK ROUTE PASSENGERS, 1983

This survey is part of a research project to assess the reaction of air travellers to different levels and types of air fares. The project is being undertaken by the Bureau of Transport Economics (BTE) in conjunction with the Independent Air Fares Committee (IAFC).

The BTE is a Commonwealth research body which undertakes independent studies and investigations to assist the Commonwealth Government in formulating policy relating to all modes of transport. The IAFC reviews the basis on which certain passenger air fares are determined and determines those fares.

Please complete this questionnaire and hand it to a BTE representative or a seat allocation officer before you board your aircraft.

The assistance of East—West Airlines in the administration of this survey is gratefully acknowledged. Thank you for your cooperation.

Q1. Which town or city do you live in?.....

Q2. What are, or were, your **MAIN** destinations away from home?

.....

Q3. What is, or was, the **MAIN** purpose of your journey?

(Please tick one box)

- ☐ Business/work
- ☐ Personal business
- ☐ Holiday
- ☐ Visiting friends or relatives
- ☐ Other - please specify

.....

Q4. How many nights will you be, or have you been, away from home on this return journey? .....

Q5. How many days prior to departure did you finally **DECIDE** to travel by air? Please note that your decision date may have occurred before the date you booked your ticket.

(Please tick one box)

- ☐ On day of travel
- ☐ 1-3 days before
- ☐ 4-14 days before
- ☐ 15-30 days before
- ☐ More than 30 days before

Q6. Who paid for your ticket for this journey?

(Please tick one box)

- ☐ Yourself/spouse
- ☐ Government
- ☐ Business/work
- ☐ Relative/friend
- ☐ Other - please specify

.....

Q7. What is your fare type? **(Please tick one box)**

- ☐ Standard
- ☐ Standby
- ☐ Super-Saver
- ☐ Excursion
- ☐ Group
- ☐ Other - please specify

  .....

- ☐ Don't know

Q8. If you had been unable to fly East-West Airlines on this journey, what would you have done? **(Please tick one box)**

- ☐ Travelled by bus, car or train - please specify

  .....

- ☐ Stayed at home (not travelled)
- ☐ Travelled by Ansett or TAA - please specify fare type if known

  .....

- ☐ Other - please specify

  .....

- ☐ Don't know

Q9. Would you still have made your present return journey by **AIR** if **ALL** airfares were

	Yes	No	
30 per cent **more?**	☐	☐	**(Please tick one box for each option)**
20 per cent **more?**	☐	☐	
10 per cent **more?**	☐	☐	

Q10. How many **RETURN** journeys by air in Australia have you made in the past 12 months? **Please include this journey in your answer.**

For business/work	.....	**(Please put a number on each line)**
For non-business purposes (holiday, visiting friends and relatives, etc)	.....	

OPTIONAL QUESTIONS

It would be helpful if you would please complete the following additional questions. Your answers will be used solely for statistical purposes and will be treated confidentially.

Q11. Are you? ☐ Male ☐ Female

Q12. What is your age?

☐ Under 15 years
☐ 15-19
☐ 20-29
☐ 30-39
☐ 40-64
☐ 65 and over

Q13. What is your **household** income before tax and other deductions? (Please include the income of **all** family members.)

☐ $0 to $99 per week / $0 to $5,199 per year
☐ $100 to $399 per week / $5,200 to $20,799 per year
☐ $400 to $649 per week / $20,800 to $33,799 per year
☐ $650 or more per week / $33,800 or more per year

Thank you for completing this questionnaire.

APPENDIX III-SURVEY FORM FOR ANSETT PIONEER COACH PASSENGERS, JANUARY-FEBRUARY 1984

Bureau of Transport Economics

SURVEY OF COACH PASSENGERS, 1984

This survey is part of a research project to understand why people travel by coach. The project is being undertaken by the Bureau of Transport Economics (BTE), which is a Commonwealth research body which undertakes independent studies to assist the Commonwealth Government in formulating policy relating to all modes of transport.

Please complete this questionnaire and hand it to a BTE representative upon disembarking in Canberra.

The assistance of Ansett Pioneer in the administration of this survey is gratefully acknowledged. Thank you for your co-operation.

Q1. In which town or city did you start this **one-way** coach journey?.....

Q2. In which town or city will you complete this coach journey?.....

Q3. What is the MAIN purpose of your journey? If you are returning home please indicate why you have been away.

(Please tick one box)

- ☐ Business/work
- ☐ Personal business
- ☐ Holiday
- ☐ Visiting friends or relatives
- ☐ Other - please specify

.....

Q4. By the time you get back home how many nights will you have been away?.....

Q5. How long ago did you **DECIDE** to make this journey? Please note that your decision date may have occurred before the date you booked your ticket.

(Please tick one box)

- ☐ On day of travel
- ☐ 1-3 days before
- ☐ 4-14 days before
- ☐ 15-30 days before
- ☐ More than 30 days before

Q6. How much was your coach ticket for this one-way journey?

$.....

Q7. If your coach fare had been **FIVE DOLLARS MORE** would you have

(Please tick one box)

- ☐ Still travelled by coach?
- ☐ Stayed at home?
- ☐ Travelled by car?
- ☐ Travelled by air?
- ☐ Travelled by train?
- ☐ Other - please specify

.....

Q8. If your coach fare had been **TEN DOLLARS MORE** would you have

(Please tick one box)

- ☐ Still travelled by coach?
- ☐ Stayed at home?
- ☐ Travelled by car?
- ☐ Travelled by air?
- ☐ Travelled by train?
- ☐ Other - please specify

.....

Q9. We want to understand why you did NOT travel by **AIR**. Would you please indicate your reasons by circling the appropriate numbers in the following list. You may circle as many numbers as necessary.

	Code Number
The price of air travel	1
Dislike of air travel	2
There is no airport near my home	3
There is no airport near my destination	4
Wanted to view country during trip	5
Other - please specify	6
.....	

Q10. Which of the reasons in Q9 was the **most** important in your decision **NOT** to travel by **AIR**?

Please indicate the code number of that reason.....

Q11. Would you have made this journey by **AIR** instead of coach if the **one-way** air fare had been

	Yes	No
$100 more than the one-way coach fare?	☐	☐
$75 more than the one-way coach fare?	☐	☐
$50 more than the one-way coach fare?	☐	☐
$25 more than the one-way coach fare?	☐	☐
$5 more than the one-way coach fare?	☐	☐

(Please tick one box for each option)

Q12. Did you try to book a **discount air fare** for this journey?

☐ Yes, please specify fare type if known

.....

☐ No

OPTIONAL QUESTIONS

It would be helpful if you would please complete the following additional questions. Your answers will be used solely for statistical purposes and will be treated confidentially.

Q13. Are you? ☐ Male ☐ Female

Q14. What is your age?

☐ Under 15 years ☐ 30-39
☐ 15-19 ☐ 40-64
☐ 20-29 ☐ 65 and over

Q15. What is your approximate **household** income before tax and other deductions? (Include the income of all **household** members).

☐ $0 to $115 per week / $0 to $6,000 per year
☐ $116 to $230 per week / $6001 to $12,000 per year
☐ $231 to $345 per week / $12,001 to $18,000 per year
☐ $346 to $423 per week / $18,001 to $22,000 per year
☐ $424 to $500 per week / $22,001 to $26,000 per year
☐ $501 to $650 per week / $26,001 to $34,000 per year
☐ $651 or more per week / $34,001 or more per year

Why did you travel by **Ansett Pioneer**?

.....

.....

APPENDIX IV-RESERVATION OF AIRCRAFT SEATS FOR DISCOUNT FARE PASSENGERS

If both full and discount fares are available for a flight[1], then the airline management usually makes a decision about the number of seats which will be made available to discount fare passengers. If too many seats are reserved for discount fare passengers then there is the risk that there may not be enough seats for full fare passengers and if too few seats are reserved the aircraft may fly with seats which could have been occupied by discount fare passengers. Usually there is an upper limit to the number of seats reserved for discount fare passengers, but if no decision is made then, by default, seats are allocated on a first-come-first-served basis. This appendix addresses the problem of how to maximise profit by allocating seats to full and discount fare passengers.

In the analysis of this seat reservation (or profit maximisation) problem two separate situations were considered. In the first and less complicated case, it was assumed that there was no advance booking requirement for discount air fare passengers. In the second case it was assumed that discount air fare passengers were required to book in advance and if the demand for discount fares at the end of the advance booking period was less than the number of reserved seats, then all the remaining seats could, if necessary, be allocated to full fare passengers. This advance booking scenario has considerable realism not only because many discount fares have advance booking requirements but also because full fare passengers tend to book later than discount fare passengers (refer Chapter 2).

It has also been assumed that, if there is competition from another airline on the same route, then both airlines offer identical fares and conditions. Although this 'single airline' assumption would limit the validity of this work in some overseas countries, its applicability in Australia is obvious. For the sake of simplicity it has also been assumed that only one type of discount fare was

---

1. The term 'flight' is used to describe a service operating regularly between a fixed origin and destination at the same time of day.

available. There are no reasons why the analysis could not easily be extended to a multi-fare situation.

The situation where the most probable demand for seats is less than aircraft capacity is illustrated in Figure IV.1. In this figure a symmetric probability distribution for full fare passengers is plotted with its origin at the left and a symmetric distribution for discount fare passengers is plotted with its origin at the right. By plotting the distributions in this way the difference between the maxima of the distributions is the most probable value for the number of vacant seats in the aircraft. Figure IV.2 illustrates the situation where the most probable demand exceeds the number of available seats. The distribution of full fare demand is assumed to be the same as in Figure IV.1 but the discount fare demand is assumed to be much larger than in the example shown in Figure IV.1. In the situation illustrated in both Figures IV.1 and IV.2 the maximum net revenue is sensitive to the allocation of seats between full and discount fare passengers.

In the situation where there is no advance booking requirement for discount fare passengers, and N seats in an aircraft of seat capacity C are reserved for full fare passengers, the average net revenue can be expressed as

$$< \text{Net revenue} > = r_f \left[\sum_{x=1}^{N} x p_f(x) + N \sum_{x=N+1}^{C} p_f(x) \right] + r_d \left[\sum_{y=1}^{C-N} y p_d(y) + (C-N) \sum_{y=C-N+1}^{C} p_d(y) \right] \qquad \text{IV.1}$$

where r_f = net revenue for a full fare ticket
r_d = net revenue for a discount fare ticket
$p_f(x)$ = probability of the demand for x full fare seats
$p_d(y)$ = probability of the demand for y discount fare seats

The second and fourth terms in equation IV.1 describe the situations where the demands for full fare and discount fare seats are greater than the seat allocations N and C-N respectively.

If there is an advance booking requirement for discount fare passengers the analysis becomes more complicated because it is then possible to sell more than N tickets to full fare passengers if the demand for discount fares is less than C-N at the end of the advance booking period. In this situation the average net revenue can be written

$$< \text{Net revenue} > = r_f \Bigg[\sum_{x=1}^{N} x p_f(x) + N \sum_{x=N+1}^{C} p_f(x) \sum_{y=C-N}^{C} p_d(y) + \sum_{x=N+1}^{C-1} x \Big[p_d(C-x) \sum_{z=x+1}^{C} p_f(z) + p_f(x) \sum_{y=0}^{C-x} p_d(y) \Big] + C p_f(C) p_d(0) \Bigg] + r_d \Bigg[\sum_{y=1}^{C-N} y p_d(y) + \sum_{y=C-N+1}^{C} (C-N) p_d(y) \Bigg] \qquad \text{IV.2}$$

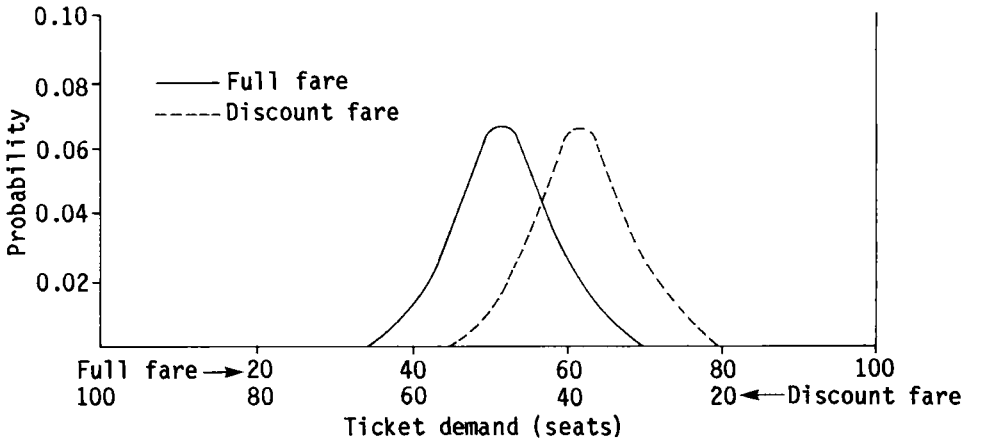


Figure IV.1-Probability density functions for full fare and discount fare demand when mode of total demand is less than aircraft capacity

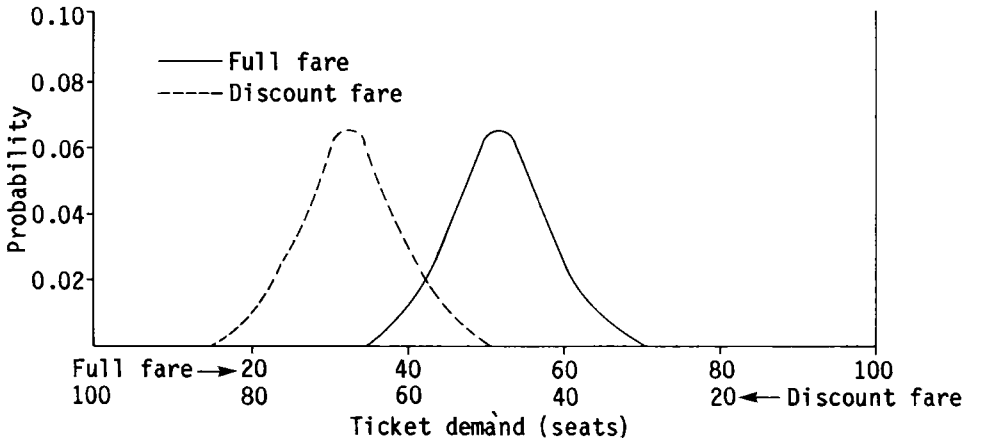


Figure IV.2-Probability density functions for full fare and discount fare demand when mode of total demand exceeds aircraft capacity

In equation IV.2,

$\sum_{x=N+1}^{C} p_f(x) \sum_{y=C-N}^{C} p_d(y)$ = probability that more than N seats are wanted for full fare, and demand for discount seats is at least C-N (that is, some full fare and discount fare demand is unsatisfied)

$p_d(C-x) \sum_{z=x+1}^{C} p_f(z)$ = probability that more than x seats are wanted for full fare passengers, and demand for discount seats is C-x

$p_f(x) \sum_{y=0}^{C-x} p_d(y)$ = probability that x seats are wanted for full fare passengers, and at most C-x seats are sought by discount fare passengers.

Figure IV.3 shows the results of a series of examples of the use of equations IV.1 and IV.2. In this figure average net revenue is plotted as a function of the number of seats allocated to full fare passengers, N. In all examples very narrow demand distributions have been used so that the principles of seat allocation can be highlighted. The dotted lines in Figure IV.3 refer to the advance booking situation. In the examples shown in the figure it has been assumed that:

r_f = 1
r_d = 0.5
C = 100
n_f = full fare passenger demand = 60
n_d = discount fare passenger demand = 0, 20, 40 and 70

Example 1 : $n_d = 0$

When $n_d = 0$ and N = 0, net revenue is zero. As N is increased revenue increases by r_f for each increment in N until $N = n_f$. Further increases in N lead to no further increase in revenue as all demand for full fare tickets has by then been satisfied. If $n_d = 0$ and an advance booking restriction applies then net revenue is independent of N.

Example 2 : $n_d = 20$

When $n_d = 20$ and N = 0, net revenue = $n_d r_d = 10$. The dependence of net revenue on N is then similar to the $n_d = 0$ case until $N = C-n_d$: from this point further increases in N result in empty seats which could have been filled with discount fare passengers. Thus net revenue declines with a slope of r_d. If $n_d = 20$ and an advance booking restriction applies then net revenue is independent of N until N exceeds $C-n_d$.

Example 3 : $n_d = 40$

When $n_d = 40$ total demand equals aircraft capacity and there is no plateau in the results because net revenue decreases as soon as N exceeds n_f. If an advance booking restriction applies, net revenue is constant until N exceeds $C-n_d$ as in Example 2.

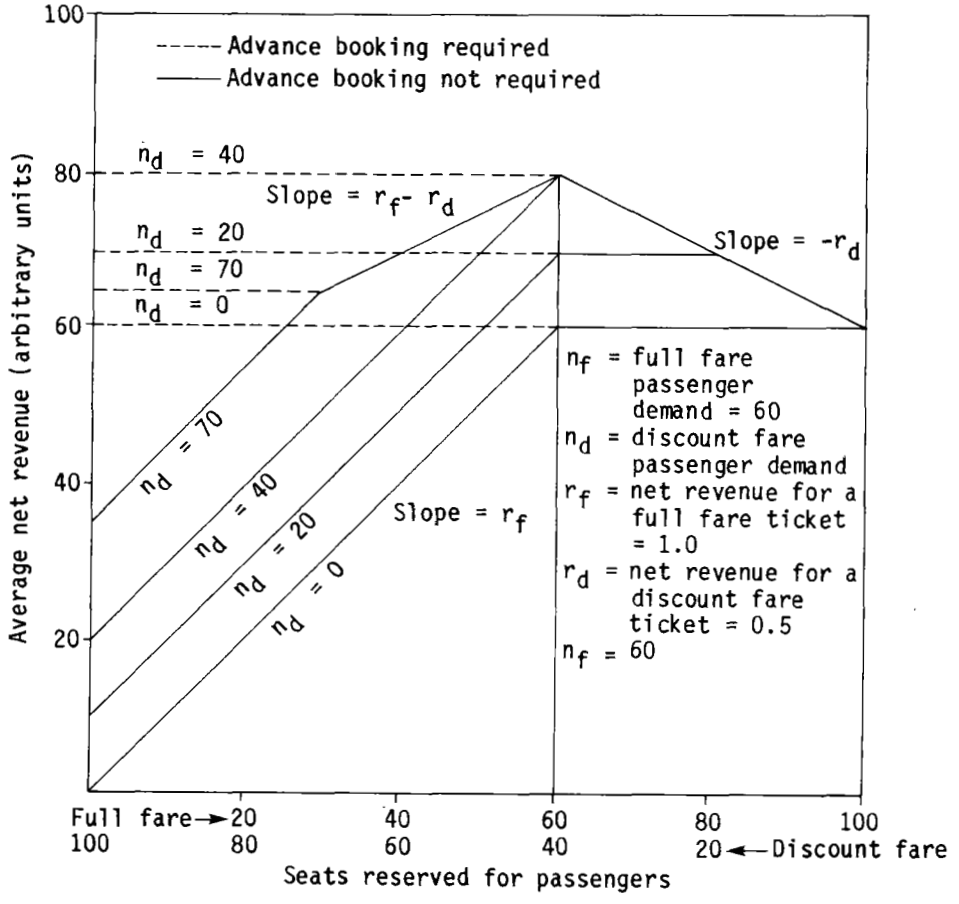


Figure IV.3-Average net revenue as a function of the number of seats reserved for full fare passengers

Example 4 : $n_d = 70$

In this example total demand exceeds capacity and the results depend on whether an advance booking condition applies to discount fare passengers. When $n_d = 70$ and no advance booking restriction applies, aircraft capacity is reached when N = 30. Further increases in revenue can be achieved at higher values of N by spilling (turning away) discount fare passengers and allocating the seats to full fare passengers. This situation occurs between $N = C-n_d$ and n_f and net revenue increases by $r_f - r_d$ for each increment in N. When N exceeds n_f the decline in net revenue follows the same pattern as in Examples 2 and 3. When an advance booking restriction applies and N is less than $C-n_d$ there are no vacant seats on the aircraft and revenue is higher than in the case where no advance booking restriction applies.

Between $N = C-n_d$ and C the net revenue curve is the same as in the no-advance booking case.

As stated earlier, the probability distributions used in these four examples were extremely narrow. If broader distributions had been used the effect would have been to round-off the discontinuities and reduce the maxima. The principles of seat allocation would, however, have been the same.

The theory in this appendix makes it possible to estimate the revenue implications of a policy of minimising the spillage of full fare passengers. This corresponds to choosing a value of N greater than the most probable demand for full fare seats. It can be seen from the examples shown in Figure IV.3 that if N is greater than n_f there can be a revenue penalty, particularly if total demand exceeds capacity. Some airlines implicitly accept this revenue penalty, presumably because of concern that spillage of full fare passengers may in the longer term result in a loss of market share as full fare passengers unable to get a seat may use another airline with a no-spillage policy. If all competing airlines adopted common spillage policies this argument would not apply.

Another implication from this analysis is that it is not possible to develop profit maximisation seat allocation procedures without knowledge of the unsatisfied demand for full fares and discount fares.

APPENDIX V-DETERMINATION OF STANDARD ERRORS FOR THE DATA ON PASSENGER CHARACTERISTICS

For reasons of clarity error estimates were not included in the tabulations of passenger characteristics (Tables 2.2 to 2.13 for airline passengers and Tables 5.1 to 5.6 for coach passengers). For each percentage figure listed in these tables the associated standard error can be calculated from the expression,

$$\text{standard error of } p = \frac{p(1-p)}{n} \qquad \text{V.1}$$

where p is the estimate obtained from the survey data and n is the size of the survey sample.

The sample sizes (that is the values of n) required for use in equation V.1 are listed in Tables V.1 to V.3.

The data in Tables V.1 and V.2 do not correspond exactly with the data in Table 2.1 as some questionnaires were only partially completed. The only question in the November 1983 survey for which the usable response rate was less than 97 per cent was the question on household

TABLE V.1-NUMBER OF USABLE RESPONSES TO QUESTIONS IN THE NOVEMBER 1983 AIR PASSENGER SURVEY, DISAGGREGATED BY ROUTE AND AIRLINE

Passenger characteristic	*Sydney-Melbourne*			*Sydney-Brisbane*		
	AAA	*TAA*	*EWA*	*AAA*	*TAA*	*EWA*
Purpose of travel	498	323	162	229	178	63
Trip duration	498	318	158	226	176	61
Travel decision time	501	321	165	230	177	63
Fare purchaser	499	322	163	229	178	64
Gender	493	317	160	227	177	61
Age	491	318	162	222	175	59
Household income	444	297	141	196	168	51

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

TABLE V.2-NUMBER OF USABLE RESPONSES TO QUESTIONS IN THE NOVEMBER 1983 AIR PASSENGER SURVEY, DISAGGREGATED BY ROUTE AND FARE TYPE

	Sydney-Melbourne				*Sydney-Brisbane*			
	AAA-TAA				*AAA-TAA*			
Passenger characteristic	*First*[a]	*Economy*	*Discount*[b]	*EWA*	*First*[a]	*Economy*	*Discount*[b]	*EWA*
Purpose of travel	115	548	119	158	44	278	52	63
Fare purchaser	115	549	119	159	44	278	52	64
Gender	113	547	113	156	43	276	52	61
Age	113	546	114	158	41	273	50	59
Household income	103	513	96	137	40	254	39	51

a. First class includes TAA business class.
b. AAA/TAA discount fare passengers are defined to be all passengers who did not travel with first or economy class tickets.

Source: BTE survey of passengers at Kingsford-Smith airport, 28 November to 1 December 1983.

income, which had a usable response rate of about 90 per cent. In the case of the coach survey the usable response rate for the household income question was 64 per cent, or 16 per cent less than the usable response rate for the other questions.

TABLE V.3-NUMBER OF USABLE RESPONSES TO QUESTIONS IN THE JANUARY-FEBRUARY 1984 COACH PASSENGER SURVEY

Passenger characteristic	*Cnaberra-Melbourne*	*All passengers*
Purpose of travel	198	473
Trip duration	192	458
Travel decision time	197	471
Gender	192	456
Age	193	455
Household income	158	367

Source: BTE survey of Ansett Pioneer passengers, Canberra, 5 January to 10 February 1984.

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