Basic Characteristics of General Aviation in Australia

Occasional Paper

This Occasional Paper reports on the basic characteristics of Australian General Aviation. Information on these characteristics provides an essential background to the understanding and interpretatian of General Aviation. In this Paper, attention is focused on the types of aircraft used in General Aviation, the size and geographical distribution of General Aviation operations, the various kinds of General Aviation activities undertaken; and the economic cost structure faced by General Aviation operators. In addition, a partial analysis of the demand characteristics of some users of scheduled commuter and charter services is presented.

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FOREWORD

At the Aviation '80 Seminar on 2 November 1978, the Minister for Transport, the Honourable P.J. Nixon announced the Government's decision to institute a study by the Department of Transport into general aviation. Following the issue of the Terms of Reference for this study on 4 May 1979, the Department of Transport asked the Bureau of Transport Economics to undertake a number of investigations in support of this study.

This Paper presents the results of those investigations focussing on the basic characteristics of general aviation in Australia. The analyses reported in this Paper were undertaken by the Systems and Information Branch.

In carrying out this study the BTE carried out a postal survey of all general aviation operators represented on the civil aviation register. The BTE acknowledges the co-operation of all those operators who responded to this survey.

The BTE is also grateful for the assistance received from a number of charter and commuter operators during the course of a survey of passengers carried out at airports in Sydney and Melbourne.

All the maps in this Paper were produced by the Division of National Mapping, Department of National Development and Energy.

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SUMMARY

This Occasional Paper reports on the basic characteristics of Australian general aviation. Information on these characteristics provides an essential background to the understanding and interpretation of general aviation. In this Paper, attention is focussed on the types of aircraft used in general aviation, the size and geographical distribution of general aviation operations, the various kinds of general aviation activities undertaken, and the economic cost structure faced by general aviation operators. In addition, a partial analysis of the demand characteristics of some users of scheduled commuter and charter services is presented.

In order that this examination of general aviation could be based on consistent and up-to-date information, the Bureau of Transport Economics (BTE) analysed three major data sources, two of which were also developed by the BTE. Firstly, a detailed examination was undertaken of the civil aviation register as at mid-1979. As well as obtaining a wide range of detail on general aviation aircraft, it was possible using this register to bring together all general aviation aircraft belonging to a single operator(1). These operators then became the source for the second data collection - namely, the General Aviation Survey 1979. The purpose of this survey was to estimate the levels of various types of flying activities undertaken in 1978-79 in terms of hours flown, flights made, passengers and freight carried and so on. Information was also sought relating to the locations of the main bases of general aviation operations and the places visited in the course of carrying out these operations. In addition, information characterising the nature of operators and details on the costs of carrying out general aviation flying operations were requested in the survey.

(1) In this Paper general aviation operators are taken to be the holders of Certificates of Registration for general aviation aircraft. The limitations of this assumption are discussed in Chapter 1.

The third data source used for this analysis was the Survey of General Aviation Passengers 1979. This survey was carried out over a four-day period at airports in Sydney and Melbourne, and sought information on the characteristics of passengers on scheduled commuter and charter services. The survey also obtained an indication of the travel alternatives which would be adopted by these passengers given certain hypothetical increases in the prices of their present general aviation flights.

Perhaps the most important feature to emerge from this exercise is the significance of general aviation in the overall Australian transport picture. Nearly 6000 aircraft, having an insured value in excess of $550 million, are used by some 4200 different operators located throughout the country. General aviation aircraft fulfil a significant transport task, flying more than 1.6 million hours annually. In 1978-79, over two million persons (including crews) were carried, and in excess of 130 000 tonnes of freight were uplifted.

The flying operations of general aviation in Australia comprise a number of quite distinct activities. These flying activities, listed in order of total hours flown in 1978-79, include the following:

- Hire-and-reward operations for passengers and freight, of which charter work accounted for 238 000 hours and commuter operations for 108 000 hours;

- Flying training, which accounted for 312 000 hours;

- Business flying, which accounted for 287 000 hours;

- Aerial agriculture, which accounted for 189 000 hours;

- Private flying, which accounted for 186 000 hours;

- Other flying, of which various other aerial work activities totalled 187 000 hours and short-term hire totalled 102 000 hours. Most of this latter figure could be expected to have been undertaken in private and business flying.

General aviation in Australia operates in the same regulatory environment which controls all forms of civil aviation. The effect of all these regulations, which are mainly administered as Air Navigation Regulations (ANRs) and Air Navigation Orders (ANOs), is the separation of airline operations[1] from all other forms of civil aviation activity. Airline operations constitute the highest standards of flying operations; special qualifications and experience are required of airline pilots, and higher aircraft maintenance procedures have to be carried out.

Besides these distinctions between airline and general aviation which are based on technical considerations, pressures of economic regulation have evolved which have made the airline sector even more a self-contained entity. For example, before the evolution of the 'Two-Airline Policy' in the 1950's, it was the practice to issue most applicants for new scheduled services with airline licences solely on technical considerations. However, in the last 20 years during which the Two-Airline Policy has operated, there have been no new airline licences issued. Consequently, the applicants for new scheduled services have been accommodated within the general aviation sector with the status of 'Commuter Operators'.

The distinction between airline and general aviation operations is clearly revealed in the way that Air Navigation Charges (ANCs), or charges made for the use of facilities, are levied. Airlines

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(1) Conducted by Qantas Airways, Trans-Australia Airlines (TAA), Ansett Airlines of Australia (AAA), Ansett Airlines of New South Wales (AANSW), Ansett Airlines of South Australia (AASA), MacRobertson Miller Airlines (MMA), East-West Airlines (EWA) and Connair.

pay ANC's according to the actual flights made, whereas all other civil aviation operators, who can be grouped as general aviation, pay a single annual charge per aircraft. This charge is based on the size of the aircraft and the use to which it is to be put.

Based on information obtained from the General Aviation Survey 1979 the cost structure of general aviation operators has been analysed. This analysis indicated that average hourly total operating costs (excluding capital charges and depreciation) varied widely depending on the nature of the operator. These costs varied from around $30 to $40 per hour for social and recreational clubs and private operators to over $100 per hour for businesses primarily concerned with general aviation and welfare organisations. However BTE's analysis has indicated that the particular component of these costs represented by Air Navigation Charges (ANCs) is a relatively small proportion of these total operating costs for the majority of operators. While certain marginal operators could be affected markedly by changes in these costs, it would appear that most larger operators are only slightly sensitive to such changes.

Although the analysis of demand for general aviation commuter and charter passenger services presented in this Paper is very limited, the evidence indicates that certain classes of passengers would be highly sensitive to changes in fare structure. These passengers tended to be those who were undertaking discretionary travel (for example leisure travel) using general aviation aircraft. As expected, passengers undertaking non-discretionary travel (for example business travellers) tended to be rather less sensitive to price changes. There was also some evidence that passengers who were not in full-time employment and who travelled comparatively frequently using general aviation aircraft, exhibited a lower sensitivity to price changes.

CHAPTER 1 - INTRODUCTION

ORIGINS AND SCOPE OF STUDY

In November 1978, the Commonwealth Government announced its intention to initiate a study within the Department of Transport (DOT) into the general aviation component of Australian civil aviation. The study was basically intended as a review of the administrative arrangements dealing with general aviation in Australia. The Terms of Reference for the study were announced in May 1979 and covered a broad range of issues which were relevant to a general review of this nature. However, the assistance of the Bureau of Transport Economics (BTE) was requested by DOT in respect of four specific Terms of Reference. The relevant Terms of Reference (together with part of the general preamble) were as follows:

> '... Without limiting the extent of this Review, to establish the functional break-up of general aviation into its sub-sectors, and for each general aviation sub-sector:
>
> - Their (sic) operational characteristics (by, for example, aircraft ownership, aircraft types, usage, use of aerodrome and airways facilities and services);
>
> - As far as is possible, indicators of the social costs and benefits, including welfare aspects, and their distribution within the community;
>
> - The demand for general aviation services and the degree to which this is met;
>
> - Expected future demand under various user charge arrangements up to and including full cost recovery.'

This Paper presents the BTE's analysis in relation to the first of these Terms of Reference[1]. However, because of the nature of the analyses and the information presented, certain aspects of the other three Terms of Reference are also addressed in this Paper, particularly in cases in which the operational characteristics of the industry impact on these other items.

One of the points to emerge most clearly in any analysis of general aviation relates to the complexity of its operations and the diversity of its activities. Given the timescale of this study, it has not been possible for the BTE to carry out an exhaustive quantitative analysis of all the operational and structural characteristics of this component of civil aviation. Rather, the principal aim of this Paper is to cover general aviation in a detailed descriptive fashion, so that further analysis can be performed against the background of a reasonably definitive statement of the nature of general aviation operations in Australia. A further unfortunate but inevitable result of the foreshortened timescale for the study is that there is a degree of unevenness to the depth of analysis relating to particular aspects of general aviation. However, the analyses which have been carried out cover the broad range of operational issues to a general depth believed to be appropriate to an understanding of general aviation as a whole.

DEFINITION OF GENERAL AVIATION

In this BTE study, 'general aviation' is defined to cover all activities directly associated with the operation of Australian civil aircraft, with two exceptions. The first exception relates

(1) A separate BTE Occasional Paper dealing with the other three Terms of Reference in detail will be prepared.

to aircraft primarily used for airline services[1], while the second covers a number of specialised aircraft types[2].

This definition of 'general aviation' is rather more restrictive than the alternative and commonly-applied definition of the 'general aviation industry'. The more common definition includes activities such as provision of spare parts, supplies and services in support of general aviation operations, as well as covering the actual operation of aircraft. These broader activities were not within the scope of the study to be conducted by the BTE.

It is useful to consider the general nature of civil aviation in the context of this definition. Civil aircraft carry out a number of tasks which can be broadly categorised[3] in the following way:

- Operation of scheduled air services for carriage of passengers and freight on a hire-and-reward basis;

- Operation of on-demand charter air services for carriage of passengers and freight on a hire-and-reward basis;

- Operation of aircraft to carry out specific tasks in the air, such as aerial agriculture, flying training, ambulance work, aerial surveys, aerial spotting, police duties, beach patrols, search-and-rescue, test-and-ferry and so on. Most of these services are normally conducted on a hire-and-reward basis;

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(1) While the term 'airline' can refer to all operators of regular public transport services, in this study the term is used to include the operations of aircraft classified only for Regular Public Transport (RPT) operation by an operator holding an airline licence. It is possible for an airline to use aircraft which are classified for other than RPT operation. Any such aircraft would be included in this study.

(2) The types excluded are balloons, gyroplanes, gliders (powered and unpowered) and 'minimum weight aircraft'. The last mentioned are aircraft which have a maximum take-off weight not exceeding 180 kg.

(3) Note that this categorisation is in no way related to the system of classification adopted for regulatory purposes. The latter is quite different, especially in regard to an extremely broad concept of hire-and-reward. This is discussed further in Chapter 2.

- Operation of aircraft which are basically ancillary to the owners' non-aviation business activities. Such operations would not generally be regarded as being conducted on a hire-and-reward basis in the context of this study[1];

- Operation of aircraft for purely private and recreational purposes. Again, these operations are not regarded as being conducted on a hire-and-reward basis.

General aviation, when seen against this categorisation, embraces all of the tasks listed. The involvement of general aviation in operating scheduled air services is a recent development that began officially on 1 July 1967. Prior to that date only airlines holding airline licences[2] were allowed to operate scheduled air services at published fares and freight rates.

When airline services to many smaller population centres were withdrawn in the late 1960's, and also as a result of pressure from charter operators to serve these centres with smaller aircraft types, permission was given to selected charter operators to commence 'commuter' services[3]. These commuter operators now

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(1) This is a particular case of a distinct difference between what would normally be regarded as the situation and what is enshrined in the regulatory system. See Chapter 2.

(2) Issued under ANR 198 to enable the holder to engage in RPT operations specified in ANR 191.

(3) Permission to operate a commuter service is given by means of an exemption under Air Navigation Regulation (ANR) 203, which allows permission to be given to charter licence holders (without being the holder of an airline licence) to provide scheduled services at published rates. It is worth noting that the terms 'commuter airline' and 'commuter service' are commonly used, but have no formal recognition in the regulatory system. This situation is under review as a result of the recent Domestic Air Transport Policy Review (DOT 1978). Despite this lack of formal recognition, the term 'commuter' is used regularly in this Paper to describe scheduled and publicly-available services which are not operated by holders of airline licences.

serve more than twice as many centres as the airlines[1], and their aircraft (in total) fly nearly one-third as many kilometres per annum as airline aircraft. In these senses, commuter services have become a significant part of front-line domestic air transport activity.

There are several other areas of operation where the distinction between airline and general aviation operations is not clear-cut. It has been the practice for some time for certain commuter operators to operate scheduled services on behalf of airlines[2]. More recently, charter operators have been allowed to operate over some airline routes[3]. Some of these are commuter services which are directly competitive with airline services, while others are pure freight operations. Several airlines own aircraft which are not used for airline purposes, and all airlines use their RPT aircraft for purposes other than scheduled carriage of passengers and freight (for example, for training). In this study, all the operations of general aviation aircraft are included and all the operations of aircraft used for airline services are excluded.

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(1) In September 1979, commuter operators served 251 airports whereas the airlines served only 123. It is worth noting that the major domestic interstate airlines (TAA and AAA) served 58 airports at that date. TAA served 47 airports and AAA served 36. 25 airports were served by both.

(2) This occurs under authority of ANR 201, which allows an airline to sub-contract a service to another operator. At September 1979, the only regular service in this category was the Albury-Canberra connection operated by Masling Commuter Services on behalf of TAA. In this context, it is interesting to note that an airline can, with approval, sub-contract a service to a non-airline operator. This means that an airline service can be operated by aircraft which are not classified or maintained to RPT standards. Further, the airline can revert to operating the service itself at any time.

(3) Normally, a charter operator cannot operate more than once in 28 days over a route over which an RPT (that is, airline) service is operating. However, with appropriate approval, ANR 197(2) can be used to exempt a nominated charter operator from the restriction of operating over an airline route only once in 28 days.

Airline aircraft which are not used at all for airline services[1] are included in this study.

The institutional framework for civil aviation in Australia is not the only factor which makes it difficult to define general aviation. The operators[2] of aircraft used for general aviation purposes cover a wide range of socio-economic and occupational categories, and these operators use aircraft for a wide variety of reasons[3]. This structural and operational diversity creates difficulty in analysing general aviation as a whole and on a consistent basis. Some of this diversity of characteristics and operations is explored later.

GROWTH OF GENERAL AVIATION

The growth in general aviation as a whole over the past twenty years or so (and the growth of particular components) can be judged from Tables 1.1 and 1.2. Table 1.1 indicates the number of general aviation aircraft on the Australian aircraft register in each year since 1958. The categories of aircraft shown correspond to classifications used for regulation purposes, and are as defined in the Air Navigation Regulations. The Table shows that in the last twenty years there has been a seven-fold increase in the number of aircraft classified as private. There was a net increase of almost 1500 registrations in this category in the five years to 1979 alone. In the same five-year period, aircraft classified in the charter category experienced a similar though slightly smaller growth rate, while the numbers of aircraft

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(1) This covers the activities of aircraft which are owned by (say) the Australian international carrier Qantas Airways, but which are not classified for RPT operation. This can include aircraft owned for training or other ancillary purposes.

(2) More correctly in the context of this study, the term 'operator' refers to holders of Certificates of Registration (C of R) for general aviation aircraft.

(3) These reasons include some not directly associated with flying activities (such as long-term lease to other operators for investment purposes).

TABLE 1.1 - AIRCRAFT REGISTRATIONS BY CATEGORY[a] - 1958 TO 1979

At 30 June	General Aviation Aircraft				Airline Aircraft	Total Aircraft
	Private	Aerial Work	Charter	Total		
1958[b]	397	365	186	948	152	1 100
1959[b]	437	386	235	1 058	152	1 210
1960[b]	481	381	272	1 134	160	1 294
1961[b]	576	391	304	1 271	168	1 439
1962	667	375	380	1 422	178	1 600
1963	773	383	445	1 601	186	1 787
1964	857	418	462	1 737	199	1 936
1965	968	483	545	1 996	211	2 207
1966	1 077	542	763	2 382	223	2 605
1967	1 141	647	949	2 737	233	2 970
1968	1 204	759	1 168	3 131	225	3 356
1969	1 311	796	1 250	3 357	202	3 559
1970	1 372	811	1 359	3 542	187	3 729
1971	1 489	793	1 327	3 609	185	3 794
1972	1 558	825	1 230	3 613	189	3 802
1973	1 648	853	1 223	3 724	181	3 905
1974	1 831	961	1 159	3 951	157	4 108
1975	2 123	941	1 051	4 115	154	4 269
1976	2 273	970	1 035	4 278	153	4 431
1977	2 540	1 099	1 087	4 726	145	4 871
1978	2 873	1 202	1 175	5 250	136	5 386
1979[c]	3 323	1 290	1 252	5 865	132	5 997

(a) On 16 September 1975, aircraft registered to Papua New Guinea were removed from the Australian Register. Some 205 aircraft were involved. The categories used are as defined in the Air Navigation Regulations. The figures given include specialised aircraft types which (as mentioned earlier) are not included in the remainder of the analysis.

(b) As at 31 December.

(c) BTE estimates. Official figures were not available at the time of preparation of this Paper.

Sources: DOT Annual Reports to 1978. BTE analysis of civil aviation register for 1979.

classified in the aerial work category grew at roughly half the rate of the other general aviation categories shown. This pattern highlights the increasing importance of general aviation (as represented by rapid growth in the private and charter categories). This growth in aircraft inventory has occurred in both urban and rural areas, but it appears that the greatest growth in recent years has occurred in aircraft based in and around urban areas. General growth in civil aviation aircraft registrations is shown in Figure 1.1.

The growth rate of the number of Private Pilot Licences in force is very similar to the growth rate of the number of aircraft classified as private. Table 1.2 shows that the number of Private Pilot Licences issued increased over seven times in the twenty years to 1978. The number of Commercial and Senior Commercial Pilot Licences in force in the corresponding period increased by a factor of nearly five. Overall growth in pilot licences is shown in Figure 1.2.

The statistics presented above take no account of the higher technological level (and hence generally increased productivity) of modern aircraft in relation to those of twenty years ago. Although Table 1.1 shows a greater than five-fold increase in the number of general aviation aircraft registered between 1958 and 1979, the potential transport task capable of being performed by these aircraft would probably have increased by a much greater margin. This general growth in general aviation and its level of activity has in turn required a significant increase in the effort required to administer its operations. The expansion in the past five years, in particular, has been substantial, and has necessitated the present review of general aviation and the procedures used in its administration.

INFORMATION SOURCES

The basic difficulty in analysing operations and activities as diverse as those of general aviation has already been noted.

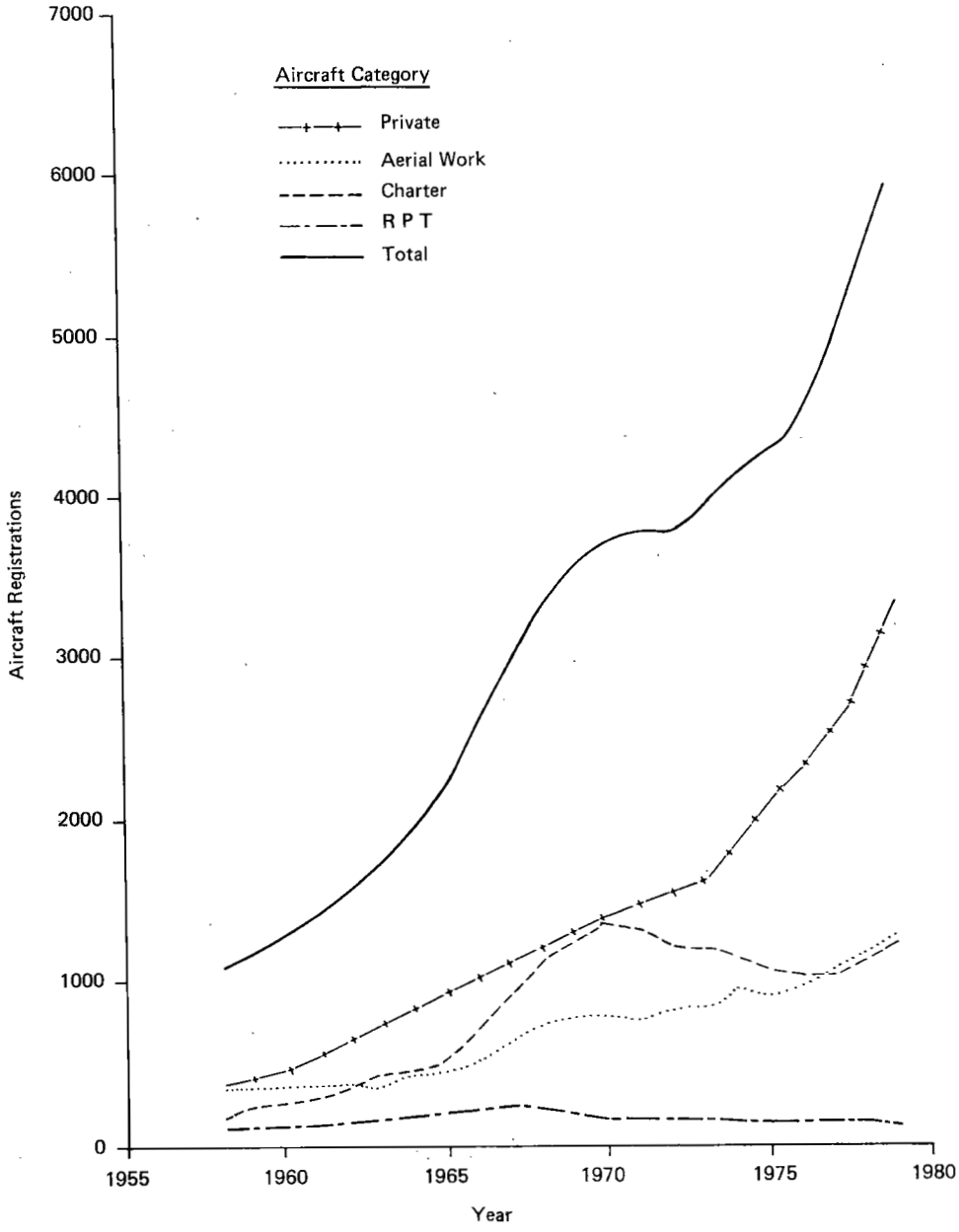

FIGURE 1.1 – CIVIL AVIATION AIRCRAFT REGISTRATIONS – 1958 TO 1979

TABLE 1.2 - PILOT LICENCES IN FORCE BY TYPE[a] - 1958 TO 1979

At 30 June	Aeroplane					Helicopter			
	Student Pilot	Private Pilot	Commercial Pilot	Senior Commercial Pilot	Airline Transport	Student Pilot	Private Pilot	Commercial Pilot	Senior Commercial Pilot
1958	3 489	2 628	845	100	1 045	4	-	18	-
1959	3 461	2 801	910	130	1 041	4	-	17	-
1960	3 696	3 001	948	132	1 036	14	-	30	-
1961	4 151	3 206	973	147	1 130	10	2	34	-
1962	4 433	3 627	1 090	154	1 122	12	2	33	-
1963	4 845	4 066	1 159	176	1 148	15	3	42	-
1964	5 676	4 720	1 263	189	1 273	41	6	53	-
1965	6 907	5 382	1 411	192	1 475	66	6	59	5
1966	8 109	6 365	1 616	192	1 579	92	12	77	6
1967	9 921	7 828	1 938	224	1 657	123	10	127	9
1968	10 401	9 282	2 326	244	1 713	100	10	152	12
1969	10 401	10 204	2 720	438	1 696	111	14	189	10
1970	9 728	11 210	2 960	390	1 737	116	15	236	13
1971	10 196	12 030	3 102	418	1 893	126	15	281	20
1972	9 844	12 738	3 274	498	1 860	119	15	313	24
1973	9 332	12 701	3 251	665	1 788	80	11	245	29
1974	10 813	14 193	3 431	680	1 919	148	11	292	44
1975	12 542	15 312	3 470	671	2 051	173	15	314	52
1976	13 093	14 410	3 441	719	1 954	132	18	254	63
1977	15 808	17 035	3 619	829	2 203	183	30	266	64
1978	17 749	19 107	3 636	973	2 053	233	37	286	52
1979	20 439	21 893	4 007	1 148	2 089	274	38	340	69

(a) Prior to 16 September 1975, licences issued to pilots in Papua New Guinea are included.

Source: DOT Annual Reports.

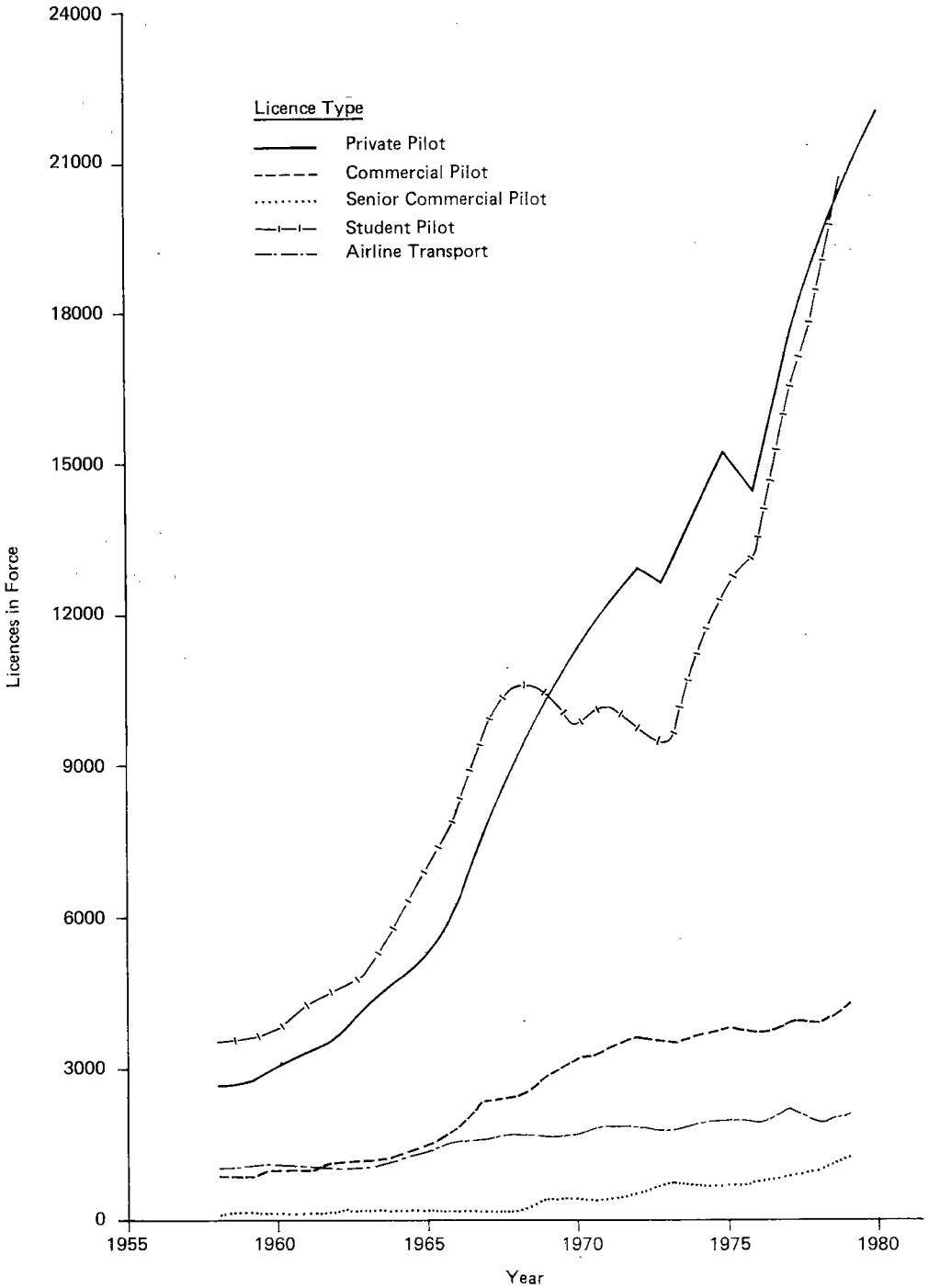

FIGURE 1.2 – PILOT LICENCES IN FORCE – 1958 TO 1979

The problem is compounded when consistent information on the various operations and activities is lacking. In order to carry out this analysis in support of the overall administrative review, a first essential was the requirement to gather comprehensive information on the operational activities of general aviation.

Information on general aviation is nominally available from a number of sources. These include:

- The register of civil aviation aircraft, which gives details of holders of Certificates of Registration (C of R) for aircraft, and which also gives details of the aircraft themselves. The register is maintained by DOT;

- The 'Survey of Hours Flown and Landings - General Aviation', which is conducted regularly at six-monthly interval by DOT;

- The 'Survey of Charter Operations' conducted for each calendar year by DOT;

- Miscellaneous official and unofficial research studies;

- The various Acts, Regulations and Orders associated with State and Federal regulation of civil aviation.

The register of civil aviation aircraft provides a valuable source of data concerning the structure and composition of the various general aviation aircraft fleets. It also gives a valuable key to their geographic location[1]. The register was used extensively by the BTE to analyse the present structure of general aviation.

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(1) At least as far as the addresses of the C of R holders represent the locations of the corresponding aircraft fleets. This was indeed found to be largely the case (see below).

The other statistical data sources mentioned above, although useful in providing time series information, were rather limited in their application to an operational analysis of general aviation. The most serious shortcoming of these data sources for the present requirements was the lack of consistency in gathering operational information and (in particular) serious limitations in regard to the type of information gathered. To proceed with a comprehensive analysis of general aviation it became clear that additional, up-to-date and comprehensive information would be required. To satisfy the Terms of Reference, information was required in the following areas:

- The level of operational flying activity carried out by operators representing all areas of general aviation;

- The characteristics of the types of flying carried out by these operators;

- The cost structure faced by the operators in carrying out flying activities;

- Details of the geographic location and other characteristics of the operators themselves;

- Attitudes of operators to issues involved in general aviation;

- Characteristics of users of the services currently provided by general aviation.

The requirement for the above information caused the BTE to initiate several comprehensive data-gathering exercises at short notice. The principal formal data-gathering exercises consisted of:

- A comprehensive and detailed analysis of the register of civil aviation aircraft;

- A postal survey of all holders[1] of Certificates of Registration for general aviation aircraft as at 30 June 1979, seeking details of the C of R holders themselves, their recent flying activities and the costs associated with carrying out these activities[2]. Details of attitudes to certain issues were canvassed and comments were also sought. This survey was known as the General Aviation Survey 1979;

- A personal contact survey of passengers on commuter and charter services, seeking various details related to the passengers themselves, the flight being undertaken and the travel alternatives which passengers might adopt if the prices of their general aviation flights were to increase. This survey was known as the Survey of General Aviation Passengers 1979.

Details relating to the design and conduct of these two surveys may be found in Appendix I and Appendix II respectively. The aim of the postal survey was to collect up-to-date statistical information on general aviation flying operations. The intention of the passenger survey was to gather some information on the users of general aviation services which are provided on a

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(1) Throughout this Paper, the holders of Certificates of Registration for general aviation aircraft are regarded as the 'operators'. There is a significant degree of leasing of aircraft to other C of R holders and also to people other than C of R holders. However, it was not possible to gather information on a consistent basis from other than the C of R holders, although (where appropriate) the information gathered encompassed the operations of aircraft leased from other holders.

(2) In addition to the postal survey of all C of R holders on the civil aircraft register, a supplementary interview aircraft fleet size exceeded five aircraft, and with a small sample of smaller operators. The total sample size was 113 operators. This survey was primarily designed as an extension to the postal survey to gather additional (and more detailed) financial information on general aviation operations (including some non-flying operations). Information from this survey is not presented in this Paper. This additional financial information is analysed in a separate BTE Occasional Paper.

hire-and-reward basis. Clearly, the commuter and charter passengers represent only one segment of users of these services, but this segment is of considerable economic importance to general aviation, and was amenable to a limited survey technique. The results obtained from this group of users is probably representative of users of general aviation passenger services in the broad.

OUTLINE OF THE PAPER

The aim of this Paper is to review the structural and operational characteristics of general aviation in Australia. These characteristics are clearly influenced (and often determined) by the regulatory environment surrounding general aviation. Some understanding of the regulations governing general aviation is therefore required, and an introductory treatment of the relevant regulations is presented in Chapter 2. This treatment, whilst by no means exhaustive, is sufficient to set the context for the remainder of the Paper.

The register of civil aviation aircraft has already been noted as an important source of information on the structure and distribution of general aviation activities. This register was analysed in considerable detail, and the results of this analysis form the basis for Chapter 3. The information from the register was processed using a geographic zoning and coding system previously devised for processing information obtained from the BTE's National Travel Survey (NTS) (Aplin and Hirsch 1978). This allowed a significant geographic analysis to be carried out in relation to the distribution and organisation of general aviation. Chapter 3 also contains a number of other analyses of factors relating to general aviation. These include an analysis of ownership of general aviation aircraft and some preliminary attempts to define geographic 'remoteness' in respect of general aviation services.[1]

(1) The analysis of remoteness was included at the additional request of DOT officers, and does not specifically relate to the other Terms of Reference.

Information on the nature and level of the flying activities undertaken in general aviation is presented in Chapter 4. That Chapter contains principal results of the General Aviation Survey 1979. The flying activities within general aviation are analysed both by category and by geographic distribution, and are related to various regional characteristics. Chapter 4 also analyses the employment structure related to the flying operations of general aviation.

Again using data from the General Aviation Survey 1979, an analysis of the investment levels of operators in general aviation aircraft, together with a study of the cost structure facing these operators, are presented in Chapter 5. To set these aspects in perspective, Chapter 5 also provides a brief outline of the present cost recovery principles employed in the aviation industry generally, together with an outline of the impact of these principles on general aviation. Various cost-estimation relationships are developed for different categories of operator costs, and a factual assessment of the likely relative effects of a number of cost structure variations on the distribution of resulting cost increases is also performed.

The Terms of Reference for the overall DOT review allude to the characteristics of future demand for general aviation services. Chapter 6 examines the characteristics of one segment of users of general aviation - passengers on charter and commuter services. The information in Chapter 6 is principally based on the results of the Survey of General Aviation Passengers 1979, and details the personal and travel characteristics of passengers surveyed at several airports in Sydney and Melbourne. The application of the survey results to questions of passenger demand for general aviation services is also examined in Chapter 6.

Chapter 7 concludes the main body of the Paper by drawing together the various issues and characteristics raised in the preceding Chapters.

A number of Appendices are also included and contain additional details related to particular aspects of the overall study. Appendix I and Appendix II have already been mentioned. These discuss the design and conduct of the two surveys carried out in support of this study. Appendix III contains an analysis of the comments volunteered by operators responding to the General Aviation Survey 1979. These comments are regarded as a valuable indicator of the feelings and opinions of persons and organisations carrying out general aviation flying activities, and as such were considered worthy of reporting. Appendix III also covers results of some of the attitudinal questions asked in the survey. Appendix IV presents a detailed analysis of the characteristics of certain trip distribution information obtained from the General Aviation Survey 1979. Appendix V contains a broad examination of the concept of regional 'remoteness' from significant centres of population, and explores the application of mathematical techniques to examine the relationship between location and degree of remoteness. Finally, Appendix VI gives details of the regional system used elsewhere in the Paper.

CHAPTER 2 - THE REGULATORY ENVIRONMENT

Air transport regulation in Australia, as in many other countries, is an extremely complex subject. This complexity is compounded by current pressures for change in the regulatory environment. In this Chapter, the aim is to discuss the place of general aviation within the overall regulatory system, and to identify key regulatory mechanisms in their application to general aviation.

ORIGINS OF REGULATION

Civil aviation in Australia has been regulated since 1920. In that year, Australia became party to the Paris Convention of 1919, which was intended to have world-wide application to civil aviation[1]. In the same year, Commonwealth legislation[2] was enacted after the States had agreed at the 1920 Premiers' Conference to refer control of air navigation to the Commonwealth Government. However, only Tasmania actually transferred this power. Early Commonwealth regulation related principally to technical matters, but economic regulation started to appear in some of the attempts to introduce (through subsidies and operator licensing) a degree of regularity to higher-level operations (particularly airlines). This trend developed through the 1920's and early 1930's, in line with the general development of air transport.

In 1936, following litigation[3], the High Court held that the Commonwealth could control air navigation insofar as it was part of interstate trade and commerce, but that it had no power to control all air navigation within Australia. As a result, Commonwealth Government regulations were amended so that they no

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(1) Detailed accounts of the beginnings of Australian civil aviation are included in Hocking and Haddon-Cave (1951), and Goodrich (1960).

(2) Air Navigation Act 1920 (as amended) and Air Navigation Regulations (as amended) made under this Act.

(3) R v Burgess, ex parte Henry 55 CLR. It is interesting that this major Constitutional interpretation resulted from a fairly minor technical infringement. See Hocking and Haddon-Cave (1951).

longer purported to cover intrastate air navigation, except to the limited extent recommended by the Paris Convention. The amended regulations were upheld by the High Court.

After an unsuccessful attempt in 1937 to amend the Constitution to give the Commonwealth Government power to make laws with respect to air navigation and aircraft, an Aviation Conference of Commonwealth and State Ministers was held. At this Conference, it was agreed that the States should enact uniform State Air Navigation Acts adopting Commonwealth ANRs as State Law. This was done, but it meant that overall Commonwealth responsibility was dependent on State support.

ECONOMIC REGULATION

Prior to 1940, the Commonwealth Government was able to exert considerable economic control over the civil aviation industry by means of subsidy payments. However, with the introduction of efficient (for the times) metal monoplanes (like the Douglas DC3) it was possible for airlines to operate unsubsidised services over the major routes. The Commonwealth Government announced in 1940 that the ANRs were to be amended to impose additional conditions for the issue of an Airline Licence. These conditions went well beyond safety requirements. This situation was enshrined in a new sub-regulation 79(3), which specified that:

> '... the Director-General (of Civil Aviation) may issue an (Airline) Licence upon such conditions in addition to compliance with these Regulations as the Director-General considers necessary, or he may refuse to issue a licence[1]'.

After this amendment of ANR 79 in 1940, it became Commonwealth Government policy to use its licensing power to prevent, as far

(1) Introduced in Statutory Rule 1940, No 25. This regulation does not appear in the current regulations, which were introduced in 1947.

as practicable, rival companies from competing over the same routes.

In 1945, the Commonwealth introduced legislation to nationalise interstate air services, but this action was successfully challenged in the High Court. The Commonwealth then passed legislation[1] to set up its own airline (later named Trans-Australia Airlines). A legal challenge to this legislation resulted in the High Court determining that the Commonwealth's licensing power in respect of an interstate service under regulation 79 was limited to safety considerations only. This limitation was in addition to the earlier High Court decisions which limited Commonwealth Government regulation in respect to intrastate services.

In the post-war period, interstate air services were operated by TAA, Australian National Airways (ANA)[2] and Ansett Airways[3]. By the early 1950s, the larger of the private airlines, ANA, was encountering financial difficulties. As a result of this, the Commonwealth (in 1952) passed the first legislation which had the intention of allowing only two operators of interstate air services in Australia[4]. Ansett Transport Industries acquired ANA in 1957, and entered into an agreement with the Commonwealth Government and TAA[5] to extend the 1952 route rationalisation provisions to cover all existing and future interstate competitive routes.

A year later, further legislation[6] was introduced which firmly established the 'Two-Airline Policy', which is now an integral

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(1) Australian National Airlines Act 1945.
(2) Not to be confused with the Australian National Airlines Commission (which trades as TAA).
(3) Butler Air Transport also later commenced intercapital services.
(4) Civil Aviation Agreement Act 1952.
(5) Civil Aviation Agreement Act 1957.
(6) Airlines Equipment Act 1958.

part of the Australian airline scene[1]. Basically, this legislation codified the situation regarding the two interstate airlines by imposing controls on the equipment which they could procure. Further discussion of the economic implications of this legislation is given in BTE (1978). In addition, provisions of Customs regulations, which require the Secretary to the Department of Transport to approve all aircraft imports, effectively ensure that airline aircraft are imported only by airlines. Traditionally, this power has been exercised very strongly, and has in many ways formed the practical demarcation line between airlines and general aviation.

The relative roles of the Commonwealth and the States in controlling air transport were not resolved until 1965 when, following litigation, the High Court held that Commonwealth Law was concerned with safety, regularity and efficiency of air navigation. It should be emphasised that in this context the terms 'regularity' and 'efficiency' refer to the viability and reliability of the service in a technical rather than an economic sense. Thus, all regulations having a safety orientation (such as registration of aircraft and licensing of pilots) are part of the Commonwealth responsibility. State responsibilities were determined in 1965 to relate to matters such as public transport needs and the suitability and fitness of the operator. Thus, a State Government has the power to determine which operators shall undertake civil aviation operations within its State borders.

AIR SERVICE LICENSING

In many senses, all air transport service licensing arrangements in Australia function under the shadow of the Two-Airline Policy.

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(1) A fuller historical account of commercial and governmental changes in the RPT situation is given by Brogden (1968). The further views expressed by Richardson and Poulton (1968) should be read in conjunction with Brogden's analysis.

At the Commonwealth level, licences are issued to operators in a number of categories. These are as follows[1]:

- Airline (RPT) Licences - these cover operations over a particular route using specified approved aircraft types. Basically, an Airline Licence covers only one route (an 'airline route'). However, Airline Licences for a number of routes may be consolidated for administrative convenience;

- Charter Licences - these cover on-demand (as opposed to regular) remunerative services involving carriage of passengers or freight;

- Aerial Work Licences - these cover basically remunerative services other than those defined in the charter and airline categories.

Air Service Licences are issued by Commonwealth authorities when they are satisfied that the applicant can meet the requirements and conditions pertaining to the issue of an air service licence as specified in ANRs. A major consideration in granting air service licences is that the operation's aircraft, maintenance and crew meet the required standards.

In most States, licences are necessary for the operation of intrastate airline[2] services, commuter[2] services and on-demand charter operations. Where State licences are required[3] the Commonwealth licence is usually issued only after the relevant State licence has been granted.

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(1) More detailed descriptions of the activities permitted under various licence categories are given later, in the context of use of aircraft in support of these activities.

(2) In this study, the term 'airline' is used to refer to RPT services only. Scheduled operations undertaken by firms which hold Charter Licences are termed 'commuter' services. See Chapter 1 for further information.

(3) All States except Victoria and South Australia currently issue licences for scheduled operations within their borders.

It should be noted that Commonwealth and State licences are issued to permit an operator to provide a service, and in some senses are independent of the aircraft and pilot requirements. This is an important distinction, and basically provides the line of demarcation between economic and technical regulation.

ELEMENTS OF TECHNICAL AND ADMINISTRATIVE REGULATION

Technical and administrative regulation of air transport equipment, operators and operations in Australia is primarily under Commonwealth Government control. During the last half-century or so, there have been enormous developments in air transport, and these have imposed considerable strains on this part of the regulatory system. These strains have been exhibited in an increasingly complex and comprehensive set of regulations regarding air transport. While these regulations are extremely complex in their own right, the fact that they are also used to bolster the limited Commonwealth power in the economic regulation area has added further complication. These problems are compounded by the necessity to administer the regulations in an efficient way, which often leads to apparent differences between the spirit and letter of regulations and the way in which they are applied in practice[1].

As a general outline of the situation, operators of aircraft in Australia must comply with a variety of Commonwealth Government regulations which have safety of operation as their principal

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(1) A very good example of this is in the combined administration of aircraft registration, Air Navigation Charges and (to an extent) air service licensing. In a formal regulatory sense, these are quite separate issues. There is further discussion of this point throughout this Paper, since it makes it very difficult to clearly define general aviation.

objective[1]. Progressive developments of ANRs in the technical and administrative arena have lead to a system which comprises the following basic elements:

- All aircraft manufactured in Australia must have a current Australian Certificates of Type Approval;

- All operating aircraft must be covered by current Australian Certificates of Airworthiness (C of A);

- All operating aircraft must be covered by current Australian Certificates of Registration (C of R)[2];

- All operating aircraft must be identified as being 'classified' for a particular category of operations, and payment of Air Navigation Charges (ANCs) appropriate to that category must be made. It should be observed that this process is often incorrectly referred to as 'registration to' a particular category. In fact, registration is a quite separate process in terms of the ANRs. Theoretically, an aircraft may be registered regardless of the purpose to which it is to be put. Similarly, requirements allow that an operator may receive an Air Service Licence in a specific category (aerial work, charter or RPT) without reference to the particular aircraft involved. Aircraft are then classified for use in respect of a particular licence, and attract ANCs accordingly. In practice, administration of this process follows a quite different path:

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(1) Aircraft for which suitable overseas certification, registration and other formalities are in effect may also be allowed to operate in Australia. However, these aircraft are basically excluded from the description of regulation given here. Some other exceptions are noted in appropriate parts of the text.

(2) Except for some balloons, gyroplanes and powered gliders, and all unpowered gliders and minimum weight aircraft.

- Flight crews must hold appropriate pilot or engineer licences;

- Airports must be constructed to standards which meet requirements for licensed aerodromes or authorised landing areas (ALAs) in respect of specified aircraft types;

- Flights must be undertaken in accordance with technical and operational procedures and standards laid down by the authorities;

- Certain principal city airports are not likely to be available to the general aviation operator unless he arrives and departs at off-peak times;

- All operating aircraft must be maintained by Licensed Aircraft Maintenance Engineers (LAMEs).

AIRCRAFT CERTIFICATION AND REGISTRATION

Aircraft operating in Australia must be registered[1]. As mentioned earlier, aircraft registered overseas may be allowed to operate in Australia. However, not all aircraft registered in other countries are eligible for Australian certification.

There are actually three certificates required before an aircraft is eligible for Australian registration. These are, in sequence:

- A Certificate of Type Approval (for Australian manufactured aircraft only). This indicates that the aircraft type meets DOT design standards, which are devised to ensure that the aircraft can be flown with safety in normal operations;

- A Certificate of Airworthiness (C of A). This is granted when

(1) All minimum weight aircraft and some gyroplanes, balloons and powered gliders are not required to be registered.

the Australian authorities[1] are satisfied that the particular aircraft is fit to fly;

- A Certificate of Registration (C of R). This indicates that the aircraft has been entered in the Australian register and granted a unique Australian identification, which has to be visible on the aircraft at all times.

All imports of aircraft, including airline aircraft, have to be approved by the Secretary to the Department of Transport. This power, exercised under the Customs (Prohibited Imports) Act, is used to prevent general aviation operators from obtaining larger aircraft which are competitive with types used by the airlines[2]. In practical terms, these would include, for example, the Fokker F27 Friendship, Fokker F28 Fellowship, Boeing 727, McDonnell-Douglas DC9 and Armstrong-Whitworth Argosy.

USE OF AIRCRAFT FOR PARTICULAR TYPES OF OPERATION

The various types of operation which can be carried out by Australian-registered aircraft are set out in ANR 191 and fall within four operational categories. These categories are 'private', 'aerial work', 'charter' and RPT[3]. Basically, an aircraft falls into a particular operational category by virtue of being cleared for use by an operator who holds an Air Service Licence

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(1) In formal terms, the Secretary to the Department of Transport.

(2) The Domestic Air Transport Policy Review (DOT 1978) noted that increasing numbers of aircraft above the limit of 5700 kg and suitable for local or commuter air services are becoming available. It considered that importation and operation of these would be unlikely to prejudice the Two-Airline Policy. Accordingly, it recommended that the import restriction should be relaxed to apply only in respect of aircraft having a certified capacity of more than 30 passengers or a maximum payload in excess of 3500 kg. Several exceptions were recommended, including permission for charter licence holders to import replacement aircraft of an equivalent type to those which they currently operated.

(3) ANCs are levied on the basis of the category of operation to which aircraft are classified.

for that category of operation. The exception is that aircraft operated by a person not holding an Air Service Licence of any kind fall, by default, into the private category. As mentioned earlier, RPT operations are excluded from this analysis, leaving three operational categories within general aviation. Aircraft classified in the charter category can also perform activities which are basically within the private class of operation. Similarly, an aircraft classified for aerial work can perform private operations, but cannot perform charter operations.

Charter Operations

Within this sytem, it is useful to consider first the additional privileges granted by the charter class of operation. These basically cover carriage of paying passengers and freight. The ANRs define charter operations to include on-demand[1] movements of passengers and freight on a hire-and-reward basis. This category also includes operations on a scheduled basis where such operations are not available for use by members of the public[2]. Charter flights cannot be performed by an individual operator over an airline route[3] more than once every 28 days, unless the operator is authorised to do so by the Secretary to the Department of Transport.

Aerial Work Operations

Classification to the aerial work category basically covers operations which are performed on a hire-and-reward basis, but excludes those operations which are defined to be in the charter category. Some operations of an aerial work nature may be

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(1) That is, movements which are not operated on a fixed schedule, to or from fixed bases.

(2) Examples of this are found in regular charter flights to holiday resorts, where the service provided is part of an overall holiday package and is not available for separate purchase.

(3) An 'airline route' is a route for which an Airline Licence has been granted to an operator.

conducted as private operations, as long as they are performed in respect of the operator's own property[1] or are not performed for remuneration. The types of operations included in the aerial work class of operation in ANR 191 are as follows:

- Aerial survey;
- Aerial spotting (for remuneration);
- Agricultural operations (other than over the operator's own land);
- Aerial photography (for remuneration);
- Advertising;
- Flying training;
- Ambulance functions;
- Carriage, for purpose of trade, of goods which are the property of the pilot, the owner or the hirer of the aircraft[1].

Private Operations

The private category of operations basically allows an aircraft to be used for the personal transport of the owner. ANR 191 lists the following examples of private operations:

- Personal transport of the owner of the aircraft[2];
- Aerial spotting (without remuneration);
- Agricultural operations on land occupied by the owner of the aircraft;
- Aerial photography (without remuneration);
- Carriage of persons or goods without a charge being made;
- Carriage of goods other than for the purposes of trade;
- Conversion training for the purpose of endorsement of an additional type or category of aircraft in a pilot licence;
- Any other substantially private operation.

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(1) With the proviso that the goods are not being carried to fixed schedules between fixed terminals.
(2) It is interesting that the specific reference is to the owner. The implications for hiring and leasing are unclear.

Commuter Operations

Although not specifically mentioned as an operational category in the ANRs, commuter operations now have to be considered as a separate category for practical purposes. Some general aviation operators with Charter Licences have been officially recognised as providers of scheduled commuter (or 'third-level') services[1] since 1 July 1967. At that time, airlines had withdrawn many Douglas DC3 services from smaller country centres because they were no longer profitable. Firms with charter licences sought to take over these routes using smaller aircraft more suited to the levels of traffic. Because their aircraft were smaller, they also had the potential to serve many centres with airports too small to accommodate DC3's.

The intitial commuter services begun in 1967 were mostly over routes which had been vacated by the airlines. The Domestic Air Transport Policy Review (DOT 1978) has noted the need for formal recognition of commuter services by introduction of an appropriate licence under the ANRs, rather than by exemption. It observed that such services are generally operated by smaller aircraft than those used by the airlines. Furthermore, the former are certified and operated to different standards. The Review recommended that ANR 198 be amended to provide (in addition to the present Airline Licence) a Supplementary Airline Licence to cover commuter-type services. The Review also recommended that (after the new licence was initiated), ANR 203 should be amended to limit its use to exceptional circumstances. Since completion of the Review, some commuter services have been allowed to operate over airline routes to supplement the airline services presently being provided.

Most commuter flights use multi-engined aircraft which can be

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(1) Normally, a charter licence does not bestow permission to operate on a scheduled basis. See above.

flown by a single pilot[1] holding a Commercial Pilot Licence. Commuter airline operations are conducted to higher operational standards than normal charter operations.

General Terminology

It is realised that the system of licensing aircraft operations is complex, and is difficult to cover in a Paper of this kind. In particular, the nexus between aircraft registration, operator licensing and aircraft operational classification is difficult to follow. In this Paper, any confusion is obviated by use of terms such as 'aircraft cleared for charter operations' and 'aircraft in the charter category'. In each of these two examples, the implication is that an operator has an Air Service Licence for charter work, and that the particular aircraft referred to is being used in conjunction with that licence. A further implication is that the aircraft would be subject to ANCs at the charter scale.

AIR NAVIGATION CHARGES

Air Navigation Charges (ANCs) were introduced in 1947[2] to cover the use of airports, air route and airways facilities, meteorological services and search-and-rescue services maintained by the Commonwealth Government. General aviation aircraft owners are required to pay an annual ANC whilst their aircraft are registered. The charge varies according to the aircraft's operational category (private, aerial work or charter) and its maximum take-off weight. Aircraft engaged in aerial work operations pay twice as much as comparable aircraft in the private category. Aircraft in the charter category attract ANCs two-and-a-half

(1) Two pilots are also required for jet and four-engined aircraft. One of these pilots must hold a Senior Commercial Pilot Licence.

(2) ANCs are levied under a cost recovery policy. This policy is discussed in some detail in Chapter 5, which also covers the current levels of charges involved.

times as high as comparable private aircraft. Aircraft in a higher-level category can perform lower-level functions[1], but the converse is not permitted unless the aircraft is transferred to the higher category.

A reduction of 50 per cent of the annual air navigation charge is granted where the aircraft owner signs a statutory declaration that the aircraft was not ordinarily kept at a Commonwealth-owned or Commonwealth-assisted aerodrome, and that less than half of its flights were operated to or from such an aerodrome.

FLIGHT CREW STANDARDS

The ANRs state that an aircraft may be flown only by a pilot assigned for duty in the aircraft or by an appropriately licenced and endorsed pilot or by a student pilot acting under the supervision of a flight instructor. A number of licence categories exist, and the higher categories generally require greater flying proficiency, aeronautical knowledge and experience.

The Student Pilot Licence is the initial category of licence. It allows flying training to be undertaken either with an instructor or solo, under the supervision of an instructor. Solo flights are restricted to a training area adjacent to or accessible from the home airport[2].

Satisfactory completion of the flight training syllabus, written examinations, medical tests and a flight test entitles an applicant to receive a Private Pilot Licence. An area restriction[3]

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(1) A reduction in charges applies if the aircraft is engaged in operations of a lower category for a period of at least three months.

(2) A student pilot undergoing full-time commercial pilot training at an approved flying school is not subject to flight area limitations for flights which are in accordance with the approved syllabus.

(3) The same as that applying to Student Pilot Licence holders.

appears as a condition of the licence and can be removed on satisfactory completion of a further syllabus of flying training and written examinations. This results in what is usually known as an 'Unrestricted Private Pilot Licence'[1].

A pilot cannot undertake aerial work or charter operations unless he has a Commercial Pilot Licence. The main requirement of an applicant for this licence is that he demonstrate sufficient aeronautical experience - this requires satisfactory completion of a flight training syllabus[2]. Holders of commercial and higher category licences who are aged 60 years and over, engaged in single pilot operations carrying paying passengers, are required to pass a flight test annually (or, every six months over 65 years of age).

The highest category of pilot licence normally held by pilots in general aviation is the Senior Commercial Pilot Licence[3], which entitles the holder to act in command of an aircraft having a take-off weight in excess of 5700 kg. This category of licence is also required for any aircraft flown on charter operations outside Australia and for certain commuter operations. This type of licence requires substantial theoretical aeronautical knowledge and flight experience.

It is important to note that at all levels the pilot's licence is really only a basic qualification. Endorsements can be inserted

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(1) In fact, several flight constraints still apply. For example, a holder of a Private or higher category licence is not allowed to carry passengers unless he has performed three take-offs and three landings during the previous 90 days and night operations require recent night experience.

(2) Alternatively, an applicant without a Private Pilot Licence can qualify directly for a Commercial Pilot Licence by completing a full-time course at an integrated commercial flying school.

(3) Two higher-category licences - the first and second class Airline Transport Pilot Licences - are normally only held by pilots engaged in RPT operations. Discussion of these is outside the scope of this Paper.

on the licence, some of which are described as 'ratings'. Some of the more common endorsements are listed below:

- Aircraft-type endorsement (for multi-engined aircraft and all aircraft over 5700 kg);
- Aircraft group endorsement (for single engined aircraft below 5700 kg);
- Instrument Ratings (Classes 1, 3, 4, 5);
- Agricultural Rating (Classes 1, 2);
- Flight Instructor Rating (Classes A, B, C).

The aircraft-type endorsement (or sometimes 'group' endorsement) indicates those aircraft types (or groups of aircraft types) for which the pilot has adequate training[1]. In the case of aircraft exceeding 5700 kg maximum take-off weight, there are two classes of endorsement - a Class 2 endorsement of this type allows the holder to act only as co-pilot.

General aviation pilots can also achieve proficiency in instrument and night flying, and this enables them to fly with greater regularity. These qualifications are again progressive, with the main requirement for higher gradings of Instrument Ratings being experience. The first qualification (Class 4 rating) allows a pilot to conduct cross country flights at night in VMC. The highest instrument classification (Class 1 and Class 3 Rating) permit operations in IMC, and require high levels of skill, knowledge and experience. A Class 3 rating has wider tolerances. There is no longer a Class 2 rating. A Class 5 rating simply authorises agricultural operations at night.

Most general aviation pilots hold an Unrestricted Private Pilot Licence, with smaller numbers holding Commercial Pilot Licences.

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(1) He is expected to know the operating limitations of these aircraft and be able to perform all normal and emergency flight manoeuvres. Only particular types of aircraft (rather than groups) can be endorsed on a Student Pilot Licence.

Those pilots who have occasion to fly over or through cloud have instrument ratings as well.

Jet aircraft (and propeller-driven aircraft in excess of 5700 kg take-off weight) require two flight crew members.

Details of the various types of licences and endorsements are summarised out in Table 2.1.

AERODROMES AND LANDING GROUNDS

Aeroplanes in Australia are permitted to land only at licenced aerodromes and authorised landing areas (ALAs). Helicopters are restricted to operations at government or licenced helipads and authorised helipads.

Licensed aerodromes are constructed to higher standards than ALAs. Licensed aerodromes range from principal city airports (with several long runways of high pavement strength and associated taxi-ways and terminal facilities) to inexpensive outback strips of natural surface with the extremities of the strips marked out against the surrounding countryside. Details of the characteristics and limitations of all licenced aerodromes in Australia are published by DOT[1], with amendments published in NOTAMs[2] when required. Some aerodromes have hangars owned by the Commonwealth Government which are available for hire. These are in two categories:

- Category A hangars are leased to such organisations as airlines and aero clubs;

- Category B hangars remain under the direct control of the Commonwealth, and charges are payable for aircraft housed in them.

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(1) In the Aeronautical Information Publication: Aerodromes and Ground Aids (DOT 1976).
(2) DOT Notices to Airmen.

TABLE 2.1 - GENERAL AVIATION PILOT LICENCES AND RATINGS

Licence/Rating	Pre-requisite[a]	Privileges and Limitations
Student	None.	Flight training within certain areas. Restrictions on solo and night flights.
Private	Student Licence; pass theoretical and practical flight syllabus.	Flights restricted to certain areas[b]; private purposes only.
Commercial	Private Licence[c]; pass theoretical and practical flight syllabus; minimum 165 hours flight experience.	Private, aerial work and domestic charters; aircraft generally less than 5700 kg all-up weight; special provision for pilots aged over 60.
Senior Commercial	Commercial Licence; pass substantial theoretical and practical knowledge syllabus; minimum 1000 hours flight experience.	Private, aerial work and all charters. Aircraft can be heavier than 5700 kg; special provisions for pilots aged over 60.
Instrument Rating (Class 1, 3, 4, 5)	Appropriate pilot licence; pass theory syllabus and/or flight proficiency test.	Depending on rating - permits day and night flight under visual and/or instrument flight rules[d].
Agricultural Pilot Rating (Class 1, 2)	Commercial or Senior Commercial Licence with sufficient experience; pass theory and flight proficiency test.	Agricultural operations.
Flight Instructor Rating (Grades A, B, C)	Commercial or higher licence; pass flight syllabus; various levels of flight and instruction experience.	Conduct flight training.

(a) All pilot licences are issued only after a satisfactory medical examination.

(b) Area restriction can be removed on completion of a further flight training syllabus.

(c) Possession of Private Pilot Licence is not necessary if undertaking full-time course through a flying school with an Integrated Commercial School Rating.

(d) Rating is endorsed for particular radio navigational aids for which the pilot has qualified.

Source: DOT Air Navigation Orders.

If an aerodrome is not owned by the Commonwealth Government, a landing fee may be levied by the owner. In August 1978, there were 56 aerodromes in this category, mostly owned by local governments. At some aerodromes, charges are levied on all aircraft. In other cases, charges are levied only on airline aircraft and (occasionally) charter or aerial work aircraft. Some charges take the form of a 'head tax' on passengers[1], while others are based on the size of the aircraft.

ALAs are private strips mostly located near homesteads on farm properties. They must be constructed to standards determined by DOT. ALAs are not available for use by persons other than those approved by the owners, and details of their locations are not published. Temporary ALAs are established for cropdusting operations as required.

Aircraft operating commuter services are allowed to use principal capital city airports[2]. However, at peak times, other general aviation aircraft may not be permitted.

FLIGHT OPERATIONS

A considerable body of regulation covers flight operation. Before a flight can commence, it is necessary to ascertain that:

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(1) As at June 1979 the aerodromes at which a charge was payable by passengers on general aviation aircraft included the following: Armidale ($0.60), Bathurst ($1.01), Cowra ($0.70), Glen Innes ($1.00), Grafton ($1.62), Kempsey ($0.88), Kununurra ($1.00), Nhulunbuy (Gove) ($2.00), Orange ($1.02), Parkes ($0.78), Proserpine ($2.00) and Taree ($1.07).

(2) At Melbourne, commuter services operate from Essendon Airport and Melbourne (Tullamarine) Airport. Commuter or charter services may use Melbourne Airport where they have arrangements with an airline for transfer of passengers and freight to or from airline services. Other charter and private operators may use the airport, subject to air traffic control priorities.

- The aircraft to be used is safe for flight and of a type which can land at the airport of destination;

- The aircraft can carry enough fuel to reach both the destination and a suitable alternative airfield if necessary;

- The aircraft is equipped with the necessary instruments to operate the flight as planned;

- The pilot is licensed to undertake the flight as planned.

Only a part of Australia's airspace is controlled by the Air Traffic Control service. Generally speaking, controlled airspace along major routes is that above a certain altitude - usually 3300 metres (10 000 feet) - and hence is usually available only to pressurised aircraft. In the vicinity of major airports, the controlled airspace zones extend to ground level. No aircraft shall enter controlled airspace without an air traffic clearance. A significant number of flights in controlled airspace are conducted under Instrument Flight Rules (IFR). Details of the principal investigation aids used in IFR flight are set out in Table 2.2.

Most general aviation flights in Australia are conducted under Visual Flight Rules (VFR). A flight which commences under VFR can be changed to IFR provided that the pilot has the necessary instrument rating and the aircraft is appropriately equipped for IFR flight.

There are several different ways in which VFR flights can be conducted. Where controlled airports exist at either the origin or the destination, it is necessary to lodge a flight plan covering the route intended to be flown. The pilot may choose to adopt a full reporting procedure, in which he confirms by radio his arrival overhead at a number of pre-determined points en route. Failure to report within two minutes of the planned reporting time initiates an alert phase and (if reporting does

TABLE 2.2 - AIDS PROVIDED FOR FLIGHTS UNDER INSTRUMENT FLIGHT RULES (IFR) CONDITIONS

Abbreviation	Full Name	Details
NDB	Non-Directional Beacon	A ground-based signal source which can be received by aircraft equipped with ADF (see below).
VAR	Visual Aural Range	A ground-based installation which lays out four tracks along which aircraft can track if equipped with VAR receivers. Only a few VAR's remain, as they have been superseded by VOR.
VOR	VHF Omnidirectional Range	A ground-based installation which lays out 360 radial tracks at 1^{o} intervals. Aircraft equipped with VOR receivers and appropriate instrumentation can fly along any nominated track.
DME	Distance Measuring Equipment	A ground-based installation which returns signals from aircraft. Receipt of the returned signal is read in an instrument which shows distance between the aircraft and the ground installation.
ILS	Instrument Landing System	A ground-based installation which lays out a glide slope and centerline from the end of a runway. An aircraft can proceed down the glide slope by holding its position relative to horizontal and vertical signal transmissions.
ADF	Automatic Direction Finding	An airborne radio compass which can be tuned to any NDB or MF signal source to indicate the direction of the station relative to the aircraft.

not follow) a search is organised for the aircraft by other aircraft in the vicinity. More experienced pilots often prefer not to use the full reporting procedures, but instead give the estimated time that search action should be initiated. Only failure to report final arrival initiates a search.

Recently, some administrative changes have occurred because of the increasing number of aircraft. Where airports at the origin and the destination of a flight are not controlled, and where the flight does not impinge on controlled airspace, a flight is allowed without a flight plan first being lodged. All that is required is a radio transmission to the nearest Air Traffic Control centre at the time of departure, giving an estimated time of arrival, and another transmission advising that the flight has been successfully completed. At secondary airports[1] in the State capital cities, it is also now possible to undertake flights without flight plans having first been submitted.

Regulations Governing Night Flying

Generally, only pilots holding an instrument rating are permitted to fly by night. Most night flights are conducted under IFR but certain flights are permitted at night in VMC. Unrated[2] pilots cannot take-off before first light and are required to reach their destination ten minutes before last light.

There are curfew restrictions on the operation of jet aircraft at Sydney (Kingsford-Smith), Brisbane and Adelaide Airports between the hours of 11pm and 6am. Turboprop and some small jet aircraft are exempted but have operating restrictions placed on them as an element of their exemption. This restriction affects many airline aircraft, although there are increasing numbers of

(1) For example, Bankstown Airport in Sydney.
(2) Unrated pilots may engage in night circuit training operations under the supervision of an appropriately qualified flight instructor.

general aviation jet aircraft which are not affected because they have passed the necessary noise tests.

MAINTENANCE OF AIRCRAFT

Strict procedures apply to the maintenance of aircraft in accord with a policy of part replacement before failure is likely to occur. Considerable attention is given to engine maintenance, with requirements that work should be done according to an approved maintenance program at specified intervals. After the expiry of a pre-determined number of hours of engine operation, major overhauls are required. Similarly, airframe inspections are necessary when a specified number of flying hours or landings have been reached.

DOT approval is necessary for all aircraft component and aircraft material modifications and, unless otherwise approved, new components must be used in repairs or maintenance(1).

After maintenance or repairs have been carried out, an authorised person (usually a LAME) must sign a Maintenance Release to certify that the aircraft is ready for the next flight or series of flights.

MAINTENANCE OF AIRPORTS

All licenced aerodromes are inspected at regular intervals, with additional inspections if conditions such as abnormally heavy rainfall (which could result in accelerated deterioration of runway surfaces) occur. Aerodromes can also be restricted because of deterioration, e.g. runway length reduced. Aerodromes are subject to inspection by the licensee and not normally by DOT. It is therefore, the licensee that effects the repairs and opens the aerodromes.

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(1) It should be noted that all maintenance work is subject to inspection by airworthiness officials at any time.

The responsibility for safe operation into an ALA rests with pilots. The owner of the ALA simply gives his permission and in so doing does not necessarily guarantee that the landing area meets the requirements.

CHAPTER 3 - BASIC CHARACTERISTICS OF GENERAL AVIATION

The conceptual boundaries of general aviation in terms of this study were outlined in Chapter 1. Basically, general aviation was defined to cover the activities of all aircraft registered in Australia, with the exception of those used for RPT services and a few additional specialised aircraft (mentioned in Chapter 1). In mid-1979, 5997 aircraft were registered in Australia. Of these, 132 were cleared for RPT services (and hence were not included in this study), leaving 5865 registrations[1] of aircraft which were identified for general aviation purposes[2]. Of these, 16 were of the specialised types mentioned earlier, leaving 5849 aircraft as the focus of this particular study.

While it is possible to obtain a detailed indication of the nature of the general aviation aircraft inventory, it is unfortunately not simple to give a parallel aggregate indication of the people involved in this activity. Basically, it is not possible to describe employment within general aviation in a precise way[3], because much general aviation activity is performed on a part-time basis by persons working in other industries. At 30 June 1979, there were 27 495 pilots licensed to fly aircraft cleared for general aviation purposes in Australia[4]. There were 21 931 pilots with private pilot licences, and 5564 with commercial or senior commercial licences. There were also 20 713 holders of student pilot licences. No fees are charged for issue of pilot licences. However, for the annual renewal of private, commercial and senior commercial licences it is necessary for the holder to

(1) Compared to 3542 in mid-1970 and 1134 at the end of 1960.
(2) This covers the categories of operations defined in the ANRs as private, aerial work and charter.
(3) Although the General Aviation Survey 1979 does give some indications of employment levels. See Chapter 4.
(4) In addition, there were 2089 airline transport pilots, who are also able to fly general aviation aircraft.

have flown a specified number of hours in a defined period prior to the renewal date[1].

A substantial maintenance infrastructure (consisting of a large number of organisations) exists to service general aviation in Australia. There were, for example, over four thousand LAMEs (described in Chapter 2) at 30 June 1979. It is not possible to determine the number of LAMEs employed in servicing general aviation aircraft, because some of these engineers are employed wholly or partly in servicing airline equipment. Nevertheless, employment in the technical aspects of general aviation is certainly significant. Employment in other aspects of general aviation is discussed in Chapter 4.

This Chapter identifies the structural characteristics of general aviation in Australia, and is principally based on an analysis of the Australian aircraft register at 30 June 1979[2]. Consideration is given both to characteristics of the aircraft registered and to the organisation of those aircraft into fleets. The location of these fleets according to operators' addresses is also considered. For the purpose of this analysis, the 'operator' of a particular aircraft is defined as the person holding the C of R for that aircraft[3]. Because general aviation provides a more basic

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(1) This requirement does not apply to student pilots. The number of student pilot licences in force almost certainly overstates the number of persons actively engaged in learning to fly.

(2) The register used in this analysis actually included all transactions effected up to and including 12 July 1979. However, for compatibility with other data used in this study, the details included in the register were used as if they related to 30 June 1979. The error involved in this is minor. It should also be noted that the register is an administrative register, and contains many more details than are formally required by ANRs relating to aircraft registration.

(3) There can obviously be some differences between C of R holders and operators in particular cases. However, the results of the General Aviation Survey 1979 showed that there is a one-to-one correspondence between the two in the vast majority of cases. There can be widespread differences between C of R holders and owners, because of hire-purchase and other financing arrangements.

transport role in outback parts of the country (where surface transport modes are less developed than in the more populated parts), some consideration is also given in this Chapter to identification of a 'remote area' concept. Some further information on the characteristics of operators is included (based on some results of the General Aviation Survey 1979).

GEOGRAPHIC DISTRIBUTION OF GENERAL AVIATION AIRCRAFT

Concentration Around Principal Cities

Most of the 5849 general aviation aircraft included in this study were registered to operators whose addresses were located more than 50 km from the country's eight capital cities[1]. Cumulative distance distributions for the various categories of general aviation aircraft are shown on this basis in Table 3.1. Some 45 per cent of aircraft were registered to locations within 50 km of Canberra, Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart or Darwin. Similarly, 59 per cent were located within 150 km of one of these cities, and 72 per cent within 250 km. Interestingly, only 40 per cent of private aircraft were registered to locations within 50 km of these cities, compared to 53 per cent and 49 per cent for aerial work and charter aircraft respectively. This indicates the relatively greater centralisation of these non-private operations. This is further demonstrated by the histograms given in Figure 3.1.

In assessing the aggregate geographic distribution of general aviation aircraft, it is also valuable to consider aircraft size.

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(1) For the purposes of this analysis, distances were determined on a straight-line basis between the nearest capital city (Canberra, Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart or Darwin) and the population centroid of each Local Government Area (LGA). All aircraft registered to addresses within a particular LGA were considered as being located at the LGAs population centroid. It should be noted that addresses listed in the register do not necessarily reflect the location of the aircraft. However, the 50 km distance categories used would minimise any error introduced.

TABLE 3.1 - GENERAL AVIATION AIRCRAFT WITHIN RADIAL DISTANCES OF CAPITAL CITIES[a] BY AIRCRAFT CATEGORY - 30 JUNE 1979

Radial Distance (km)	Aircraft Category			Total Aircraft
	Private	Aerial Work	Charter	
50	1 319	689	615	2 623
100	1 542	791	712	3 045
150	1 775	883	796	3 454
200	1 997	963	843	3 803
250	2 266	1 057	903	4 226
500	2 815	1 217	1 040	5 072
750	2 992	1 242	1 085	5 319
1 000	3 114	1 251	1 116	5 481
1 250	3 205	1 268	1 152	5 625
All Distances	3 307	1 290	1 252	5 849
PROPORTION OF TOTAL AIRCRAFT (Per cent)				
50	40	53	49	45
100	47	61	57	52
150	54	68	64	59
200	60	75	67	65
250	69	82	72	72
500	85	94	83	87
750	90	96	87	91
1 000	94	97	89	94
1 250	97	98	92	96
All Distances	100	100	100	100

(a) Canberra, Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart and Darwin. Each aircraft is recorded once only, according to the distance from the closest of the eight cities.

Source: BTE analysis of civil aviation register.

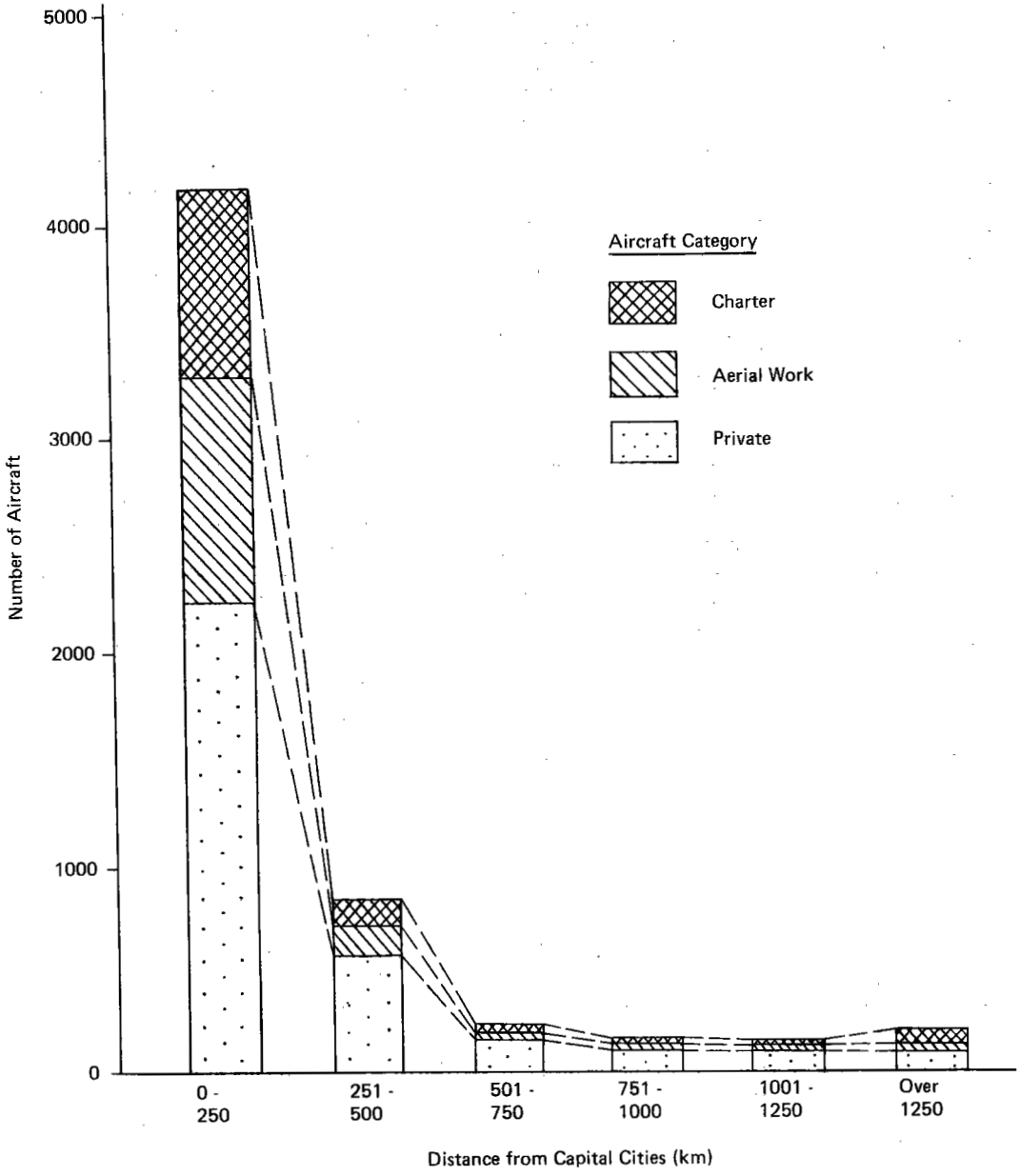

FIGURE 3.1 – CONCENTRATION OF GENERAL AVIATION AIRCRAFT AROUND CAPITAL CITIES BY AIRCRAFT CATEGORY – 30 JUNE 1979

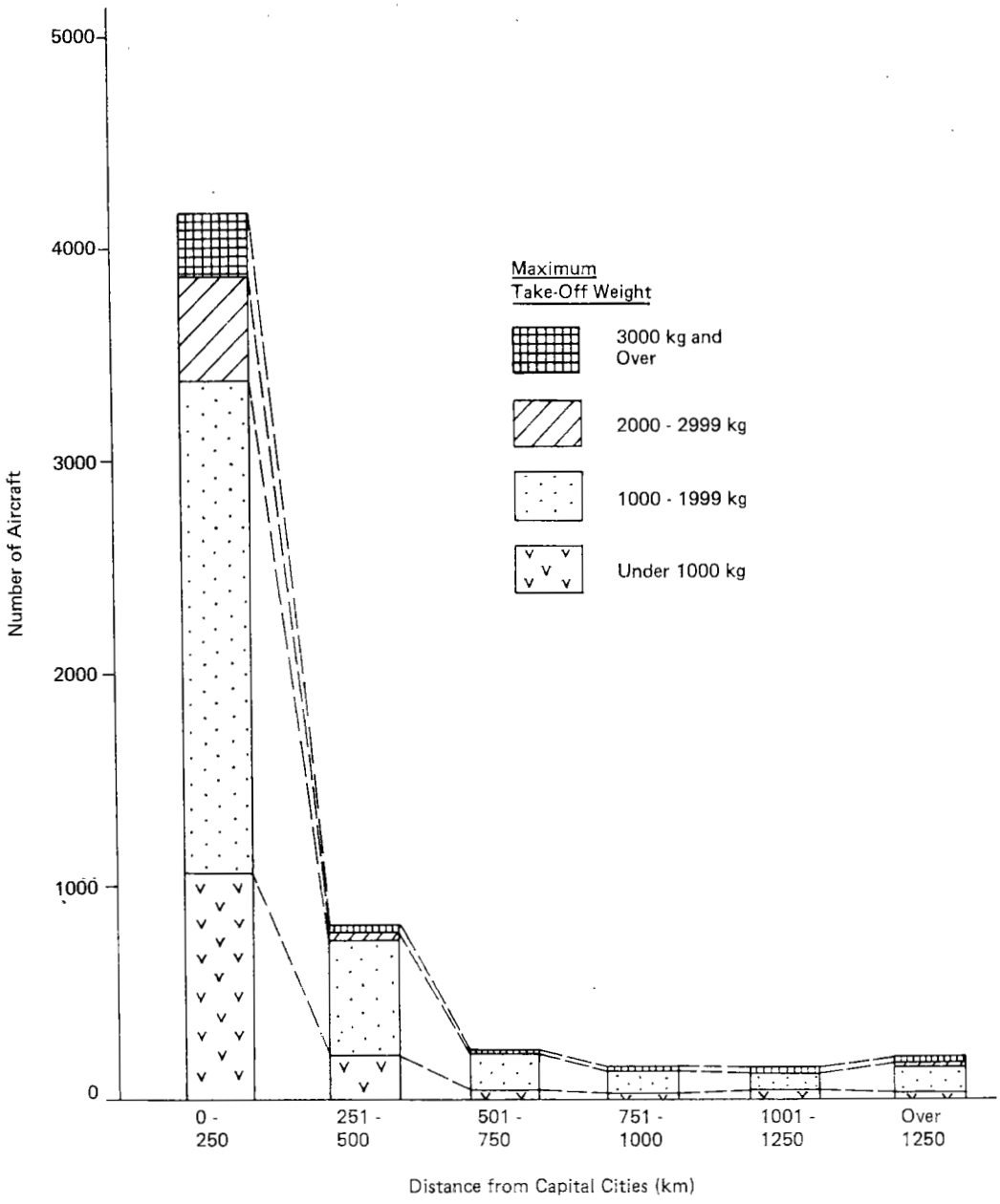

FIGURE 3.2 – CONCENTRATION OF GENERAL AVIATION AIRCRAFT AROUND CAPITAL CITIES BY AIRCRAFT SIZE – 30 JUNE 1979

The most useful and readily-available proxy for this characteristic is maximum permissible take-off weight[1]. As a guide, over 83 per cent of general aviation aircraft weighed less than 2000 kg for take-off. Most of the aircraft in this weight grouping were single-engined aircraft. The appropriate distribution by take-off weight and distance from the eight capital cities is shown in Table 3.2. This parallels the aircraft category distribution given in Table 3.1. The geographic distribution of aircraft of various sizes is also shown in Figure 3.2.

The general geographic implications of Table 3.2 are quite clear. There is an extremely strong relation between aircraft size and location in or near major cities. Only 43 per cent of the lightest aircraft (those with take-off weights less than 1000 kg) were registered to locations within 50 km of the five airports. For aircraft between 1000 kg and 1999 kg, the corresponding proportion was 40 per cent. For all higher weight classes, vastly greater concentration occurred around the eight cities, with proportions ranging from 60 per cent to 85 per cent.

State Distribution of Inventory

A distribution of aircraft registrations by take-off weight and State (and Territory) is shown in Table 3.3. Some 1889 aircraft (or nearly one-third of the general aviation total) were registered to locations in New South Wales. Victoria had 23 per cent of total registrations, Queensland 19 per cent, Western Australia 12 per cent, and South Australia 8.5 per cent. New South Wales was slightly under-represented in weight classes over 4000 kg, whereas Victoria had more than its relative share of aircraft in these classes. These proportions refer to both aeroplanes and helicopters combined. Looking at helicopters separately, New South Wales had almost 30 per cent of total registrations, followed by Queensland with 22 per cent and Victoria with 17 per cent.

(1) Generally referred to as 'take-off weight' in this Paper.

TABLE 3.2 - GENERAL AVIATION AIRCRAFT WITHIN RADIAL DISTANCES OF CAPITAL CITIES[a] BY AIRCRAFT SIZE - 30 JUNE 1979

Radial Distance	Take-off Weight (kg)							Total Aircraft
	Under 1 000	1 000-1 999	2 000-2 999	3 000-3 999	4 000-4 999	5 000-5 999	6 000 and over	
	NUMBER OF AIRCRAFT							
50	614	1 393	373	139	28	25	51	2 623
100	745	1 642	407	145	28	27	51	3 045
150	862	1 888	439	155	31	28	51	3 454
200	975	2 084	461	160	35	33	55	3 803
250	1 088	2 349	493	172	36	33	55	4 226
500	1 296	2 913	545	192	37	33	56	5 072
750	1 340	3 097	562	194	37	33	56	5 319
1 000	1 365	3 223	573	194	37	33	56	5 481
1 250	1 395	3 317	587	198	39	33	56	5 625
All Distances	1 427	3 462	619	202	44	35	60	5 849
	PROPORTION OF TOTAL AIRCRAFT (Per cent)							
50	43	40	60	69	64	71	85	45
100	52	47	66	72	64	77	85	52
150	60	55	71	77	70	80	85	59
200	68	60	74	79	80	94	92	65
250	76	68	80	85	82	94	92	72
500	91	84	88	95	84	94	93	87
750	94	89	91	96	84	94	93	91
1 000	96	93	93	96	84	94	93	94
1 250	98	96	95	98	89	94	93	96
All Distances	100	100	100	100	100	100	100	100

(a) Canberra, Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart, and Darwin. Each aircraft is recorded once only, according to the distance from the closest of the eight cities.

Source: BTE analysis of civil aviation register.

TABLE 3.3 - GENERAL AVIATION AIRCRAFT BY STATE AND AIRCRAFT SIZE - 30 JUNE 1979

State[(a)]	Take-off Weight (kg)							Total Aircraft
	Under 1 000	1 000-1 999	2 000-2 999	3 000-3 999	4 000-4 999	5 000-5 999	6 000 and over	
AEROPLANES								
ACT	10	25	3	1	-	1	-	40
NSW	476	1 069	195	68	11	9	13	1 841
Vic	390	728	119	58	10	11	26	1 342
Qld	201	693	121	25	8	7	8	1 063
SA	105	307	61	22	1	-	1	497
WA	187	376	82	21	8	3	4	681
Tas	17	60	8	5	-	-	-	90
NT	13	93	23	2	-	-	-	131
Overseas	1	2	-	-	-	-	-	3
Australia	1 400	3 353	612	202	38	31	52	5 688
HELICOPTERS								
ACT	-	1	1	-	-	-	-	2
NSW	5	39	-	-	-	1	3	48
Vic	5	15	-	-	4	3	1	28
Qld	8	25	3	-	-	-	-	36
SA	1	1	3	-	-	-	-	5
WA	1	7	-	-	2	-	4	14
Tas	2	4	-	-	-	-	-	6
NT	5	17	-	-	-	-	-	22
Overseas	-	-	-	-	-	-	-	-
Australia	27	109	7	-	6	4	8	161
AIRCRAFT								
ACT	10	26	4	1	-	1	-	42
NSW	481	1 108	195	68	11	10	16	1 889
Vic	395	743	119	58	14	14	27	1 370
Qld	209	718	124	25	8	7	8	1 099
SA	106	308	64	22	1	-	1	502
WA	188	383	82	21	10	3	8	695
Tas	19	64	8	5	-	-	-	96
NT	18	110	23	2	-	-	-	153
Overseas	1	2	-	-	-	-	-	3
Australia	1 427	3 462	619	202	44	35	60	5 849

(a) State or Territory in which the aircraft concerned were registered.

Source: BTE analysis of civil aviation register.

Regional Inventory

In order to analyse the geographic distribution of aircraft in a rather more detailed fashion, the BTE investigated general aviation aircraft registrations on a regional basis. This analysis was undertaken in terms of the aircraft registered to locations in various National Travel Survey Regions[1]. This distribution is shown in Table 3.4, which also includes an aggregate distribution of fleets - as opposed to aircraft - in each region.

In New South Wales, some 788 aircraft (or 42 per cent of the State total of 1889 aircraft) were registered to locations in the Sydney Region (Region 214). In rural areas, the Armidale Region (Region 202) contained almost 9 per cent of New South Wales registrations. It is interesting that this high proportion was due to a relatively heavy concentration of aerial work and charter aircraft in the Armidale Region. The significance of the Armidale Region in terms of aerial work and charter aircraft is possibly due to the concentration of operators based at Tamworth (which also has a comparatively large maintenance workforce)[2].

In the private category, however, both the Dubbo and Bathurst Regions (Regions 203 and 208, respectively), ranked ahead of the Armidale regional total. This reflects Dubbo's importance as a regional centre in the Central West of the State[3] and the presence of a number of important country centres within the Bathurst Region. In addition to these figures, 42 aircraft were registered to locations in the Australian Capital Territory.

In Victoria, the Melbourne Region (Region 311) accounted for 903

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(1) Full details of NTS Region system are set out in a BTE Occasional Paper (Aplin and Hirsch 1978). Basically, Australia is divided into 64 NTS Regions. Maps of these regions are given in Appendix VI.

(2) For example, East-West Airlines has its maintenance base at Tamworth (which is within this region).

(3) In addition, Airlines of New South Wales has its maintenance base at Dubbo.

TABLE 3.4 - GENERAL AVIATION AIRCRAFT AND FLEETS BY NTS REGIONS - 30 JUNE 1979

NTS Region	Aircraft Category			Total Aircraft	Number of Fleets
	Private	Aerial Work	Charter		
AUSTRALIAN CAPITAL TERRITORY					
101	18	13	11	42	32
NEW SOUTH WALES					
201	28	18	13	59	42
202	65	66	36	167	116
203	97	14	13	124	107
204	46	8	9	63	53
205	34	1	2	37	33
206	47	18	7	72	51
207	64	13	13	90	75
208	82	47	20	149	95
209	21	12	4	37	28
210	18	10	8	36	30
211	40	43	36	119	65
212	12	4	7	23	22
213	26	10	5	41	33
214	403	229	156	788	527
215	22	4	8	34	29
216	33	6	11	50	44
Total	1 038	503	348	1 889	1 350
VICTORIA					
301	29	11	12	52	43
302	33	9	4	46	38
303	16	14	3	33	25
304	28	7	2	37	32
305	36	10	11	57	47
306	49	5	7	61	51
307	39	13	6	58	45
308	28	7	6	41	32
309	23	3	5	31	19
310	33	9	9	51	41
311	475	232	196	903	585
Total	789	320	261	1 370	958

TABLE 3.4 (CONT) - GENERAL AVIATION AIRCRAFT AND FLEETS BY NTS REGIONS - 30 JUNE 1979

NTS Region	Aircraft Category			Total Aircraft	Number of Fleets
	Private	Aerial Work	Charter		
			QUEENSLAND		
401	132	61	54	247	171
402	**59**	**12**	**25**	96	**75**
403	22	11	17	50	37
404	52	6	16	74	58
405	59	14	24	97	74
406	30	6	17	53	39
407	**43**	10	20	73	54
408	38	9	68	115	67
409	39	7	25	71	51
410	49	1	4	54	52
411	50	7	5	62	56
412	64	22	21	107	81
Total	637	166	296	1 099	815
			SOUTH AUSTRALIA		
501	139	67	65	271	187
502	30	11	6	47	42
503	13	-	-	13	12
504	26	4	9	39	36
505	8	1	-	9	9
506	18	5	6	29	25
507	24	12	1	37	32
508	21	4	8	33	26
509	22	-	2	24	22
Total	301	104	97	502	391
			WESTERN AUSTRALIA		
601	36	13	5	54	47
602	27	6	3	36	33
603	21	6	1	28	24
604	65	9	2	76	69
605	33	5	8	46	39
606	28	3	16	47	35
607	37	8	6	51	45
608	129	89	96	314	172
609	30	4	9	43	36
Total	406	143	146	695	500

TABLE 3.4 (CONT) - GENERAL AVIATION AIRCRAFT AND FLEETS BY NTS REGIONS - 30 JUNE 1979

NTS Region	Aircraft Category			Total Aircraft	Number of Fleets
	Private	Aerial Work	Charter		
			TASMANIA		
701	9	9	22	40	21
702	25	2	7	34	26
703	12	4	5	21	18
704	1	-	-	1	1
Total	47	15	34	96	66
			NORTHERN TERRITORY		
801	43	18	45	106	64
802	26	8	13	47	36
Total	69	26	58	153	100
			AUSTRALIA		
Total[(a)]	3 307	1 290	1 252	5 849	4 215

(a) Includes three single aircraft fleets whose owners reside outside the Commonwealth. Two of these aircraft were used for private purposes and one for charter work.

Source: BTE analysis of civil aviation register.

aircraft registrations, or 66 per cent of the Victorian total of 1370 aircraft). This aircraft registration figure for Melbourne is 15 per cent greater than Sydney's total, with the extra numbers being principally in the private and charter categories. Although slightly smaller than Sydney in population, Melbourne tends to be a more important centre for civil aviation (due at least partly to the fact that the two principal airlines - TAA and AAA - are based there). In the rural areas of Victoria, the Bendigo Region (Region 306) had more registrations than any other, with 4 per cent of the State total. Bendigo's overall strength was due to private registrations only, as several other regions had more aircraft registered in the aerial work and charter categories. However, registrations in these regions were relatively small when compared with registrations in the country regions of New South Wales.

Queensland's decentralised population distribution resulted in the Brisbane Region (Region 401) having a low share of total State registrations, with 247 aircraft (or 22 per cent of the State total of 1099). The Cairns Region (Region 408) was the next most important, with 115 aircraft - this Region had the largest number of charter aircraft in Queensland[1]. The Toowoomba and Rockhampton Regions (Regions 412 and 405 respectively) also had large numbers of aerial work and charter aircraft registered.

In South Australia, the Adelaide Region (Region 501) had 271 (or 54 per cent) of the 502 aircraft registered in the State, and dominated all other regions. The remaining regions of South Australia demonstrated a fairly uniform and low level of registrations.

The greater distances within Western Australia and its dependence on air transport to remote centres resulted in 695 aircraft being

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(1) A large commuter and charter operator (Bush Pilots Airways) is based in Cairns.

registered to locations in that State (a figure 38 per cent greater than the South Australian total). The Perth Region (Region 608) had 314 aircraft registered (or 45 per cent of the State total) followed next in importance by the Northam Region (Region 604) with 76 aircraft (or 11 per cent of the total). The Northam Region had 16 per cent of total State private registrations, while the Albany Region (Region 601) had the highest number of aerial work registrations. The Derby Region (Region 606) had more registrations of charter aircraft than any other rural region, apparently due mainly to the needs of the mineral exploration industry. Otherwise, the distribution within Western Australia was basically uniform (on a regional basis).

There were only 96 aircraft registered to locations in Tasmania. Some 42 per cent and 35 per cent of total State registrations were in the Hobart Region (Region 401) and the Launceston Region (Region 702), respectively. Northern Territory locations accounted for 153 aircraft registrations, of which 58 (or over one-third) were in the charter category. Two-thirds of the total registrations were in the northern half of the Territory (Region 801).

Aggregate Distribution in Australia

The overall distribution of locations to which general aviation aircraft were registered at 30 June 1979 is shown in Figure 3.3. The diagrammatic representation in that illustration is principally based on numbers of aircraft registered to particular LGAs.

AIRCRAFT CHARACTERISTICS

Aircraft Size

It has already been established that the lighter general aviation aircraft (that is, those with a take-off weight of less than 2000 kg) made up over 83 per cent of all registrations in Australia at 30 June 1979. These aircraft were mostly cleared for operation in the private and aerial work categories. Heavier aircraft

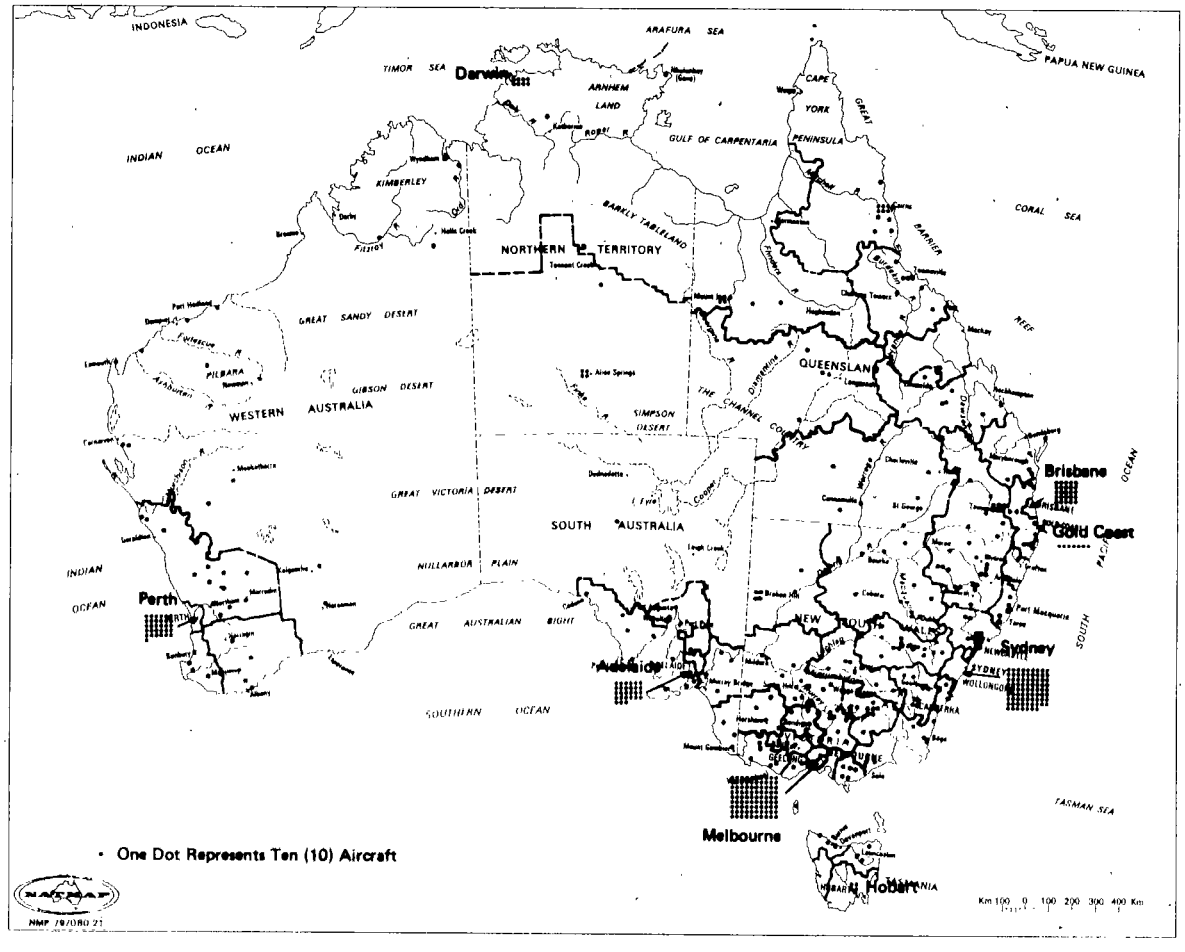

FIGURE 3.3 – LOCATION OF GENERAL AVIATION AIRCRAFT – 30 JUNE 1979

tended to be in the charter category. Of the 5849 aircraft registered at 30 June 1979 and considered in this study, 5688 were fixed-wing aeroplanes and only 161 were helicopters. Over two-thirds of the helicopters were in the charter category, possibly because the higher utilisations achievable in this category of operations tend to offset their higher operating costs. Some 109 helicopters (or two-thirds of the total) had take-off weights between 1000 kg and 1999 kg. A distribution of aircraft size and category of operation is given in Table 3.5.

Fuel Type

Some 5660 aircraft (or 97 per cent of the total registered) used aviation gasolene (AVGAS) as their fuel. The proportion of aircraft in the private category using AVGAS was 99 per cent. Almost half of the aircraft using AVGAS were designed to operate with fuel of 80-87 octane rating, while the remainder required fuel of 100-130 octane rating. It is possibly significant that charter aircraft outnumbered other aircraft categories amongst these aircraft which required aviation turbine (AVTUR) fuel. In fact, charter aircraft comprised 125 of the total of 189 aircraft which required AVTUR. Full details are shown in Table 3.6.

Aircraft Manufacturers

Table 3.7 shows the manufacturers (and, in some cases, models) of all aircraft on the Australian register. The figures given are basically for every year from 1970 to 1979. However, figures for 1960 are also included for comparative purposes.

About 43 per cent of all general aviation aeroplanes registered in Australia at 30 June 1979 were manufactured by Cessna, followed by Piper with around 25 per cent. Over 81 per cent of aircraft were single-engined. From 30 June 1970 to 30 June 1974 aeroplane registrations increased from 3446 to 3839 (an increase of 11 per cent). However, over the next five years to 30 June 1979, total aeroplane numbers further increased to 5688 (an increase of 48 per

TABLE 3.5 - GENERAL AVIATION AIRCRAFT BY AIRCRAFT SIZE AND CATEGORY - 30 JUNE 1979

Take-off Weight (kg)	Aircraft Category			Total Aircraft
	Private	Aerial Work	Charter	
		AEROPLANES		
Under 1000	948	433	19	1 400
1000-1999	2 107	663	583	3 353
2000-2999	172	109	331	612
3000-3999	32	42	128	202
4000-4999	14	6	18	38
5000-5999	3	3	25	31
6000 and over	10	6	36	52
Total Aeroplanes	3 286	1 262	1 140	5 688
		HELICOPTERS		
Under 1000	4	7	16	27
1000-1999	10	17	82	109
2000-2999	-	4	3	7
3000-3999	-	-	-	-
4000-4999	4	-	2	6
5000-5999	3	-	1	4
6000 and over	-	-	8	8
Total Helicopters	21	28	112	161
		AIRCRAFT		
Under 1000	952	440	35	1 427
1000-1999	2 117	680	665	3 462
2000-2999	172	113	334	619
3000-3999	32	42	128	202
4000-4999	18	6	20	44
5000-5999	6	3	26	35
6000 and over	10	6	44	60
Total Aircraft	3 307	1 290	1 252	5 849

Source: BTE analysis of civil aviation register.

TABLE 3.6 - GENERAL AVIATION AIRCRAFT BY FUEL TYPE AND AIRCRAFT CATEGORY - 30 JUNE 1979

Type of Fuel	Aircraft Category			Total Aircraft
	Private	Aerial Work	Charter	
AEROPLANES				
AVGAS				
80-87 Octane	1 918	582	266	2 766
100-130 Octane	1 346	657	812	2 815
Total AVGAS	3 264	1 239	1 078	5 581
AVTUR				
Jet A1	22	23	62	107
All Fuel types	3 286	1 262	1 140	5 688
HELICOPTERS				
AVGAS				
80-87 Octane	4	13	27	44
100-130 Octane	5	8	22	35
Total AVGAS	9	21	49	79
AVTUR				
Jet A1	12	7	63	82
All Fuel types	21	28	112	161
TOTAL AIRCRAFT				
AVGAS				
80-87 Octane	1 922	595	293	2 810
100-130 Octane	1 351	665	834	2 850
Total AVGAS	3 273	1 260	1 127	5 660
AVTUR				
Jet A1	34	30	125	189
All Fuel types	3 307	1 290	1 252	5 849

Source: BTE analysis of civil aviation register.

TABLE 3.7 - MANUFACTURERS[a] OF GENERAL AVIATION AIRCRAFT ON THE AUSTRALIAN REGISTER - 1960 TO 1979

Manufacturer	At 30 June										
	1960	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
JET AEROPLANES[b]											
Cessna Citation	-	-	-	-	-	3	4	1	1	1	4
Dassault Falcon	-	1	1	1	1	-	-	-	1	2	2
Fokker F28	-	-	-	-	-	-	-	-	1	3	3
Gates Learjet	-	-	-	-	-	2	4	5	7	10	16
Grumman Gulfstream II	-	-	-	1	2	2	2	2	2	2	2
Hawker Siddeley 125	-	4	5	4	3	3	2	2	2	2	2
Israel Westwind	-	-	-	-	-	-	-	-	-	-	1
Total Jet	-	5	6	6	6	10	12	10	14	20	30
TURBO-PROP AEROPLANES											
Four-engined											
Armstrong-Whitworth Argosy	-	-	-	-	-	-	1	-	-	1	3
Twin-engined											
Aero Commander[c]	-	-	-	-	1	2	3	4	6	6	8
Beechcraft	-	4	3	4	4	6	7	8	6	7	11
Cessna	-	-	-	-	-	-	-	-	-	-	1
De Havilland	-	1	2	2	2	1	1	2	4	5	5
Embraer Bandeirante	-	-	-	-	-	-	-	-	-	-	4
Fokker F27	2	2	2	2	2	2	3	3	3	3	1
GAF Nomad	-	-	-	1	2	2	4	3	8	16	21
Grumman Gulfstream I	-	3	3	3	3	2	2	2	2	2	2
Mitsubishi MU2	-	1	1	2	1	1	1	1	1	2	3
Piper	-	-	-	-	-	-	-	-	-	-	2
Short Skyvan	-	2	2	-	-	-	-	-	-	-	-
Swearingen	-	3	6	7	8	8	7	6	7	7	15
Single-engined											
Pilatus	-	5	4	5	5	3	1	2	1	1	1
Total Turbo-prop	2	21	23	26	28	27	30	31	38	50	77

TABLE 3.7 (CONT) - MANUFACTURERS[a] OF GENERAL AVIATION AIRCRAFT ON THE AUSTRALIAN REGISTER - 1960 TO 1979

Manufacturer	At 30 June										
	1960	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
PISTON-ENGINED AEROPLANES											
Four-engined											
De Havilland Heron	1	-	-	-	-	1	1	2	2	2	2
Douglas DC4	-	1	-	-	-	-	-	-	-	2	2
Three-engined											
Britten-Norman Trislander	-	-	-	-	-	1	3	4	5	5	6
De Havilland Drover	10	5	5	5	6	5	4	4	4	4	4
Twin-engined											
Beechcraft	6	110	125	123	138	152	158	169	179	193	217
Bristol 170	1	4	4	4	4	4	3	3	3	2	1
Cessna	6	120	128	131	143	165	178	179	191	210	231
Douglas DC3	14	16	21	20	15	14	15	13	14	15	12
Piper	7	123	138	149	162	182	208	232	254	286	315
Others	76	80	89	86	91	93	96	103	118	131	159
Single-engined											
Auster	208	167	158	152	150	139	125	117	111	108	107
Beechcraft	15	226	228	229	231	245	252	261	281	289	305
Cessna	247	1 302	1 305	1 304	1 356	1 451	1 565	1 649	1 795	2 056	2 306
De Havilland	407	216	201	189	185	182	170	159	167	165	179
Mooney	-	44	43	41	40	40	45	46	57	68	75
Piper	79	674	675	676	691	750	790	818	933	1 012	1 118
Victa	-	99	95	95	94	92	87	86	81	83	85
Others	179	233	241	246	264	286	273	296	364	415	457
Total Piston-engined	1 256	3 420	3 456	3 450	3 570	3 802	3 973	4 141	4 559	5 046	5 581
HELICOPTERS											
Twin-engined											
Bell	-	-	-	-	-	-	-	1	2	2	4
Sikorsky	-	1	1	2	2	1	1	1	1	2	7
Westland	-	-	-	-	-	-	-	-	-	-	3
Single-engined											
Bell	7	67	86	90	93	82	70	63	72	86	93
Hughes	-	12	16	16	7	15	15	19	27	28	31
Others	6	16	21	23	18	14	14	12	13	16	23
Total Helicopters	13	96	124	131	120	112	100	96	115	134	161
AIRCRAFT											
TOTAL AIRCRAFT	1 271	3 542	3 609	3 613	3 724	3 951	4 115	4 278	4 726	5 250	5 849

(a) Model designations are also included in some cases for clarity of identification.

(b) All of these jet aeroplanes are twin-engined.

(c) Includes Rockwell aircraft.

Source: BTE analysis of civil aviation register.

cent). In contrast to the steady growth in aeroplane registrations, helicopter numbers had totalled 131 at 30 June 1972, but fell away to only 96 at 30 June 1976. There was, however, a subsequent rise to 161 at 30 June 1979. Bell helicopters made up 58 per cent of the 1979 total.

Aircraft Age

In view of the extremely rapid expansion of aircraft registrations in recent years, it is not surprising that 49 per cent of aeroplanes and 68 per cent of helicopters registered at 30 June 1979 were less than 10 years old. In fact, the average age of aircraft at that date was around 10 years. A distribution of aircraft by age and category is given in Table 3.8. There were, however, considerable differences between the various aeroplane categories, with those in the private category tending to be much older than those in the aerial and charter work categories. About 62 per cent of private aeroplanes were manufactured prior to 1970, whereas corresponding figures for the aerial work and charter categories were 38 per cent and 34 per cent, respectively. Further, more private aircraft dated from 1965 to 1969 than from any other five-year period. At 30 June 1979, 31 per cent of all aeroplanes had been manufactured since 1974 with a further 18 per cent manufactured between 1970 and 1974.

About 41 per cent of all the helicopters registered in Australia at 30 June 1979 had been manufactured since 1974. Almost 46 per cent of helicopters in the charter category were manufactured during this period, compared to 29 per cent and 32 per cent in the private and aerial work categories respectively.

Further light is thrown on the age distribution of aircraft in Australia by examining Table 3.9 which shows aircraft numbers by age group and the State or Territories of registration.

In general, the distribution of aeroplanes by age is spread evenly over all States and Territories. Perhaps the most noticeable

TABLE 3.8 - GENERAL AVIATION AIRCRAFT BY YEAR OF MANUFACTURE AND AIRCRAFT CATEGORY - 30 JUNE 1979

Year of Manufacture	Aircraft Category			Total Aircraft
	Private	Aerial Work	Charter	
	AEROPLANES			
To 1949	198	6	19	223
1950-1954	78	9	3	90
1955-1959	255	31	16	302
1960-1964	604	117	58	779
1965-1969	888	312	291	1 491
1970-1974	475	249	289	1 013
1975-1979(a)	788	538	464	1 790
Total Aeroplanes	3 286	1 262	1 140	5 688
	HELICOPTERS			
To 1949	-	-	1	1
1950-1954	-	-	-	-
1955-1959	1	1	1	3
1960-1964	2	5	7	14
1965-1969	3	5	26	34
1970-1974	9	8	26	43
1975-1979(a)	6	9	51	66
Total Helicopters	21	28	112	161
	AIRCRAFT			
To 1949	198	6	20	224
1950-1954	78	9	3	90
1955-1959	256	32	17	305
1960-1964	606	122	65	793
1965-1969	891	317	317	1 525
1970-1974	484	257	315	1 056
1975-1979(a)	794	547	515	1 856
Total Aircraft	3 307	1 290	1 252	5 849

(a) Note that this age group only covers 4½ years, since the figures given are to 30 June 1979.

Source: BTE analysis of civil aviation register.

TABLE 3.9 - GENERAL AVIATION AIRCRAFT BY YEAR OF MANUFACTURE AND STATE - 30 JUNE 1979

State[a]	To 1949	1950-1954	1955-1959	1960-1964	1965-1969	1970-1974	1975-1979[b]	Total
				AEROPLANES				
ACT	1	1	-	6	11	4	17	40
NSW	77	24	113	266	486	305	570	1 841
Vic	77	30	72	159	359	212	433	1 342
Qld	38	9	60	162	290	183	321	1 063
SA	12	7	23	75	124	107	149	497
WA	16	14	27	83	172	151	218	681
Tas	2	4	3	11	21	19	30	90
NT	-	1	4	16	26	32	52	131
Overseas	-	-	-	1	2	-	-	3
Total Aeroplanes	223	90	302	779	1 491	1 013	1 790	5 688
				HELICOPTERS				
ACT	-	-	-	-	-	2	-	2
NSW	-	-	1	3	8	12	24	48
Vic	-	-	-	2	6	7	13	28
Qld	-	-	-	2	6	13	15	36
SA	-	-	-	3	-	1	1	5
WA	1	-	1	2	5	1	4	14
Tas	-	-	-	-	-	4	2	6
NT	-	-	1	2	9	3	7	22
Overseas	-	-	-	-	-	-	-	-
Total Helicopters	1	-	3	14	34	43	66	161
				AIRCRAFT				
ACT	1	1	-	6	11	6	17	42
NSW	77	24	114	269	494	317	594	1 889
Vic	77	30	72	161	365	219	446	1 370
Qld	38	9	60	164	296	196	336	1 099
SA	12	7	23	78	124	108	150	502
WA	17	14	28	85	177	152	222	695
Tas	2	4	3	11	21	23	32	96
NT	-	1	5	18	35	35	59	153
Overseas	-	-	-	1	2	-	-	3
Total Aircraft	224	90	305	793	1 525	1 056	1 856	5 849

(a) State or Territory in which the aircraft concerned were registered.

(b) Note that this age group only covers 4½ years, since the figures given are to 30 June 1979.

Source: BTE analysis of civil aviation register.

variation occurred in the Northern Territory, where the proportion of aeroplanes manufactured since 1974 was 40 per cent compared with an Australia-wide figure of 31 per cent. Table 3.10 sets out the median age of aircraft in each State by aircraft category, as well as the average age of all registered aircraft.

TABLE 3.10 - AGES OF GENERAL AVIATION AIRCRAFT BY STATE AND AIRCRAFT CATEGORY - 30 JUNE 1979

(Years)

State or Territory	Median Age				Average Age of All Aircraft
	Aircraft Category			All Aircraft	
	Private	Aerial Work	Charter		
ACT	13	3	4	8	9
NSW	13	6	6	10	10
Vic	12	6	6	10	11
Qld	12	5	7	10	10
SA	11	6	6	9	10
WA	12	6	5	8	10
Tas	14	5	4	6	9
NT	8	9	5	6	8
Overseas	19	-	13	13	14
Australia	12	6	6	10	10

Source: BTE analysis of civil aviation register.

FLEET ORGANISATION

The basic characteristics of general aviation aircraft are a useful guide to the civil aviation inventory in Australia.

However, the organisation of these aircraft into fleets[1] is in some senses a more important indicator of the economic nature of

(1) Note that a 'fleet', in the context of this Paper, includes an operation involving only one aircraft.

general aviation. The BTE undertook an analysis of this characteristic by examining 'fleets' formed by bringing together aircraft registered to one C of R holder. It is recognised that this is not a precise method of determining the practical distribution of aircraft into fleets, but it was the only available method at the time of analysis. This exercise was conducted in parallel with selection of operators for the General Aviation Survey 1979. Accordingly, the latter survey formed a useful cross-check on the validity of the BTE's internal fleet analysis. In the event, very few problems were found in this area, so that the BTE's analysis of fleets can be treated with some confidence. In fact, the principal use of this analysis is encountered in Chapter 4, but some of the aggregate considerations are discussed below.

In line with the above comments, an aggregate distribution of fleets on the basis of fleet size and location is given in Table 3.11. At 30 June 1979, there were 4215 aircraft fleets (covering 5849 aircraft) in Australia. Of these, 1740 fleets were located in the eight capital cities[1] and 2475 were located elsewhere. The largest fleet of general aviation aircraft according to registration documents (used in the BTE analysis) consisted of 29 aircraft[2]. There were 8 fleets with 20 or more aircraft, and these fleets contributed 197 aircraft in total. Also, there were 29 fleets with 10 or more aircraft, comprising (in total) 489 aircraft. In fact, 85 per cent of fleets consisted of only one aircraft and these one-aircraft fleets accounted for 3578 aircraft (or 61 per cent of all aircraft). Overall some 59 per cent of fleets were based away from the eight capitals included in the analysis. However, the larger fleets tended to be based in these capital cities. In the case of fleets of 10 or more aircraft, only 19 per cent of the aircraft were registered to locations in rural areas. A total of 1350 fleets were based in New South Wales

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(1) Canberra, Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart and Darwin.

(2) It should be noted that, in practice, fleet sizes may vary greatly from actual registrations. This is principally because of cross-hiring arrangements between owners and operators.

TABLE 3.11 - GENERAL AVIATION FLEETS AND AIRCRAFT BY SIZE OF FLEET - 30 JUNE 1979

Size of Fleet	Capital Cities[a]		Other Areas		Australia	
	Fleets	Aircraft	Fleets	Aircraft	Fleets	Aircraft
29	-	-	1	29	1	29
28	1	28	-	-	1	28
27	1	27	-	-	1	27
25	1	25	-	-	1	25
22	3	66	1	22	4	88
19	2	38	-	-	2	38
17	1	17	-	-	1	17
16	3	48	1	16	4	64
15	2	30	-	-	2	30
14	1	14	1	14	2	28
13	3	39	-	-	3	39
12	1	12	-	-	1	12
11	4	44	-	-	4	44
10	1	10	1	10	2	20
9	4	36	3	27	7	63
8	3	24	4	32	7	56
7	6	42	4	28	10	70
6	14	84	9	54	23	138
5	16	80	11	55	27	135
4	30	120	34	136	64	256
3	56	168	68	204	124	372
2	145	290	201	402	346	692
1	1 442	1 442	2 136	2 136	3 578	3 578
Total	1 740	2 684	2 475	3 165	4 215	5 849

(a) Defined as the ACT, Sydney, Melbourne, Brisbane, Adelaide and Perth NTS Regions (Regions 101, 214, 311, 401, 501 and 608 respectively) and the Hobart and Darwin Statistical Divisions. For this study, the Hobart SD included all of the Brighton, Kingborough, New Norfolk and Sorrell Municipalities.

Source: BTE analysis of civil aviation register.

(over 32 per cent of the Australian total) but the region[1] with the greatest number (585) of fleets was Melbourne (Region 311). Apart from the five mainland State capitals, the only regions with more than 100 fleets[2] were the Armidale Region (Region 202) and the Dubbo Region (Region 203).

OWNERSHIP OF GENERAL AVIATION AIRCRAFT

Respondents to the BTE's General Aviation Survey 1979 were asked to indicate the category which best described the capacity in which they participated in general aviation[3]. Estimates of the numbers of operators and aircraft in particular categories are given in Table 3.12. Of the eight categories listed, businesses primarily concerned with general aviation accounted for the highest number of aircraft (with over 2000 or 35 per cent of the total number at 30 June 1979). However, these same businesses accounted for only 17 per cent of the fleets operating in general aviation, because they tended to have more aircraft in each fleet. In terms of numbers of operators, private individuals formed the largest category (27 per cent), followed by rural producers (26 per cent) and businesses not primarily concerned with general aviation (22 per cent). Operators in these categories operated 20 per cent, 20 per cent and 16 per cent of the total numbers of general aviation aircraft respectively.

Approximately 5 per cent of general aviation operators were categorised as social or recreational clubs. These clubs operated over 300 aircraft (or 5 per cent of the total registrations). Religious or charitable organisations accounted for about 2 per cent of both general aviation operators and total aircraft. Government and semi-government bodies accounted for around 1 per cent of both operators and aircraft, while community welfare

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(1) On the basis of NTS Regions, as outlined earlier in this Chapter.
(2) Again, including one-aircraft fleets.
(3) See the questionnaire form set out in Appendix I.

TABLE 3.12 - TYPE OF INVOLVEMENT[a] IN GENERAL AVIATION - 30 JUNE 1979

Involvement Capacity	Operators		Aircraft	
	Number	Per Cent	Number	Per Cent
Social or Recreational Club	190	4.5	314	5.4
Government or Semi-government Body	38	0.9	68	1.2
Rural Producer	1 083	25.7	1 164	19.9
Business Primarily Concerned with General Aviation	695	16.5	2 001	34.2
Business Not Primarily Concerned with General Aviation	911	21.6	891	15.2
Religious/Charitable Organisations	68	1.6	94	1.6
Other Community Welfare Organisations	13	0.3	29	0.5
Private Individual[b]				
. Not specified (Public Servant)[c]	8	0.2	8	0.1
. Professional, technical and related workers	285	6.8	310	5.3
. Administrative, executive and managerial workers	152	3.6	155	2.7
. Clerical Workers	20	0.5	19	0.3
. Sales Workers	135	3.2	145	2.5
. Farmers, fishermen, hunters, timber getters and related workers	152	3.6	163	2.8
. Miners, quarrymen and related workers	12	0.3	10	0.2
. Transport and communications workers	138	3.3	155	2.7
. Tradesmen, production process workers and labourers	178	4.2	172	2.9
. Service, sport and recreation workers	13	0.3	13	0.2
. Members of armed services	8	0.2	6	0.1
. Retired persons	48	1.1	48	0.8
Not Stated	68	1.6	84	1.4
Total	4 215	100.0	5 849	100.0

(a) Figures given are statistical estimates, and are subject to error. Therefore, there may be discrepancies between operator and aircraft figures. See also Appendix I.

(b) Classified into broad occupational groups.

(c) Includes respondents who simply quoted 'public servant' without further elaboration.

Source: General Aviation Survey 1979.

organisations made up the smallest category with less than 0.5 per cent of both operators and aircraft.

Those respondents who indicated that they were private individuals were also asked to describe their main occupation over the financial year 1978-79. The answers given were coded by occupation according to the coding system used in the National Travel Survey[1] and the results are again given in Table 3.12. A more detailed analysis[2] of operators in this category indicated that the largest single group involved those who described themselves as 'farmers and farm managers', accounting for 156 aircraft (or 12 per cent of the total of approximately 1200 operated by private individuals). The grouping of 'employers, workers on own account, directors, managers, etc.' operated 151 aircraft. There were 107 aircraft in this category operated by 'private medical practitioners and dentists', and 102 aircraft operated by private individuals in the 'architects, engineers and surveyors' grouping. These four occupational categories accounted for 40 per cent of all aircraft operated by private individuals. The remaining 60 per cent, or 795 aircraft, were distributed over 44 other occupational categories.

REMOTE AREA CONSIDERATIONS

Australia has a very diverse population distribution, with relatively very large numbers of people living in the capital cities and extremely few in the more remote rural areas. General aviation has developed to serve the needs of people in all parts of the country, but to people in the 'outback' the use of aircraft has become a fundamental element of the way-of-life. The high degree of reliance on the Royal Flying Doctor Service[3] for medical assistance

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(1) Full details of the coding system are given in Hirsch (1979).
(2) Not reported here, but based on finer classifications than those shown in Table 3.12.
(3) The Royal Flying Doctor Service provides medical, dental, nursing and ambulance services to people in remote areas who would normally be unable to obtain such services at short notice or on a routine basis.

is a case in point. In the outback areas of Australia, aviation is performing a role which often cannot be undertaken by surface transport. This is mainly due to the sheer distance and the often poor quality of road and rail links. The vagaries of weather conditions are also important. In the northern 'wet season', it is often not possible to move by surface transport for long periods of time. The use of general aviation services in the remote areas of Australia has also possibly reduced the community's need for costly long-distance road networks.

In turn, this basic dependence on aviation would be expected to manifest itself in high aircraft ownership rates per head of population in outback areas. That this is the case is demonstrated broadly in Figure 3.4, which shows ownership of aircraft per head of population on a regional basis. Almost universally, the more remote and sparsely-populated areas of Australia exhibit high aircraft ownership rates (typically greater than one aircraft per thousand people, compared to an Australia-wide average of around 0.4).

Given all of these considerations, the view is often expressed that because of the unique role of general aviation in the remote areas, some special consideration should be given to the owners of aircraft based there. The generally-suggested method of assistance is by way of reduced ANCs. It has also been stated that operators in remote areas have to incur higher costs for fuel and spare parts than do operators in other areas, again leading to propositions for assistance of some sort. In this context (as already mentioned), the BTE considered ways in which 'remoteness' might be defined[1]. It is specifically emphasised that this Paper does not cover the economic issues involved in assistance of this kind, and no implicit or explicit support or non-support of the proposition is included here. The following discussion relates mainly to technical

(1) It was known that the DOT team involved with the Review was interested in the definition of remoteness.

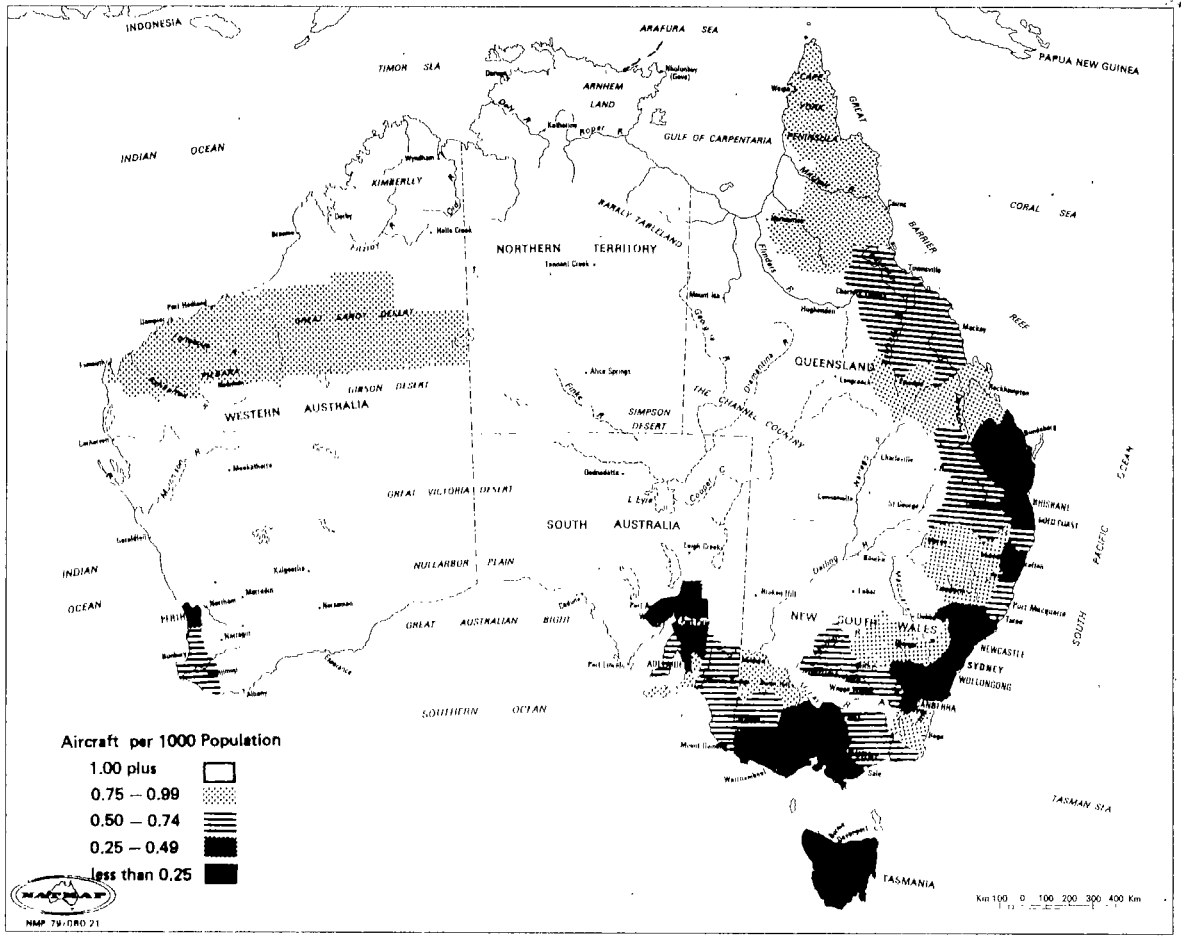

FIGURE 3.4 – PER CAPITA AIRCRAFT OWNERSHIP – 30 JUNE 1979

issues involved in defining remote areas. Further, given the lack of economic analysis of the subject, it is impossible to draw definitive conclusions. Rather, the discussion centres on technical relationships which could be used to define remoteness in association with specific economic objectives.

Detailed examination of the concept of remoteness is a study in itself, and it has not been possible to make other than a cursory and preliminary examination of the subject in this Paper. While it is possible to look at remoteness in terms of distance from various services offered in the larger population centres, pursuance of such objectives may not always be relevant to the general aviation role in certain parts of the country. This is a result of the fact that some aircraft are based on remote station properties and are used to fly to the larger service centres, while others are based at the service centres and are used to fly out to surrounding properties. Included in this latter category are Royal Flying Doctor Service aircraft and aircraft owned by such persons as veterinary officers (who need to travel around properties to innoculate cattle against disease). All charter and most aerial work operations which take place in outback Australia are based in the larger population centres. In this sense, it is therefore necessary to distinguish between remote areas themselves and operations which service remote areas (but which may be located in population centres). Nevertheless the concept of remoteness is intrinsic to both aspects.

In concept, geographic remoteness could be defined as lack of access to a 'normal' range of basic community amenities[1]. These amenities would usually be taken to include:

- Medical, dental and hospital services;
- Police and general community welfare services;

(1) This type of concept has been explored recently in assessing regulatory aspects of remote passenger air services. See Director-General of Transport, Western Australia (1976).

- Educational institutions;
- A range of shopping facilities;
- Other professional services (lawyers, accountants and so on);
- Social and recreation facilities (theatres, cinemas, hotels and other social gathering places).

In addition to all of these, there is an undoubted psychological effect of location far away from centres of population. On the other hand, it would be remiss to ignore the effects of the personal economic trade-offs incurred in living in remote localities. Basically, people choosing to live in such localities are trading proximity to a wide range of community services for other attributes which they presumably value[1]. While it is a natural response to attempt to minimise costs in regard to one particular aspect of remote location, the fact that there are balancing considerations should not be overlooked. It is also worth mentioning that the same arguments have been put forward[2] in respect of telephone, electrical and television service availability, and all of these are still basically open questions. As some form of guide to concepts of remoteness used in fields other than aviation, Figure 3.5 shows zones used for application of 'remote area allowances' to personal income taxation[3].

Given all this, some attempt was made by the BTE to define remote areas in a technical sense. The details of this analysis are given in Appendix V, but are described briefly here. Basically, two factors are involved:

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(1) Such as low land costs, a considerable degree of personal freedom and perhaps even (in some cases) remoteness itself. This may explain why some city-dwellers and overseas visitors find 'jackaroo' holidays very attractive.

(2) With varying degrees of success.

(3) Persons living in 'Zone A' of Figure 3.5 receive substantial concessions, including additional rebates for dependants and educational expenses. Persons living in 'Zone B' receive similar concessions at lower scales.

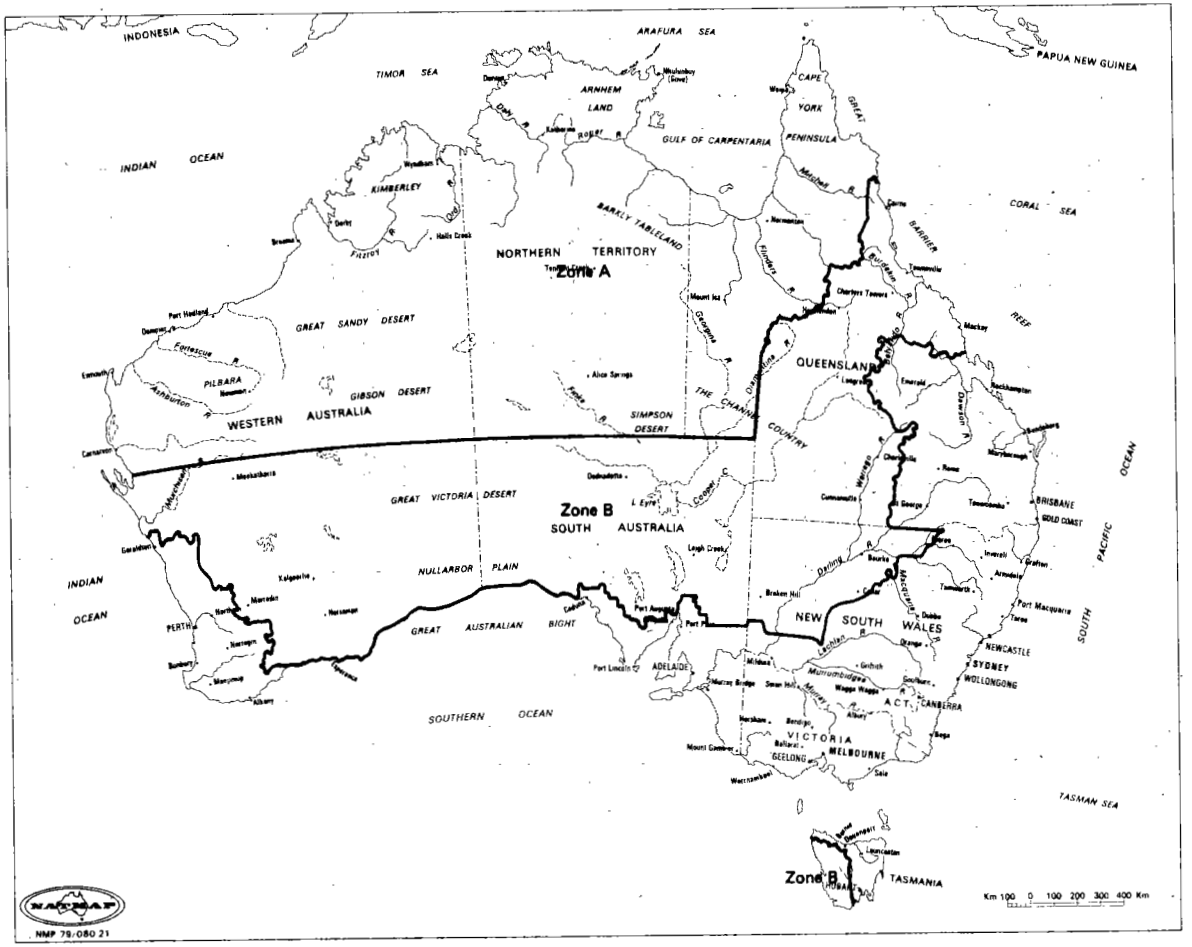

FIGURE 3.5 – ZONES FOR TAXATION CONCESSIONS – 1978 –79

- The levels of general amenity[1] provided by particular population centres. Basically, capital cities would be regarded as having high levels, with progressively lower levels through large regional centres, 'hinterland' areas, high-value pastoral and farming areas, mining areas and (as the lowest levels) the outback regions;[2]

- The difficulty (in the sense of a generalised cost) of gaining access to those services, as measured by some function of the distance at which they are located from potential users.

In the BTE analysis, population density (at the LGA level) was used as a proxy for generalised amenity. This measure is directionally correct, in the sense that areas of higher population density almost invariably have higher levels of service facilities. The doubt which might be expressed is whether (for example) an area with three times the population density of another area actually has three times the amenity level (as opposed, to say, twice or four times). However, this problem was not regarded as major in the context of this limited study of remoteness, and should not affect the overall validity of the basic indicators developed here. In terms of difficulty of access, difficulty clearly increases with distance. Appropriate functional forms of the relationship are discussed in Appendix V.

The final form of the remoteness indicator is also discussed in Appendix V. Basically, it consists of looking at each LGA in turn, and summing the accessibility of people in that LGA to services provided in all LGAs. The result of this process gives a basic measure of overall amenity availability for the particular LGA in question. This result is then inverted and scaled to give the remoteness indicator value. Lower values of the latter

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(1) In the sense of some measure of the general availability of services (medical, educational and so on) of the kinds noted earlier in this Section.

(2) Note that this relates to existence of services, not accessibility to them.

indicator imply less 'remoteness', and typical values are discussed in Appendix V. Values of the indicator for various parts of Australia are shown in Figure 3.6.

It should be emphasised that the figures given in Appendix V (and shown in Figure 3.6) are relative only. Further, an indicator value for one area of (say) twice that for another does not necessarily imply that the former is twice as 'remote', since the indicator is basically non-linear. The BTE does not make any judgement about which cut-off level should be chosen to delineate remoteness. Clearly, some of the areas of Australia are remote by any standards, and these show up in Figure 3.6. Equally, there are areas which are certainly not remote, and again these are fairly clearly delineated. However, choice of the level at which remoteness could be regarded as a significant characteristic of a particular geographic area is well outside the range of this study.

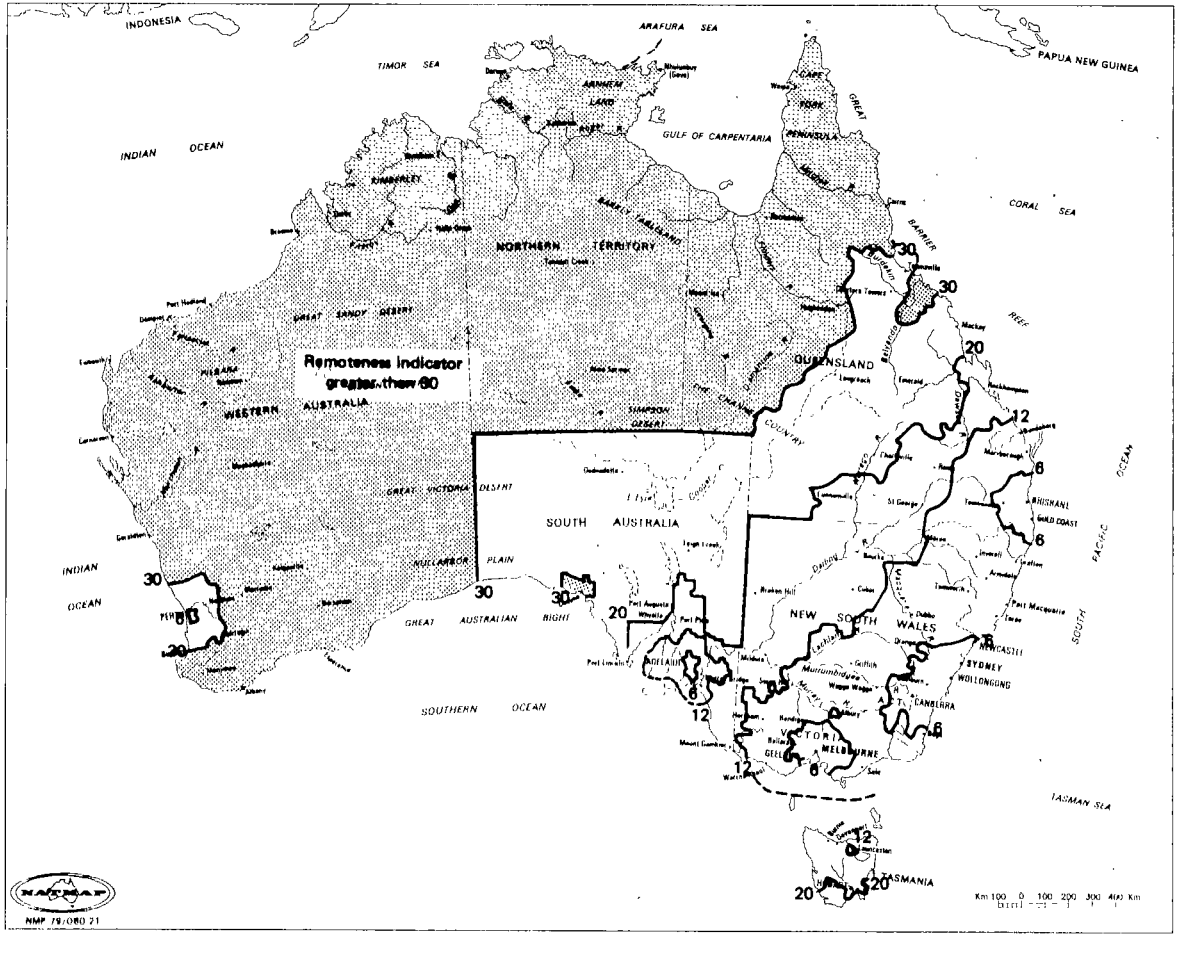

FIGURE 3.6 – REMOTENESS INDICATOR VALUES – 1976 CENSUS DATA

CHAPTER 4 - GENERAL AVIATION ACTIVITIES

Earlier Chapters of this Paper have dealt with the nature of the regulatory environment for civil aviation in Australia, and with some of the basic characteristics of general aviation. In this Chapter, the principal focus is on the way in which Australian general aviation activities are performed. The basic operational characteristics examined in this analysis are as follows:

- Growth in both aggregate and individual general aviation operations relative to other civil aviation activity;
- Detailed indicators of operational levels associated with a number of tasks performed by general aviation. This analysis is primarily based on results of the BTE's General Aviation Survey 1979;
- Certain trip distribution information relating to principal places visited by general aviation operators[1];
- Bases for maintenance purposes[1];
- Details of employment in general aviation operations[1];
- A detailed description of commuter operations, based on services scheduled.

GROWTH IN GENERAL AVIATION ACTIVITIES

In 1978-79, general aviation in Australia accounted for 1.6 million hours flown, or 82 per cent of the total of 2.0 million hours performed by Australian civil aviation as a whole. A comparative breakdown of hours flown from 1970-71 to 1978-79 is

(1) Again, these items of information were derived from the BTE's General Aviation Survey 1979.

shown in Table 4.1. The general aviation share of the total has grown significantly in recent years. In 1970-71, general aviation accounted for 1.0 million hours (or 75 per cent of the civil aviation total), but by 1978-79 the general aviation share had increased to 82 per cent. Whereas the total number of general aviation hours flown grew by 55 per cent between 1970-71 and 1978-79, the number of hours flown by Australian scheduled airlines remained relatively constant over that period.

TABLE 4.1 - HOURS FLOWN IN CIVIL AVIATION - 1970-71 TO 1978-79

('000)

Year	Scheduled Airline Operations			General Aviation Operations[a]	Total Civil Aviation
	Domestic	International (QANTAS)	Total		
1970-71	268	88	356	1 047	1 403
1971-72	257	82	339	1 034	1 373
1972-73	265	80	345	1 077	1 422
1973-74	291	81	372	1 216	1 588
1974-75	291	83	374	1 258	1 632
1975-76	275	83	358	1 263	1 621
1976-77	261	78	339	1 441	1 780
1977-78	279	78	357	1 531	1 888
1978-79	279	71	350	1 628	1 978

(a) Includes non-airline operations of airline aircraft. In 1978-79, hours flown in these operations totalled 13 600.

Source: Air Transport Statistical Unit, DOT.

In the context of this study, general aviation operations are basically defined as covering all civil aviation operations by aircraft other than those associated with scheduled airline services[1]. However, in order to examine general aviation on a

(1) Together with a few specialised exceptions noted in Chapter 1.

somewhat finer basis, the following groups of flying activities are generally separately identified[1] as being within the ambit of general aviation:

- Commuter Operations - these are regular scheduled services operating under an ANR 203 exemption, involving carriage of passengers and freight according to a published schedule of movements and fares;

- Charter Operations - these cover all flying (other than commuter operations) involving the carriage of passengers and freight for hire and reward;

- Aerial Agriculture Operations - these are operations in which the aircraft is used in connection with pest and disease control, fertilising, seeding and similar agricultural functions;

- Flying Training Operations - these cover all flying for the purposes of obtaining practical instruction (such as for issue or renewal of a licence or rating or for aircraft-type endorsement);

- Other Aerial Work Operations - these include aerial survey, photography, towing, spotting, advertising, ambulance, search and rescue, coastal surveillance, police work, test and ferry and other operations not described elsewhere;

- Business Flying Operations - these cover all flying involving transportation of the aircraft owner (or employees of the owner) for business purposes;

- Private Flying Operations - these cover all flying involving the transportation of the owner (or relatives, friends or employees of the owner) for personal or recreational purposes.

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(1) An even finer breakdown was used in the BTE's General Aviation Survey 1979, as discussed later.

In terms of these groupings of activities, the most important single element of Australian general aviation in terms of hours flown in 1978-79 was flying training, which totalled 360 000 hours (or 22 per cent of all general aviation hours flown). Other important activities were business flying and charter operations (both at around 275 000 hours or 17 per cent of the total), and private flying (264 000 hours or 16 per cent). Aerial agriculture in 1978-79 contributed 118 000 hours (7 per cent) and commuter operations 100 000 hours (6 per cent). Full details of hours flown within this breakdown of general aviation activities are shown in Table 4.2 for each year from 1970-71 to 1978-79.

In 1978-79, all of these activities were being performed at higher levels than in 1970-71. However, the overall growth varied from activity to activity. Also, not all activities exhibited consistent positive growth over the period under consideration. In particular, growth in charter and aerial agriculture[1] activity fluctuated quite markedly, with several cases of negative growth from year to year. Growth in total hours flown in general aviation, however, was consistently positive from 1971-72 onwards (after a small decline from the 1970-71 level).

Comparing 1978-79 figures for hours flown directly with 1970-71 figures, commuter operations over this eight-year period had grown by 233 per cent, while the corresponding figures for charter, aerial agriculture and flying training operations were 15 per cent, 26 per cent and 61 per cent. On the same basis, other aerial work activity increased by 81 per cent, while business and private flying activity increased by 107 per cent and 35 per cent respectively. It could be surmised that the low overall increase in charter activity was caused by development of commuter or business activity.

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(1) Both of these activities (and particularly aerial agriculture) would be expected to vary depending on conditions in other areas of the economy.

TABLE 4.2 - HOURS FLOWN IN GENERAL AVIATION[a] - 1970-71 TO 1978-79

('000)

Year	Flying Activity							Total Hours Flown
	Commuter	Charter	Aerial Agric-ulture	Flying Training	Other Aerial Work	Business	Private	
1970-71	30	239	94	224	132	133	195	1 047
1971-72	32	230	92	225	133	124	198	1 034
1972-73	33	253	112	205	145	125	204	1 077
1973-74	47	276	134	235	161	138	225	1 216
1974-75	60	280	95	262	161	140	260	1 258
1975-76	69	233	71	290	173	184	243	1 263
1976-77	77	254	88	323	211	238	250	1 441
1977-78	82	234	111	357	214	278	255	1 531
1978-79	100	274	118	360	237	275	264	1 628

(a) Includes non-airline operations of airline aircraft. In 1978-79, hours flown in these operations totalled 13 600.

Source: Air Transport Statistical Unit, DOT.

CURRENT GENERAL AVIATION OPERATIONS

The figures set out in the previous Section were based on official figures produced by DOT, and were derived from six-monthly surveys covering all aircraft registered in Australia. Figures for current flying activities collected in the BTE's General Aviation Survey 1979 were compiled on a slightly different basis, in that the non-scheduled operations of airline aircraft were excluded and some of the activity categories were defined[1] differently. The principal difference was the BTEs recognition of a separate category to include the total operations of aircraft hired out without crew for periods of up to two weeks at a time. The BTE survey also split out a number of separate additional categories of aerial work activity ('search and rescue', 'aerial ambulance' and 'other community welfare services'), and it included aerial mustering with aerial agriculture. The fashion in which information was collected in the BTEs General Aviation Survey 1979 also allowed for correlation of results with other geographic and economic factors. However, the information is subject to the normal sampling errors and figures presented should not be regarded as absolute.

Hours Flown

Details of hours flown in 1978-79 in each activity category and State (as estimated by the BTE survey) are set out in Table 4.3. As might be expected, the total hours flown (at 1 609 000) was slightly less than the figure of 1 628 000 hours recorded by the DOT Air Transport Statistical Unit[2].

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(1) This difference of definition was largely due to desires to bring BTE statistics into line with overseas categorisations, and also to line up with objectives of the DOT review. The figures are basically compatible with previous DOT surveys of hours flown, but the BTE figures are on a finer basis.

(2) As previously mentioned, the BTE survey excluded non-scheduled operations of airline aircraft. The residual differences between the two sets of figures are within normal statistical tolerances.

TABLE 4.3 - HOURS FLOWN IN GENERAL AVIATION - 1978-79

('000)

State[a]	Flying Activity											Total Hours Flown	
	Search and Rescue	Aerial Ambulance	Other Community Welfare	Commuter	Charter	Hired-out Aircraft	Aerial Agriculture	Flying Training	Other Aerial Work	Business	Private	Number	Per cent
NSW[b]	1	20	2	33	62	34	82	92	16	72	69	483	30
Vic	-	-	1	13	51	26	13	88	14	56	40	302	19
Qld	1	6	4	26	50	16	40	56	16	61	25	301	19
SA	-	7	6	16	11	13	11	34	9	30	18	155	9
WA	-	27	25	11	35	6	35	31	15	41	23	249	15
Tas	-	1	1	8	6	3	-	6	-	4	4	33	2
NT	-	3	2	1	21	4	2	3	8	12	4	60	4
Not Stated	2	-	-	-	2	-	6	2	-	11	3	26	2
Australia	4	64	41	108	238	102	189	312	78	287	186	1 609	100

(a) Refers to the State or Territory in which the fleet concerned was based.

(b) Includes ACT.

Source: General Aviation Survey 1979.

The total hours flown in 1978-79 by aircraft based in New South Wales were 483 000, over a third of which were contributed by aircraft based in the Sydney Region (Region 214 in terms of the NTS regional system used in Chapter 3). These Sydney-based aircraft made up nearly all of the total State commuter hours, 60 per cent of flying training hours and around half of the private flying hours. The Armidale and Bathurst Regions (Regions 202 and 208, respectively) each made up more than one-quarter of the total State aerial agriculture hours. These same regions accounted for more total hours than any other region apart from Sydney.

Victorian-based aircraft flew 302 000 hours on general aviation activities in 1978-79, with aircraft based in the Melbourne Region (Region 311) making up nearly two-thirds of this total. The next most important region in terms of total flying hours was Shepparton (Region 307).

In Queensland, general aviation aircraft flew 301 000 hours. Although Brisbane-based aircraft (Region 401) flew more hours than those from any other region, they contributed only 24 per cent to the total hours flown in the State. The next most important regions were Rockhampton and Cairns (Regions 405 and 408, respectively), each with 11 per cent of total hours flown in the State.

South Australia recorded the lowest level of General Aviation activity of any mainland State (with 155 000) hours). Slightly over half of this total was contributed by Adelaide-based aircraft (Region 501). However, for both business and private flying these Adelaide-based aircraft made up only about 30 per cent of the respective State totals.

General aviation aircraft based in Western Australia flew 249 000 hours, of which 36 per cent were flown by aircraft based in Perth (Region 608). After Perth, more hours were flown by aircraft based in the Port Hedland and Derby Regions (Regions 605 and 606 respectively) than in other regions.

Tasmanian-based aircraft flew 33 000 hours and those based in the Northern Territory flew 60 000 hours. The hours recorded in the BTE survey as flown by aircraft not identified to a particular State or Territory totalled 26 000 hours.

Flights

In 1978-79, general aviation aircraft made 1 705 000 flights. Of this total, 727 000 were made by aircraft based in New South Wales (43 per cent of total). Aircraft based in Victoria, Queensland, Western Australia and South Australia made 303 000, 263 000, 191 000 and 152 000 flights respectively. Full details are set out in Table 4.4.

A comparison of the number of flights made and hours flown (Table 4.3) indicates that the average flight time was 0.94 hours. The average flight time for the various categories of operation varied greatly, with the longest (search-and-rescue flights) being of around four hours duration, on average. Aerial agriculture flights were the shortest with 0.3 hours duration on average. Flights in other aerial work operations averaged 0.6 hours. The average flight time for commuter services was 1.4 hours.

Persons carried

In 1978-79, the BTE estimates that general aviation aircraft carried 2 042 000 persons, of whom 608 000 or approximately 30 per cent were carried in conjunction with charter operations. The commuter airlines carried another 590 000 (29 per cent of total) while business aircraft carried 480 000 (24 per cent) and private aircraft 284 000 (14 per cent). A total of 80 000 passengers were carried on ambulance aircraft. Overall details of persons carried are shown in Table 4.5. It should be noted that the BTEs survey did not request details for persons carried in a number of activity categories. Hence, only a limited number of categories is shown in Table 4.5.

TABLE 4.4 - FLIGHTS UNDERTAKEN IN GENERAL AVIATION - 1978-79

('000)

State[a]	Flying Activity											Total Flights	
	Search and Rescue	Aerial Ambulance	Other Community Welfare	Commuter	Charter	Hired-Out Aircraft	Aerial Agriculture	Flying Training	Other Aerial Work	Business	Private	Number	Per cent
NSW[b]	-	20	2	48	56	3	387	100	27	48	36	727	43
Vic	-	-	1	8	13	14	79	61	50	52	25	303	18
Qld	-	3	4	5	38	10	62	71	23	33	14	263	15
SA	-	3	5	3	3	11	33	20	26	34	14	152	9
WA	-	11	9	11	21	5	50	39	7	19	19	191	11
Tas	-	1	1	-	4	3	-	17	-	3	1	30	2
NT	-	1	-	-	10	3	1	3	4	5	3	30	2
Not Stated	1	-	-	-	1	1	2	1	-	1	2	9	-
Australia	1	39	22	75	146	50	614	312	137	195	114	1 705	100

(a) Refers to the State or Territory in which the fleet concerned was based.

(b) Includes ACT.

Source: General Aviation Survey 1979.

TABLE 4.5 - PERSONS CARRIED IN GENERAL AVIATION - 1978-79

('000)

State[a]	Flying Activity					Total Persons Carried	
	Aerial Ambul-ance	Commuter	Charter	Business	Private	Number	Per cent
NSW[b]	30	293	214	172	95	804	39
Vic	-	28	67	117	65	277	14
Qld	3	163	222	42	22	452	22
SA	6	53	16	25	15	115	6
WA	38	(c)	45	67	76	226	11
Tas	(c)	53	17	25	2	97	5
NT	3	(c)	23	31	5	62	3
Not Stated	-	-	4	1	4	9	-
Australia	80	590	608	480	284	2 042	100

(a) Refers to the State or Territory in which the fleet concerned was based.

(b) Includes ACT.

(c) Figures unreliable and not reported due to small sample size.

Source: General Aviation Survey 1979.

Freight Carried

The total amount of freight carried in commuter, charter and business flying activity in 1978-79 (as reported in the BTE's General Aviation Survey 1979) was 133 000 tonnes. Business activity accounted for most of this total (85 000 tonnes) with charter activity covering 40 000 tonnes and commuter activity 7 000 tonnes. Some 53 per cent of total freight was carried by Queensland-based aircraft, and a further 17 per cent by aircraft based in New South Wales. Western Australian aircraft carried 16 per cent of the total freight, followed by aircraft based in Victoria with 11 per cent. Most of the Victorian freight was carried across Bass Strait. Full details are given in Table 4.6, in which the flying activity categories are again a subset of the full range used in the BTE's survey.

PLACES MOST FREQUENTLY VISITED

The BTEs General Aviation Survey 1979 asked operators to list both the places most frequently visited during 1978-79 and the numbers of visits made to those places. This information, combined with information on the principal bases for the flying activities of respondents, provided an indication of the general nature and distribution of principal aircraft movement patterns in Australia.

For the purpose of analysis of aircraft movement patterns, the number of visits reported to a particular airfield were taken to represent 'trips' between that airfield and the base of flying activity of the operator. 'Trips' may or may not equate with actual flights made. For example, places indicated as being visited frequently by operators in the survey may not have been visited directly from the base of operations (that is, intermediate stops may have been made).

In order to permit an unambiguous analysis of aircraft movement patterns, those responses which indicated multiple bases for

TABLE 4.6 - FREIGHT CARRIED ON GENERAL AVIATION - 1978-79

(Tonnes)

State[a]	Flying Activity			Total Freight	
	Commuter	Charter	Business	Number	Per cent
NSW[b]	1 760	5 603	15 774	23 137	17
Vic	43	6 997	8 105	15 145	11
Qld	4 115	26 834	39 330	70 279	53
SA	280	24	366	670	1
WA	186	623	19 770	20 579	16
Tas	847	180	225	1 252	1
NT	13	3	1 435	1 451	1
Not Stated	-	-	28	28	-
Australia	7 244	40 264	85 033	132 541	100

(a) Refers to the State or Territory in which the fleet concerned was based.

(b) Includes ACT.

Source: General Aviation Survey 1979.

their operations were excluded. As a result, the base airfields indicated in response to Question 4 of the questionnaire were taken as the effective origins of the trips and the airfields visited as indicated in response to Question 5 were taken as effective destinations. The aircraft movement pattern reported by 2477 operators[1] who returned usable questionnaires is discussed in Appendix IV. These operators reported a total of 77 494 trips in the survey.

These trips were not weighted to account for the incomplete sample of operators responding to the survey, as it could not necessarily be assumed that the places visited (as indicated by the respondents) were representative of the true range of most-frequently-visited airfields. In any case, the main thrust of this Section is concerned with the distribution rather than the absolute numbers of trips. The most frequently indicated aircraft bases and places visited are shown in Tables 4.7 and 4.8. The corresponding NTS regions are shown in Tables 4.7 and 4.8, together with their populations.

Of the twenty NTS regions with the highest departure levels, eighteen regions had populations of over 50 000. However, forty-eight of the sixty-four NTS regions had populations in this range. Thus, any relationship between regional populations and the number of trips originating from operations based in that region is far from clear-cut.

The same conclusion applies to places visited. From Table 4.8, twenty-one of the twenty-five NTS regions with the highest visit levels had populations greater than 50 000, but this was less than half of the number of NTS regions containing this population range. Hence, on the basis of the visits reported in the survey, there was no apparent simple relationship between the

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(1) Only sixty-six operators (or 3 per cent of those responding to the survey) reported having more than one base for their operations.

TABLE 4.7 - NTS REGIONS WITH MAJOR DEPARTURE LEVELS INDICATED IN THE GENERAL AVIATION SURVEY 1979[a]

NTS Region Number	NTS Region Name[b]	Departures (Per cent)	Population[c]
311	Melbourne	16.6	2 649 134
214	Sydney	9.8	2 901 208
401	Brisbane	5.2	696 740
202	Armidale	5.0	168 015
501	Adelaide	5.0	903 003
608	Perth	4.2	819 078
406	Mackay	3.9	77 038
305	Mildura	3.2	68 605
211	Newcastle	2.6	419 612
210	Cooma	2.4	47 210
205	Deniliquin	2.4	36 537
216	Taree	1.8	71 665
203	Dubbo	1.7	99 004
301	Geelong	1.6	181 008
405	Rockhampton	1.6	126 395
507	Murray Bridge	1.5	58 591
402	Gold Coast	1.5	310 130
307	Shepparton	1.4	120 720
504	Whyalla	1.3	82 727
404	Bundaberg	1.3	152 095
	Other Regions	26.0	3 544 385
Australia		100.0	13 532 900[d]

(a) Specific regions nominated are those with more than 1000 departures reported in the Survey.

(b) These NTS regions represent the regions of origin of the trips tabulated.

(c) These population figures were obtained from the Census of Population and Housing conducted by the Australian Bureau of Statistics on 30 June 1976.

(d) Excludes migratory population totalling 15 567.

Source: General Aviation Survey 1979.

TABLE 4.8 - NTS REGIONS WITH MAJOR VISIT LEVELS INDICATED IN THE GENERAL AVIATION SURVEY 1979[a]

NTS Region Number	NTS Region Name[b]	Visits (Per cent)	Population[c]
311	Melbourne	11.4	2 649 134
214	Sydney	7.8	2 901 208
202	Armidale	5.5	168 015
207	Wagga	5.2	134 737
401	Brisbane	4.9	696 740
501	Adelaide	4.1	903 003
406	Mackay	3.7	77 038
211	Newcastle	2.8	419 612
608	Perth	2.8	819 078
702	Burnie	2.6	88 861
203	Dubbo	2.5	99 004
405	Rockhampton	2.4	126 395
607	Geraldton	2.2	45 219
305	Mildura	2.2	68 605
206	Albury	2.1	54 439
506	Victor Harbour	2.1	34 914
412	Toowoomba	1.8	155 313
703	Launceston	1.7	109 569
309	Sale	1.6	56 513
101	ACT	1.6	196 935
208	Bathurst	1.6	155 462
409	Mount Isa	1.5	41 058
402	Gold Coast	1.3	310 130
216	Taree	1.3	71 665
509	Woomera	1.3	14 948
	Other Regions	22.0	3 135 305
Australia		100.0	13 532 900[d]

(a) Specific regions nominated are those with more than 1000 visits reported in the Survey.

(b) These NTS regions represent the regions of destination of the trips tabulated.

(c) These population figures were obtained from the Census of Population and Housing conducted by the Australian Bureau of Statistics on 30 June 1976.

(d) Excludes migratory population totalling 15 567.

Source: General Aviation Survey 1979.

population of a region and the number of visits to that region by general aviation aircraft.

Several further points emerge from a consideration of the analysis presented in Tables 4.7 and 4.8 and in Appendix IV. These points are summarised below:

- There was a much more even spread of trips across the NTS regions in Queensland than in the other States;

- Widely-differing numbers of departures and visits occurred in some adjacent regions with virtually identical populations. Also, in some cases far fewer trips were associated with the region with the larger population. Special geographic characteristics of various regions sometimes accounted for this[1], and other differences may be explained by the provision of domestic or regional air services to some regions;

- Several NTS regions close to State capitals were more popular as places visited than as bases of operations. This is probably due to the advantages of a more central operations base in the NTS region containing the capital city;

- Several NTS regions associated with mining or tourism were more popular as places visited than as bases of operations, indicating that operations serving these regions were based elsewhere;

- With the exception of departures from the far north coast of New South Wales and visits to Tasmania, the majority of aircraft movements were intrastate;

- The large number of visits to northern Tasmania (predominantly

(1) For example, certain regions were bases for visits to offshore islands not readily accessible by means other than aircraft.

originating in Melbourne) reflect the relative lack of access to these regions by other means of transport;

- There were significantly more reported visits to and departures from the Melbourne Region than the Sydney Region. However, visits originating and terminating in the same NTS region accounted for much of this difference - there were nearly 4000 reported in the Melbourne Region compared with only 2000 reported in the Sydney Region;

- Intra-regional visits were a significant proportion (32 per cent) of all visits reported in the survey. Of all departures from capital city NTS regions, 27 per cent were to places in the same region. Of all departures from other regions, 35 per cent were to places in the same region;

- The pattern of rural-based aircraft movements differed among the States. This is considered in Appendix IV in more detail;

Table 4.9 provides an overview of aircraft movements by type of operation and nature of flight. It is considered that the proportions of charter, aerial work (including flying training, aerial agriculture and so on) and business and private flying shown adequately indicate the general nature and distribution of aircraft movement patterns in Australia.

A comparison of the figures set out in Table 4.9 shows that, for Australia as a whole, between 31 and 36 per cent of all flights were made to destinations located within the same region as the base of operations. For aerial work, business and private flying, half or more of the flights were made to other destinations within the same State. For charter operations, this proportion fell to around 38 per cent, because a greater proportion of charter flights (about 25 per cent of the total) were made to interstate destinations.

TABLE 4.9 - PROPORTIONS OF TOTAL VISITS BY TYPE OF OPERATION, NATURE OF FLIGHT AND STATE[a] - 1978-79

(Per cent)

State[b]	Flights to Destinations in			Total Flights
	Same Region	Other Regions in Same State	Regions in Other States	
	CHARTER OPERATIONS			
NSW[c]	47.7	34.5	17.8	100.0
Vic	18.8	32.2	49.0	100.0
Qld	55.2	40.9	3.9	100.0
SA	39.0	59.4	1.6	100.0
WA	24.7	69.9	5.4	100.0
Tas	20.0	20.0	60.0	100.0
NT	100.0	-	-	100.0
Australia	36.4	38.2	25.4	100.0
	AERIAL WORK			
NSW[c]	22.3	68.1	9.6	100.0
Vic	40.2	43.9	15.9	100.0
Qld	36.4	54.0	9.6	100.0
SA	18.2	36.5	45.3	100.0
WA	49.7	43.0	7.3	100.0
Tas	40.0	60.0	-	100.0
NT	70.4	-	29.6	100.0
Australia	31.3	54.1	14.6	100.0
	BUSINESS AND PRIVATE FLYING			
NSW[c]	31.4	55.2	13.4	100.0
Vic	24.4	35.2	40.4	100.0
Qld	43.1	49.4	7.5	100.0
SA	9.6	67.4	23.0	100.0
WA	28.3	69.9	1.8	100.0
Tas	47.2	47.2	5.6	100.0
NT	73.0	-	27.0	100.0
Australia	32.0	50.0	18.0	100.0

(a) Based on data provided by operators operating out of a single base. Where operators reported more than one category of operations they were classified to the highest category according to the following schedule: (1) commuter services, (2) charter operations, (3) aerial work, (4) business and private.

(b) Refers to the State or Territory in which the aircraft concerned were based.

(c) Includes ACT.

Source: General Aviation Survey 1979.

A considerable number of charter flights were made to destinations within the same region. The proportions of total flights exhibiting this characteristic were 55 per cent in Queensland and 47 per cent in New South Wales. The proportions of interstate charter flights were highest in Victoria and Tasmania, due to the high level of movements across Bass Strait.

In general, aerial work is undertaken mainly within a State, although results for aircraft based in South Australia indicated that 45 per cent of flights were made to interstate destinations. Aircraft based in the Murray Bridge Region (Region 507) and flying to Victoria made up most of this total.

Figures for business and private flying did not indicate marked differences in flight distribution patterns between States, although the low proportion of South Australian flights made within the same region (around 10 per cent) and the low proportion of Western Australian interstate flights (around 2 per cent of total) are worthy of note. A more detailed presentation of aggregate flight distribution characteristics is given in Appendix IV.

AIRCRAFT MAINTENANCE

Aircraft operators were asked in the BTEs General Aviation Survey 1979 to indicate where major maintenance of aircraft was carried out in 1978-79. These details were tabulated according to the regions in which the aircraft were based and the regions where maintenance was carried out. Details of the results (in a summarised form) are set out in Table 4.10.

Geographic Distribution of Maintenance

The most important feature of the maintenance picture in Australia (in a geographic sense) is that 59 per cent of aircraft were maintained at airports located in the same region as the one in which they were based. A further 26 per cent of aircraft had

maintenance carried out at airports in other regions within the same State. Only 6 per cent of aircraft were taken to interstate destinations for maintenance. For a further 10 per cent of aircraft, various factors prevented adequate identification of a maintenance base.

TABLE 4.10 - GENERAL AVIATION AIRCRAFT BY STATE AND LOCATION OF MAINTENANCE BASE - 30 JUNE 1979

State[a]	Aircraft Maintained in				Total Aircraft
	Same Region	Other Regions in Same State	Regions In Other States	Not Stated	
NSW[b]	1 249	388	67	141	1 845
Vic	903	353	135	39	1 430
Qld	511	288	48	157	1 004
SA	321	153	36	25	535
WA	320	275	19	48	662
Tas	62	5	5	2	74
NT	86	13	10	5	114
Not Stated	-	-	-	185	185
Australia	3 452	1 475	320	602	5 849

(a) Refers to State or Territory in which the aircraft concerned were based.

(b) Includes ACT.

Source: General Aviation Survey 1979.

On a State basis, the pattern of maintenance location was generally similar to the Australian picture. However, in Western Australia there was a greater tendency to fly aircraft to other regions in the State for maintenance (42 per cent of total), with a corresponding proportional decrease in the number maintained in the region in which they were based (48 per cent of total). In Tasmania, there was a greater tendency to have maintenance carried out locally (84 per cent of aircraft being

maintained in the region of base). In the Northern Territory, some 9 per cent of aircraft were flown interstate for maintenance.

Principal Maintenance Centres

In New South Wales, about 35 per cent of aircraft maintained in the State[1] were handled at Bankstown Aerodrome, with smaller numbers being maintained in rural areas. The Armidale, Albury, Wagga and Bathurst Regions (Regions 202, 206, 207 and 208, respectively) included locations where most maintenance work was carried out in country areas.

Moorabbin Airport (in Melbourne) is the main maintenance centre in Victoria, handling maintenance for 33 per cent of all Victorian aircraft. Essendon Airport (again in Melbourne) accounted for a further 10 per cent. Other maintenance bases were included in the Ballarat and Mildura Regions (Regions 303 and 305, respectively).

In Queensland, Archerfield Aerodrome (in Brisbane) was the principal maintenance centre, as was Parafield Aerodrome (near Adelaide) in South Australia and Jandakot Aerodrome (in Perth) in Western Australia. Devonport was an important maintenance base in Tasmania, while Darwin, Batchelor and Alice Springs had the most frequently used facilities in the Northern Territory.

EMPLOYMENT IN GENERAL AVIATION

In the BTEs General Aviation Survey 1979, some 73 per cent of respondents indicated that there was no specific employment[2] in respect of their general aviation activities. The remaining 27 per cent of respondents did employ staff and it is estimated that 76 per cent of these staff members were employed on a

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(1) These include aircraft actually based in other States.
(2) In this context, 'specific employment' refers to paid employment related to general aviation flying operations. It excludes activities of owners, pilots and so on, if these activities were conducted without remuneration.

full-time basis and 24 per cent on a part-time basis. Based on estimates derived from the survey results, general aviation operations in 1978-79 accounted for some 4210 full-time employees and around 1350 part-time employees. Full details are given in Table 4.11.

The most significant employment category covered pilots and aircrew, and this category accounted for 39 per cent of all full-time employees and 48 per cent of all part-time employees. Engineering staff (LAMEs and other engineering and maintenance staff) together accounted for 28 per cent of full-time and 15 per cent of part-time staff. Similar proportions for management and other staff were 33 per cent and 37 per cent, respectively.

Businesses primarily concerned with general aviation employed 3109 persons full-time, which was 74 per cent of total full-time employees, and 735 persons part-time (or 54 per cent of total part-time employees). Rural producers employed more full-time employees (317) than any other category of operator except general aviation businesses. Businesses not primarily concerned with general aviation followed general aviation businesses in numbers of part-time employees (229). Private individuals employed 21 full-time and 78 part-time employees.

CURRENT COMMUTER OPERATIONS

Because of the growing significance of commuter operations in Australia, the BTE undertook a separate analysis of current services provided by operators in this category. In many senses, this analysis covers an otherwise unreported aspect of Australian general aviation.

Because of the scheduled nature of their operations, an analysis of commuter services can be carried out using published timetable

TABLE 4.11 - ESTIMATED AVERAGE NUMBERS OF EMPLOYEES IN GENERAL AVIATION BY CATEGORY - 1978-79

Operator Category	Number of Operators	Category of Employee								Total	
		Management		Pilots and Aircrew		Engineering		Other			
		Full-time	Part-time	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time
Social or Recreational Club	201	8	5	25	12	10	3	12	3	55	23
Government or Semi-Government Body[(a)]	37	25	5	101	10	38	2	15	2	179	19
Rural Producer	1 069	48	20	118	71	80	18	71	76	317	185
Business Primarily Concerned with General Aviation	625	346	73	1 127	340	946	116	690	206	3 109	735
Business not Primarily Concerned with General Aviation	896	37	37	138	148	62	26	35	18	272	229
Religous/Charitable Organisation	53	15	10	48	23	23	-	37	5	123	38
Other Community Welfare	10	10	5	22	7	9	2	13	-	54	14
Private Individual	1 258	2	3	12	35	5	30	2	10	21	78
Not Stated	66	15	3	40	3	20	2	7	22	82	30
Total	4 215	506	161	1 631	649	1 193	199	882	342	4 212	1 351

(a) Excludes DOT Flying Unit.

Source: General Aviation Survey 1979.

sources[1]. All details included in this Section have come from timetable sources. In September 1979, there were 48 commuter operators who were serving 251 airports. These airports were linked by 339 stages (which are defined as direct links between airports). Together, the commuter operators were scheduled as flying around 700 000 km per week, and were providing a payload task capability in excess of 900 000 tonne km per week[2].

This is the equivalent of 37 million aircraft-km for a whole year, and the corresponding annual capacity payload figure is 47 million tonne km. Aggregate details of all commuter operations scheduled in September 1979 are set out in Table 4.12[3].

Commuter operations vary greatly in size. Bush Pilots Airways (based at Cairns but operating throughout Queensland) is the largest commuter operator, with a network which includes 77 airports. In September 1979, Bush Pilots Airways each week was scheduling 492 flights and flying 111 800 km (or around 12 per cent of the Australian total for commuter operators). Advance Airlines, Masling Commuter Services, and Stillwell Airlines[4] were the next

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(1) In assembling timetable details, the BTE acknowledges the assistance given by the Superintendents of Air Transport in the various DOT Regional Offices.

(2) There are a number of ways of determining available payload capacity. In this study, capacity was determined by counting each passenger seat on a particular aircraft type as 0.1 tonnes, and multiplying the total tonneage by the distance which aircraft of that particular type flew each week. Distances were taken as great-circle measurements between airports.

(3) The service operated from Canberra to Albury by Masling Commuter Services has been included as a commuter service although, in fact the route licence in September 1979 was held by TAA. As mentioned in Chapter 1, Masling operated the service on behalf of TAA under the authority of ANR 201 (which allows an airline to sub-contract a service to another approved operator). In October 1979, Masling took over the Canberra to Albury stage as an ANR 203 exempt service.

(4) In September 1979, Stillwell Airlines were operating some ANR 201-type services on a 'trial' basis over the Perth-Kalgoorlie route on behalf of MacRobertson Miller Airlines, which also operated over the same route. This ANR 201 operation of Stillwell Airlines is not included in this study.

TABLE 4.12 - SCHEDULED COMMUTER SERVICES - SEPTEMBER 1979

Operator and State[a]	Centres Served	Stages Flown	Weekly Scheduled - Flights	Aircraft km('000)	Available Payload Capacity tonne - km ('000)
Advance Airlines (NSW)	9	8	156	68	82
Aeropelican Intercity Comm. (NSW)	3	2	192	21	37
Air Tasmania (Tas)	10	13	110	19	14
Avior (WA)	8	14	95	20	18
Bush Pilots Airways (Qld)	77	103	492	112	193
Business Jets (Vic)	7	7	123	29	52
Butler Airlines (Qld)	2	1	20	1	<1
Chartair (NT)	4	4	4	1	<1
Clubair (NSW)	2	1	68	10	13
Cobden Air (NSW)	3	2	56	24	21
Commodore Aviation (SA)	2	1	24	6	4
Davey Air Services (NSW)	5	6	42	9	16
East Coast Commuter Airlines (NSW)	11	17	155	20	20
Eastern Airlines (Qld)	4	6	24	2	1
Emu Air Charter (SA)	3	2	56	4	3
Executive Airlines (Vic)	7	7	89	21	19
Falcon and Sopac Transport (NSW)	2	1	28	4	2
Gawne Airlines (Vic)	2	1	20	3	2
Hazleton Air Services (NSW)	2	1	20	4	4
Henebery Aviation (Qld)	2	1	42	3	1
Island Air (Qld)	3	2	47	6	5
Jet Charter Airlines (NSW)	2	1	6	4	3
Jet Charter (WA)	7	5	56	7	8
Kendell Airlines (NSW)	6	7	100	32	58
MacKnight Airlines (NSW)	3	2	28	3	2
Masling Commuter Services (NSW)	8	6	224	43	78
Murray Valley Airlines (Vic)	2	1	22	7	7
Navair (NSW)	3	2	8	<1	<1
Noosa Air (Qld)	3	2	64	7	6
Norfolk Island Airlines (Qld)	3	2	20	28	31
Opal Air (SA)	5	7	41	24	18
Ord Air Charter (WA)	21	25	21	2	1
Oxley Airlines (NSW)	8	8	22	10	9
PAGAS (SA)	8	9	98	17	12
Radford-Silver City Airlines (NSW)	4	3	34	13	12
Rossair (SA)	2	1	6	9	6
Rundle Air Services (Qld)	2	1	4	1	1
Sandon Airlines (NSW)	2	1	12	4	4
Scheduled Airlines (Vic)	4	3	36	4	2
Scruse-Air Helicopters (NSW)	2	1	40	3	1
South Coast Airlines (Vic)	3	3	36	6	6
Southern Cross Air Services (NSW)	6	4	82	14	14
Sovereign Airlines (Vic)	4	3	57	8	8
Stillwell Airlines (WA)	9	11	86	38	76
Thorpes Transport (Qld)	8	8	26	2	2
Trans-West Air Charter (WA)	18	21	124	23	24
Tropic Air Services (WA)	2	1	4	<1	<1
Williams Aviation (SA)	7	6	68	18	15
All Commuter Operators	251	339	3 188	712	909

(a) Refers to the State or Territory in which the operators concerned were based.

Source: BTE analysis of timetable data.

largest commuter operators in terms of aircraft km flown, with around 10 per cent, 6 per cent and 5 per cent, of the total respectively.

Figures 4.1 to 4.6 set out the stages flown by commuter operators in September 1979 and the frequency of flights[1] over each stage. The busiest stages by far linked Sydney with the two Newcastle airports. These are Belmont (with 172 scheduled movements weekly) and Williamtown (97 movements weekly).

(1) Frequency is shown in ranges of 1-4, 5-9, 10-19, 20-39, 40-80, and above 80.

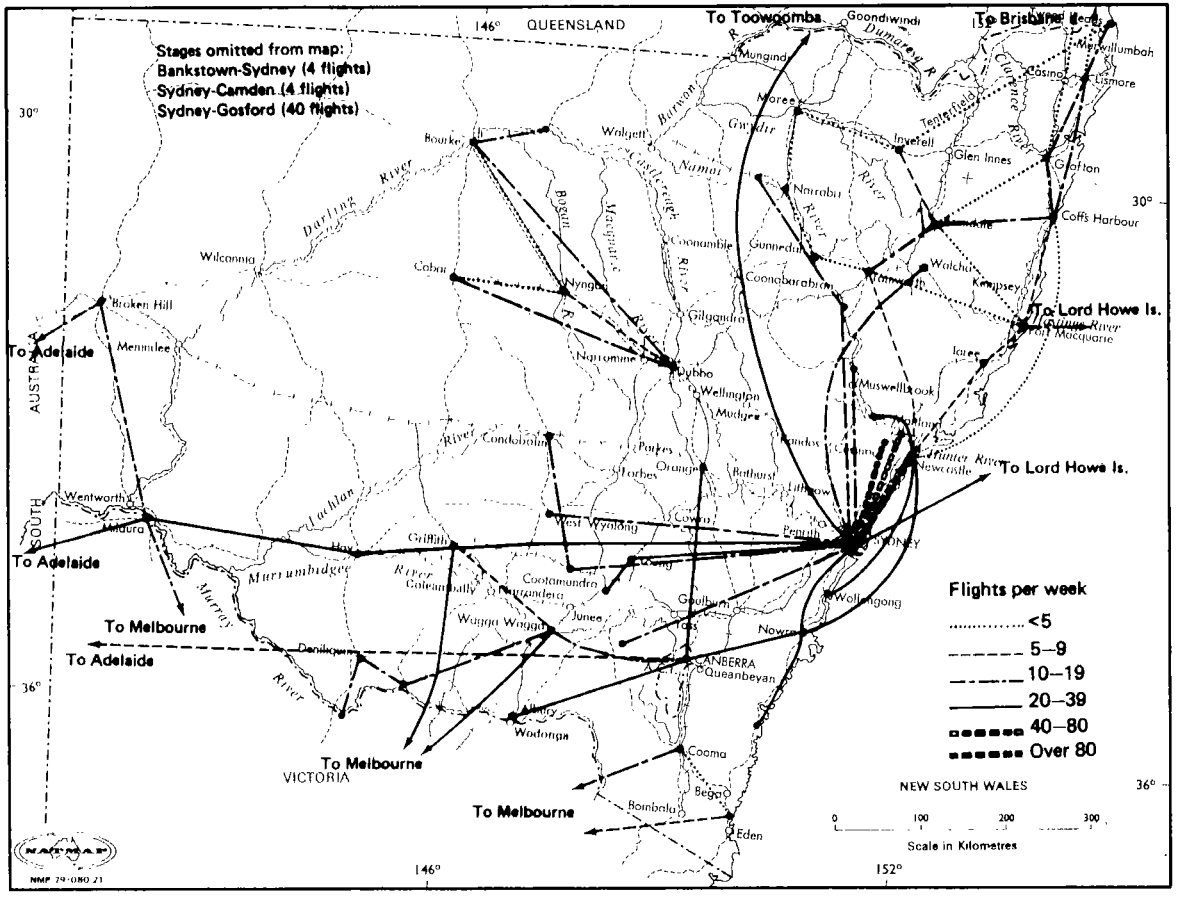

FIGURE 4.1 – STAGES FLOWN BY COMMUTER OPERATORS – SEPTEMBER 1979 – NEW SOUTH WALES AND AUSTRALIAN CAPITAL TERRITORY

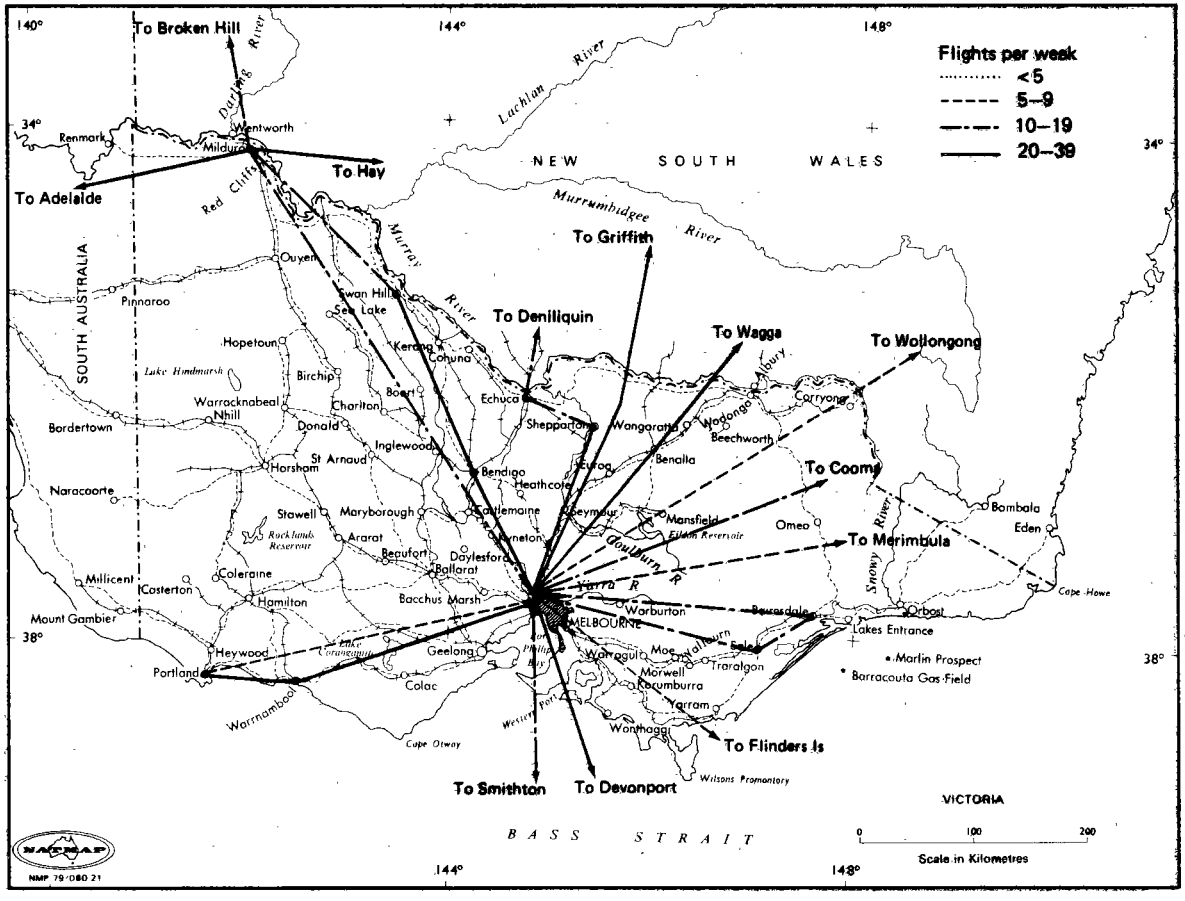

FIGURE 4.2 – STAGES FLOWN BY COMMUTER OPERATORS – SEPTEMBER 1979 – VICTORIA

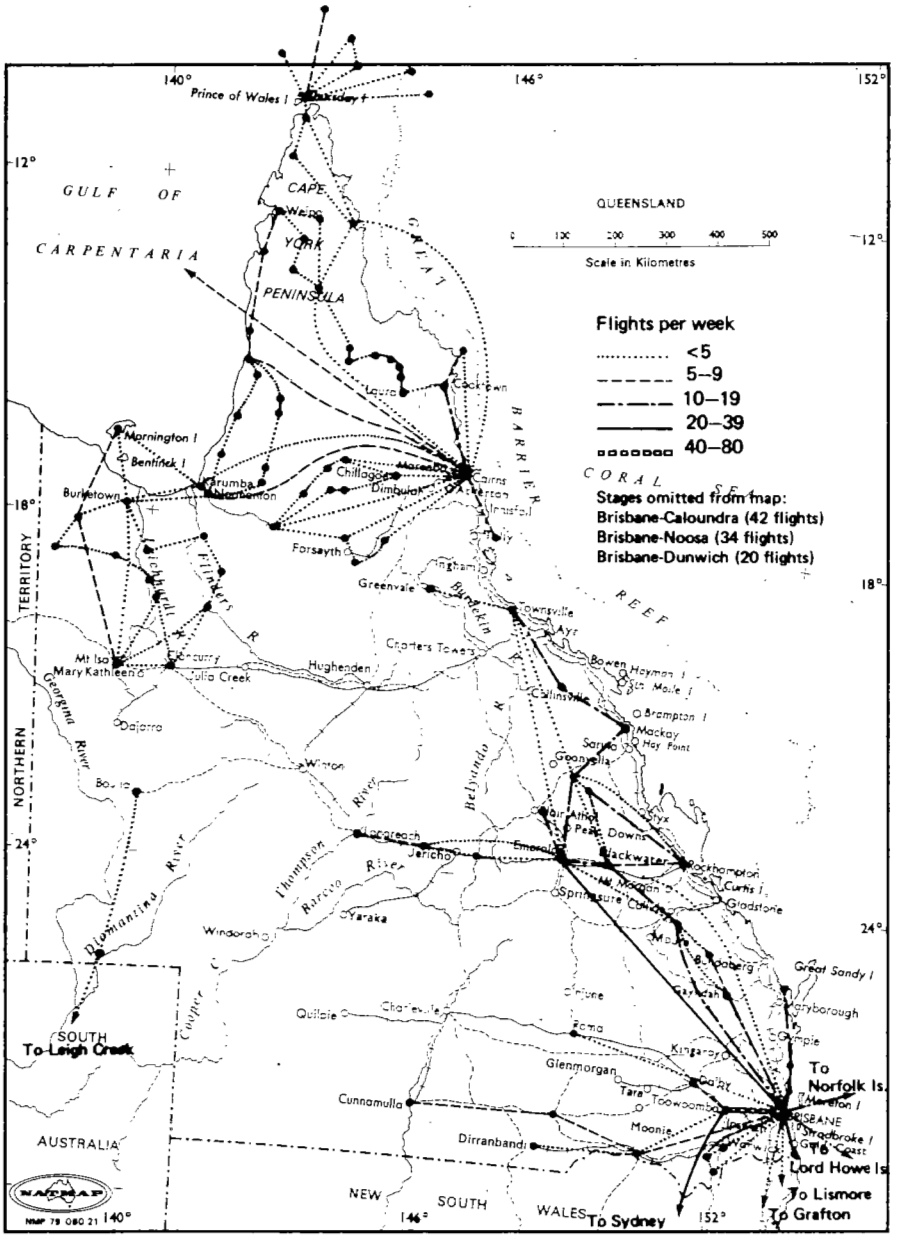

FIGURE 4.3 – STAGES FLOWN BY COMMUTER OPERATORS – SEPTEMBER 1979 – QUEENSLAND

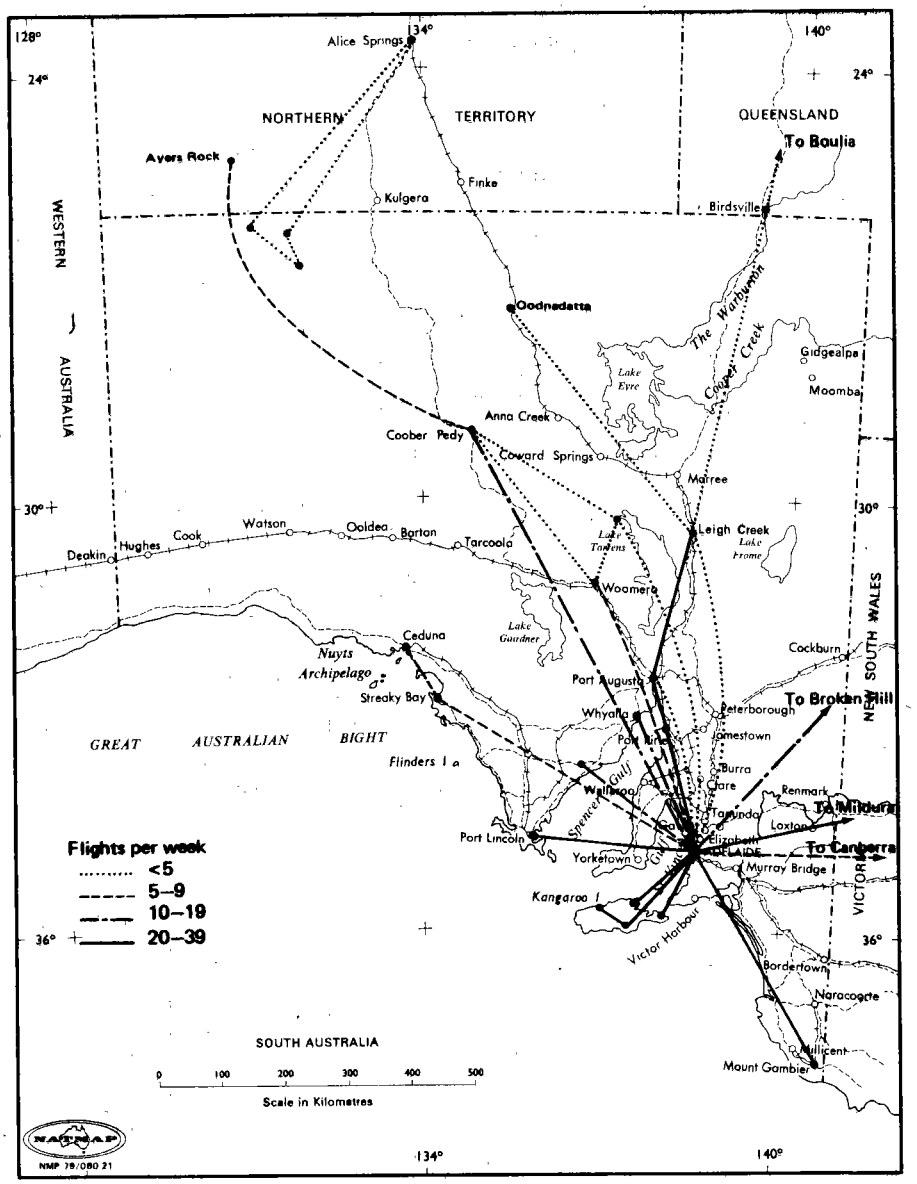

FIGURE 4.4 – STAGES FLOWN BY COMMUTER OPERATORS – SEPTEMBER 1979 – SOUTH AUSTRALIA AND NORTHERN TERRITORY

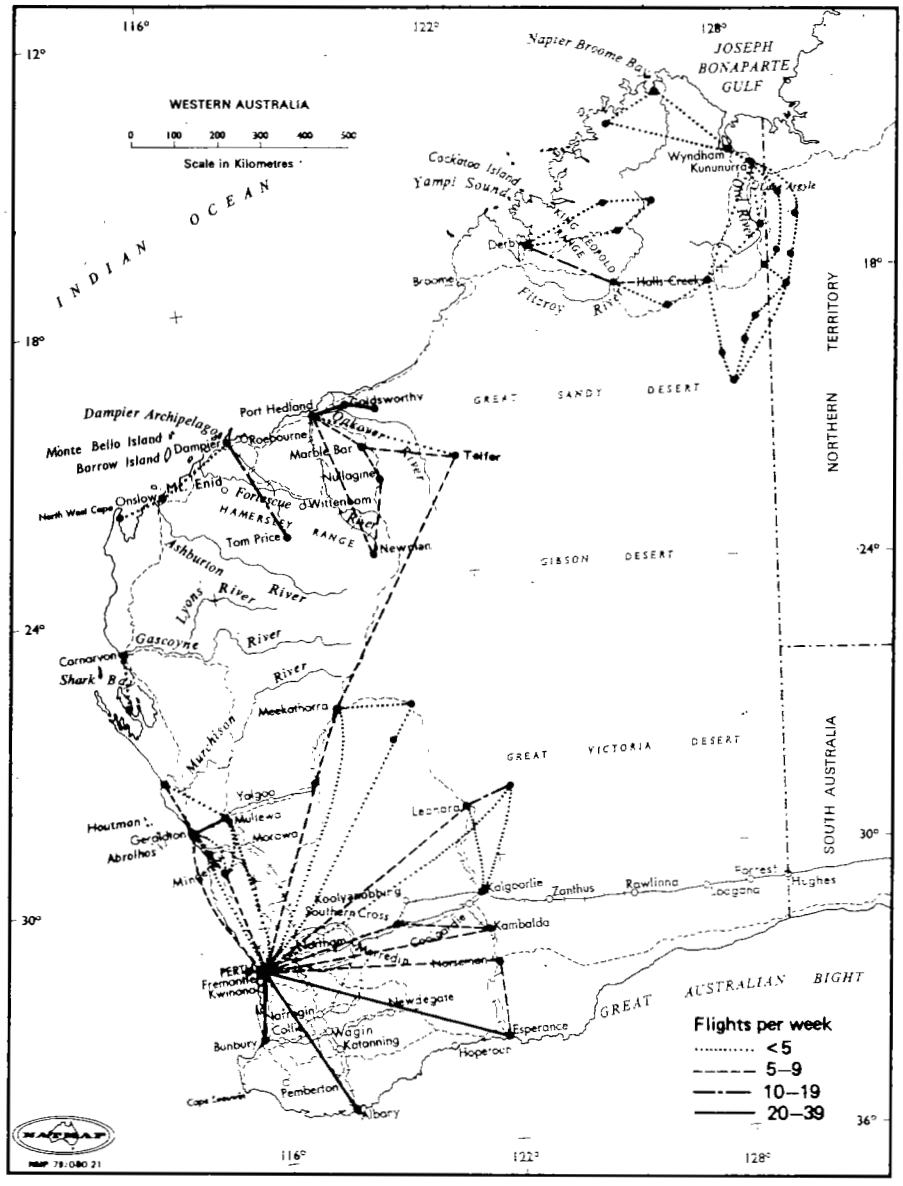

FIGURE 4.5 – STAGES FLOWN BY COMMUTER OPERATORS – SEPTEMBER 1979 – WESTERN AUSTRALIA

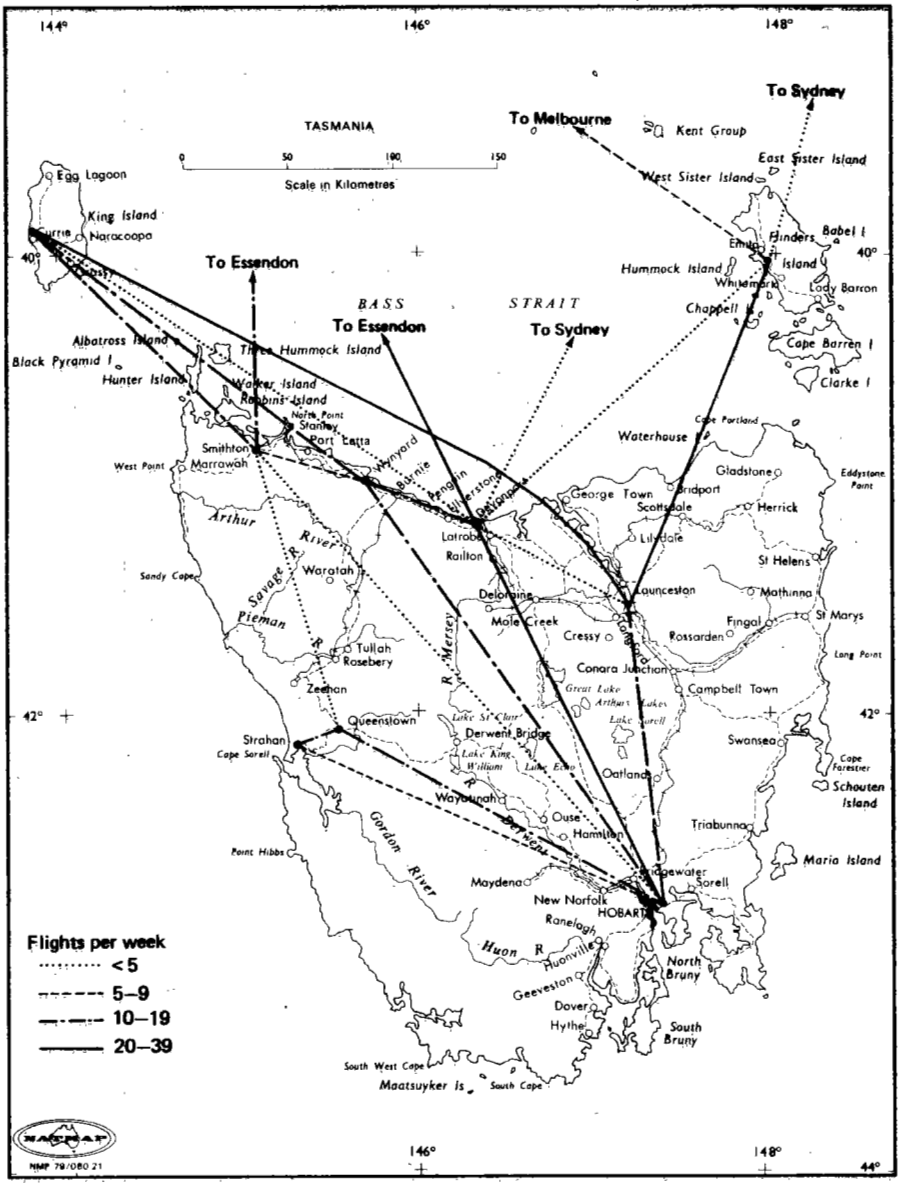

FIGURE 4.6 – STAGES FLOWN BY COMMUTER OPERATORS – SEPTEMBER 1979 – TASMANIA

CHAPTER 5 - GENERAL AVIATION COST STRUCTURE

As well as being influenced by the general regulatory environment described in Chapter 2, development of general aviation and its operational structure is also determined to a large degree by the various costs involved in engaging in this activity. In order to assess the effects which different cost structures might have on general aviation activities, some understanding of the present distribution of costs of general aviation flying operations is required. Given the large diversity in general aviation activities (and also in the characteristics of operators carrying out these activities), it is to be expected that costs would vary significantly across different activities and across different categories of operator. One result of this difference is that changes in the cost structure of general aviation will have differential impacts on operators. These impacts will depend both on the nature of the operators and on the types of flying activities in which they are engaged.

From the point of view of this study, costs of general aviation fall into two main groups. These are:

- Air Navigation Charges (ANCs), licencing fees and other charges which are levied by the Commonwealth Government on general aviation operators or operations;

- Operating costs associated with flying activities.

The principal reason for dealing with Commonwealth charges separately is that they are subject to a specific cost recovery policy. They are therefore of considerable intrinsic interest in the context of this analysis. In return for ANCs and allied charges, the Commonwealth Government provides services to general aviation. These services cover the provision of basic infrastructure such as the major terminals and runways, together with services such as air traffic control and navigational aids. In addition to this concept of direct charges for services, the

Commonwealth Government also considers the fuel excise paid by operators as contributing to the cost of providing services such as those outlined above.

This Chapter presents an analysis of the cost structure faced by general aviation at the present time. A brief outline of the Commonwealth Government's cost recovery program is presented to provide background information on the official charges presently imposed on operators. However, it should be stressed that this outline is not intended to be definitive. The remainder of the Chapter presents an analysis of the operating costs of general aviation, together with an examination of the estimated capital invested in current aircraft stock. As well, some examination is made of the labour cost structure associated with flying operations in general aviation. The structure of labour costs is obviously a significant determinant of the operating costs of general aviation and, in turn, changes in the general cost environment of general aviation will influence the level of employment. Finally, a brief examination is made of the sensitivity of the operational cost structure to hypothetical changes in particular cost elements. The hypothetical changes examined are purely illustrative, and are used only to indicate the differential cost sensitivities of various areas of general aviation to such changes.

HISTORY OF COST RECOVERY

Apart from the rental from on-site buildings (such as hangars), the initial move towards a formal Commonwealth Government cost recovery policy dates from amendments to the Air Navigation Act in 1947. A 30 per cent recovery target rate was established through ANCs, but this was soon abandoned because of Constitutional problems and opposition from aviation operators. Charges were reduced retrospectively in 1952, and a further 5-year moratorium on increases was applied. The 1947 Air Navigation Act provided for maximum rate increases of 10 per cent per annum in ANCs and this part of the Act was invoked quite frequently from 1958 to 1973. In 1973, the Air Navigation Act was changed to allow the maximum annual increase in ANCs to be 15 per cent.

Also in 1973, fuel excise was deemed attributable[1] for the purposes of cost recovery, and a policy of reaching an 80 per cent recovery rate over a five-year period was established. This figure was to be an average rate over all attributable Commonwealth Government civil aviation activity. As well as announcing the general objective of achieving a cost recovery rate of 80 per cent within five years, the Budget Speech for financial year 1973-74 also pointed out that a policy of full economic cost[2] recovery would be implemented on future developments and existing buildings as current leases expired.

Implementation of this revitalised cost recovery program was delayed in anticipation of a complete review of General Aviation activity and its cost structure. The initial publication as background for this view was a BTE Report (BTE 1977) relating to general cost recovery policies and rates associated with the whole transport sector. This Report (released in 1978) pointed out the endemic nature of deficits in almost all forms of public transport, the difficulties of attributing and allocating[3] joint and common costs in an appropriate manner, and the problems involved in analysing asset replacement and depreciation. These aspects remain amongst the most contentious issues in any general transport cost recovery program.

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(1) The term 'attributable' is used in cost recovery to denote cost or revenue items which can be properly associated with a particular activity. In this particular context, the term 'attributable' means that revenue gathered by the Commonwealth from excise imposed on aviation fuel is counted towards the total revenue gathered from aviation operations as part of the cost recovery program. The term 'attributable' is also applied to the costs initially borne by the Commonwealth. The cost recovery program defines some of these costs as being 'attributable' to aviation operations, and (as such) subject to recovery from aviation operators.

(2) This involved regular asset revaluations in line with current cost accounting procedures.

(3) The term 'allocation' refers to the share of the attributable costs or revenues assigned to a particular sub-group of the economic activity under consideration.

Attribution and Allocation of Costs

In order to determine cost recovery requirements, various working groups involving DOT and industry representatives have been established since 1969. These groups have determined which costs should be attributable to civil aviation in general and have refined the manner in which these costs and revenue items (such as concessions, licence fees and fuel excises) should be allocated among the various elements of aviation. In general, DOT has favoured cost allocation measures based on administratively simple parameters such as passenger volumes, aircraft movements, aircraft weights and estimates of aircraft usage by category. Each cost item is then allocated according to one of three criteria, which are described below. Where possible and practical costs are allocated to particular activities on the basis of the known use which these activities make of the facilities being costed. Alternatively, where joint or common costs are involved, and the level of use of a facility by a particular aviation activity is not readily determined, costs may be allocated on the basis of a simple deterministic[1] parameter. Finally, where the particular categories of users of a facility cannot be determined, costs may be allocated arbitrarily on the basis of estimated levels of use[2]. Alternative methods of revenue-raising based on demand elasticities (such as by 'charging what the market will bear') have been avoided on the grounds of equity and in the light of possible Constitutional problems.

The general areas of Commonwealth Government costs attributable to all aviation activities are set out in Table 5.1. This Table also indicates the proportions of the total attributable cost represented by each category. Of the total Commonwealth Government

(1) An example of such a parameter might relate to allocation of costs associated with control tower operation through the number of aircraft movements recorded at particular airports.
(2) For example, particular users of en route aids to navigation cannot be identified exhaustively.

costs attributed to civil aviation overall in 1977-78, it is estimated that $70m would have been allocated to general aviation activities. Costs which are currently considered not to be attributable are costs associated with environmental control, general policy formulation and economic regulation (including subsidies) and so on.

TABLE 5.1 - ESTIMATED DISTRIBUTION OF ATTRIBUTABLE COSTS FOR AVIATION SERVICES PROVIDED BY THE COMMONWEALTH GOVERNMENT - 1977-78

Cost Item	Proportion (per cent)
Communications & Navigation Aids (including depreciation)	8
Runways and Buildings (including depreciation)	11
Air Traffic Control	8
Flight Services	6
Fire-Fighting	5
Necessary Non-flying Administration (security, phones and so on)	9
Engineering	6
Regional Support Facilities and Training	11
DOT Central Office (including research and development)	7
Meteorological Services	5
Interest (mainly runways, buildings and navigation aids)	14
Superannuation	10
Total	100

Source: DOT estimates.

Attributable Revenue

Table 5.2 shows the major sources of attributable revenue received from civil aviation for the year 1977-78. The allocation of revenues received from ANCs is also indicated.

TABLE 5.2 - COMMONWEALTH GOVERNMENT REVENUES FROM CIVIL AVIATION - 1977-78

Revenue Item	Revenue ($m)
Air Navigation Charges	
- International Airline Operations	42.9
- Domestic Airline Operations	26.3
- General Aviation[a] Operations	4.3
Rentals, Concessions and Miscellaneous	26.2
Aviation Fuel Excise	40.0
Total	139.7

(a) In DOT publications, this category is referred to as 'Private, Charter and Aerial Work'.

Source: DOT Annual Reports.

GENERAL AVIATION COST RECOVERY

Discussion in the previous Section has given a broad outline of the development of the overall aviation cost recovery program administered by DOT, and has indicated the overall costs incurred and revenues obtained as a result of this program for the year 1977-78. It should be stressed that this program is under constant review by DOT, and is subject to alteration year by year. Estimates based on current allocation of costs and revenues indicate that the cost recovery rate for general aviation is of the order of 15 per cent. This results in a shortfall of revenues compared with costs[1] of around $60m per annum.

Attempts are made to recover attributable Commonwealth Government

(1) This refers to attributable civil aviation costs and revenues allocated to general aviation (including commuters).

costs from general aviation operators in a number of ways[1]. These are discussed in the following paragraphs, and basically include the following:

- ANCs (which are annual charges levied on aircraft classified to various operational categories);
- Fuel excise on AVGAS and AVTUR;
- Rental on ground facilities and equipment.

Air Navigation Charges

General aviation aircraft attract ANCs on an annual basis[2]. These ANC's are levied on aircraft at rates depending on two basic factors. The relevant factors are:

- Maximum take-off weight of the aircraft (rounded up to the nearest 450 kg for aircraft weighing up to 9000 kg and rounded up to the nearest 500 kg for aircraft weighing in excess of 9000 kg);
- Class of operation (private, aerial work or charter) to which the aircraft is classified.

Table 5.3 indicates the formulae which are used to calculate the ANCs for general aviation aircraft. These formulae were

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(1) A closely related cost for many operators (but one which is not attributable for Commonwealth revenue purposes) relates to fees paid to local authorities operating aerodromes under the Local Ownership Plan. Airports transferred from the Commonwealth under this plan may charge landing and/or passenger fees to recover local costs. These fees are not attributable items, as the only effective interest which the Commonwealth Government retains in these airports is related to the traffic control or flight service areas. ANC's are normally the means of cost recovery for these services.

(2) Aircraft classified for RPT operations attract ANCs on a per flight basis, with the charge varying with the route involved. They do not attract annual ANCs.

derived from Schedule 2 of the Air Navigation (Charges) Act, and were effective from 1 December 1978.

TABLE 5.3 - FORMULAE FOR CALCULATING ANCs FOR GENERAL AVIATION AIRCRAFT AS AT 30 JUNE 1979

Take-off Weight (kg)	Annual Private ANC[(a)]
Up to 700	$93.60
701-9 000	$163.80 per 450 kg (or part thereof)
9 001-20 000	$4 368.00 plus $522.91 per 500 kg (or part thereof) in excess of 9 000 kg
20 001-100 000	$15 862.08 plus $642.72 per 500 kg (or part thereof) in excess of 20 000 kg
100 001 and above	$118 697.28 plus $595.30 per 500 kg (or part thereof) in excess of 100 000 kg

(a) These ANC values are for aircraft classified for private operations. For aerial work and charter aircraft, the figures should be multiplied by 2.0 and 2.5, respectively.

Source: DOT charging scales.

Examples of ANCs for a range of typical aircraft are given in Table 5.4.

It is worth noting that partial remissions of ANCs are applicable in certain situations. Examples of these remissions include:

- ANCs for aircraft classified for aerial work and charter operations may only be payable for part of the year, depending on the period for which the aircraft operated in these categories;

- Aircraft not stationed at Commonwealth Government airports (or at 'assisted' airports) may be subject to a 50 per cent remission of their ANCs if less than half of their flights originated from such airports. In addition, the Air Navigation

(Charges) Act allows considerable discretion on the part of the charging authority in setting ANCs in particular circumstances.

TABLE 5.4 - ANCs FOR TYPICAL GENERAL AVIATION AIRCRAFT AS AT 30 JUNE 1979

Manufacturer and Model[a]	Take-off Weight (kg)	Aircraft Category		
		Private ($)	Aerial Work ($)	Charter ($)
Cessna 150	680	93.60	187.20	234.00
Piper Cherokee	890	327.60	655.20	819.00
Cessna 172	1 000	491.40	982.80	1 228.50
Beech Bonanza	1 650	655.20	1 310.40	1 638.00
Britten-Norman Islander	2 900	1 146.60	2 293.20	2 866.50
Piper Navajo	3 150	1 146.60	2 293.20	2 866.50
GAF Nomad	3 855	1 474.20	2 948.40	3 685.50
Embraer Bandeirante	5 670	2 129.40	4 258.80	5 323.50
Gates Learjet	8 165	3 112.20	6 222.40	7 780.50
Douglas DC3	11 900	7 505.47	15 010.94	18 763.68
Fokker Friendship	17 690	13 780.42	27 560.83	34 451.04
Fokker Fellowship	29 480	28 073.76	56 147.52	70 184.40
Armstrong-Whitworth Argosy	42 200	47 998.08	95 996.16	119 995.20

(a) Take-off weights may vary within model designations. Typical values are given.

Source: DOT charging scales.

Fuel Excise

The rate of fuel excise at 20 January 1979 was $0.04555 per litre for AVGAS and $0.0419 per litre for AVTUR. The Commonwealth Government crude oil levy as a component of the price of these fuels is not attributable for revenue purposes, since it is considered to be a general revenue purpose tax.

Rental on Ground Facilities

The current Commonwealth Government policy is for current cost accounting to be used in deriving charges for buildings on Commonwealth land. Leases are entered into for varying periods of time, depending on the requirement for future planning changes to infrastructure as perceived by DOT. Hangar space is basically charged at about $0.09 per sq m per week up to 900 sq m, and at about $0.01 per sq m per night above this. Details of actual charges may be found in relevant DOT aeronautical publications.

OPERATING COSTS OF GENERAL AVIATION

In order to assess the implications and effects of changes in particular cost elements on general aviation operators, some understanding of the overall cost structure faced by these operators is required. As indicated in previous Chapters, operators of general aviation aircraft represent a wide range of socio-economic and occupational characteristics. General aviation is performed by operators who range from private individuals using aircraft for their own personal transport to significant commercial operators providing basic public transport services. All of these operators are impacted by cost structure changes to varying degrees. In order to assess these differential impacts, information is required on the various cost structures applying to the different types of operators.

The BTE's General Aviation Survey 1979 requested details on various types of costs faced by operators of general aviation aircraft[1]. Because of some doubt concerning the ready availability of labour costs, information on this aspect was not requested in the survey[2]. Instead, details of the numbers of

(1) The particular cost categories on which information was sought are shown in Questions 8 and 10 of the questionnaire (which is reproduced in Appendix I).

(2) These doubts arose primarily because the survey was conducted as a postal survey, and payments to staff might have been regarded as sensitive information in some instances.

employees in particular occupation groups were sought[1]. As discussed later, some labour costs were synthesised using this information in conjunction with information relating to prescribed rates of pay under relevant awards negotiated through the Australian Arbitration Commission. This synthesis also involved data on average weekly earnings.

Analysis of Costs

In examining cost structures in an analytical fashion, a principal concern relates to rates of pay for particular employee categories. Table 5.5 summarises the rates of pay assumed for various classes of full-time employees[2] in the subsequent analyses. In compiling this Table, information on award rates of pay for LAMEs and pilots of various classes of general aviation aircraft was used. In addition, the published average weekly earnings (ABS 1978) for managerial and other staff were used in the estimates given in Table 5.5 for the rates of pay for these classes of employees. Unfortunately, no information was readily available on a number of additional labour costs accruing to an employer of staff. These additional costs could include (for example):

- Superannuation provisions;
- Over-award payments;
- Workers' compensation insurance;
- Holiday payments[3].

The cost structure for general aviation operations was analysed in terms of so-called 'direct' costs, maintenance costs and overheads. For the present analysis, these categories were defined in the following manner:

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(1) This information was sought in Question 7 of the questionnaire (see Appendix I).
(2) The assumed rates of pay for part-time employees are described subsequently.
(3) It should be noted that holiday payments should only be included if an employee is actually replaced during holidays. In many cases, this would not occur.

TABLE 5.5 - ESTIMATED AVERAGE RATES OF PAY FOR EMPLOYEES IN GENERAL AVIATION - 1979

Employee Category	Annual Rate of Pay ($)
Management[a]	18 700
Pilot (commuter operations)[b]	17 000
Pilot (other general aviation)[c]	14 500
LAME[d]	10 900
Other engineering staff[e]	10 500
Other staff[f]	9 700

(a) This estimate is based on the average weekly earnings in private employment for full-time management staff in the Transport and Storage industry (ABS 1978), with an adjustment for subsequent award decisions.

(b) This estimate is based on the award rate of pay for pilots of multi-engined aircraft (up to 5700 kg) on commuter operations with five years' experience.

(c) This estimate is based on award rate for equivalent pilots on other general aviation operations.

(d) This estimate is based on the New South Wales award rate for LAMEs who are authorised to approve aircraft as fit for service. In addition, the estimate includes an adjustment for the average increase in pay due to overtime worked by employees in the Transport and Storage industry (ABS 1978).

(e) This estimate is based on the NSW award rate for LAMEs who are not authorised to approve aircraft as fit for service. A similar adjustment to that for LAMEs authorised to approve aircraft as fit for service is included.

(f) This estimate was based on the average weekly earnings for females (non-managerial) in the Transport and Storage industry (ABS 1978), with an adjustment for subsequent award decisions.

Source: BTE estimates based on various data.

- Direct costs - these include pilot salaries, landing fees, fuel costs and hiring and leasing charges;

- Maintenance costs - these include salaries of all engineering staff, costs of consumable items[1], payments for maintenance to other organisations and costs incurred for spare parts;

- Overheads[2] - these include salaries of management and other general staff, licence fees paid for pilot licences and LAMEs, ANCs, payments to other organisations for flying training, rental and upkeep of ground facilities and insurance premiums on aircraft.

These classifications are defined in terms of the items for which information was requested in the BTEs survey. It should be noted that the above classifications are to some extent arbitrary. For example, in some organisations, management is carried out by personnel who also engage in flying activities. Again, if leasing charges are of a long-term nature, they would be more appropriately classified under overheads. Similarly, inclusion of pilot costs in the direct costs category may vary in appropriateness, depending on the degree to which pilots are employed rather than hired on a per-flight basis.

Average operating cost per hour[3] in each of the direct, main-

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(1) Consumable items include (for example) oil, tyres, filters and so on.

(2) It should be noted that depreciation and the opportunity cost of capital have not been included in the analysis to this stage. Although there is an allowable maximum depreciation rate on historic capital value for taxation purposes, this typically does not reflect the real (economic) depreciation of capital items. This aspect is discussed further in a later part of this Chapter.

(3) Average hourly costs are defined as the average operating costs in each of the categories per hour flown. These average hourly costs were calculated from the responses to Questions 7, 8 and 10, using the total hours flown in the year to 30 June 1979 (as provided in Question 2 of the survey).

tenance and overhead cost categories were calculated from the survey data[1]. Table 5.6 presents these costs for the various operator[2] categories, related to levels of flying activity. As well as the hourly costs in the various categories, Table 5.6 also shows the average total costs per hour flown for the various operator categories and for each level of flying activity. The last column of Table 5.6 shows the average hourly costs over all levels of flying activity for each operator category. In compiling Table 5.5, labour and staff costs were estimated from the number of employees in each of the appropriate categories (that is, management, pilots and aircrew, LAMEs, other engineering staff and other ancillary staff) as given by the response to Question 7 of the survey, and from the estimated rates of pay for each of these categories (given in Table 5.5). It was assumed that part-time employees in each of the categories worked 40 per cent of the average hours worked by full-time employees (ABS 1978).

Table 5.6 indicates that the number of operators in some particular categories who responded to the survey is quite small. Hence, the cost information for general aviation operations in these categories should be treated with due caution.

It appears from Table 5.6 that there are generally few significant cost advantages[3] associated with operations where levels of activity exceed 100 hours per year. One important exception,

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(1) Because of incomplete and inconsistent responses not all survey returns could be incorporated in the analysis. The subsequent analysis is based on a total of 1810 respondents.

(2) Average hourly costs are defined as the average operating costs in each of the categories per hour flown. These average hourly costs were calculated from the responses to Questions 7, 8 and 10, using the total hours flown in the year to 30 June 1979 (as provided in Question 2 of the survey).

(3) The cost advantages in these cases accrue from increased capacity utilisation rather than true 'economies of scale'. It should again be noted that capital charges and depreciation are excluded.

TABLE 5.6 - OPERATING COSTS BY OPERATOR CATEGORY AND LEVEL OF FLYING ACTIVITY - 1979

Operator Category	Cost Category	Operating Costs per Hour ($) [a] Total hours flown in year							Overall
		0 to 50	51 to 100	101 to 200	201 to 500	501 to 1 000	1001 to 2 000	More than 2 000	
Social or Recreational Club	Direct	20.03	11.13	13.44	11.70	13.44	6.05	20.17	16.08
	Maintenance	27.78	9.86	13.01	7.02	5.84	7.44	8.41	8.30
	Overhead	27.45	11.24	10.27	6.82	21.56	3.48	10.48	11.34
	Total	75.26	32.23	36.72	25.53	40.84	16.97	39.06	35.72
		(20)	(11)	(16)	(22)	(8)	(<5)	(<5)	(83)
Government or Semi-Government Body [b]	Direct	-	-	96.39	87.74	61.09	103.48	55.36	65.50
	Maintenance	-	-	195.00	105.12	28.53	97.94	32.60	48.69
	Overhead	-	-	62.25	20.12	12.91	35.20	17.13	20.26
	Total	-	-	353.64	212.98	102.53	236.61	105.08	134.46
		(0)	(0)	(<5)	(<5)	(<5)	(<5)	(<5)	(12)
Rural Producer	Direct	14.48	12.59	17.03	21.10	39.04	40.36	40.44	27.79
	Maintenance	33.24	18.03	13.55	12.39	25.69	30.57	37.06	22.03
	Overhead	26.64	17.62	10.39	9.29	31.32	33.16	24.12	19.49
	Total	74.35	48.25	40.96	42.78	96.05	104.09	101.63	69.31
		(90)	(119)	(143)	(87)	(28)	(8)	(5)	(480)
Business Primarily Concerned with General Aviation	Direct	8.47	55.00	39.86	38.27	43.00	48.69	50.29	48.58
	Maintenance	22.35	32.03	38.89	17.72	23.12	17.78	33.63	28.91
	Overhead	254.47	131.03	86.07	43.72	30.19	28.07	25.68	28.86
	Total	285.29	218.06	164.82	99.72	96.32	94.54	109.60	106.35
		(6)	(15)	(35)	(67)	(40)	(49)	(56)	(268)
Business not Primarily Concerned with General Aviation	Direct	33.69	22.86	28.78	37.14	38.25	45.70	69.49	39.55
	Maintenance	35.99	18.04	16.49	16.21	21.49	10.99	75.09	27.06
	Overhead	58.70	26.52	18.09	16.93	28.56	13.38	18.95	20.27
	Total	128.38	67.42	63.35	70.28	88.30	70.07	163.53	86.88
		(39)	(102)	(234)	(98)	(17)	(<5)	(<5)	(396)
Religious/Charitable Organisation	Direct	9.45	18.05	79.81	37.64	55.24	-	60.57	51.97
	Maintenance	9.43	94.00	62.37	9.80	20.00	-	41.93	30.16
	Overhead	22.27	20.00	25.78	18.18	8.73	-	76.47	40.71
	Total	41.14	132.05	167.96	65.61	83.97	-	178.97	122.84
		(<5)	(<5)	(<5)	(<5)	(7)	-	(<5)	(16)
Other Community Welfare Organisation	Direct	-	-	19.77	-	-	36.10	74.31	56.47
	Maintenance	-	-	55.24	-	-	21.59	46.13	37.40
	Overhead	-	-	19.48	-	-	27.45	56.34	43.12
	Total	-	-	94.49	-	-	85.14	176.77	137.00
		(0)	(0)	(<5)	(0)	(0)	(<5)	(<5)	(<10)
Private Individual	Direct	13.74	11.45	16.86	20.19	12.99	-	-	16.15
	Maintenance	27.43	17.14	15.47	11.23	6.58	-	-	14.87
	Overhead	28.09	15.53	10.15	9.99	4.19	-	-	12.51
	Total	69.27	44.13	42.48	41.41	23.77	-	-	43.53
		(193)	(166)	(110)	(62)	(8)	(0)	(0)	(539)
Not Stated	Direct	8.67	11.13	8.67	30.30	48.28	20.47	90.84	71.28
	Maintenance	166.67	5.25	-	34.35	13.40	18.60	27.22	25.59
	Overhead	29.93	14.62	3.62	27.48	113.46	16.80	26.52	28.75
	Total	205.27	31.01	12.29	92.13	175.14	55.87	144.58	125.61
		(<5)	(<5)	(<5)	(<5)	(<5)	(<5)	(<5)	(12)
Overall	Direct	16.38	16.25	22.97	29.70	37.04	47.94	50.34	40.96
	Maintenance	29.94	18.16	17.89	15.53	20.96	21.76	34.13	26.05
	Overhead	35.68	23.14	18.90	19.08	27.90	27.73	24.57	24.04
	Total	82.00	57.55	59.76	64.31	85.90	97.43	109.04	91.04

(a) Numbers in parenthesis indicate the number of operators in each category whose survey responses were sufficiently complete to be analysed. A total of 1310 responses were analysed to produce this Table. Where suitable responses were received from 1 to 4 operators in a particular operator category and hours flown class, this is indicated as '<5' to avoid any chance of identification of individual operators. Also, the figures shown exclude capital charges and depreciation.

(b) Excludes DOT flying unit.

Source: General Aviation Survey 1979.

however, is that of businesses primarily concerned with general aviation itself (that is, operators who are in the mainstream of general aviation activity). For these operators, reductions in total hourly costs would appear to occur up to around 500 hours flown per year. In excess of this level of activity, costs show a tendency to increase slightly. It is noticeable that operators involved principally in rural production and in businesses not primarily concerned with general aviation also appear to experience rising costs with increasing levels of flying activity above 500 hours per year. These effects, however, may be related to the appearance of different types of general aviation operations at the higher levels of activity. For example, aerial agriculture operations could account for a large proportion of the general aviation operations of rural producers at high activity levels. These operations would have a different cost structure to that of private operations. This pattern would be repeated to some degree for most operators, and operators reporting high levels of hours flown would generally be expected to be operating several aircraft, or aircraft of types which differ from the norm.

It is of interest to note the sensitivity of the average hourly operating costs to costs of staff and labour. The values given in Table 5.6 are based on the estimated rates of pay discussed previously. A 10 per cent increase in these rates of pay would result in an increase of 4.4 per cent in the total hourly costs for businesses primarily concerned with general aviation. The same rise in rates of pay would result in increases of around 3.5 per cent in total hourly operating costs of social and recreational clubs, and around the same figure in the total hourly operating costs of rural producers. The corresponding increase in the total hourly operating costs of businesses[1] not primarily concerned with general aviation would be somewhat less (at 2.8 per cent).

The cost information given in Table 5.6 for social and recreational

(1) That is, operating costs directly associated with the flying activities of these businesses.

clubs and for private operators is generally in line with information provided by the Royal Federation of Aero Clubs of Australia (RFACA). This information (RFACA 1978) reported operating costs for various clubs as ranging from $34 per hour flown to $45.70 per hour flown in 1978. The average hourly costs of $35.72 for social and recreational clubs and $43.53 for private operators shown in Table 5.6 compare reasonably well with the RFACA data[1].

CAPITAL INVESTED IN AIRCRAFT

In the BTEs General Aviation Survey 1979, respondents were asked to indicate the total insured value of all aircraft for which they held C of Rs. This information was primarily obtained to allow the current stock value of the total Australian general aviation aircraft fleet to be estimated[2]. Table 5.7 presents information on the capital value of the current stock of aircraft.

Capital Charges

In previous discussion of operating costs in this Chapter, it was pointed out that no allowance was made for depreciation and interest on borrowed money. Depreciation (in an accounting sense) is a sum of money deemed tax-deductable by the taxation authorities so that suitable provision can be made for asset

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(1) It should be noted, however, that the data in Table 5.6 refer to the year to 30 June 1979. The RFACA information relates to the year to 30 June 1978. The RFACA figures also include depreciation and interest components, which are excluded from the analysis above. Given that this would increase RFACA figures relative to BTE equivalents, and that the difference in time periods would work in the opposite direction, the two sets of figures can be regarded as reasonably compatible.

(2) In this context, current stock value is being measured by current insured value. The main reason for requesting insured value in the survey was that operators in general may not be aware of the true market value of their aircraft. However, most operators would know the value for which they insured their aircraft, and the insured value would in general represent a reasonable proxy for the current market value of the aircraft.

TABLE 5.7 - ESTIMATED[a] CURRENT STOCK VALUE OF GENERAL AVIATION AIRCRAFT BY OPERATOR CATEGORY AS AT 30 JUNE 1979

Operator Category	Number of Aircraft	Insured Value ($m)	Average value per aircraft ($)
Social or Recreational Club	274	5.4	19 800
Government or Semi-government Body[b]	62	8.9	142 500
Rural Producer	1 208	37.9	31 400
Business Primarily Concerned with General Aviation	1 542	165.5	107 300
Business not Primarily Concerned with General Aviation	1 114	302.6	271 600
Religious/Charitable Organisation	89	8.3	93 000
Other Community Welfare Organisation	18	1.8	99 800
Private Individual	1 488	27.5	18 500
Not Stated	54	4.4	81 100
Total	5 849	562.3	96 100[c]

(a) These estimates were derived from results of the General Aviation Survey 1979 by weighting the survey values by a factor relating the number of aircraft covered by the useable responses (3008) and the total number of general aviation aircraft on the aircraft register (5849).

(b) Excludes DOT Flying Unit.

(c) Overall average value.

Source: General Aviation Survey 1979.

replacement. The taxation authorities set maximum levels for the depreciation allowance, and these levels are based on the historic cost of the assets. For aircraft, the general limit is 18.75 per cent per annum (RFACA 1978)[1]. Higher rates may apply in particular circumstances.

Depreciation in an economic sense is the reduction in ability to perform the service required of the asset. This is usually reflected in changes of market value of an asset from one year to the next, and is dependent on the maintenance policy of the organisation concerned. As aircraft in Australia are subject to exacting requirements in maintenance standards, it would not be expected that depreciation in this (economic) sense would be very high. Other reasons for the market value of an asset not reflecting depreciation in this sense would be obsolescence through technical change in newer aircraft, changing profitability in aviation generally, and (of course) inflationary pressures.

Another real cost to general aviation is the opportunity cost of capital employed. This may be in the form of interest paid on borrowed money. Alternatively, it may be a notional cost incurred by using venture capital for purchasing assets or covering contingencies, rather than for some other purpose. In this sense, the notional interest rate is the foregone profitability of alternative uses of capital (with due allowance for risk). The cost of capital is thus variable, depending upon the risk involved in maintaining a profitable enterprise.

In order to give insight into this aspect of general aviation costs, an arbitrary 10 per cent annual charge on current aircraft value was applied[2] to the costs summarised by the operator category in Table 5.6. The rises in hourly operating costs which

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(1) This figure is applied on a 'diminishing balance' basis. The corresponding 'flat rate' limit is 12.5 per cent per annum.
(2) At a level depending on the number of hours flown per year.

emerged from this procedure are shown as a percentage of other operating costs in Table 5.8.

TABLE 5.8 - INCREASES IN AVERAGE HOURLY OPERATING COSTS AS A RESULT OF CHARGE[a] ON CURRENT AIRCRAFT VALUE - 1978-79

Operator Category	Rise in Costs[b] (Per cent)
Social or Recreational Club	16
Government or Semi-government Body[c]	6
Rural Producer	18
Business Primarily Concerned with General Aviation	9
Business Not Primarily Concerned with General Aviation	30
Religious/Charitable Organisation	17
Other Community Welfare Organisation	12
Private Individual	38
Not Stated	12
Overall	20

(a) As noted in the text, this charge may represent amortisation, the opportunity cost of capital and so on. It is meant to represent the cost (in the economic sense) of capital employed in general aviation activity. The level used was a 10 per cent annual charge on aircraft value, spread across the number of hours flown. See text.

(b) The values shown represent the rise in the average hourly operating costs for all levels of activity as a proportion of the costs presented in Table 5.6. The values shown are rounded to the nearest per cent.

(c) Excludes DOT flying unit.

Source: General Aviation Survey 1979.

RELATIONSHIPS BETWEEN COSTS AND FLYING ACTIVITIES

Earlier in this Chapter, average hourly operating costs were presented for each operator category and for various levels of flying activity. It is also of interest to examine the average

variable[1] hourly costs associated with particular types of flying activity, and the annual fixed costs[2] associated with general aviation operations. The types of flying activity considered are those listed in Question 3 of the questionnaire for the BTE's General Aviation Survey 1979[3]. In order to obtain estimates of variable hourly costs for these individual flying activities, total operating costs reported by respondents were used in a regression model which described the relationship between these costs and hours flown in each of the twelve[4] flying activity categories incorporated in Question 3. The model was specified in such a way as to estimate a linear relationship between total operating costs (excluding capital charges and depreciation) and hours which an operator flew in each type of flying activity. The constant term in the resulting regression model estimates the annual fixed costs mentioned above. From Table 5.6, it was observed that operations in certain categories exhibit rising costs per hour with increasing total hours flown. It was assumed that this was caused by the employment of heavier aircraft as the level of flying activity increased. In order to extract as much information as possible, the survey data were split into three groups[5]. The groups were as follows:

- Operators with less than $10 000 annual costs;
- Operators whose costs ranged between $10 000 and $50 000 per annum;

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(1) The variable cost reported is the average cost to the operator of flying one hour in each category after overheads have been removed.

(2) Fixed costs encompass annual overhead costs which do not vary with hours flown.

(3) See Appendix I.

(4) In fact, no operators reported flying operations in the 'other' category. Hence, in effect, only 11 categories were applicable.

(5) Analysis of the data in three separate groups was also dictated by technical considerations. It was noted that the variance of the total costs of operators increased as the value of the total costs increased. This property of the data is known as 'heteroscedasticity' and tends to reduce the reliability of the estimated regression parameters.

. Operators whose costs were over $50 000 and under $500 000[1].

Table 5.9 presents the results obtained from this regression model. Except where noted in Table 5.9, the results of this analysis were highly significant in statistical terms.

TABLE 5.9 - ESTIMATED AVERAGE VARIABLE HOURLY COSTS FOR FLYING ACTIVITY CATEGORIES - 1978-79

Flying Activity	Annual Total Costs Category[a]		
	$0-$10 000	$10 000-$50 000	$50 000-$500 000
Search and Rescue	(b)	107.2	(c)
Aerial Ambulance	74.8	(c)	160.8
Other Community Welfare	10.1	33.9	54.7
Commuter	(b)	89.6	99.9
Charter	27.5	69.4	93.6
Hired-out Aircraft[d]	16.2	31.8	36.4
Aerial Agriculture	7.5	37.7	76.6
Flying Training[e]	13.4	27.0	40.4
Other Aerial Work	9.7	37.8	124.7
Business	14.7	36.9	76.5
Private	12.2	14.7	(c)
Constant Regression Parameter	2 105.0	2 978.0	47 290.0
No. of Observations	1 086	438	197

(a) The annual total costs implied by these categories represent the sums of all costs reported in Questions 8 and 10 of the General Aviation Survey 1979, together with the labour costs estimated from Question 7.

(b) No flying activity reported in these categories.

(c) These results were statistically insignificant at the 10 per cent significance level.

(d) This covers 'dry lease' arrangements (that is, lease of aircraft without crew) for periods up to 2 weeks at a time.

(e) Only for training other people - personal training is excluded from this category.

Source: Analysis of results of the General Aviation Survey 1979.

As discussed previously, the constant reported in each regression captures any 'fixed' overheads, thus allowing an interpretation of the other costs as 'variable' costs per hour of operation within each category of flying activity. Note however that this estimate of 'fixed' costs is exclusive of any depreciation or other costs of capital.

It is worth drawing out the two points which distinguish the analysis presented in this Section from the analysis used to produce Table 5.6. The first point to note is that Table 5.6 refers to the operator category, whereas Table 5.9 refers to the category of flying activity. It is, for example, possible for a private individual to engage in charter operations. Similarly, a rural producer may carry out some flying activity in the 'private' category. The second distinction between the two analyses relates to the inclusion of fixed overhead costs in the average costs presented in Table 5.6. As noted above, these fixed costs and the variable costs are identified individually in the regression analysis presented in this Section.

SENSITIVITY TO PARTICULAR COST STRUCTURE CHANGES

The cost structure of general aviation has been outlined in this Chapter. One aspect of this structure which has already been alluded to is the sensitivity of the average costs of various categories of operator to relative changes in the prices of various cost factors. The sensitivity of overall costs to the relative prices of labour and capital has already been examined in this Chapter.

Other cost items of concern to the operators in general aviation include the price of fuel and the level of government charges (ANC's and landing charges for airports transferred under the Local Ownership Plan). In this Section, the cost structure summarised in Table 5.6 and detailed in the discussion relating to

that Table is subjected in turn to changes arising from the following[1]:

- A general increase in fuel prices (AVTUR and AVGAS) of 25 per cent;
- An increase in ANCs of 100 per cent;
- A broadly-based landing charge at all airports;
- A narrowly-based landing charge on commuter and charter operations to all airports.

Fuel Price Changes

To examine the effect of fuel price movements on the general aviation cost structure, an across-the-board 25 per cent increase was imposed on the fuel bills actually reported by operators for the year ending 30 June 1979[2]. The sample of respondents used in this analysis was weighted to reflect the total number of general aviation operators covered by this study.

The percentage change in average hourly costs of operators in each category due to the fuel price change is shown in Table 5.10, together with an assessment of the absolute change in costs impinging on each operator category[3]. A summary for general

(1) It has been assumed that government operators would pay no taxes or levies and these are thus excluded from the ensuing analysis.

(2) An average price for AVGAS can be determined from Prices Justification Tribunal decisions made during the year to 30 June 1979 by weighting the decisions made by the number of months for which each was current. This weighting process gave an approximate value of $0.2675 per litre. The assumed 25 per cent alteration would thus have the effect of changing fuel prices by about $0.067 per litre.

(3) The resultant drop in General Aviation activity caused by a price rise in any cost component has not been taken into account in the absolute changes shown in the Table.

aviation overall is also provided. The Table shows that the change in fuel prices has a fairly even impact, with most operators experiencing cost movements of the order of 5 to 7 per cent.

Changes in Annual Charges

Present annual Commonwealth Government charges are a relatively small component of current general aviation costs. Therefore, a 100 per cent change in the levels of these charges was examined to obtain a basis on which to assess the sensitivity of the general aviation cost structure to changes in Commonwealth Government pricing policy. The change in the level of these annual charges was calculated relative to charges levied in the year to 30 June 1979. A sample of those respondents to the survey who reported paying such charges was weighted to give the change in total for all general aviation operators. The results are reported in Table 5.10, while the specific change in particular ANC levels can be gauged by examining the standard levels in Table 5.3 and the typical current values in Table 5.4.

Table 5.10 shows that the operator categories most heavily affected are private individuals (10 per cent change in costs) and businesses not primarily concerned with general aviation (7 per cent change). Other major operator groups would experience increases of around 4 per cent in their total hourly operating costs. Given the relatively high level (for some operators) and fixed nature of ANCs, the impact of variations would be likely to change considerably with utilisation levels.

Application of Landing Charges

Since the advent of the Local Ownership Plan (described earlier), certain licensed aerodromes have been permitted to levy landing charges on civil aviation operators[1]. The current approvals

(1) Further details are given in the relevant AIPs, and selected values are given in Chapter 2.

TABLE 5.10 - ESTIMATED CHANGE IN TOTAL HOURLY OPERATING COSTS ARISING FROM VARIOUS COST STRUCTURE VARIATIONS - 1978-79

Operator Category	Fuel price change of 20 per cent		ANC change of 100 per cent		Landing Charge of $5 per Landing (Broadly-Based)		Landing Charge of $10 per Landing (Narrowly-Based)	
	$m	per cent	$m	per cent	$m	per cent	$m	per cent
Social or Recreational Club	0.2	6	0.1	4	1.0	32	-	-
Government or Semi-government Body[(a)]	-	-	-	-	-	-	-	-
Rural Producer	1.0	6	0.6	4	0.5	3	-	-
Business Primarily Concerned with General Aviation	4.7	5	3.3	4	1.9	2	2.7	3
Business not Primarily Concerned with General Aviation	1.2	7	1.1	7	0.8	4	0.1	-
Religious/ Charitable Organisation	0.1	5	-	3	-	1	-	-
Other Community Welfare Organisation	0.1	5	-	1	-	-	-	-
Private Individual	0.4	7	0.6	10	0.4	7	-	1
Not Stated	0.3	9	0.1	2	-	-	-	-
Overall	8.0	6	5.8	4	4.6	3	2.8	2

(a) No taxes have been assessed for government organisations.

Source: BTE analysis.

also specify the basis for charging at each aerodrome for which a permit is in force. There are two major charging mechanisms which can be analysed fairly readily. The first is a charge levied on all aircraft landings, while the second is a landing charge for charter, commuter and RPT aircraft only. In the terminology of this study, the former is referred to as a 'broadly-based' charge, and the latter is a 'narrowly-based' charge. The levels selected were $5 and $10 respectively. The analysis was carried out by examining the responses to Question 3 in the BTEs survey, and by applying a landing charge to all flights recorded by respondents(1). The resultant cost structure charges were then analysed with respect to particular operator categories, and the results are summarised in Table 5.10.

As can be seen from the results in Table 5.10, a broadly-based $5 landing charge of the type analysed would have a substantial impact on operating costs for social and recreational clubs (with an increase of around 32 per cent). The apparent reason for this steep rise in costs is that clubs of the types analysed undertake a large number of short-duration flights. They thus experience a high ratio of landings to hours flown. Other operator categories experienced much lower relative rises (generally between 2 and 4 per cent) with the highest being for private operators (7 per cent). Imposition of a $10 narrowly-based landing charge would have quite a different impact distribution. As might be expected, only businesses primarily concerned with general aviation would experience significant cost structure changes, with average hourly operating cost variations of about 3 per cent.

(1) Certain operational categories were excluded from the analysis because of the likely difficulty of imposing the proposed form of charge.

CHAPTER 6 - CHARACTERISTICS OF USERS OF COMMUTER AND CHARTER SERVICES

From the information presented in previous Chapters of this Paper, a significant component of general aviation activity in Australia is related to commuter and charter operations. Of the total hours flown by general aviation, over twenty per cent were performed in the charter and commuter categories. A considerable proportion of commercial general aviation activity is represented by these two categories, and the economic viability of these activities is largely dependent on the willingness of the travelling clientele to pay the amounts charged for these services as well as on the costs incurred in operating the services. In particular, it is important to have some information on the sensitivity of demand for commuter and charter services to changes in the prices of these services. Information of this kind is required to assess the impact of changes in the form or level of administrative or other charges on charter and commuter activity.

There are difficulties in estimating the price sensitivity of demand using an econometric approach, given the current lack of information on the characteristics of demand for charter and commuter services[1]. One method of obtaining the necessary information would involve the planning and execution of a carefully controlled experiment in which the prices for particular charter and commuter services were varied and the resulting changes in demand for these services monitored.

Such an experiment would at best be artificial and would require the cooperation of a number of charter and commuter operators. It would also require careful monitoring of the changing levels

(1) The type of information required relates to the influence of prices for charter and commuter services on the numbers of passengers carried by these services. Historical information of this type is very limited and at best is available only in aggregate form, unsuitable for detailed econometric analysis.

of demand for these types of general aviation services, and would have to extend over a considerable period of time. These conditions are sufficient to preclude further consideration of this option as a method for estimating demand characteristics as a function of price.

An alternative approach to estimating demand sensitivity is to question travellers on their reaction to hypothetical changes in price for the service they are patronising. This approach suffers from the considerable disadvantages which all attitudinal surveys tend to have. One particular disadvantage relates to the fact that the avowed behaviour of individuals[1] under hypothesised conditions can often differ significantly from their actual behaviour when those conditions come about[2]. The result of this effect tends to make the information derived from such attitudinal surveys somewhat unreliable. However, this problem can be overcome to some extent by seeking additional information of a factual nature from the survey respondents. This factual information can be used as a reference to which the attitudinal responses may be related and against which they may be checked for some measure of consistency.

For the present exercise of estimating the demand for commuter and charter services as a function of the price of these services, a survey of passengers actually using these services appeared to be the only feasible approach. Such a survey was carried out by the BTE, and was known as the BTE Survey of General Aviation Passengers 1979. Details of the design and operation of this survey are provided in Appendix II.

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(1) This refers to behaviour which the individuals themselves indicate they would adopt under hypothesised conditions.

(2) Specifically, individuals may tend to overstate their reactions to the hypothetically changed conditions. This in part may be due to the changes not being recognised as such if they came about.

CHARACTERISTICS OF TRAVELLERS

The total response from the 1521 commuter and charter passengers who responded to the survey was analysed. This number represents the total response obtained over the survey period, together with a very small number of responses which were returned by mail on the first two or three days after the conclusion of the survey. A further 27 responses were received subsequently, but these arrived too late to be included in the present analysis.

Trip Purposes

Table 6.1 shows the structure of the total sample, in terms of the distribution of trip purposes obtained in the survey from both commuter and charter passengers. In a number of cases, respondents did not respond to particular questions. For completeness, these responses have been included in the 'Not Stated' categories in Table 6.1 and subsequent tables. Although not shown in Table 6.1, the approximate distribution of the total sample across the various airports surveyed was approximately as follows:

- 76 per cent of the responses were obtained from Sydney (Kingsford-Smith) Airport;
- 12 per cent of the responses were obtained from Essendon Airport;
- 9 per cent of the responses were obtained from Melbourne (Tullamarine) Airport;
- 3 per cent of the responses were obtained from Moorabbin Airport;
- A very small number of responses (less than ten) was obtained from Bankstown Airport.

TABLE 6.1 - NUMBERS OF PASSENGERS SURVEYED BY TRIP PURPOSE AND TYPE OF FLIGHT - TOTAL SAMPLE - 1979

Trip Purpose	Type of Flight			Total
	Commuter	Charter	Not Stated	
Attend Conference	202	30	5	237
Other Business	679	90	10	779
Personal/Family Affairs	188	7	6	201
. Sightseeing	13	3	3	19
. Holiday	113	16	2	131
. Visit Friends or Relatives	105	4	2	111
. Other Recreation	27	8	2	37
Not Stated	5	-	1	6
Total	1 332	158	31	1 521

Source: Survey of General Aviation Passengers 1979.

It is clear from Table 6.1 that the total passenger sample obtained from the airports was dominated by commuter passengers. Furthermore, only 24 per cent of the sample was obtained from passengers embarking at the Victorian airports surveyed[1] in this study. In terms of coverage of all commuter and charter operations from the airports being surveyed, it is believed that the sample represented a higher than 90 per cent response rate for all commuter passengers embarking during the survey period. Hence the characteristics of commuter travellers obtained from the survey are regarded as being an accurate representation

(1) In discussions with general aviation operators at the Victorian airports, it was stated that the particular period under survey was an unusually quiet one (in the opinion of those operators).

of all commuter travellers embarking at the particular airports under survey[1].

Because of the more diverse nature of the charter operations, logistic difficulties (associated with the number of staff available to cover all points of departure) are likely to have resulted in a lower coverage of all charter passengers embarking during the survey period. The extent of the survey coverage of these passengers is difficult to determine, but is estimated as being in the vicinity of 50 per cent.

Table 6.1 shows that general business[2] travel dominated the sample in terms of the trip purposes surveyed. Business travellers (on this definition) constituted around 67 per cent of the total sample and 76 per cent of the charter passengers surveyed. Recreational travel[3] accounted for around 20 per cent of overall travel. In fact, recreational travel accounted for around 20 per cent of all travel for both commuter and charter passengers. The remaining purpose category of 'Personal or family affairs'[4] accounted for 13 per cent of trips overall, but represented only around 4 per cent of charter trips.

Occupation Groups

Table 6.2 describes the distribution of the sample in terms of

(1) Some care must be exercised, however, in extrapolating this picture too far on a national basis. The characteristics of travellers may vary during the year, from State to State, and (more particularly) from capital city to regional and rural airports.

(2) Defined here as including the two categories of 'Attend Conference' and 'Other Business' as specified on the questionnaire.

(3) This is broadly defined as including the specific purpose categories of 'Sightseeing', 'Holiday', 'Visit friends or relatives' and 'Other recreation'.

(4) This category includes for example, travel associated with visits to doctors, lawyers and other professional consultants, travel to school and so on.

TABLE 6.2 - NUMBERS OF PASSENGERS SURVEYED BY OCCUPATION GROUP AND ANNUAL TRIP FREQUENCY - TOTAL SAMPLE - 1979

Occupation Group[a]	Annual Number of Trips Declared								Total	Mean Annual Number of Trips
	1-10	11-20	21-30	31-40	41-50	51-100	Over 100	Not Stated		
Public Servants	24	4	1	2	-	-	1	4	36	10.6
Professional, Technical and Related Workers	251	61	28	11	13	17	7	27	415	11.9
Administrative, Executive and Managerial Workers	164	41	36	11	13	18	17	38	338	21.2
Clerical Workers	55	7	4	1	-	1	3	7	78	13.0
Sales Workers	73	26	14	3	1	3	2	7	129	12.9
Farmers, Fishermen, Hunters, Timber-getters and Related Workers	44	7	4	-	2	4	3	2	66	16.0
Miners, Quarrymen and Related Workers	3	3	1	-	-	-	-	-	7	9.0
Transport and Communication Workers	32	5	2	3	3	3	2	10	60	25.7
Tradesmen, Production Process Workers and Labourers	60	9	6	1	-	2	-	9	87	6.7
Service, Sport and Recreation Workers	17	5	1	2	-	1	-	3	29	8.3
Members of Armed Services	26	2	1	-	-	-	-	1	30	2.8
Not employed[b]	165	9	7	1	-	4	1	21	208	5.3
Not stated	15	2	1	1	-	-	-	19	38	6.2
Total	929	181	106	36	32	53	36	148	1 521	13.3

(a) Occupation groups are defined in detail by Hirsch (1979).

(b) This group includes all passengers who indicated that they were not in full-time employment. It includes (for example) students, housewives, retired persons and so on.

Source: Survey of General Aviation Passengers 1979.

the occupation groups into which the surveyed passengers were classified. The frequency of respondents' travel[1] by general aviation aircraft is also shown in Table 6.2. The occupation groups shown are based on the classification scheme developed for the NTS and used earlier (in Chapter 3) for classifying general aviation operators who did not fall into particular industry-related groupings. Full details are given in Hirsch (1979).

In addition to occupation groups defined in this system, a 'Not employed' category was used to include passengers who indicated that they were not in full-time employment. Included in this category were passengers who indicated that they were students, housewives, retired persons and so on. As indicated by Table 6.2, almost half of the total sample comprised persons in the professional and administrative groups, with sales workers and the general 'not employed' grouping also representing significant components. Passengers in the professional and administrative categories also tended to travel very frequently on general aviation aircraft. On average, passengers in these groups combined, travelled about twenty times by general aviation aircraft in the past year. The average number of trips taken by passengers in the other occupation groups in the same period was about 12.

Table 6.3 shows a similar breakdown for charter passengers only. Nearly 60 per cent of these passengers indicated that they belonged to the professional and administrative occupation groups. However, the average number of trips taken by these passengers in the past year using general aviation aircraft was substantially lower (at 13) than for the same occupation groups in the total sample[2].

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(1) The frequency of travel was measured by the number of trips which respondents estimated they had undertaken in the last year.

(2) Recalling that the total sample was dominated by commuter passengers.

TABLE 6.3 - NUMBERS OF PASSENGERS SURVEYED BY OCCUPATION GROUP AND ANNUAL TRIP FREQUENCY - CHARTER PASSENGERS ONLY - 1979

Occupation group[a]	Annual Number of Trips Declared								Total
	1-10	11-20	21-30	31-40	41-50	51-100	Over 100	Not Stated	
Public Servants	-	1	-	-	-	-	-	-	1
Professional, Technical and Related Workers	42	9	6	2	1	3	-	2	65
Administrative, Executive and Managerial Workers	17	1	4	-	1	2	1	1	27
Clerical Workers	5	-	1	-	-	-	-	-	6
Sales Workers	5	2	1	-	-	1	-	-	9
Farmers, Fisherman, Hunters, Timber-getters and Related Workers	7	1	-	-	-	1	-	1	10
Miners, Quarrymen and Related Workers	1	-	1	-	-	-	-	-	2
Transport and Communication Workers	3	-	-	1	1	-	-	1	6
Tradesmen, Production Process Workers and Labourers	8	1	1	-	-	-	-	-	10
Service, Sport and Recreation Workers	2	2	-	-	-	-	-	-	4
Members of Armed Services	1	-	-	-	-	-	-	-	1
Not employed[b]	11	1	1	-	-	-	-	-	13
Not stated	1	-	-	-	-	-	-	3	4
Total	103	18	15	3	3	7	1	8	158

(a) Occupation groups are defined in detail by Hirsch (1979).

(b) This group includes all passengers who indicated that they were not in full-time employment. It includes (for example) students, housewives, retired persons and so on.

Source: Survey of General Aviation Passengers 1979.

Source of Payment for Flight

The breakdown of the total sample in terms of the source of payment for the flights being undertaken by the passengers in the survey is shown in Table 6.4. Essentially, it identifies whether the flight was being paid for by passengers or their family as a private expense or whether the flight was being paid for as a business expense (either to passengers or their employers). The Table indicates that 56 per cent of the passengers in the survey had their flights paid for as a business expense, about 36 per cent had their flights paid for privately and the remaining 8 per cent of passengers indicated that their flight was paid for from some other source or did not respond to the question. These results are roughly in line with what might be expected, given the distribution of the sample in terms of both the occupation groups of the passengers and their trip purposes.

TABLE 6.4 - NUMBERS OF PASSENGERS SURVEYED BY SOURCE OF PAYMENT AND TYPE OF FLIGHT - TOTAL SAMPLE - 1979

Payment Source	Type of Flight			Total
	Commuter	Charter	Not Stated	
Passenger as Private Expense	443	33	11	487
Passenger as Business Expense	236	32	5	273
Other Member of Family	58	4	4	66
Employer	502	67	9	578
Other	70	21	1	92
Not stated	23	1	1	25
Total	1 332	158	31	1 521

Source: Survey of General Aviation Passengers 1979.

Over-water Flights

Before discussing demand sensitivities of the various categories of commuter and charter passengers, there is one further category of passengers whose trip and occupation characteristics warrant special mention. The category in question comprises those passengers who undertook charter or commuter flights to destinations which were not accessible by land transport. In other words, they undertook 'over-water' flights. These passengers (and their associated trips) are worth examining separately, since the alternative modes of transport to the destinations involved would have been limited to comparatively slow sea transport. This may have some influence on the price sensitivity of demand for this type of trip.

Table 6.5 indicates the distribution of over-water flights sampled in the passenger survey by trip purpose for both charter and commuter passengers. In contrast to the sample as a whole, journeys to destinations not accessible by land tended to be leisure-oriented rather than business-oriented[1]. Furthermore, the greater personal travel orientation of the sampled over-water trips is reinforced by the figures given in Table 6.6, which shows the breakdown of these trips by the source of payment for the flights. The overwhelming majority of these flights were paid for privately.

General Considerations

Tables 6.1 to 6.6 have summarised the general characteristics of respondents to the Survey of General Aviation Passengers 1979. Clearly, although the size of the sample of commuter passengers is most satisfactory, the number of charter passengers

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(1) This will later be seen to be reflected in the price sensitivity of the demand for these trips in comparison with the sensitivity of demand for other classes of commuter and charter trips.

TABLE 6.5 - NUMBERS OF PASSENGERS SURVEYED BY TRIP PURPOSE AND TYPE OF FLIGHT - OVER-WATER FLIGHTS - 1979

Trip Purpose	Type of Flight			Total
	Commuter	Charter	Not Stated	
Attend Conference	5	1	-	6
Other Business	20	8	-	28
Personal/Family Affairs	15	1	-	16
Sightseeing	8	-	-	8
Holiday	50	6	-	56
Visit Friends/Relatives	26	-	2	28
Other Recreation	4	1	-	5
Not stated	1	-	-	1
Total	129	17	2	148

Source: Survey of General Aviation Passengers 1979.

TABLE 6.6 - NUMBERS OF PASSENGERS SURVEYED BY PAYMENT SOURCE AND TYPE OF FLIGHT - OVER-WATER FLIGHTS - 1979

Payment Source	Type of Flight			Total
	Commuter	Charter	Not Stated	
Passenger as Private Expense	101	8	-	109
Passenger as Business Expense	4	1	1	6
Other Member of Family	8	1	-	9
Employer	7	7	-	14
Other	5	-	1	6
Not stated	4	-	-	4
Total	129	17	2	148

Source: Survey of General Aviation Passengers 1979.

is most satisfactory, the number of charter passengers in the survey is somewhat disappointing. The lower sample size for charter passengers in turn results in a lower statistical confidence in derived results which describe the distributions of various characteristics in the sample. Appendix II provides an outline of the method by which distributional errors may be estimated. It is apparent from the discussion in Appendix II that even the low sample size obtained for charter passengers is sufficient to provide a useful indication of the characteristics of these passengers.

SENSITIVITY OF DEMAND TO PRICE

As previously indicated, an important objective in conducting the Survey of General Aviation Passengers 1979 was to obtain some estimate of the sensitivity of demand for charter and commuter services to potential price increases. Tables 6.7 to 6.13 summarise the results obtained from the responses to Questions 4, 5 and 6 of the questionnaire, for various classifications and for various subsets of the total sample. These tables indicate the number of passengers (in individual categories) who indicated that they would not have undertaken their present flight[1] at the various price increases specified in the questionnaire.

Passengers who indicated that they would not undertake their flights given a price rise of 10 per cent are shown in the first row of each Table. These passengers would have abandoned their flights given a rise in price of something less than 10 per cent. Some passengers indicated that they were 'unsure' regarding their choice of alternatives given a 10 per cent rise in the price of their flight, but stated that they would not have undertaken their present flight at a 25 per cent rise in price. It was assumed that this group of passengers would alter their present

(1) The reference to the 'present' trip or flight of passengers relates to flights which passengers were about to undertake when they were asked to take part in the survey.

TABLE 6.7 - NUMBERS OF SURVEYED PASSENGERS WHO WOULD NOT UNDERTAKE FLIGHT AT GIVEN PRICE CHANGE BY PURPOSE - TOTAL SAMPLE[a] - 1979

Price Increase for Passenger Abandonment of Flight	Trip Purpose								Total
	Attend Conference	Other Business	Personal/ Family Affairs	Sight-seeing	Holiday	Visit Friends or Relatives	Other Recreation	Not Stated	
Less than 10 per cent	30	86	41	2	22	21	6	1	209
About 10 per cent	6	9	2	-	9	2	1	-	29
Between 10 and 25 per cent	64	177	65	2	37	27	8	4	384
About 25 per cent	7	18	3	3	7	8	1	-	47
Between 25 and 50 per cent	25	100	15	3	17	9	4	1	174
About 50 per cent	5	29	4	1	7	2	2	-	50
More than 50 per cent	68	271	38	3	13	22	8	-	423
Not Stated[b]	32	89	33	5	19	20	7	-	205
Total	237	779	201	19	131	111	37	6	1 521

(a) Table shows the price increase at which surveyed passengers (in each purpose category) indicated that they would not undertake the current flight. Where the relevant price increase is quoted as 'About ...', passengers were unsure at the next lower level, but were sure at the next higher level. See text for full details.

(b) As well as including passengers who did not complete questions 4, 5 and 6 of the questionnaire, this category also includes those who were inconsistent in their responses, or who responded 'unsure' to more than one of these questions.

Source: Survey of General Aviation Passengers 1979.

TABLE 6.8 - NUMBERS OF SURVEYED PASSENGERS WHO WOULD NOT UNDERTAKE FLIGHT AT GIVEN PRICE CHANGE BY DISTANCE - TOTAL SAMPLE[a] - 1979

Price Increase for Passenger Abandonment of Flight	Flight Distance (km)									Total
	0-100	101-200	201-300	301-400	401-500	501-1 000	Over 1 000	Over-water[b]	Not Stated	
Less than 10 per cent	2	83	27	26	23	25	-	17	6	209
About 10 per cent	-	16	1	1	2	3	-	5	1	29
Between 10 and 25 per cent	4	179	49	41	35	28	2	41	5	384
About 25 per cent	1	13	5	5	4	10	-	9	-	47
Between 25 and 50 per cent	1	77	25	24	13	15	-	17	2	174
About 50 per cent	-	27	3	2	2	4	-	11	1	50
More than 50 per cent	3	224	45	50	28	42	5	21	5	423
Not Stated[c]	4	77	28	22	16	25	6	27	-	205
Total	15	696	183	171	123	152	13	148	20	1 521

(a) Table shows the price increase at which surveyed passengers (in each distance category) indicated that they would not undertake the current flight. Where the relevant price increase is quoted as 'About ...', passengers were unsure at the next lower level, but were sure at the next higher level. See text for full details.

(b) This category includes all flights to destinations not linked by land to mainland Australia.

(c) As well as including passengers who did not complete Questions 4, 5 and 6 of the questionnaire, this category also includes those who were inconsistent in their responses, or who responded 'unsure' to more than one of these questions.

Source: Survey of General Aviation Passengers 1979.

TABLE 6.9 - NUMBERS OF SURVEYED PASSENGERS WHO WOULD NOT UNDERTAKE FLIGHT AT GIVEN PRICE CHANGE BY OCCUPATION GROUP - TOTAL SAMPLE[a] - 1979

Price Increase for Passenger Abandonment of Flight	Occupation Group[b]						Total
	Professional, Technical and Related Workers	Administrative, Executive and Managerial Workers	Sales Workers	Other	Not Employed[c]	Not Stated	
Less than 10 per cent	44	43	18	58	41	5	209
About 10 per cent	3	6	6	5	8	1	29
Between 10 and 25 per cent	94	83	47	100	51	9	384
About 25 per cent	13	8	3	11	12	-	47
Between 25 and 50 per cent	50	51	10	36	23	4	174
About 50 per cent	16	10	4	15	2	3	50
More than 50 per cent	131	105	25	123	34	5	423
Not Stated[d]	64	32	16	45	37	11	205
Total	415	338	129	393	208	38	1 521

(a) Table shows the price increase at which surveyed passengers (in each occupation group) indicated that they would not undertake the current flight. Where the relevant price increase is quoted as 'About ...', passengers were unsure at the next lower level but were sure at the next higher level.

(b) Occupation groups are described in detail by Hirsch (1979).

(c) This group includes all passengers who indicated that they were not in full-time employment. It includes (for example) students, housewives, retired persons and so on.

(d) As well as including passengers who did not complete Questions 4, 5 and 6 of the questionnaire, this category also includes those who were inconsistent in their responses, or who responded 'unsure' to more than one of these questions.

Source: Survey of General Aviation Passengers 1979.

TABLE 6.10 - NUMBERS OF SURVEYED PASSENGERS WHO WOULD NOT UNDERTAKE FLIGHT AT GIVEN PRICE CHANGE BY PURPOSE - CHARTER PASSENGERS[a] - 1979

Price Increase for Passenger Abandonment of Flight	Trip Purpose								Total
	Attend Conference	Other Business	Personal/ Family Affairs	Sight-seeing	Holiday	Visit Friends or Relatives	Other Recreation	Not Stated	
Less than 10 per cent	2	13	-	-	3	2	-	-	20
About 10 per cent	1	-	-	-	1	1	-	-	3
Between 10 and 25 per cent	7	15	3	-	3	-	1	-	29
About 25 per cent	3	2	-	-	-	-	1	-	6
Between 25 and 50 per cent	1	8	-	-	4	-	-	-	13
About 50 per cent	-	4	-	-	-	-	-	-	4
More than 50 per cent	10	29	-	2	1	1	3	-	46
Not Stated[b]	6	19	4	1	4	-	3	-	37
Total	30	90	7	3	16	4	8	-	158

(a) Table shows the price increase at which surveyed passengers (in each purpose category) indicated that they would not undertake the current flight. Where the relevant price increase is quoted as 'About ...', passengers were unsure at the next lower level, but were sure at the next higher level. See text for full details.

(b) As well as including passengers who did not complete Questions 4, 5 and 6 of the questionnaire, this category also includes those who were inconsistent in their responses, or who responded 'unsure' to more than one of these questions.

Source: Survey of General Aviation Passengers 1979.

TABLE 6.11 - NUMBERS OF SURVEYED PASSENGERS WHO WOULD NOT UNDERTAKE FLIGHT AT GIVEN PRICE CHANGE BY DISTANCE - CHARTER PASSENGERS[a] - 1979

Price Increase for Passenger Abandonment of Flight	Flight Distance (km)									Total
	0-100	101-200	201-300	301-400	401-500	501-1 000	Over 1 000	Over-water[b]	Not Stated	
Less than 10 per cent	1	-	3	3	1	9	-	1	2	20
About 10 per cent	-	1	-	-	-	2	-	-	-	3
Between 10 and 25 per cent	-	8	3	8	2	5	2	-	1	29
About 25 per cent	-	-	2	3	-	1	-	-	-	6
Between 25 and 50 per cent	1	-	3	4	1	2	-	2	-	13
About 50 per cent	-	-	-	-	-	-	-	4	-	4
More than 50 per cent	-	8	7	7	2	13	5	4	-	46
Not Stated[c]	1	4	7	7	1	11	-	6	-	37
Total	3	21	25	32	7	43	7	17	3	158

(a) Table shows the price increase at which surveyed passengers (in each distance category) indicated that they would not undertake the current flight. Where the relevant price increase is quoted as 'About ...', passengers were unsure at the next lower level, but were sure at the next higher level. See text for full details.

(b) This category includes all flights to destinations not linked by land to mainland Australia.

(c) As well as including passengers who did not complete Questions 4, 5 and 6 of the questionnaire, this category also includes those who were inconsistent in their responses, or who responded 'unsure' to more than one of these questions.

Source: Survey of General Aviation Passengers 1979.

TABLE 6.12 - NUMBERS OF SURVEYED PASSENGERS WHO WOULD NOT UNDERTAKE FLIGHT AT GIVEN PRICE CHANGE BY OCCUPATION GROUP - CHARTER PASSENGERS[a] - 1979

Price Increase for Passenger Abandonment of Flight	Occupation Group[b]						Total
	Professional, Technical and Related Workers	Administrative, Executive and Managerial Workers	Sales Workers	Other	Not Employed[c]	Not Stated	
Less than 10 per cent	9	3	1	7	-	-	20
About 10 per cent	1	1	-	-	1	-	3
Between 10 and 25 per cent	6	8	3	11	1	-	29
About 25 per cent	1	3	1	-	1	-	6
Between 25 and 50 per cent	5	4	-	3	1	-	13
About 50 per cent	2	1	-	1	-	-	4
More than 50 per cent	23	5	2	14	2	-	46
Not Stated[d]	18	2	2	4	7	4	37
Total	65	27	9	40	13	4	158

(a) Table shows the price increase at which surveyed passengers (in each occupation group) indicated that they would not undertake the current flight. Where the relevant price increase is quoted as 'About ...', passengers were unsure at the next lower level but were sure at the next higher level. See text for full details.

(b) Occupation groups are described in detail by Hirsch (1979).

(c) This group includes all passengers who indicated that they were not in full-time employment. It includes (for example) students, housewives, retired persons and so on.

(d) As well as including passengers who did not complete Questions 4, 5 and 6 of the questionnaire, this category also includes those who were inconsistent in their responses, or who responded 'unsure' to more than one of these questions.

Source: Survey of General Aviation Passengers 1979.

TABLE 6.13 - NUMBERS OF SURVEYED PASSENGERS WHO WOULD NOT UNDERTAKE FLIGHT AT GIVEN PRICE CHANGE BY PURPOSE - OVER-WATER FLIGHTS[a] - 1979

Price Increase for Passenger Abandonment of Flight	Trip Purpose								Total
	Attend Conference	Other Business	Personal/ Family Affairs	Sight-seeing	Holiday	Visit Friends or Relatives	Other Recreation	Not Stated	
Less than 10 per cent	-	1	1	2	7	3	2	1	17
About 10 per cent	-	1	-	-	4	-	-	-	5
Between 10 and 25 per cent	1	5	5	-	21	9	-	-	41
About 25 per cent	-	-	-	3	4	2	-	-	9
Between 25 and 50 per cent	-	4	1	1	10	1	-	-	17
About 50 per cent	1	5	1	1	1	-	2	-	11
More than 50 per cent	4	7	3	1	2	4	-	-	21
Not Stated[b]	-	5	5	-	7	9	1	-	27
Total	6	28	16	8	56	28	5	1	148

(a) Table shows the price increase at which surveyed passengers (in each purpose category) indicated that they would not undertake the current flight. Where the relevant price increase is quoted as 'About ...', passengers were unsure at the next lower level, but were sure at the next higher level. See text for full details.

(b) As well as including passengers who did not complete Questions 4, 5 and 6 of the questionnaire, this category also includes those who were inconsistent in their responses, or who responded 'unsure' to more than one of these questions.

Source: Survey of General Aviation Passengers 1979.

travel arrangements at a price increase of 'about 10 per cent'. Similarly, the other price increase categories of 'between 10 and 25 per cent' and 'between 25 and 50 per cent' refer to passengers who indicated that they would continue to undertake their present flights at the lower price level but not at the higher level. Passengers who indicated that they were 'unsure' at a given price increase but that they would choose an alternative at the next level of increase are shown as altering their travel arrangements at 'about' the lower level. Passengers who indicated that they would continue with their existing travel arrangements at a 50 per cent increase in price are shown in the 'more than 50 per cent' category.

As well as including passengers who did not answer Questions 4, 5 and 6 of the questionnaire, the price increase category of 'not stated' in Tables 6.7 to 6.13 includes passengers who provided inconsistent responses or who indicated that they were 'unsure' at more than one price level. Inconsistent responses included those where passengers indicated that they were 'unsure' at one price level but also indicated that they would still undertake their present trip at a higher price level.

Demand Curves

The information contained in Tables 6.7 to 6.13 can be used to derive approximate normalised demand curves[1] which provide a clearer illustration of the variations in demand sensitivity for various classes of passengers and various types of travel.

Table 6.7 was used to produce Figure 6.1, which shows normalised demand curves for various trip purpose categories. In deriving

(1) The curves derived are actually those segments of the demand curves covered by the price variations hypothesised in the survey questionnaiare.

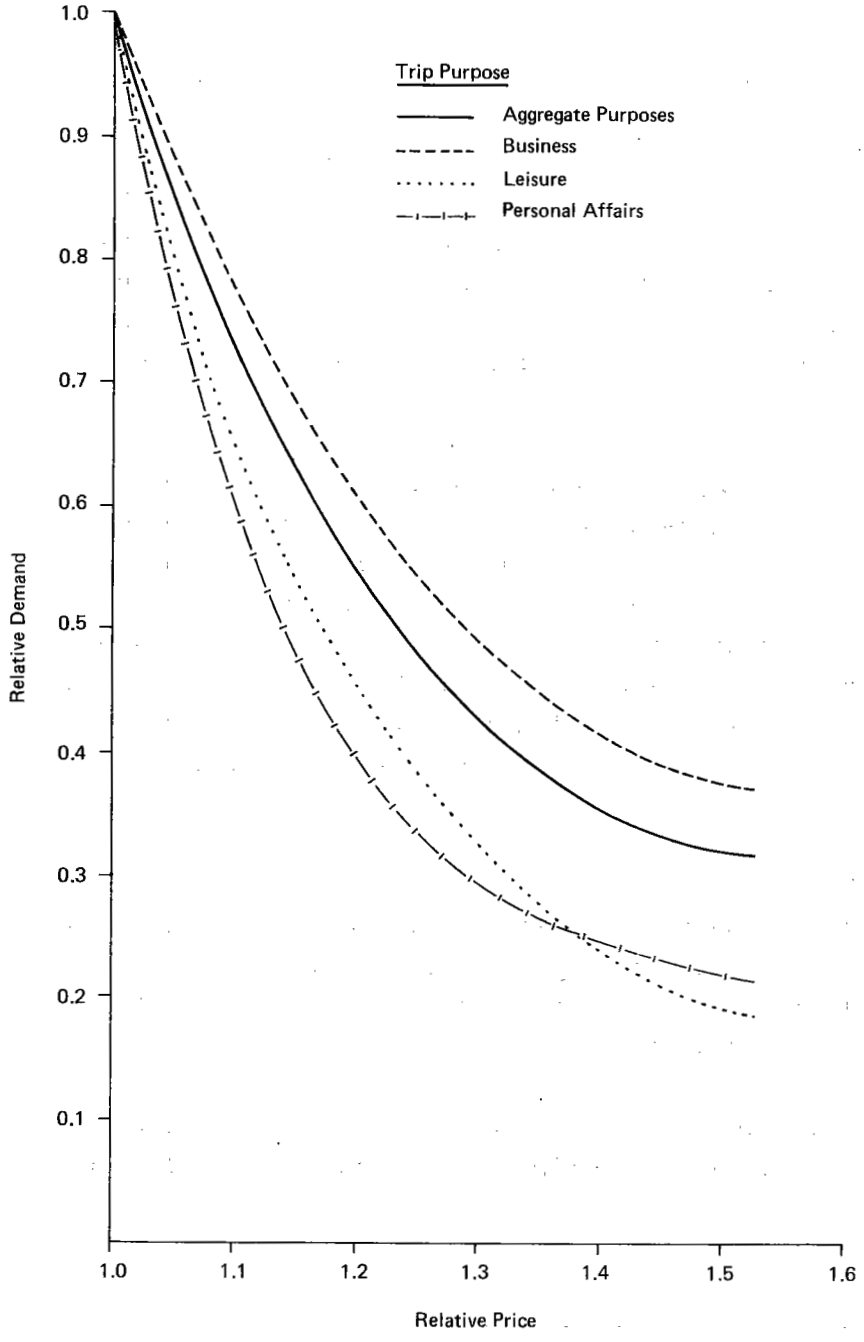

FIGURE 6.1 – VARIATION IN DEMAND SENSITIVITY WITH TRIP PURPOSE – SURVEY OF GENERAL AVIATION PASSENGERS 1979 – TOTAL SAMPLE

these curves, it was assumed[1] that the average levels corresponding to the six price increase categories shown in Table 6.7 were 6 per cent, 13 per cent, 20 per cent, 28 per cent, 40 per cent and 53 per cent, respectively. In general, the numbers of passengers in the categories 'about 10 per cent', 'about 25 per cent' and 'about 50 per cent'[2] were comparatively small, and the resulting points produced demand curves whose slopes varied considerably. In view of the low reliability of these points, the demand curves shown in Figure 6.1 were produced to yield reasonable fits to the points at price increases of 6 per cent, 20 per cent and 40 per cent, with the remaining points being given comparatively less weight. Apart from the curve[3] for 'personal affairs', the curves shown in Figure 6.1 represent certain combinations of the purpose categories shown in Table 6.7. This convention was established earlier in this Chapter. The curve labelled 'business' on Figure 6.1 represents the combined categories of 'attend conference' and 'other business' shown in Table 6.7. The curve labelled 'leisure' combines the categories of 'sightseeing', 'holiday', 'visit friends or relatives'

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(1) This general approach follows that used in an earlier BTE study (Smith and Toms 1978). However, whereas Smith and Toms considered constant price increase increments of 10 per cent, the present analysis deals with varying price increase increments of 10 per cent, 15 per cent and 25 per cent. Having arbitrarily set 13 per cent, 28 per cent and 53 per cent as representing the average price increases for passengers who indicated that they would not undertake the flight at price increases of 'about 10 per cent', 'about 25 per cent' and 'about 50 per cent' respectively, the remaining reference points were taken as the approximate midpoints of the intervals defined by these three values.

(2) These correspond to assumed average price increases of 13 per cent, 28 per cent and 53 per cent, respectively.

(3) Note that in producing the curves in Figure 6.1 and all the remaining diagrams, the component of the total sample belonging to 'not stated' categories was excluded. In these figures the point (1,1) represents the normalised values of the present price and passenger demand. The curves represent the proportion of passengers continuing to undertake the flight at a given price increase.

and 'other recreation'. The curve labelled 'aggregate' represents the demand curves for the whole sample[1].

Figure 6.1 indicates that personal leisure travel is substantially more sensitive to price than is business travel. At a 20 per cent price rise, demand for business travel would decrease by approximately 40 per cent, whereas the corresponding change in demand for leisure travel would appear to be in the vicinity of 55 to 60 per cent. Given the mix of business and leisure travel in the sample[2], aggregate demand would have declined by approximately 45 per cent[3].

Figure 6.2 shows the demand curves derived from Table 6.8 for various flight distance categories. Again, a number of distance categories in Table 6.8 have been combined to produce the curves shown in Figure 6.2. The demand curves exhibit comparatively little variation between various distance categories. This would probably also indicate that demand sensitivity does not vary greatly with variations in the existing prices of flights[4]. The demand curve for the over-water flights (as defined previously) is also shown in Figure 6.2. The leisure orientation of passengers sampled in this category is reflected in higher levels of price sensitivity.

Figure 6.3 illustrates demand curves for specific occupation groups and for the 'not employed' category. These curves show that there is a substantial variation in demand among the occupation

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(1) It should be recalled that the total sample is dominated by commuter passengers.

(2) In the sample, business travel represented the major component of travel.

(3) The demand curves indicate arc elasticities of between approximately -2 and -4 for a 10 per cent rise in the existing price depending on trip purpose. The elasticities decrease in magnitude to approximately -1 to -2 at a price 40 per cent above the present level.

(4) It is assumed that distance represents a reasonable proxy for the price paid by a passenger. Typical commuter fares are $40 for a flight of 220 km, $50 for a flight of 400 km and $80 for a flight of 800 km.

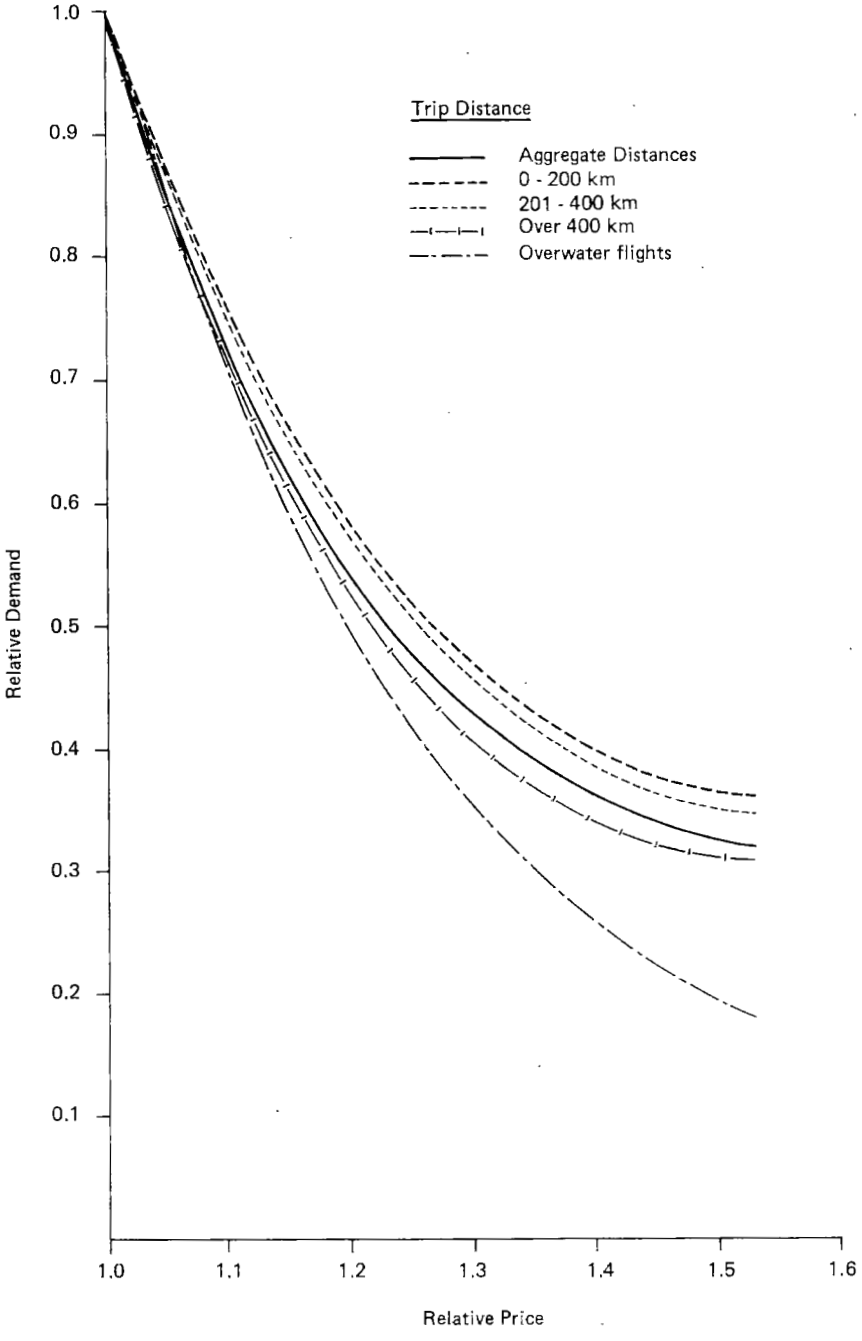

FIGURE 6.2 – VARIATION IN DEMAND SENSITIVITY WITH TRIP DISTANCE – SURVEY OF GENERAL AVIATION PASSENGERS 1979 – TOTAL SAMPLE

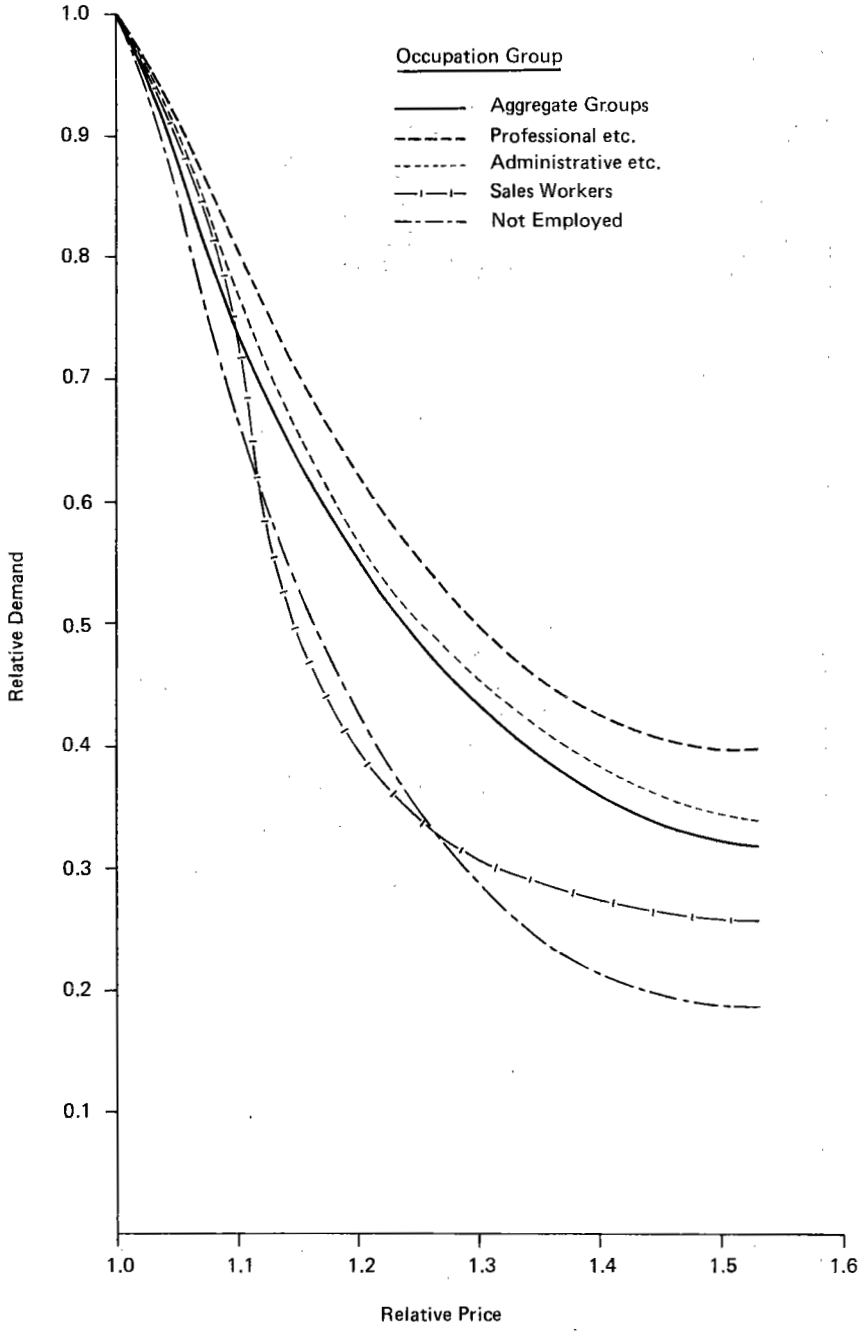

FIGURE 6.3 – VARIATION IN DEMAND SENSITIVITY WITH OCCUPATION GROUP – SURVEY OF GENERAL AVIATION PASSENGERS 1979 – TOTAL SAMPLE (UNWEIGHTED)

groups for large changes[1] in the price of general aviation passenger services. As expected, passengers in the 'not employed' category exhibited the greatest demand sensitivity. The curve for sales workers is worthy of comment. Assuming that passengers responded objectively to the questionnaire, it seems that the effect of substantial rises in travel cost on commercial sales organisations could be significant[2].

It is also of interest to examine another aspect of the demand for general aviation services by different occupation groups. If it is assumed that there is a reasonable degree of homogeneity in the travel characteristics of passengers in individual occupation groups[3], the results for each occupation group can be weighted by travel frequency to obtain a demand curve more representative of travel over all.

Figure 6.4 illustrates the weighted demand curves for specific occupation groups and for the 'not employed' category. In deriving these curves, the data in Table 6.9 were weighted by the frequency with which passengers in each of the occupation groups travelled by general aviation aircraft. This weighting resulted in greater emphasis being given to passengers who travelled more frequently[4]. Although the curves for passengers in the professional, administrative and sales groups are similar in form to

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(1) This refers to price changes in the order of 50 per cent.
(2) A number of passengers in this occupation group indicated that they paid for the flight themselves as a business expense.
(3) This homogeneity implies that the particular flight of a passenger sampled in the survey is in a general sense 'similar' to other general aviation flights that passenger has undertaken (in the previous 12 months in this case).
(4) Note, however, that it would not be appropriate to weight the results used to derive demand curves by trip purpose and distance, since these parameters may vary from flight to flight for any particular passenger. It should be stressed that weighting procedure adopted here assumes homogeneity in the characteristics of flights undertaken by passengers in particular occupation groups.

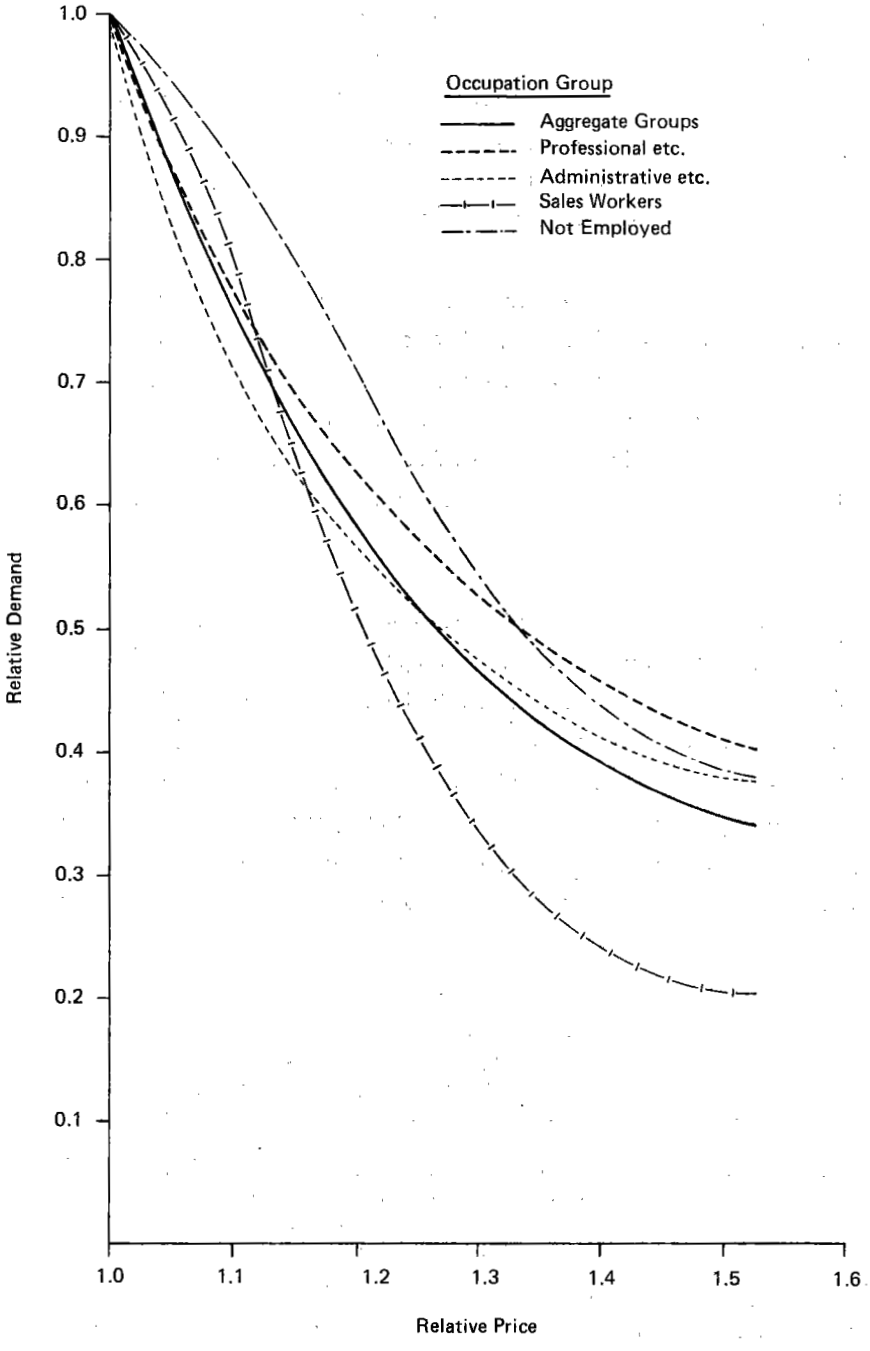

FIGURE 6.4 – VARIATION IN DEMAND SENSITIVITY WITH OCCUPATION GROUP – SURVEY OF GENERAL AVIATION PASSENGERS 1979 – TOTAL SAMPLE (WEIGHTED)

the corresponding unweighted curves in Figure 6.3, the curve for passengers in the 'not employed' category is somewhat surprising.

Passengers in the 'not employed' category who travelled frequently[1] by general aviation appeared to have a much lower price sensitivity of demand. Presumably, this reflects particular classes of passengers (such as students, people who travel regularly for medical consultations and so on) who rely on this form of transport and would continue to pay for it.

Similar curves can be drawn for the charter flights alone using Tables 6.10 and 6.13. However, only Figure 6.5 is presented, showing demand curves for business travel and other travel[2]. Comparison with Figure 6.1 indicates a somewhat lower demand sensitivity than for similar types of trips in the total sample[3].

Alternative Choices

The analysis described above relates to the total change in demand for the actual flights being undertaken by passengers in the survey. This changed demand can be diverted to a number of alternative courses of action which passengers may choose. These alternative courses of action are as follows:

- Undertake the same trip but using different means of transport;

- Undertake a trip to a different place using the existing means of transport (that is, using general aviation);

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(1) The unweighted results in Table 6.9 and Figure 6.3 show the group of passengers in this category to be quite sensitive to price increases.

(2) As in Figure 6.1, 'business' represents the combination of trip purposes 'attend conference' and 'other business'. For Figure 6.5 all other purpose categories were combined because of sample size limitations.

(3) The arc elasticity at the existing price level for a 10 per cent increase in price is estimated as between approximately -2.5 and -3.5. At a 40 per cent increase in price the elasticities decrease in magnitude to around -1.

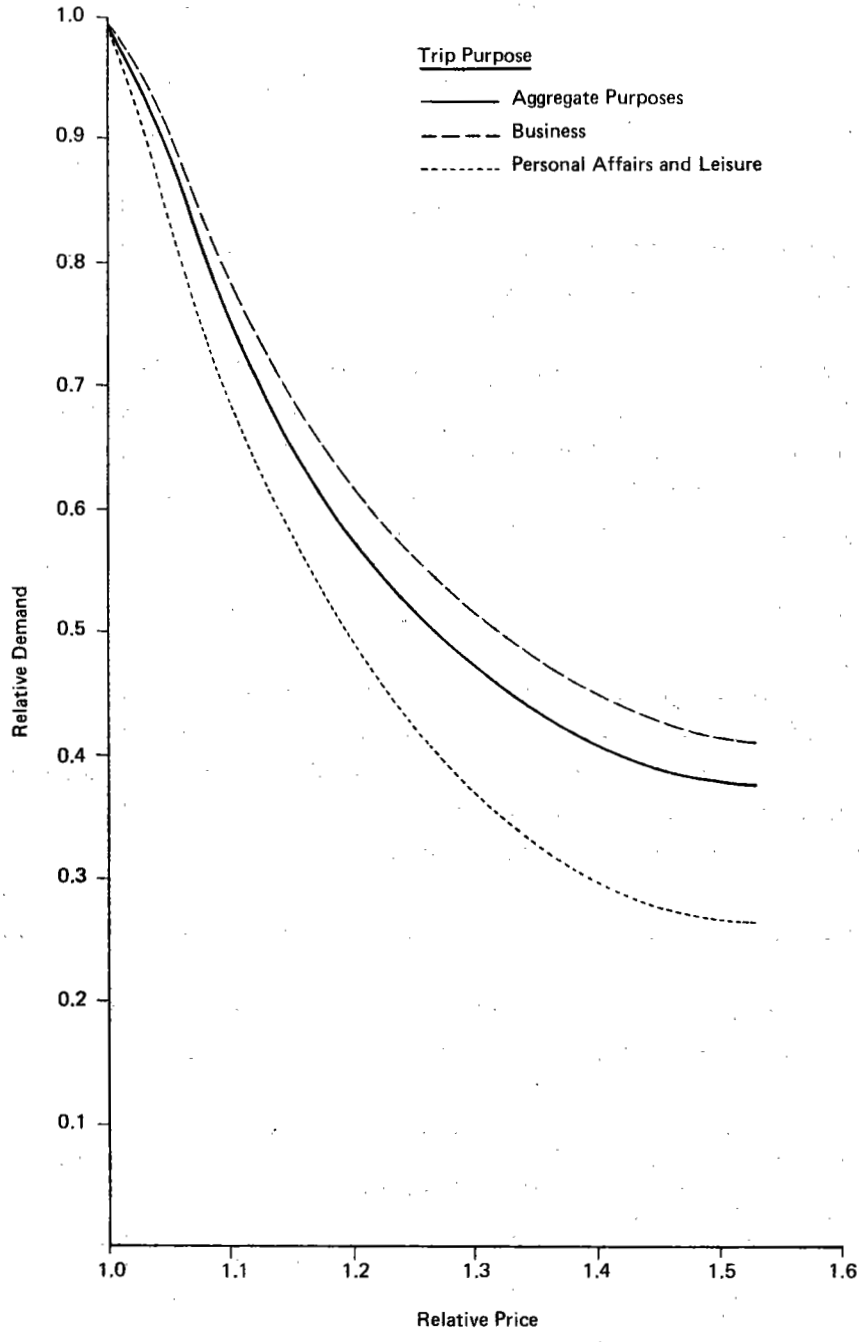

FIGURE 6.5 – VARIATION IN DEMAND SENSITIVITY WITH TRIP PURPOSE – SURVEY OF GENERAL AVIATION PASSENGERS 1979 – CHARTER FLIGHTS

- Undertake a trip to a different place using transport other than general aviation;

- Not undertake the trip at all.

Passengers in the survey were asked to indicate which alternative they would choose if they did not continue to undertake their present trip at an increased price level. It was apparent from the survey results that very few passengers would choose alternative travel using general aviation as a means of transport. Of all passengers who indicated that they would not undertake their present trip at one of the three specified price levels, only 22 passengers[1] indicated that they would use general aviation to travel to a different destination. Ten of these passengers had indicated 'holiday' as their main purpose in undertaking their present trip, and of these seven were undertaking flights over water.

The majority of passengers who exhibited high price sensitivity and indicated that they would choose an alternative to their present flight at some level of price increase specified that they would undertake the same basic trip, but using a means of transport other than general aviation[2]. In the total sample, approximately 85 per cent of the most price-sensitive passengers (that is, those who would not undertake their present flight at a 10 per cent price increase) specified that they would travel to the same destination by alternative transport. This proportion reduced to around 70 per cent for the least price-sensitive passengers (that is, those who specified an alternative choice at the 50 per cent price increase level). Interestingly, 24 per cent of this latter group indicated that they would not undertake

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(1) This represents approximately 3 per cent of passengers who specified that they would choose an alternative to their present trip.

(2) In many cases, although requested in the questionnaire, the new means of transport was not specified.

a trip at all if the price of their general aviation flight rose by 50 per cent. In contrast, only 4 per cent of the most price-sensitive passengers suggested that they would not travel at all. This suggests that the least price-sensitive passengers have a lower propensity to substitute in their travel behaviour. The trip they are undertaking has a certain level of importance to them for which they are willing to tolerate a reasonable cost increase. However, if the cost of the trip exceeds this tolerance, there is no alternative travel choice which they would wish to adopt.

The general trends outlined in the paragraph above which applied to the total sample (and hence, effectively, applied to commuter passengers) were also found to apply in the case of charter passengers.

GENERAL IMPLICATIONS

The Survey of General Aviation Passengers 1979 showed that general business travel dominated, representing nearly 70 per cent of all trips in the survey. For charter passengers, the proportion of general business travel was even higher, representing nearly 80 per cent of charter flights in the survey. Given the fact that the survey was carried during a working week at capital city airports and in a non-holiday period, these proportions are not particularly surprising.

The majority of passengers in the survey came largely from the professional and technical occupation group and from the administrative, executive and managerial occupation group. Passengers in these two groups alone represented nearly 50 per cent of all passengers in the survey. Sales workers and persons belonging to the 'not employed' category also represented substantial proportions of the passengers surveyed.

The survey of general aviation passengers yielded information which suggested that the demand for charter and commuter services

was reasonably sensitive to price increases. Analysis of this information indicated that a 10 per cent rise in price for these services would yield a drop of around 20 per cent in the demand for them, for most types of travel and for most classes of passengers. In view of the high proportion of business travel in the survey, this price sensitivity might be regarded as somewhat surprising. However, it was also clear that the price sensitivity of personal and leisure travel tended to be even higher.

Extrapolation of these results requires considerable care. It must be stressed that the survey was quite restricted in its scope, covering only embarkations at five major metropolitan airports over a period of 4 days. The extent to which the survey sample represents the general aviation passenger population elsewhere in Australia is essentially unknown. Specifically, no information is available concerning the characteristics of charter and commuter passengers travelling to or from the smaller capital cities and the larger rural centres. These unknowns obviously must temper the application of the results derived from the present survey to the national level. Bearing in mind the cautions stated at the beginning of this Chapter, these results, nevertheless, appear to represent a consistent and interpretable estimate of the likely variation in demand for charter and commuter services as a function of the price of these services. With the present state of knowledge, it appears reasonable to assume that these results apply in a wider context than that represented by the survey framework itself.

CHAPTER 7 - CONCLUDING REMARKS

The preceding chapters of this Paper have presented an analysis of various features of general aviation in Australia. In turn, this analysis covered the regulatory environment, the inventory of general aviation aircraft and their operation, the likely level of costs incurred in general aviation, and aspects of user demand for certain general aviation services. This Chapter summarises the situation and focuses on a number of significant features which have been brought to light by the BTE study.

There were almost 6000 general aviation aircraft in Australia at the end of 1978-79. Nearly sixty per cent of these aircraft were used basically for private purposes. On the basis of BTE estimates, general aviation aircraft flew more than 1.6 million hours in 1978-79. In the same year, these aircraft carried over two million persons and over 130 000 tonnes of freight. The insured value of aircraft engaged in general aviation activities exceeded $550m, and their average age was 10 years.

The most outstanding feature of general aviation in recent years has been its rapid growth. For the three years to 1979, the rate of growth in numbers of general aviation aircraft registered exceeded 11 per cent per annum. Similar annual rates of growth were recorded for numbers of general aviation pilot licences in force. The level of general aviation activity, measured by hours flown, has been increasing by a lesser amount of around 6 per cent per annum but, even so, increases of this magnitude have placed sizeable demands on Australian air transport infrastructure system. At the same time, a number of more sophisticated aircraft types have been introduced into general aviation in Australia, and these have also placed extra demands on air transport infrastructure.

At the end of World War II, there was a clearer distinction between the general aviation and airline components of Australian civil aviation than exists today. In the late 1940s and early

1950s, nearly all of the heavier aircraft were used by the airlines, and there were very few aircraft specifically used as executive transports. Most general aviation aircraft were small aircraft used for aerial work (such as cropdusters) and low-performance private/business aircraft carrying about two persons. Charter flying was in its infancy, and a small number of the larger war-surplus aircraft types (such as the Douglas DC3, Lockheed Hudson, and Avro Anson) were used for specific aerial tasks such as surveying and newspaper deliveries. Needs for scheduled air transport were met by the ready issue of new airline licences.

The current situation is quite different. The issue of new airline licences has been restricted for many years, basically since establishment of the Two-Airline Policy in 1952. As a result of this, general aviation has developed to provide a number of scheduled passenger and freight services which would otherwise fall into a general category of airline operations. The most obvious example of this is in commuter services.

The charter role is now a well-established general aviation feature, and many large aircraft (up to the size of the Douglas DC3) are available for hire. Also, a number of business firms have introduced executive jets and other sophisticated aircraft types for their private use. Nevertheless, the great majority of general aviation aircraft today are still light aircraft used for private and business purposes. These, however, have grown in average size, and now usually have four seats.

The changing role of general aviation in recent years is perhaps most noticeable in the area of commuter service operations, which began in 1967. The scheduled passenger and freight services provided by commuter operators now constitutes a substantial operation serving over 250 centres (more than twice the number served by airlines).

The basically arbitrary distinction in terms of service between general aviation and airlines results in some general aviation aircraft having performance characteristics indistinguishable from those of some airline aircraft. The heaviest aircraft in Australian general aviation is the Armstrong Whitworth Argosy, weighing 42 000 kg. General aviation aircraft like the Fokker Fellowship (29 480 kg) and the Fokker Friendship (17 690 kg) are identical with similar aircraft used by the airlines.

As mentioned earlier, general aviation in Australia has seen the introduction of a number of aircraft types which have much improved performance characteristics over earlier types. Most such aircraft are turbine-powered (turbo-jet, turbo-fan and turbo-prop). There were 107 turbine-powered aircraft registered at 30 June 1979, a figure more than twice that recorded two years earlier. This trend towards turbine-powered aircraft is likely to continue because of the easier access to AVTUR fuel supplies (relative to AVGAS supplies) in this country. These turbine-powered aircraft (and some high-performance reciprocating-engined types) are able to operate at greater heights than the majority of general aviation aircraft, and mix with airline aircraft in traffic operations.

General aviation meets the needs of both the urban dweller and the person living in rural areas, although these needs tend to be rather different. While general aviation aircraft are well distributed throughout the rural parts of the continent, most aircraft are located around the larger centres where the great majority of the Australian population resides. In fact, almost 75 per cent of all general aviation aircraft were registered to addresses within 250 km of State and Territory Capital cities.

The regulatory environment for general aviation in Australia is complex and extensive. Principal features noted in the BTEs study related to the incursion of economic regulation into what is overtly a basically technical regulatory system. Further, the fact that the upper limits of general aviation

activity are basically constrained by the application of the Two-Airline Policy means that the overall framework for civil aviation regulation in Australia contains certain discontinuities. The ultimate manifestation of this has occurred in the emergence of a relatively strong level of commuter activity. However, the effects of these regulatory discontinuities are far broader than this, and reach as far as economic regulation of the operators of small aircraft used for hire and reward activity. This clouding of the distinction between airlines and higher-level general aviation operations has also led to some doubts about continued application of ANCs in their present form.

In terms of the cost structure facing operators of general aviation aircraft, the BTEs study revealed few surprises. In fact, general aviation, with a few exceptions, would appear to be reasonably well insulated from the effects of likely changes in particular cost structure elements. In most cases, ANCs are a relatively small component of direct operating costs. Although fuel costs represent a substantial component of direct operating costs and are therefore perceived as a relatively high cost by operators, these costs nevertheless represent a comparatively small proportion of total operating costs when capital charges are taken into account. Accordingly, variations of even quite large magnitudes in such costs would not cause substantial relative variations in total operating costs. While it is certainly not denied that marginal operators could be affected markedly by such changes, the 'average' operator is only moderately sensitive to such changes.

The analysis of demand for general aviation passenger services in this Paper was very limited. However, the evidence available tended to suggest that certain classes of passengers would be highly sensitive to changes in fare structures. These passengers were generally those who were travelling on general aviation in a discretionary capacity (for example, leisure travellers). Other categories of passengers were found to be markedly less sensitive.

The conclusions of this limited study of user characteristics and demand were in line with what might be expected.

Overall, this BTE study of the characteristics of general aviation in Australia gives a picture of a fairly 'normal' area of transport activity. There appears to be a suitable level of geographic dispersion of general aviation operations to cover the diverse transport tasks to which such operations address themselves. Similarly, the broad range of equipment in use suggests that there would be at least fairly adequate tailoring of equipment needs to most types of likely transport tasks. Above all, the sustained high growth rates exhibited in various aspects of general aviation lend support to the view that this form of activity at present is fairly buoyant, despite short-term problems of various types[1].

On the negative side, it is fairly clear that the regulatory environment for general aviation has grown in a somewhat fragmentary way. There could well be advantages in adjustments to the regulatory system to bring it more into line with the actual situation. This has already been recognised in the Domestic Air Transport Policy Review (DOT 1978), in which the question of additional licence categories was canvassed. However, there are other issues which might also be relevant, and some of these have been noted earlier.

In conclusion, the BTEs study suggests that general aviation is an integral and viable part of the Australian transport system. It covers many types of operations and involves relatively significant levels of investment. In both senses, general aviation would appear to warrant greater governmental attention as a transport activity than it has received in the past.

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(1) In particular, at the time of writing this Paper, in respect to AVGAS shortages and price rises.

REFERENCES

Aplin, W.N. and Flaherty, H.M. (1976), *Sampling Processes for the National Travel Survey*, BTE Occasional Paper 5, AGPS, Canberra.

Aplin, W.N. and Hirsch, N.A. (1978), *National Travel Survey 1977-78, Geographic Zoning and Coding System*, BTE Occasional Paper 21, AGPS, Canberra.

Australian Bureau of Statistics (ABS) (1978), *Earnings and Hours of Employees, October 1978*, ABS Canberra.

Brogden, S. (1968), *Australia's Two-Airline Policy*, Melbourne University Press.

Bureau of Transport Economics (BTE) (1977), *Cost Recovery in Australian Transport 1974-75*, AGPS, Canberra.

____ (1978), *Australian Domestic Air Transport - Some Economic Issues*, BTE Occasional Paper 15, AGPS, Canberra.

Department of Transport (DOT) (1976), *Aerodromes and Ground Aids*, Aeronautical Information Publication.

____ (1978) *Domestic Air Transport Policy Review, Report to the Minister for Transport, the Honourable P.J. Nixon, M.P.*, (Vols I and II), AGPS, Canberra.

Director General of Transport, Western Australia (1976) *Regular Air Services to Isolated Areas of Western Australia: Studies of Demand in the Kimberley and Murchison Regions*, DGT 166.

Goodrich, R.K. (1960), The Economic Structure of Interstate Air Transport in Australia, 1921-58, Unpublished. M. Comm. Thesis, University of Melbourne.

Harris, C.P. (1975), *The Classification of Australian Local Authorities*, ANU, Canberra.

Hirsch, N.A. (1979), *National Travel Survey 1977-78, Description of the NTS Data Base*, BTE Information Paper 1, AGPS, Canberra.

Hocking, D.M., and Haddon-Cave, C.P. (1951), *Air Transport in Australia*, Angus and Robertson, Sydney.

Richardson, J.E. and Poulton, H.W. (1968), 'Australia's Two-Airline Policy - Law and the Layman', *Federal Law Review*, Vol. 3, No. 1.

Royal Federation of Aero Clubs of Australia (RFACA 1978), Statement of Income and Expenditure of Fifteen Member Clubs, Unpublished Statement to Members by President of RFACA.

Smith, A.B. and Toms, J.N. (1978), *Factors Affecting Demand for International Travel to and from Australia*, BTE Occasional Paper 11, AGPS, Canberra.

APPENDIX I - GENERAL AVIATION SURVEY 1979

In order to develop a comprehensive understanding of the present structure of general aviation in Australia, up-to-date information is required on the nature and scope of general aviation activities and on the economic situation confronting operators. As set out in Chapter 1, the basic intention in this Paper is to develop a picture of general aviation activities in terms of the following attributes:

- The nature and geographic distribution of the holders of Certificates of Registration (C of R) for general aviation aircraft;

- The types of flying activities carried out by these operators[1], together with some measure of the levels of these activities;

- The cost structure faced by operators.

Whereas the first of these attributes could be analysed in the main from the Australian register of general aviation aircraft, appropriate information for comprehensive analysis of the remaining two aspects was not readily available. Although the Department of Transport (DOT) regularly surveys operators to obtain a measure of their flying activity in various classifications[2], this information by itself was too restricted for the present study. In particular, there was a requirement for information which would allow development of relationships involving the level of flying activities, the geographic distribution of these activities and the costs of carrying out these activities (all on a consistent basis). As a result, it was decided to carry

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(1) The term 'operator' is used throughout to refer to C of R holders. It does not refer only to commercial organisations, but includes C of R holders with aircraft used for private purposes as well.

(2) This survey is conducted at six-monthly intervals and is formally known as the 'Survey of Hours Flown and Landings - General Aviation Industry'.

out a survey of all C of R holders registered at 30 June 1979. This survey was entitled the 'General Aviation Survey 1979', and is described in some detail in the remainder of this Appendix.

SURVEY DESIGN

Given the time and resource constraints on BTE involvement in the general aviation study as a whole, the only practical method of carrying out a survey of operators was by means of a postal survey. As a result, the questionnaire to be completed by the operators had to be specific in describing the information required. Further, it had to be designed in such a way as to allow this information to be supplied in a convenient form.

To cover all those aspects of general aviation which were outlined above as being subject to analysis, information was sought on the following:

- The numbers of aircraft used by the operators and associated with their normal flying activities;
- The nature of the types of flying operations carried out by each operator, together with various measures of the levels of each of these activities;
- The principal locations at which operators base their flying operations;
- The locations of the places principally visited by their aircraft in the course of their general flying activities;
- An indication of employment patterns in the industry;
- The various categories of costs faced by the operators;

- The nature of the operators in relation to their involvement in general aviation activities.

It was necessary to gather all this information from the operators on a consistent basis. This approach was necessary (for example) to allow costs to be related to particular types of operators and (where possible) to types of flying activity and to allow the scale of these activities to be analysed geographically.

Figures I.1 to I.6 illustrate the questionnaire used in the postal survey to gather the information summarised above. The questionnaire took the form of a blue sheet of overall size 525 mm by 250 mm. This was folded into three parts, each of B5 size, producing a total of six 'pages' as shown in Figures I.1 to I.6. As indicated in Figure I.1, the completed survey forms were treated confidentally, with the results being used only to produce statistical information in an aggregate form. The questions themselves (Figures I.2 to I.6) were divided into four basic groupings, as follows:

- Aircraft Inventory - seeking information on numbers of aircraft in various categories;

- General Aviation Flying Operations - seeking information on the types and levels of the flying activities of the operators, and on the costs faced by the operators in their general aviation activities;

- Maintenance and Insurance - seeking information to permit analyses of the current value of the aircraft stock (on which depreciation estimates can be based), and maintenance costs incurred by operators;

- Details and Views of Respondents - seeking information on

№ 4691 R

COMMONWEALTH OF AUSTRALIA

BUREAU OF TRANSPORT ECONOMICS
GENERAL AVIATION SURVEY 1979

CONFIDENTIAL
Reply will only be seen by authorised BTE representatives

The Bureau of Transport Economics (BTE) has been asked to perform specific research work associated with the current Department of Transport review of administrative arrangements dealing with general aviation in Australia. This survey is part of the BTE's research program, and seeks information from holders of Certificates of Registration (C of R) for general aviation aircraft. The major objectives of the survey are as follows:

- To collect information which will allow the BTE to assess the activities of the general aviation industry. In particular, the BTE is interested in the operational characteristics and geographic dispersion of the industry;
- To provide basic factual data for economic analysis of the general aviation industry.

Results of the BTE research work will help to ensure that administrative arrangements associated with the industry are established with full knowledge of general aviation and its role in the Australian economy.

The BTE seeks your co-operation in completing this questionnaire as carefully as possible and returning it promptly in the reply-paid envelope provided. If the exact figures requested are not readily available, please give your best estimates. Any information you give will be treated as strictly confidential, and individual responses will not be available in any form to anyone outside the BTE.

The statistical information provided by this survey will be used to prepare results which describe the nature of general aviation in Australia. If you are interested in receiving a copy of these results, please indicate this in the place provided.

Please tick this box if you wish to receive a copy of the BTE's study results ..... ☐

Bureau of Transport Economics
P.O. Box 495
CANBERRA CITY, A.C.T. 2601

PLEASE COMPLETE AND RETURN THIS QUESTIONNAIRE WITHIN 7 DAYS

If you have any queries regarding this questionnaire please write to the BTE at the above address or contact Mr John Moll in Canberra on 'phone (062) 46 9249

FIGURE I.1 - QUESTIONNAIRE FOR GENERAL AVIATION SURVEY 1979 – FIRST PAGE

SECTION I — AIRCRAFT INVENTORY

1. **How many aircraft associated with your *general aviation flying operations* were in the categories given opposite at 30 June 1978 and 30 June 1979?**

Each aircraft should be counted in the *one category* which *best describes* its use at the dates specified.

		Numbers at 30 June 1978	1979
(a)	Aircraft for which you held the C of R and which were:		
	● used by you in your private or business operations	.....	.....
	● used for long-term hire/lease to other users	.....	.....
	● held in stock by you as an aircraft dealer or agent	.....	.....
(b)	Aircraft which you hired/leased from another C of R holder, but which you used for your private or business operations	.....	.....

SECTION II — GENERAL AVIATION FLYING OPERATIONS

Please answer Q.2 to Q.8 in relation to your ***general aviation flying operations*** over the periods specified. *Include* operations by all aircraft when they were used for your private or business purposes, regardless of who held the C of R for each aircraft involved, except as follows:

- *Exclude* operations by hired/leased aircraft for which you did *not* hold the C of R, when you used them for a period of *less* than 2 weeks at a time;
- *Exclude* operations by aircraft for which you held the C of R, when these aircraft were hired/leased out to other users for periods of *more* than 2 weeks at a time.

2. **Please give the total number of hours flown in your general aviation flying operations during the year ended 30 June 1979 and the month ended 30 June 1979.**

(a) Year ended 30 June 1979 ..... hours

IF YOU ANSWER '0' TO Q.2 (a)
GO DIRECTLY TO Q.6

(b) Month ended 30 June 1979 ..... hours

3. **Please tick boxes for every category in which you undertook flying operations during the year ended 30 June 1979. If you tick a box, enter the other information requested beside it.** The following notes apply:

- Where *'Year'* is specified, enter details for the *year ended* 30 June 1979;
- Where *'Month'* is specified, enter details for the *month ended* 30 June 1979;
- An *'Aircraft Flight'* is defined as a passage between a takeoff and the next landing;
- *'Persons Carried'* is defined as the *total number of people* who boarded flights carried out during the periods specified. *Include crew.* Exclude re-boardings in transit (e.g. as a result of fuel stops).
- *'Freight Carried'* is defined as the total amount of freight placed on board during the periods specified. Exclude personal luggage.

Category of Operations		Period	Hours Flown	Aircraft Flights	Persons Carried	Freight Carried (tonnes)
(a) Search and rescue	☐	Year	.....	.....		
		Month	.....	.....		
(b) Aerial ambulance (including 'Flying Doctor' services)	☐	Year	.....	.....	.....	
		Month	.....	.....	.....	

FIGURE 1.2 – QUESTIONNAIRE FOR GENERAL AVIATION SURVEY 1979 – SECOND PAGE

SECTION II (cont.) — GENERAL AVIATION FLYING OPERATIONS

3. (Continued) Category of Operations	Period	Hours Flown	Aircraft Flights	Persons Carried	Freight Carried (tonnes)
(c) Other community welfare services (coastal surveillance, police work, fire spotting, beach patrol, etc.)	☐ Year / Month	..... /	..... /	[redacted]	
(d) Scheduled commuter services	☐ Year / Month	..... /	..... /	..... /	..... / .....
(e) On-demand charter (with crew)	☐ Year / Month	..... /	..... /	..... /	..... / .....
(f) Hiring out aircraft (without crew — for periods of up to 2 weeks at a time)	☐ Year / Month	..... /	..... /	[redacted]	
(g) Aerial agriculture (dusting, spraying and seeding, mustering, etc.)	☐ Year / Month	..... /	..... /		
(h) Flying operations for training others	☐ Year / Month	..... /	..... /		
(i) Other aerial work (towing, aerial survey/photography, test and ferry, etc.)	☐ Year / Month	..... /	..... /		
(j) Business (other than specified above)	☐ Year / Month	..... /	..... /	..... /	..... / .....
(k) Private (recreation, personal or family affairs, etc.)	☐ Year / Month	..... /	..... /	..... /	[redacted]
(l) Other (please specify, but only give details for total)	☐ Year / Month	..... /	..... /	..... /	
.....					
.....					
.....					

4. Indicate the airfield(s) at which you primarily based your *general aviation flying operations* during the year ended 30 June 1979. For each airfield listed, indicate the total number of aircraft for which you regarded that airfield as the principal base. For each of these airfields which is operated for public use please give your general assessment of the facilities provided.

Airfield Name	State	Number of Aircraft	Assessment of Facilities: Poor	Fair	Good
.....	.....	.....	☐1	☐2	☐3
.....	.....	.....	☐1	☐2	☐3
.....	.....	.....	☐1	☐2	☐3
.....	.....	.....	☐1	☐2	☐3
.....	.....	.....	☐1	☐2	☐3

FIGURE I.3 – QUESTIONNAIRE FOR GENERAL AVIATION SURVEY 1979 – THIRD PAGE

SECTION II (cont.) — GENERAL AVIATION FLYING OPERATIONS

5. *Excluding* the airfields which you listed in Q.4, indicate the airfields which aircraft associated with your *general aviation flying operations* visited most frequently in the year ended 30 June 1979. For each airfield listed, indicate the approximate number of times the airfield was visited during the year. For each of these airfields which is operated for public use please give your assessment of the facilities provided.

Airfield Name	State	Number of Visits	Assessment of Facilities		
			Poor	Fair	Good
.....	.....	.....	☐1	☐2	☐3
.....	.....	.....	☐1	☐2	☐3
.....	.....	.....	☐1	☐2	☐3
.....	.....	.....	☐1	☐2	☐3
.....	.....	.....	☐1	☐2	☐3

6. Indicate the place(s) at which major maintenance for aircraft associated with your *general aviation flying operations* was performed over the year ended 30 June 1979.

Placename	State
.....	.....
.....	.....
.....	.....

7. How many people did you directly employ (full-time or part-time) in your *general aviation flying operations* over the year ended 30 June 1979? Please give the numbers in each of the categories listed. If the numbers of employees fluctuated over the year, give the average number employed in each category.

IF NO PERSONS WERE EMPLOYED, TICK THIS BOX AND GO TO Q.8 ☐

Employee Type	Average Number Full-time	Part-time
(a) Management	.....	.....
(b) Pilots and aircrew	.....	.....
(c) Licensed aircraft engineers	.....	.....
(d) Other engineering and maintenance staff	.....	.....
(e) Other (ground staff, clerical staff, etc.)	.....	.....

8. Indicate amounts paid for operation of aircraft associated with your *general aviation flying operations* over the year ended 30 June 1979. Please give total amounts paid in each category listed.

Payment Category	Total Amount
(a) Licence fees for pilots and licensed aircraft engineers	$.....
(b) Aircraft registration fees	$.....
(c) Aircraft landing fees	$.....
(d) Payments to other organisations for flying training	$.....
(e) Payment for aviation fuel	
• AVGAS	$.....
• AVTUR	$.....
• Other aviation fuel	$.....
(f) Payments for rental and upkeep of ground facilities	$.....
(g) Payments to other organisations for hire/lease of aircraft	$.....
(h) Payments for consumable items (e.g. cabin requisites, tyres, oil, etc.) and upkeep of aircraft (excluding scheduled maintenance)	$.....

PLEASE TURN OVER

FIGURE I.4 — QUESTIONNAIRE FOR GENERAL AVIATION SURVEY 1979 — FOURTH PAGE

SECTION III — MAINTENANCE AND INSURANCE

Please complete Q.9 and Q.10 for *all aircraft* for which you held the C of R at 30 June 1979, *regardless* of whether you used these aircraft in your own general aviation flying operations.

9. **What was the total insured value of these aircraft at 30 June 1979?**

	Amount
Insured value	$.....

10. **Indicate amounts paid for insurance and maintenance for these aircraft over the year ending 30 June 1979.**

In answering (b) and (c) *exclude* payments for consumable items included in your answer to Q.8 (h).

Payment Category	Total Amount
(a) Insurance premiums	$.....
(b) Maintenance payments to other organisations	$.....
(c) Payments for spare parts associated with your own maintenance procedures	$.....

SECTION IV — DETAILS AND VIEWS OF RESPONDENT

11. **Please indicate which category best describes the capacity in which you participate in general aviation. Tick only one box.**

If you tick the 'Private Individual' box, please answer Q.12. Otherwise, go directly to Q.13.

(a) Social or recreational club	☐1	GO TO Q.13
(b) Government or semi-Government body	☐2	
(c) Rural producer	☐3	
(d) Business *primarily* concerned with general aviation	☐4	
(e) Business *not* primarily concerned with general aviation (excludes rural producers)	☐5	
(f) Religious/charitable organisation	☐6	
(g) Other community welfare organisation	☐7	
(h) Private individual	☐8	ANSWER Q.12

12. **Please describe in a few words your main occupation(s) over the year ended 30 June 1979 (e.g. electrical engineer in public service, accountant in mining industry, etc.)**

.....

.....

13. **Please indicate your opinion of the facilities provided for general aviation in Australia. Tick only one box, and add any comments you may wish to make.**

No opinion	☐1
Inadequate	☐2
Adequate	☐3
More than adequate	☐4

Comments .....

.....

.....

.....

FIGURE I.5 — QUESTIONNAIRE FOR GENERAL AVIATION SURVEY 1979 —FIFTH PAGE

SECTION IV (cont.) — DETAILS AND VIEWS OF RESPONDENT

14. If you wish to make any specific comments on general aviation in Australia, or if you wish to elaborate on any of the answers to these questions, please do so in the space below.

THANK YOU FOR YOUR COOPERATION

13382/79—L

Printed by C. J. Thompson, Commonwealth Government Printer, Canberra

№ 4691 R

FIGURE I.6 – QUESTIONNAIRE FOR GENERAL AVIATION SURVEY 1979
– SIXTH PAGE

the respondents and their organisations, and inviting comments[1] on general aviation.

The rather diverse nature of general aviation imposed certain requirements on the design of the questionnaire. The questionnaire had to be suitable for, and applicable to, a large variety of general aviation interests, ranging from substantial commercial organisations to private owners of single aircraft. These conditions placed a restriction on the amount and detail of information which could be sought in a general survey of this kind. The questionnaire design reflects these considerations.

As noted in the introduction to Section II of the questionnaire (Figure I.2), the intention of the survey was to gather information on all flying activities of the operators, regardless of who held the C of R for the aircraft involved. However, because of likely problems in complying with the request for information solely on this basis, two exclusions were made. Where an operator hired or leased an aircraft to another organisation for more than two weeks at a time, details of the flying activities of this aircraft during the periods of lease were to be excluded from the reply to the questionnaire. Conversely, details of flying activities by aircraft leased from other organisations for periods of less than two weeks were to be excluded from the reply to the questionnaire[2].

---

(1) An analysis of the general comments received from the operators is presented in Appendix III.

(2) These exclusions are complementary and avoid 'double-counting'. The philosophy behind the exclusions was that operators who hired out their aircraft for significant periods of time would not have ready access to details concerning the use of these aircraft during the periods of lease. These details are more appropriately supplied by the user of these aircraft. An obvious problem with this approach is that details for aircraft excluded in this way would not be picked up unless such aircraft were used by another C of R holder during the period of exclusion. The extent of error caused by this situation (which is largely unavoidable and appeared to be less error-prone than other approaches which might have been adopted) is not known.

The operations categories shown in Question 3 (Figures I.2 and I.3) of the questionnaire were devised to allow activity details to be obtained in the most appropriate manner for analysis. Although they are based on the categories used in the DOT 'Hours Flown' survey (mentioned previously), there are some important differences. The principal differences are summarised below:

- A category described as 'Other community welfare' was included in the questionnaire to allow particular community service activities to be identified;

- A category described as 'Hiring out aircraft without crew for periods of up to two weeks at a time' was included to allow 'dry leasing' to be separated from hire of aircraft with crew ('wet leasing');

- To maintain a self-contained 'rural' category, stock mustering was included in the general category of 'Aerial agriculture';

- The category 'Other aerial work' was used to gather miscellaneous flying activities (including test and ferry, aerial survey, aerial photography, and so on), individual details of which were not required.

SURVEY OPERATION

As previously noted, the questionnaire was sent to all holders of C of Rs for general aviation aircraft on the Australian register. A computer file of the aircraft register was processed to identify and isolate all operators[1] holding C of Rs for one or more aircraft in the categories of aircraft relevant to the present study. These aircraft are defined in Chapter 1. 4215 general

(1) It should be noted that the basic register is in terms of aircraft rather than operators. This process therefore involved considerable editing and data processing to bring together all aircraft for which the C of Rs were held by a particular operator.

aviation operators were identified in this way. Each operator was assigned a unique four-digit code which was also printed on the survey questionnaire[1] sent to that operator. The use of this numeric code was sufficient to allow the returns to be identified and incorporated in the survey data file for purposes of analysis. The addresses to which the questionnaires were sent were those recorded for each C of R holder in the aircraft register.

The initial questionnaires were posted to all operators on 9 August 1979. In addition to the questionnaire, each operator received a reply-paid envelope in which to enclose his reply for return to the BTE. As the replies were received they were coded appropriately to allow a machine-readable data file to be prepared for subsequent analysis. In addition, records were kept of those operators who had submitted completed returns[2].

On 30 August 1979, reminders were posted to all operators who had not submitted returns by that date. The reminders took the form of a further copy of the questionnaire[3] together with a reply-paid envelope and a card[4] reminding the operator of the purpose of the survey. The timescale for the whole exercise precluded any further follow-up of operators who did not respond subsequent to the dispatch of the reminders. For analysis purposes, the survey

---

(1) The questionnaire shown in Figures I.1 to I.6 applies to an operator assigned the code 4691. This number is hypothetical - no actual operator was assigned this code. The letter 'R' following this code indicates that the particular form was a reminder questionnaire sent tc operators who had not replied to the initial questionnaire.

(2) This was purely a survey housekeeping process. Response to the survey was completely voluntary, and hence there was no question of a penalty or other action in the case of non-response.

(3) Identified as a 'reminder' questionnaire by the letter 'R' following the four-digit operator code. Again, this separate identification was purely for survey control and administration purposes.

(4) The reminder card is reproduced in Figure I.7.

BUREAU OF TRANSPORT ECONOMICS
GENERAL AVIATION SURVEY 1979

REMINDER

About two weeks ago, the Bureau of Transport Economics (BTE) posted you a questionnaire which was designed to collect information to assist research work related to general aviation in Australia. The BTE would very much appreciate your co-operation in completing the questionnaire and returning it in the reply-paid envelope provided. In case you did not receive the questionnaire, a further copy is enclosed together with another reply-paid envelope.

13512/79

FIGURE I.7 – REMINDER CARD FOR GENERAL AVIATION SURVEY 1979

was 'closed' on 28 September 1979, although considerable numbers of replies were received after that date.

GENERAL OBSERVATIONS

Although co-operation in responding to the survey was voluntary, it appeared that operators on the whole were making genuine attempts to provide detailed and accurate information. Returns were being received at peak rates of up to 130 per day, although the average rate would have been closer to 50 per day during the main survey period. Returns were still being received well into October. Unfortunately, these late returns could not be included in the overall analysis.

Although the timing of the survey was directly dictated by the timescale of the BTE study, it was somewhat unfortunate from two viewpoints. The first of these related to the delayed receipt of many of the replies (as mentioned in the previous paragraph). A number of operators contacted the BTE pointing out that some documents for the information being requested were with their accountants, who were preparing taxation documents for the end of the financial year. Much of this information could not be supplied to the BTE until late September or even October, causing problems in producing a comprehensive final data base. Even excluding this particular problem the time distribution of response to the survey was much 'flatter' than is usual in such cases. This further inhibited orderly processing and completeness of analysis in the time available to the BTE.

The second unfortunate aspect of the timing of the survey related to its relatively close co-incidence with the regular six-monthly 'Hours Flown' survey conducted by DOT. Although efforts were made to distinguish the BTEs activities from those of DOT, there nevertheless appeared to be confusion among a number of operators

regarding the relationship between the two surveys[1]. This confusion may also have had a prejudicial effect on the response to the BTE survey.

STATISTICAL CONSIDERATIONS

As noted earlier, all 4215 C of R holders were sent questionnaires in this survey. These operators accounted for a total of 5849 fixed-wing aircraft and helicopters used in general aviation activities and registered in Australia. 2543 forms were returned with sufficient information provided to make them useable, and these forms were processed to produce a data file from which the information contained in the body of this Paper was produced. The 2543 useable forms represented 3528 aircraft (of a total registration of 5849 aircraft), so that the response rate for the survey was around 60 per cent in terms of either fleets (that is, registered C of R holders) or aircraft[1].

However, the response rate varied with fleet size (amongst other factors). For example, the coverage of total aircraft was 73 per cent over all aircraft fleets of size fourteen or more, 52 per cent over all fleets of size six to thirteen and 60 per cent for fleets of size one to five. Thus, the effective situation was that a sample survey (rather than a 'census') had been conducted. While the overall useful response rate was around 60 per cent, there were differences in response for subsets of the population. This non-response resulted in the need to appropriately weight the data gathered in the survey in order to produce statistical estimates applicable to the population of operators as a whole.

---

(1) In particular, a number of replies to the Department's survey were received in the BTE reply-paid envelopes.

(2) The actual overall response rate was a little better than this after allowance for questionnaires which were 'returned unopened' or which were unuseable or returned too late for inclusion. The gross figure to the date of writing this Paper was close to 70 per cent on the basis of the ratio of forms completed and returned to effective forms mailed. 'Effective' forms, in this context are those forms which were not returned unopened or otherwise undelivered.

Furthermore, since the response rate varied both geographically and with size of operator[1] the weighting factors adopted for this statistical expansion[2] process varied across the sample of operators.

As a preliminary to estimation of appropriate weighting factors, the sample of respondent operators was post-stratified on the following basis:

- Fleets of size fourteen or more, regardless of their geographic location as recorded in the Australian aircraft register, were grouped into one stratum;

- Fleets of size six to thirteen, regardless of location, were grouped into one stratum;

- The remainder of the fleets were stratified according to three criteria:

  - State (with the Australian Capital Territory (ACT) and Northern Territory being regarded as States);

  - whether they were located in a capital city National Travel Survey (NTS) region, or in the remainder of the State;

  - whether they were of size one, two or three to five.

This basic post-stratification yielded forty-nine strata[3]. However, some of the strata contained few sample observations

---

(1) The size of an operator in this context is measured by the number of aircraft for which the operator holds the C of R. This is also referred to as the operator's 'fleet size'.

(2) 'Expansion' of survey results refers to the process of producing statistical estimates applying to the population as a whole, using sample survey data.

(3) The ACT consists of a single NTS region and hence was not further stratified into the capital city and the remainder of the Territory.

and would have been far too small to produce statistically valid results. To produce sampling strata which contained statistically meaningful samples, certain of the survey responses falling into the smaller strata defined above were combined into single larger strata. For example, the operators from the ACT represented in the sample were combined into a single stratum which represented fleet sizes ranging from one to five. Similarly, the Brisbane NTS Region was represented by two strata, one containing fleets of size one and the other stratum containing fleets of size two to five. A similar procedure was required for other States. The net result produced an effective total of thirty-two strata for the sample expansion process. It is recognised that there is an inherent trade-off between homogeneity of strata and sample sizes required for statistical accuracy within particular strata. This trade-off is embodied in the process described above.

A weight was calculated separately for each of the thirty-two strata by dividing the number of aircraft in all fleets on the aircraft register which were classified to that stratum, by the total number of aircraft in those fleets in the stratum which responded to the survey. The weights varied from 2.2 to 1.3, which corresponded to response rates varying from 46 per cent to 77 per cent in the different strata. These weights were then used in the production of the aggregate statistics contained in this Paper. It is worth emphasising that numeric values calculated using these weights are only statistical estimates of particular quantities associated with the whole population of general aviation operators. As such, these quantities are subject to various sources of statistical error. In fact, the only quantity which will be absolutely correct will be the estimate of the number of aircraft for which operators hold the C of R, since the weighting factor used automatically ensures this.

SAMPLING ERROR

As mentioned in the preceding Section, the survey, in retrospect, was effectively conducted on a sample basis, as questionnaires

were returned by 60 per cent of the operators rather than by the whole population of operators. Therefore, the statistics estimated from the survey are subject to sampling error. That is, they may differ from the figures which would have been obtained if all the operators had responded to the survey. One measure of the likely difference between the two possible sets of statistics is given by the standard error, which measures the extent to which a statistic may have varied by chance because only a sample of the population was enumerated. There are about two chances in three that a sample estimate will differ by less than one standard error from the figure which would have been obtained from a comparable complete enumeration of the population. Also, there are nineteen chances in twenty that the difference will be less than twice the standard error.

A more appropriate presentation of the accuracy of an estimated statistic is through a statement of its relative error. The relative error of an estimated quantity is defined as its standard error divided by the estimated quantity itself. In mathematical form, the estimated relative error $(\hat{r})$ in an estimated statistic $\hat{x}$ is given by:

$$\hat{r} = \frac{\hat{\sigma}_{\hat{x}}}{\hat{x}} \qquad \text{(I.1)}$$

where $\hat{\sigma}_{\hat{x}}$ is the estimated standard error of $\hat{x}$,
and $\hat{x}$ is the estimated value of x

An example of the application of this process could be the case in which $\hat{x}$ is the estimate of the total hours flown in general aviation operations in New South Wales in 1978-79. From the survey data, $\hat{x}$ had a value of 483 000 hours. The relative error $(\hat{r})$ of this estimate was calculated by the BTE[1] to be approximately 0.008. Hence, the standard error $\hat{\sigma}_{\hat{x}}$ of this estimate was

(1) Further details on this process are given in Appendix II.

approximately 4000 hours. This implies that there are around two chances in three that the actual number of hours flown in New South Wales was between 479 000 and 487 000, and around nineteen chances in twenty that the actual number of hours flown was between 475 000 and 491 000.

As this survey had a fairly large sample size and enumerated 60 per cent of the operator population, the sampling errors are not particularly significant on large estimates[1]. However, sampling error becomes proportionately greater very quickly for small estimates, so that relative errors can become quite large. To illustrate this, a number of estimates of hours flown in a range of categories are given in Table I.1, together with their estimated relative errors.

It can be seen that the larger estimates are quite accurate, while some of the smallest estimates are of doubtful accuracy. Estimates with relative errors of more than 0.2 should be treated with considerable caution when they are being interpreted.

Finally, it should be noted that the statistical errors discussed in this Section refer only to errors associated with the sample size used for the statistical estimations. These errors do not include non-sampling error such as that associated with incorrect completion of the questionnaire by some respondents. Non-sampling error can be significant in a survey as detailed as the one currently under consideration. However, non-sampling error is very difficult to measure, and requires supplementary survey techniques to achieve any indication of its importance. The

---

(1) Although approximately 60 per cent of operators responded to the survey overall, not all of these responses were suitable for all the various analyses and estimates presented in this Paper. Incomplete or incorrectly completed returns required that a number of the responses had to be eliminated from particular analyses. This problem was most apparent in the cost analyses presented in Chapter 5. Nevertheless, even in this situation the sample sizes on which estimates were made remain quite substantial.

timescale of the BTE study did not permit this potential source of error to be evaluated.

TABLE I.1 - RELATIVE ERRORS OF SOME SELECTED ESTIMATES OF HOURS FLOWN

State or Territory	Flying Activity	Estimated Hours Flown ('000)	Relative Error
Australia	Total	1 609	<0.01
NSW	Total	483	<0.01
Qld	Total	301	0.025
SA	Total	155	0.040
Australia	Not Stated	26	0.10
NSW	Aerial Ambulance	20	0.11
Tas	Charter	6	0.21
NT	Aerial Agriculture	2	0.36
Qld	Search and Rescue	1	0.51

APPENDIX II - SURVEY OF GENERAL AVIATION PASSENGERS 1979

Complete analysis of general aviation operations requires some knowledge of the characteristics of the clientele for general aviation commercial services. Clearly, the economic performance of certain commercial sections of the industry will be influenced heavily by the characteristics of the clients of these sections. More specifically, the economic performance of commuter and charter operators (for example) will be affected by the sensitivity of their passengers to changes in the prices of these services. In turn, the prices of these services will be related to the cost structures faced by the operators providing them.

Information on the personal and travel characteristics of general aviation charter and commuter passengers and on their price sensitivity for this type of travel is virtually non-existent. In order to develop some indication of these characteristics, the BTE decided to carry out a limited survey of charter and commuter passengers at a number of airports. This Appendix describes the operation of the survey, which was known as the Survey of General Aviation Passengers 1979.

SURVEY DESIGN

As indicated above, the main purpose of the survey was to provide information which would permit some degree of assessment of changes in demand for commuter and charter passenger services as a function of changes in the prices of those services. The main problem was to structure the survey questionnaire in a form which would minimise respondent bias and achieve maximum reliability of the attitudinal information[1] sought. The solution adopted was

---

(1) In addition, there were organisational constraints on the design of the questionnaire. Given the nature of the survey operation (which was to be carried out at a number of airports) it was important to minimise the time taken by respondents to complete the questionnaire. This consideration severely limited the amount of information which could be gathered, and also limited the complexity of that information.

to include three questions asking respondents to indicate their choice of a number of specified alternatives in the event of hypothetical price rises of 10 per cent, 25 per cent and 50 per cent. These questions were presented in this order, and permitted a logical set of responses to the specified alternatives at the various price rises[1]. A number of other more general questions were also included.

Figures II.1 and II.2 illustrate the two sides of the survey questionnaire used in this project. The questionnaire itself was designed to permit folding, sealing and return to the BTE by post. However (as discussed later) this was not intended to be the prime means by which the completed questionnaires were to be collected for analysis.

Figure II.1 illustrates side A of the questionnaire, which incorporated the covering letter introducing the survey, together with a request for respondents to specify the origin and destination of the flight being undertaken. The remaining half of Figure II.1 contains the return address, which remains visible after folding and sealing preparatory to posting.

Figure II.2 illustrates side B of the questionnaire, incorporating the major questions to be answered by respondents. Questions 1, 2, 3, 7, 8, and 9 were designed to obtain factual information on the passengers surveyed and on the particular trips which those passengers were undertaking. It is to be expected (for example)

---

(1) The approach used was based on a similar method used in a BTE survey of international air travellers carried out by Smith and Toms (1978). In their survey, Smith and Toms asked the respondents to indicate, inter alia, their reaction to lifting of conditions associated with low-fare packages. In that case, respondents were being asked to indicate the value to them of having the conditions lifted from their low-priced fares. In the case of the general aviation passenger survey described here, however, the respondents were to be asked for their reaction to a price increase per se, with no stated benefit in return.

Survey of General Aviation Passengers 1979

The Bureau of Transport Economics (BTE) is carrying out research work into the economics and operation of the general aviation industry. We need information on users of general aviation services in order to develop an understanding of the reasons they choose general aviation as a means of transport. Furthermore, the degree to which travellers are dependent on general aviation services is of vital importance in our research work.

This questionnaire is directed to passengers on chartered and scheduled general aviation services. It seeks various details relating to this particular trip and the alternatives to this trip which might be available to you. Your co-operation in completing the questionnaire would be greatly appreciated. Please return the completed questionnaire to a BTE officer (if available) or fold, seal and post. No postage stamp is required.

Bureau of Transport Economics
P.O. Box 495,
CANBERRA CITY, A.C.T. 2601

Please state the name of the airport at which you board this flight (that is the airport at which you received this card) and the name of the airport at which you are leaving this flight.

AIRPORT AT WHICH
YOU BOARD FLIGHT.....

AIRPORT AT WHICH
YOU LEAVE FLIGHT.....

No 2034

BUSINESS REPLY POST
Permit No. 29 Issued at Canberra City
Postage and fee will be paid on delivery to:

BUREAU OF TRANSPORT ECONOMICS
P.O. BOX 495,
CANBERRA CITY, A.C.T. 2601

No postage stamp required if posted in Australia

FIGURE II.1 – QUESTIONNAIRE FOR SURVEY OF GENERAL AVIATION PASSENGERS 1979 – FRONT

SURVEY OF GENERAL AVIATION PASSENGERS 1979

THE TERM 'FLIGHT' IS TO BE TAKEN AS REFERRING TO YOUR FLIGHT DEPARTING FROM THE AIRPORT AT WHICH YOU RECEIVED THIS CARD. THE TERM 'TRIP' REFERS TO YOUR COMPLETE JOURNEY STARTING AND FINISHING AT HOME.

1. Please indicate whether you are a passenger on a regular scheduled flight or on a charter flight
   - Passenger on a scheduled (commuter) flight ☐
   - Passenger on a charter flight ☐

2. What is your main purpose in taking this trip?
   - Attend Conference ☐
   - Other business ☐
   - Personal/family affairs ☐
   - Sightseeing ☐
   - Holiday ☐
   - Visit friends or relatives ☐
   - Other recreation ☐

3. Who paid for your flight?
   - Yourself as private individual ☐
   - Yourself as a business expense ☐
   - Another member of your family ☐
   - Employer ☐
   - Other ☐

4. If the fare or charge for your flight were to rise by 10 per cent (one-tenth) which one of these options would you choose?
   - Undertake same trip unchanged ☐
   - Undertake same trip but by different means of transport ☐
   - SPECIFY MEANS .....
   - Undertake a trip to a different place using same means of transport as indicated in Q.1 ☐
   - Undertake a trip to a different place using different means of transport ☐
   - SPECIFY MEANS .....
   - Not undertake trip at all ☐
   - Unsure ☐

5. If the fare or charge for your flight were to rise by 25 per cent (one-quarter) which one of these options would you choose?
   - Undertake same trip unchanged ☐
   - Undertake same trip but by different means of transport ☐
   - SPECIFY MEANS .....
   - Undertake a trip to a different place using same means of transport as indicated in Q.1 ☐
   - Undertake a trip to a different place using different means of transport ☐
   - SPECIFY MEANS .....
   - Not undertake trip at all ☐
   - Unsure ☐

6. If the fare or charge for your flight were to rise by 50 per cent (one-half) which one of these options would you choose?
   - Undertake same trip unchanged ☐
   - Undertake same trip but by a different means of transport ☐
   - SPECIFY MEANS .....
   - Undertake a trip to a different place using same means of transport as indicated in Q.1 ☐
   - Undertake a trip to a different place using different means of transport ☐
   - SPECIFY MEANS .....
   - Not undertake trip at all ☐
   - Unsure ☐

GO TO Q7

7. In the periods stated how many times have you boarded an aircraft with less than 25 seats? EXCLUDE PRESENT FLIGHT
   - Number of boardings in last month .....
   - Number of boardings in last year .....

8. Please describe in a few words your main occupation
   - Occupation .....

9. Please indicate your place of residence
   - ..... (City/Town) ..... (State)

THANK YOU FOR YOUR CO-OPERATION

On completion please hand this card to a BTE officer (if available) or fold, seal and post. No postage stamp is required.

FIGURE II.2 – QUESTIONNAIRE FOR SURVEY OF GENERAL AVIATION PASSENGERS 1979 – BACK

that persons in different occupation groups or undertaking trips for different purposes would react differently to a particular change in the price of the trips they are undertaking[1]. In addition, it is likely that persons in different occupation groups would tend to make use of commuter and charter services to varying degrees. Hence, Question 8 was included to allow the disaggregate usage levels for these types of services to be estimated. The responses to Questions 4, 5 and 6 represent the basic information relating to change in demand for these services as a function of price variations. In each of Questions 4, 5 and 6, respondents were asked to indicate whether they would still undertake the present trip at the increased price or whether they would:

- Choose to undertake an alternative trip, either to the same place using a different form of transport, or to a different place;

- Not undertake the present trip at all.

The questionnaire also permitted the respondents to indicate if they were 'unsure' of their reactions to the postulated price increases. Also, in progressing through Questions 4, 5 and 6 and encountering the sequence of hypothetical price increases of 10 per cent, 25 per cent and 50 per cent, a respondent who indicated adoption of a positive alternative to the existing trip at any increased price level was expected to proceed directly to Question 7. The assumption was made that the alternative choice was applicable at all price levels above that indicated by respondents

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(1) Note that the questionnaire was designed to allow respondents to indicate their choice of alternative specifically with respect to the trip currently being undertaken or about to be undertaken. It was not intended that respondents should indicate their general reactions to increased prices, although a number of them simply indicated that they would travel less frequently. Such qualitative information is of little direct use in estimating demand.

as being sufficient for them to choose an alternative in the first place[1].

In designing the questionnaire in the way shown in Figures II.1 and II.2 (and, in particular, in framing Questions 4, 5 and 6), the aim as far as possible was to obtain a complete picture of the alternatives which various classes of passengers would choose when confronted with an increased price for the service currently being used. As designed, the questionnaire required a minimum of writing, with the majority of the information being indicated by means of structured rather than open-ended questions.

SURVEY OPERATION

The survey questionnaire was designed to be distributed to commuter and charter passengers prior to their embarkation on a flight. There would have been serious problems with non-response if the aim had been to survey passengers on their arrival at the airport, after leaving a flight. Arriving passengers are usually anxious to proceed through the airport terminal with a minimum of delay. It would also have been logistically difficult to attempt to survey both arriving and departing passengers at a terminal simultaneously[2]. On the other hand, passengers (and particularly commuter passengers) about to embark generally wait in the terminal for their flight call. This waiting period permitted embarking

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(1) In the event, only a minority of respondents actually understood or heeded the directive to proceed to Question 7 (as expressed by the stylised arrows on the questionnaire). However, the assumption noted in the text tended to be borne out, since, in the great majority of cases, respondents indicating the choice of an alternative at a given price level also indicated the same choice at higher price levels.

(2) Staff resources would not have permitted a comprehensive coverage of both classes of passengers. Uneven coverage, combined with the non-response problem postulated earlier, would have resulted in sample control problems which would have led to a deterioration in the quality of the information to be obtained from the survey analysis.

passengers to be approached for their co-operation in taking part in the survey, and also provided time for their completion of the questionnaire at little or no marginal inconvenience to themselves.

The survey was carried out over the four days from 2 October 1979 to 5 October 1979 at the following airports:

- Kingsford-Smith (Sydney);
- Bankstown (Sydney);
- Tullamarine (Melbourne);
- Moorabbin (Melbourne);
- Essendon (Melbourne).

The choice and number of airports and the time period for the survey were largely dictated by the timescale for this study and by the staff available for administering the survey. The airports listed represented a selection which could be covered adequately with available staff and which were expected to yield a significant sample size in a short time period[1].

BTE staff were stationed at the high-traffic terminals to contact intending passengers personally, and to collect questionnaires immediately on their completion. At other terminals, where the passenger traffic did not justify stationing a BTE staff member for an extended period of time[2], the co-operation of appropriate general aviation operators was obtained. In these cases, operators agreed to distribute questionnaires to their clients and to gather the completed questionnaires for later collection by BTE staff[3]. Although, as previously noted, the questionnaire was designed

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(1) As discussed later, the sample sizes obtained from some of these airports were still rather disappointing, particularly in relation to charter passengers.

(2) These low-traffic terminals were generally operated by charter operators.

(3) It may be noted the BTE received a very high degree of co-operation from all the operators approached at the airports under survey. This co-operation is appreciated and acknowledged.

to permit a respondent to complete it at his convenience and return it by mail, every endeavour was made to collect completed questionnaires 'on the spot'. That this was the only satisfactory approach can be judged from the low response[1] obtained from those passengers who indicated that they were pressed for time and who were given a questionnaire for completion and subsequent return by mail.

GENERAL OBSERVATIONS

In spite of the limited scope of this survey, considerable useful statistical information was obtained from it. A very high degree of co-operation was obtained from the passengers approached. Very few passengers refused to take part in the survey. Some passengers were pressed for time and agreed to take a questionnaire for completion at a later time and to return the completed questionnaire. As noted previously, the response rate for this particular group was quite low.

In all, a total of 1521 responses were received in time for analysis. Of these, 1332 were received from commuter passengerss and 158 from charter passengers. Thirty-one responses had no indication of the type of passenger to which they referred. The number of responses received from each of the airports at which the survey was conducted were as follows:

- Kingsford-Smith (Sydney) - 1146 replies;
- Bankstown (Sydney) - 8 replies;
- Tullamarine (Melbourne) - 134 replies;
- Moorabbin (Melbourne) - 39 replies;

(1) Of approximately 120 questionnaires which were distributed in this way, only 20 or so were received in the mail within one week after the survey was completed. This has obvious implications on the design of similar surveys in the future. Clearly, for the survey to be worthwhile, reliance on voluntary return of the questionnaire by post should be minimised.

- Essendon (Melbourne) - 179 replies;
- Airport unknown[1] - 15 replies.

Clearly, the sample was dominated by replies from Kingsford-Smith Airport. In discussions with operators at the airports surveyed near Melbourne, various charter and commuter operators remarked that the particular week of the survey seemed to be especially quiet from their point of view.

The number of charter passengers included in the survey was somewhat disappointing - particularly the small sample obtained from Bankstown Aerodrome. It was to be expected that because of the greater diversity of charter operations, a comprehensive survey of passengers would be far more difficult for charter passengers than for commuter passengers. Nevertheless, BTE officers conducting the passenger survey indicated that they believed that 50 per cent[2] of charter passengers embarking at these airports during the survey period were covered.

STATISTICAL CONSIDERATIONS

Since the passenger survey was essentially a sample survey, statistical estimates derived from the information are subject to certain accuracy tolerances. These tolerances are based on the size of the sample used to develop particular estimates. The passenger survey was restricted to passengers at five airports over 4 days. Hence, the sample of passengers was drawn from quite a limited population size. As noted in the previous Section, it is believed that around 90 per cent of the commuter passenger population was sampled and around 50 per cent of the charter

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(1) These replies had no indication of the airport which was the point of embarkation for the passenger.

(2) The coverage of commuter passengers was much higher, since a large proportion of all scheduled flights departing during the survey period were included in the survey. The coverage of commuter passengers was estimated by the BTE to have been at least 90 per cent.

passenger population. These high sampling fractions lower the statistical error in the estimates derived from the sample for the population and period under consideration. However, they do not lead to substantive indications for broader populations or longer time periods.

SAMPLING ERROR

Since most of the practical information derived from this survey related to estimated distributions of particular characteristics rather than to absolute magnitudes, error estimates of particular interest are those relating to the estimated proportions. The definition and interpretation of relative errors have been discussed in Appendix I. The method of calculating the relative error of an estimated proportion is outlined below. The resulting mathematical formulation is then illustrated for a range of proportion estimates derived from the commuter and charter passenger samples, respectively.

For the purposes of analysis, $\hat{p}$ can be assigned to represent a proportion[1] estimate derived from the sample survey, and n can be used to represent the number of sampled passengers (in a particular category). Further, N can be taken as the total number of passengers (in that category) who could potentially have been sampled during the survey. The estimated standard error $\hat{\sigma}_{\hat{p}}$ in $\hat{p}$ is then given by:

$$\hat{\sigma}_{\hat{p}} = \left[\frac{\hat{p}\ (1-\hat{p})}{n} \quad \frac{(N-n)}{(N-1)} \right]^{\frac{1}{2}} \qquad \text{(II.1)}$$

(1) In the context of this survey, $\hat{p}$ could for example refer to the proportion of charter passengers in a particular occupation group, or the proportion of passengers who indicate that they would not continue to undertake their flight at a given price increase.

The relative error r then becomes[1]

$$\hat{r} = \frac{\hat{\sigma}_{\hat{p}}}{\hat{p}} = \left[\frac{(1-\hat{p})\ (N-n)}{\hat{p}\ n\ (N-1)} \right]^{\frac{1}{2}} \qquad \text{(II.2)}$$

Using equation (II.2), Table II.1 illustrates the relative errors for a range of proportion values estimated from the passenger surveys, assuming sampling fractions (n/N) of 90 per cent for commuters and 50 per cent for charter passengers respectively.

TABLE II.1 - RELATIVE ERRORS IN ESTIMATES OF PROPORTIONS

Proportion ($\hat{p}$)	Relative Error	
	Commuter passengers n = 1332	Charter passengers n = 158
0.01	0.086	0.56
0.1	0.026	0.17
0.2	0.017	0.11
0.3	0.013	0.086
0.4	0.010	0.069
0.5	0.0087	0.056
0.6	0.0071	0.046
0.7	0.0057	0.037
0.8	0.0043	0.028
0.9	0.0028	0.019

The values shown in Table II.1 are illustrative only. If proportion estimates are based on particular sub-categories of the sample (for example, passengers travelling a given distance) the relevant sample size (n) is the number of passengers in each sub-category. The tables given in Chapter 6 are expressed in

(1) The significance of relative errors is discussed in Appendix I.

terms of the actual survey sample and permit the sample size for any particular estimate to be determined readily.

APPENDIX III - ANALYSIS OF VIEWS EXPRESSED IN THE GENERAL AVIATION SURVEY 1979

In the General Aviation Survey 1979 (described in Appendix I), respondents were asked to provide general attitudinal information relating to a number of areas of general aviation. Space was provided in Section IV of the survey questionnaire for respondents to submit any comments which they wished to make on general aviation. In addition, attitudinal information in structured form was requested in particular instances. Respondents were asked to indicate their opinions of the facilities provided at airfields operated for public use and used by respondents either as bases for their flying operations, or as places visited in the course of their flying operations. As well as reporting their personal assessments of the particular airfields which they used, respondents were also asked to indicate their assessments of facilities provided for general aviation overall.

This Appendix presents an overview of the comments received from operators responding to the survey, and analyses the responses obtained to the structured attitudinal questions mentioned above. It should be noted, however, that the analysis of comments received does not constitute a rigorous statistical exercise which would necessarily permit quantitative extrapolation of the views expressed by all general aviation operators. In other words, the proportion of respondents to the survey making a particular comment may not reflect the proportion of all operators who hold that specific view. The voluntary nature of the comments militates against this type of quantitative extrapolation. All that can really be inferred is that the general frequency with which particular comments are made in the survey is probably representative of the feeling of operators as a whole in a qualitative sense. It is in this sense that the analysis presented below should be interpreted.

GENERAL VIEWS OF OPERATORS

Almost half of all the survey respondents took the opportunity to express their views on a broad range of topics related to general aviation. The comments received were generally fairly brief and tended to describe the major and immediate concerns of the operators[1] (for example, rising costs, problems of fuel availability and so on). A small number of respondents to the survey included detailed comments on aspects such as current and emerging industry problems, while others gave suggestions for improvements to the regulatory environment and the DOT cost recovery program. Approximately 1000 respondents chose to make some comment on general aviation, and a significant number of these respondents discussed more than one aspect. As a result, almost 1700 comments were received in total.

APPROACH TO THE ANALYSIS

In view of the wide-ranging and open-ended nature of the comments received, some formal structure was required in order to allow them to be classified and analysed. A framework for classification of the comments was initially developed from an examination of the first few hundred survey returns received. This examination permitted the boundaries of the classification scheme to be identified with reasonable confidence. These boundaries encompassed the issues which were apparently of concern (or at least of interest) to the operators. To some extent, any classification scheme is arbitrary, but the scheme developed for this analysis was devised with the aim of achieving a comprehensive coverage of all the comments volunteered. To be successful, the classification scheme had to allow comments to be classified with a maximum of consistency and minimum of ambiguity. Given the

(1) The term 'operator', as before, refers to the holder of a Certificate of Registration for at least one general aviation aircraft.

nature of opinions and comments in general, a totally satisfactory classification scheme satisfying the above criteria was difficult to devise without losing some of the meaning of the classified comments. However, it is believed that the scheme developed for the present purposes was adequate.

The classification scheme was developed to facilitate computer analysis, which provided an efficient and effective method of tabulation and assessment. In some cases, where specific types of comments were small in number and were not completely described by the overall classification scheme, these comments were classified together with a brief statement explaining the substance of the comment. Thus, this method enabled the major issues and broad trends to be identified, while at the same time being sufficiently comprehensive to bring forward specialised areas of concern.

General Outline of the Classification Scheme

The basic thrust of the classification scheme is described in Table III.1. In line with the description given in that Table, each comment was classified into a three-tier system, constructed as follows:

- The first element specified a major interest area;
- The second element specified secondary aspects associated with each major interest area;
- The third element specified the nature or thrust of the comment - for example, whether the comment was expressing a favourable or unfavourable opinion.

ANALYSIS OF COMMENTS

The analysis of comments was undertaken with the aim of deter-

TABLE III.1 - DESCRIPTION OF COMMENT CLASSIFICATION SCHEME

Primary Classification	Secondary Classification	Opinion Expressed [a]
DOT administration of general aviation	Regulatory environment Air Traffic Control Cost recovery program Provision of other services to general aviation Staffing aspects	Inadequate Room for improvement Adequate Excessive
Costs imposed on operators	Fuel costs Air Navigation Charges [b] Maintenance costs Other costs	Low Appropriate High
Fuel availability and infrastructure	Fuel availability Fuelling facilities Landing grounds	Inadequate availability Adequate availability Inadequate in quality Adequate in quality
Other issues	Maintenance operations Meteorological forecasts Unfair competition Safety issues Government financial aid Industrial disputes	Inadequate Room for improvement Adequate Excessive

(a) The alternatives shown in this column apply to each of the items in the adjacent secondary classification. For example, the terms 'inadequate', 'room for improvement', 'adequate' and 'excessive' apply to each of the secondary classifications within the primary classification, 'DOT administration of general aviation'.

(b) This obviously relates to DOT administration of general aviation, which is a separate major interest area defined in this scheme. However, it was thought appropriate to isolate these comments in the second major classification of 'Costs imposed on operators'.

mining the concerns of the industry as a whole[1], the specific issues of concern to the different types of operators, and the problems of city-based versus rural-based operations. To the extent that these aims could be met, it was considered that a reasonably comprehensive summary of the operators' views could be obtained. It should be noted that the following discussion presents the views of the operators as volunteeredin the survey, and no assessment of the validity or accuracy of their claims is attempted. Also, it is suggested that any analysis of these comments should not be considered to have rigorous statistical reliability, since comments were invitational, and more than half of the respondents to the survey did not provide comments.

FREQUENTLY EXPRESSED VIEWS

Before commencing a discussion on the individual categories of comment it is appropriate to highlight the views which operators most frequently expressed. Not unexpectedly, the important issues of apparent concern (as expressed at the time of the survey) related to the problems of rising fuel costs, fuel shortages and high Air Navigation Charges (ANC's) and the unfavourable aspects of DOT's cost recovery program. These four areas of specific comment constituted almost half of all the comments received, and these generally expressed opinions of the following nature:

- Fuel costs were rising excessively;
- Fuel shortages were a major problem to all types of operators;
- ANCs were excessive or could be reduced;
- DOTs cost recovery program was seen by the operators as inappropriate, unworkable or unreasonable to general aviation.

The distribution of these comments as a percentage of all comments received is shown in Table III.2.

(1) At least as far as they were reflected by the respondents' comments in the survey.

TABLE III.2 - DISTRIBUTION OF MAJOR SPECIFIC COMMENTS

Nature of Comment	Comments Received (per cent)
Fuel costs	15
Fuel shortages	12
Air Navigation Charges	10
DOT cost recovery program	7
Remaining comments	56
Total	100

Source: General Aviation Survey 1979.

It is recognised that the issues of high ANCs and the DOT cost recovery program overlap and that these two types of comment may be classified together. To the extent that these two issues involve different aspects, it was decided that opinions on both issues should be noted separately in the tabulation of comments. However, in aggregate, these two categories account for the major proportion of all comments received.

Each of these major objects of comment is discussed in detail in the general analysis of comments provided in the following Section.

DISTRIBUTION OF COMMENTS WITHIN THE PRIMARY CLASSIFICATIONS

Using the classification scheme explained above, Table III.3 presents a breakdown of the operators' broad areas of concern, as reflected in the comments received. As indicated in Table III.3, aspects associated with the DOT's administration of general aviation were commented on most frequently. These comments accounted for 45 per cent of all comments received. Costs imposed on operators represented the second most frequently occurring comment, accounting for 31 per cent of comments. Comments on fuel

supply and infrastructure accounted for 19 per cent of comments, with the remaining 5 per cent referring to miscellaneous issues.

TABLE III.3 - DISTRIBUTION OF COMMENTS WITHIN THE PRIMARY CLASSIFICATIONS

Primary Classification	Comments Received (per cent)
DOT administration of general aviation	45
Costs imposed on the operators	31
Fuel availability and infrastructure	19
Other issues	5
Total	100

Source: General Aviation Survey 1979.

In order to assess the general opinions of operators on each of the issues, comments coming within the ambit of each of the primary classifications are discussed in turn. Since all percentages shown are rounded to the nearest whole number, the percentages given in Table III.2 for the general distribution of major comments received may differ slightly from the values derived from Table III.3 and the subsequent tables given for each of the primary classifications.

DOT Administration of General Aviation

As previously indicated, 45 per cent of all comments received referred to this major area of interest. The distribution of comments within this primary classification is shown in Table III.4. Comments under each of the secondary classifications were relatively evenly distributed, with 'Air Traffic Control' being most frequently commented on and representing 27 per cent of these comments, followed by 'Provision of other services to general aviation' accounting for 24 per cent, 'Regulatory environ-

TABLE III.4 - DISTRIBUTION OF COMMENTS - DOT ADMINISTRATION OF GENERAL AVIATION[a]

(per cent)

Secondary Classification	Opinion Expressed				Total
	Inadequate	Room for Improvement	Adequate	Excessive	
Regulatory environment	-	10	-	11	21
Air traffic control	15	6	2	4	27
Cost recovery program	-	10	-	5	15
Provision of other services to general aviation	6	9	2	7	24
Staffing aspects	2	1	7	3	13
Total	(b)	(b)	(b)	(b)	100

(a) Percentages refer to comments relating to DOT administration of general aviation. As noted previously, 45 per cent of all comments received belonged to this category.

(b) Not applicable.

Source: General Aviation Survey 1979.

ment' accounting for 21 per cent, 'Cost recovery program' accounting for 15 per cent and lastly 'Staffing aspects' accounting for 13 per cent. Each of these secondary classifications is discussed in turn below.

A number of different comments belonging to the secondary classification of 'Regulatory environment' were received. For example, comments related to pilot licencing arrangements, maintenance requirements and other aspects of ANRs were grouped under this heading. General comments (that is, comments which did not discuss any particular aspect of regulation) were mainly critical of the overall regulatory environment. Some complained of over-regulation on the part of DOT, while others simply suggested there was scope for improvement in the regulatory environment. Comments on particular aspects of regulation covered a broad range of issues. Obviously, it is neither possible nor appropriate to indicate the details of each individual comment in a general analysis such as this. Rather, it is aimed to give the substance of the points covered. Some of the issues which were the objects of reasonably frequent comment in one form or another are summarised below:

- Consideration should be given to the introduction of an 'en route' instrument flight rating, since existing instrument ratings are of a standard unnecessarily high for many private and business pilots;

- Sporting, Recreational and Experimental categories of aircraft registration should be introduced, attracting lower ANCs;

- DOT was geared towards RPT operations, with insufficient consideration given to general aviation operations. For example, constraints were imposed on ANR 203 (1) operators

(1) The definition of these operations has been given in Chapter 2.

by the Two-Airline Policy (in terms of route allocation and so on);

- A number of requirements, procedures and restrictions which have been developed and enforced over recent years at great expense, are not necessary for general aviation - for example, some meteorological, radio and control procedures.

Comments on air navigation facilities, air traffic control procedures, radio communication and so on were grouped under the classification of 'Air traffic control'. No consensus emerged in regard to the standard of air navigation facilities overall. A number of operators complained of having to pay for facilities which could not be used by the type of aircraft which they operated, while others believed the existing network of facilities was inadequate. For example, some suggested that a satellite communication system for use by general aviation is required in Australia. However, in country areas, air navigation facilities (for example, non-directional beacons, VHF omnidirectional range and distance measuring equipment) as well as radio communication facilities were seen to be generally inadequate. With regard to air traffic control procedures, comments often referred to the excessive amount of controlled civil and military airspace, which was an inconvenience to some general aviation and parachuting operations[1]. Other respondents requested that greater provision be made for business flights into capital city primary control zones[2], such as Melbourne Airport (Tullamarine) and Sydney Airport (Kingsford-Smith).

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(1) Some operators complained of having to divert their flights to circumvent a control zone, thus costing extra fuel and time.

(2) Refer to DOT Aeronautical Information Publication sections setting out air traffic rules, services and flight procedures. These dictate flight priorities into and out of capital city primary control zones. When all requirements for operation cannot be accommodated, priority is given in the following order: (1) regular public transport, military and charter aircraft; (2) aircraft engaged in aerial work; (3) private aircraft proceeding to the primary airport; (4) other private aircraft.

As a reasonably specific group, comments concerning the cost recovery program undertaken by DOT accounted for 7 per cent of all comments received. Table III.2 showed that these comments represented the fourth-highest proportion of comments of a specific nature.

These comments reflected the following general areas of opinion:

- The structure of the present cost recovery scheme is inappropriate to general aviation, since not all operators can make use of the equipment and facilities provided by DOT. It was suggested that cost recovery should be based on the actual use of those facilities. Some operators further suggested that the present ANCs could be replaced by a lower fixed charge, together with an extra tax on fuel or on the number of landings made at DOT airports;

- As well as pursuing the cost recovery program, it was suggested that DOT should be undertaking a parallel program of cost reduction. Areas in which cost savings may be possible were seen to include issue of publications (1) and the level of staffing in flight service and administration areas.

A number of comments were received relating to a range of services provided to general aviation by DOT (2). One point made quite strongly by a number of operators concerned what they regarded as the excessive number of publications sent to every licensed pilot and LAME, notifying, for example, minor

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(1) Numerous operators believed that there could be greater rationalisation in the number and frequency of publications sent out to each C of R holder, with considerable in cost. They complained that many of these publications bore no relevance to their operations. This is discussed further in regard to provision of other services to general aviation.

(2) Particular examples of services which attracted comment included the issue of publications (for instance, NOTAMs) and provision of ground and terminal facilities.

changes to the ANRs. While it was conceded that issue of all of these publications may be important to some operators, many pilots (especially those operating in rural areas) commented that they had no need at all for most of that information. As noted previously, they regarded the service as being financially wasteful. It was suggested, for example, that where publications were relevant, they be posted out only at regular intervals (perhaps once a month). While most comments relating to the provision of services to general aviation by DOT complained of too many publications, there were a few operators requesting that additional information be sent to pilots. The main requests were for DOT to compile a directory indicating the location and condition of authorised landing areas throughout Australia. Other operators requested that DOT supply information on the location and standard of fuelling facilities (especially those in country areas). This information would obviate the need for pilots to take on extra fuel for long distance trips, since refuelling would then be possible en route.

Many operators regarded ground and terminal facilities provided by DOT as being inadequate at both city and rural airports. More sealed parking areas, tiedown facilities and hangarage were indicated as being required, while the standard of terminal facilities for general aviation operations (such as washrooms, canteens and waiting lounges) could be improved. At some airports, these terminal facilities were claimed to be non-existent[1].

The final group of comments on DOT administration of general aviation dealt with staffing matters related to DOTs administration. The substance of these comments was as follows:

(1) The overall assessment of facilities by respondents to the survey is presented later in this Appendix. This assessment would indicate that operators are generally reasonably well satisfied with facilities.

- Flight service staff were commended for the quality of service provided by them;

- Some complaints were received concerning the administrative areas within DOT. For example, a number of operators complained of excessive delays experienced in obtaining administrative decisions;

- The level of staffing was generally thought to be too high. A number of operators claimed that the staff levels in Australia were over twice the corresponding level in the US (on a per aircraft basis).

Costs Imposed on Operators

Comments belonging to the primary classification which related (in general) to costs faced by operators accounted for the second highest proportion of all comments (1). These comments represented 31 per cent of all comments received. The overwhelming consensus of the operators was that costs were too high or were rising excessively, and were having an unfavourable effect on the viability of many operations (both private and commercial). The distribution of the comments relating to different areas of costs is shown in Table III.5.

All comments in this category expressed the opinion that costs were too high or were rising at an excessive rate. Hence, Table III.5 does not include the 'low' or 'appropriate' classifications of opinions included as part of the classification scheme shown in Table III.1.

From Table III.5, it is evident that fuel costs and ANCs constitute a considerable area of concern to operators. From Table III.2,

(1) It has already been noted that comments of specific rising fuel costs represented the most frequent opinion expressed in the survey.

these represented around 25 per cent of all specific comments received. Some operators pointed out that, in 1979 alone, the price of aviation gasolene (AVGAS) had more than doubled, while ANC's were due to rise by 20 per cent per annum for the next three years. Because of rising costs, many operators believed that general aviation is now facing a recession, with a number of operators (both private and commercial) claiming that they had sold their aircraft, or indicating that they intended to do so in the near future. Such an exodus from general aviation was said to be having a depressing effect on the resale value of aircraft. Also, some of those operators choosing to remain in general aviation pointed out that rising costs would prevent them from installing avionics[1] (which could improve the general level of safety in the industry).

TABLE III.5 - DISTRIBUTION OF COMMENTS - COSTS IMPOSED ON OPERATORS[a]

Secondary Classification	Comments Received (per cent)
Fuel costs	56
Air Navigation Charges (ANCs)	36
Maintenance Costs	5
Other Costs[b]	3
Total	100

(a) Percentages refer to comments dealing with costs imposed on operators. As noted previously, 31 per cent of all comments received belonged to this category.

(b) Other costs included spare parts costs, insurance premiums, hangar rental charges, landing fees and so on.

Source: General Aviation Survey 1979.

(1) The term 'avionics' refers here to airborne instrumentation used for the purpose of navigation, radio communication and so on.

Fuel Availability and Infrastructure

Comments relating to the availability of fuel and the availability and standard of fuelling facilities and landing grounds were grouped in this major classification, comprising 19 per cent of all comments received. The distribution of comments within this classification is presented in Table III.6.

The lack of fuel availability (namely AVGAS) was seen to be a major problem for many operators, and especially for those in rural areas. This specific comment represented around 12 per cent of all comments received and was the second-highest proportion of comments received on a particular topic. Some commercial and private operations were adversely affected by the recent AVGAS shortage, with the result that pilot training and other ancillary general aviation operations were experiencing a corresponding downturn. Criticisms of the Federal Government and the oil companies were expressed, because of their failure to ensure adequate supplies of AVGAS.

Refuelling facilities were regarded as inadequate both in number and standard in the more isolated rural areas. In some areas, refuelling from drums was said to be the only available method, and on weekends and after hours, fuel supplies were difficult to obtain.

On the subject of landing grounds, some operators expressed the opinion that rural Australia is in need of more authorised landing areas. As well, secondary airports[1] in the capital cities (and especially Sydney, Melbourne and Brisbane) were regarded as being too congested. Suggestions were made that the facilities at these airports should be upgraded or new airports

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(1) The secondary airports are as follows: for Sydney, Bankstown and Camden; for Melbourne, Essendon and Moorabbin; for Brisbane, Archerfield; for Adelaide, Parafield; and for Perth, Jandakot.

TABLE III.6 - DISTRIBUTION OF COMMENTS - FUEL AVAILABILITY AND INFRASTRUCTURE[a]

(per cent)

Secondary Classification	Opinion Expressed				Total
	Inadequate	Room for Improvement	Adequate	Excessive	
Fuel availability	55	9	-	-	64
Fuelling facilities	14	2	-	-	16
Landing grounds	18	2	-	-	20
Total	(b)	(b)	-	-	100

(a) Percentages refer to comments on the availability of fuel and infrastructure. As noted previously, 19 per cent of all comments received belonged to this category.

(b) Not applicable.

Source: General Aviation Survey 1979.

should be constructed for use by general aviation. The northern suburbs of Sydney and the western suburbs of Melbourne were cited as areas in particular need of general aviation airport facilities.

Other Issues

A number of other comments were received, and these covered a wide range of miscellaneous issues. In general, these comments did not fit within the framework of the major classifications discussed above, and were insufficient in number to warrant further disaggregate classification. As indicated previously, these comments constituted 5 per cent of all comments received. Issues raised by the operators included the following:

- Maintenance operations;
- Meteorological forecasts;
- Unfair competition facing charter and scheduled commuter operators;
- Safety issues;
- Government financial aid for private landing grounds and the local aircraft manufacturing industry;
- Industrial disputes.

Comments relating to maintenance operations mostly complained of poor quality of service and 'exhorbitant' prices charged by some maintenance firms. However, these comments were few in number, indicating that these aspects of maintenance were not of overriding concern.

Comments concerning meteorological forecasts complained that the coded forecasts were too complex for a pilot to decipher easily while flying an aircraft. Requests were made for a simplified coding scheme (as well as more accurate forecasts).

The problem of unfair competition (an issue specific to commuter, charter and flying training operators) is discussed in the following Section.

The question of safety in general aviation per se was an issue most notable by its general absence from the comments of the operators. Clearly, some of the issues raised by the operators and discussed previously have safety implications. However, since safety as a separate issue was seldom referred to in the comments, the extent to which some of the suggestions were made with due consideration given to safety is unclear. While a small number of operators requested that ordinary motor spirit be allowed for use in aircraft (because of the AVGAS cost and shortage) other operators expressed the concern that such use would result in a deterioration in engine reliability and hence safety.

Government financial aid for the construction and upkeep of private landing grounds and to generally assist the Australian aircraft industry was requested by a few operators. Finally, industrial disputes in areas essential to general aviation operations were seen as a problem by some affected businesses and commuter or charter operators.

ISSUES RAISED BY VARIOUS CATEGORIES OF OPERATOR

The preceding discussion has described the various issues which were the subject of comment by general aviation operators, without identifying those issues which were of particular concern to specific groups of operators. To complete the analysis, it is appropriate to discuss some of the more frequently occurring comments pertaining to particular types of general aviation operations. The categories of general aviation operations which will be discussed include the following:

- Commuter, charter and flying training operations;
- Aerial agriculture operations;
- Private and business operations (other than specified in the previous two categories).

Commuter, Charter and Flying Training Operations

The major problem facing a large number of these operators was that of earning an adequate income at a time of rapidly rising costs and an attendant downturn in the demand for their services. At some airports, a small number of operators complained of unfair competition from charter and flying training operators who were undercutting the established operators. It was indicated that these relatively new entrants into the business were not subject to the same level of overheads faced by the established operators, and could charge lower prices (especially if they were operating on a part-time basis). For example, some of these cut-rate operators would accept rates of pay lower than the award rate to which pilots are entitled. As well, they may have hired or purchased aircraft obtained under the Federal Government's Investment Allowance Scheme[1], giving them a cost advantage compared to those operators using aircraft purchased before the introduction of the investment allowance. It was claimed that one of the effects of this scheme on general aviation was to increase the supply of new aircraft to the market, thus exerting a downward pressure on aircraft hire charges and resale values.

Another problem discussed by some commuter, charter and flying training operators was concerned with construction of new buildings by them at DOT controlled airports. They believed that in some cases it was difficult to justify major private investments at these airports, for a number of reasons. Periods of lease of Commonwealth land by private operators were in some instances too

(1) The investment allowance, introduced in 1976, is a special income tax deduction available in respect of the capital cost of acquiring or constructing new plant and equipment. Taxpayers are entitled to the investment allowance by way of a lump sum deduction in calculating their taxable income for the year of income in which the plant or equipment is first used for assessable income-producing purposes.

short to enable the operator to obtain an adequate return on his investment[1]. Another problem facing these operators was that existing buildings constructed by them on land leased from the Commonwealth were not acceptable by banks as a mortgage instrument, since legal ownership of these buildings is vested in the Commonwealth. Also, for this same reason, no depreciation allowance on such buildings could be claimed when assessing income tax.

Some commuter and charter operators were also concerned about the constraints imposed on their operations by the Two-Airline Policy. Some of these operators indicated that they would like to expand their operations to include routes already served by RPT operators, but are unable to do so because of the Two-Airline Policy. Others who already operate regular services under ANR 203 feared that at any time the major airlines could apply to DOT for permission to operate those routes, thus forcing the smaller operators out of business. In summary, the general thrust of comments made by commuter, charter and flying training operators was that DOT seemed to give undue priority and emphasis to RPT operators[2] in its administration and regulation of the aviation industry. This consideration was seen to be at the expense of general aviation operations, and the operators in this commercial category expressed their desire to have the balance redressed somewhat in their favour.

Aerial Agriculture Operations

As defined in the General Aviation Survey 1979, aerial agriculture

(1) Because of airport planning constraints, DOT is unable in many instances to grant a lease of sufficient duration to enable a lessee to fully write-off his investment. Where improvements have been made by private individuals on leases at DOT airports, ownership is vested in the Commonwealth. However, provision can be made for such improvements to be removed by the lessee at expiry of the lease or to be left in situ after expiry.

(2) More specifically, general aviation operators identified the participants in the Two-Airline Policy (as opposed to other RPT operators) as receiving undue consideration.

operations included those operators who were engaged in crop dusting, spraying and seeding, and mustering of livestock. The major complaint of these operators was that ANCs were too high when compared to their use of facilities supplied by DOT. Because of the nature of aerial agriculture, they pointed out that their aircraft were usually not equipped to use the facilities available to other general aviation aircraft, and that these aircraft were mostly designed so that they could not be used for any operation except aerial agriculture. Also, the majority of these operations were based away from DOT airfields, and seldom made use of these airfields. Some of these operators believed that an aircraft which is used for aerial agriculture should be considered as an agricultural implement. Consequently, fuel and spare parts for these aircraft should be exempt from tax and import duty.

Private and Other Business Operations

Operations involving aircraft used for the purposes of recreation, personal or family affairs and for business not primarily concerned with general aviation are grouped in this category. The majority of pilots of these aircraft flew fewer hours compared to other operators, and so for their use of DOT facilities, they considered the ANCs to be too high. Some suggested that these charges should be based on the number of hours flown or the number of landings made at DOT airports. As with commuter and charter operators, many private and other business operators complained that DOT unduly favoured RPT operators. However, a number were also critical of the emphasis given to commuter operators at the expense of the private and business categories.

A small number of private aircraft owners who flew vintage aircraft complained of the high ANCs applying to their type of aircraft. Usually, vintage aircraft are flown only on special occasions (for example, at air shows and other public displays). As well, these aircraft were not equipped to use many facilities supplied by DOT. Their owners believed that, by reducing ANCs, DOT would encourage more people to restore and maintain these aircraft, and so promote greater interest in aviation history.

STRUCTURED ASSESSMENT OF FACILITIES

The preceding discussion has presented an outline of the written views of the operators as volunteered in the General Aviation Survey 1979. Since their views were obtained as a result of an open-ended request, it should be pointed out that as an overall assessment of the facilities provided for general aviation, these comments may not give an accurate impression of the general opinion on particular facilities. Generally, operators would comment only when they wished to register some form of complaint, even though they may have been satisfied with most features of the facilities. Those operators who had no complaints or suggestions for improvement would obviously have little incentive to comment at all. To gain an overall assessment of the quality of the facilities provided for general aviation as perceived by operators, respondents to the survey were asked (in Question 13 of the questionnaire) to indicate their opinion of these facilities in a structured form, by specifying one of the categories - 'no opinion', 'inadequate', 'adequate' and 'more than adequate'[1]. In response, the major proportion of respondents assessed general aviation facilities as being at least adequate. As can be seen in Table III.7 below, 70 per cent of all respondents believed that general aviation facilities were 'adequate' or 'more than adequate'. Only 21 per cent of all respondents indicated that facilities in general were inadequate.

In the survey, respondents were also asked to indicate their assessments of the standard of facilities at particular airfields[2]. The survey asked respondents to assess these particular airfield facilities in terms of the categories 'poor', 'fair', and 'good'.

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(1) Question 13 of the questionnaire for the General Aviation Survey 1979 refers to this. Any comment written in response to Question 13 were coded following Table III.1 and have been included in the analysis presented in the previous Sections.

(2) Questions 4 and 5 of the General Aviation Survey 1979 asked respondents to indicate their assessment of the facilities provided at airfields representing their main bases of operation and at airports most frequently visited.

TABLE III.7 - RATING OF FACILITIES PROVIDED FOR GENERAL AVIATION

Opinion	Percentage of Responses
No Opinion	9
Inadequate	21
Adequate	57
More than Adequate	13
Total	100

Source: General Aviation Survey 1979.

Tables III.8 and III.9 below show the overall distribution of responses received for all airfields for which a minimum of 20 responses[1] were received. Table III.8 shows the results for the airfields representing the bases of operations, while Table III.9 shows the results relating to places visited.

To gain some indication of the overall assessment of particular airfields a simple rating scheme was devised. Airfields assessed as 'good' by a respondent were given an arbitrary rating of +1, airfields assessed as 'fair' by a respondent were given the arbitrary rating of 0 and airfields assessed as 'poor' by a respondent were given the arbitrary rating of -1. By algebraically summing the ratings of each airfield and dividing the result by the number of responses for that airfield, an average rating for the airfield was calculated. These average ratings are also shown in Tables III.8 and III.9.

An average rating may vary between -1 (facilities assessed as poor) to +1 (facilities assessed as good). All of the airfields selected had an average rating of between 'fair' and 'good'. Tables III.8 and III.9 show that Cairns, Camden and Hoxton Park

(1) It was considered that a smaller response would not provide a sufficiently reliable indicator of the quality of facilities.

had the lowest ratings while Jandakot, Moorabbin, and Kalgoorlie, were among the highest. Where airfields are shown both as bases of operations and places visited their general ratings tended to be higher as places visited. Presumably operators making use of an airfield as a base of operations would be more familiar with its disadvantages from their point of view. It is pointed out that the smaller airports are not represented in this sample because of an insufficient number of responses giving an assessment of their facilities. Consequently, no conclusions can be made on the standard of their facilities.

TABLE III.8 - RATING OF AIRFIELDS REPRESENTING BASES OF OPERATION

Airport	Sample Size	Percentage of Responses			Average Rating
		Poor	Fair	Good	
NSW -					
Albury	20	5	35	60	0.55
Bankstown	171	11	40	49	0.39
Vic -					
Essendon	60	3	25	72	0.68
Moorabbin	124	2	21	77	0.75
Qld -					
Archerfield	62	3	26	71	0.71
Cairns	16	31	25	44	0.13
SA -					
Parafield	49	-	31	69	0.69
WA -					
Jandakot	55	-	11	89	0.89

Source: General Aviation Survey 1979.

GENERAL CONSIDERATIONS

An attempt has been made in this Appendix to cover the range of comments made by respondents to the General Aviation Survey 1979. Some indication has also been given of the frequency with

TABLE III.9 - RATING OF AIRFIELDS REPRESENTING PLACES VISITED

Airfield	Sample Size[a]	Percentage of Responses			Average Rating
		Poor	Fair	Good	
NSW[b] -					
Albury	93	4	17	79	0.74
Bankstown	191	9	25	66	0.58
Bathurst	35	6	26	68	0.62
Broken Hill	58	2	14	84	0.82
Camden	30	13	40	47	0.33
Canberra	79	5	9	86	0.81
Coffs Harbour	44	7	39	54	0.48
Dubbo	87	2	17	81	0.78
Griffith	64	5	9	86	0.81
Hay	24	8	29	63	0.54
Hoxton Park	21	23	29	48	0.24
Maitland	22	-	41	59	0.59
Mudgee	30	7	30	63	0.57
Sydney Airport	121	10	16	74	0.64
Wagga Wagga	52	2	21	77	0.75
Vic -					
Essendon	143	3	14	83	0.80
Moorabbin	141	1	9	90	0.88
Swan Hill	63	8	27	65	0.57
Qld -					
Archerfield	105	5	19	76	0.71
Brisbane Airport	74	19	11	70	0.51
Bundaberg	27	-	30	70	0.70
Cairns	29	17	21	62	0.45
Coolangatta	62	10	18	72	0.63
Longreach	32	3	28	69	0.66
Mackay	32	-	22	78	0.78
Mt Isa	27	7	22	71	0.63
Rockhampton	59	5	20	75	0.69
Roma	25	4	28	68	0.64
Townsville	45	7	15	78	0.71
SA[c] -					
Adelaide Airport	90	3	11	86	0.82
Mt Gambier	28	-	11	89	0.89
Parafield	71	6	18	76	0.70
Alice Springs	34	3	9	88	0.85
WA -					
Perth	43	14	12	74	0.60
Carnarvon	28	-	11	89	0.89
Geraldton	50	6	26	68	0.62
Jandakot	99	1	9	90	0.89
Kalgoorlie	24	-	8	92	0.92
Port Hedland	24	4	25	71	0.67

(a) The sample size excludes those responses which gave no opinion of the standard of airfields.

(b) Includes ACT.

(c) Includes Northern Territory.

Source: General Aviation Survey 1979.

which comments on particular issues were raised. The primary aim has been to report the comments actually received. Clearly, some of the comments have been made in ignorance of the real situation[1]. However, it would not have been possible to analyse all comments to determine whether or not they were soundly based. Hence, no attempt has been made to analyse comments raised in this way.

It is assumed that comments freely volunteered (as they were in this survey) represent the issues of major importance to the operators concerned. It must also be stressed that, in general, those comments contain (at least to some extent) subjective opinion rather than analytical argument. Within this framework, it is believed that the discussion presented in this Appendix gives a reasonable summary of issues of importance to general aviation operators.

Analysis of the structured responses relating to facilities indicates that operators generally regard the standards of these facilities overall as being quite high. This is not inconsistent with particular adverse comments relating to ground facilities (as indicated in the general comments provided by some operators). As noted above, the structured responses on facilities provide an indication of the overall assessment of facilities. On the other hand, particular comments are usually only provided to indicate some form of criticism.

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(1) For example, some operators (mostly private) complained that the RPT operators should pay charges based on their use of facilities. It appears that operators making this comment believed that flat annual ANCs were levied across the whole of civil aviation. In fact, RPT operators are charged on their level of use of facilities, with different charges applying to different routes throughout Australia.

APPENDIX IV - CHARACTERISTICS OF GENERAL AVIATION BASES AND PLACES VISITED

The general geographical characteristics of travel undertaken by general aviation were described in Chapter 4. This Appendix describes these characteristics in more detail, and continues this description into a number of more specific areas. These are:

- Rural operations;
- The distribution of visit distances;
- Short-distance visits.

TRAVEL DISTRIBUTION

Using results of the General Aviation Survey 1979, it was possible to derive a form of travel distribution matrix for general aviation in Australia. This analysis was constrained by the fact that the only available information on travel 'origins' related to places at which aircraft were based[1]. In addition, respondents were only asked to specify the five most frequently visited airfields. Both of these constraints, coupled with the problems caused by non-response to the survey, limited the general accuracy of the analysis of travel distribution. Despite all this, the results of the General Aviation Survey 1979 provide some interesting insights into patterns of travel undertaken by general aviation aircraft in Australia.

In order to perform this analysis, operational bases for single-base operators were coded on a place-name and regional basis, again using the NTS zoning and coding system[2]. The places most

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(1) Further, only those respondents using a single base could be included. This led to exclusion of 66 operators who responded to the survey, leaving 2401 operators with single bases (101 respondents did not state their base).

(2) Described elsewhere and (particularly) in Appendix VI.

frequently visited were treated in the same way. The relevant results were then aggregated and inserted in a form of 'origin-destination' matrix. The results of this process (on a regional basis) are shown in Tables IV.1 to IV.7, which give matrices of New South Wales (including the Australian Capital Territory), Victoria, Queensland, South Australia, Western Australia, Tasmania and the Northern Territory. These results are discussed in greater detail in Chapter 4.

RURAL OPERATIONS

An important aspect of general aviation operations is provision of transport services to rural regions. The distribution of travel associated with these regions is discussed in this Section. For the purposes of this discussion, a rural NTS region was defined as an NTS region which did not contain a capital city.

It can be seen in Tables IV.1 to IV.7 that (with the exception of trips from the far north coast of New South Wales and visits to Tasmania), the majority of travel was to intrastate destinations. The States therefore provide a reasonable basis for a description of variations in the pattern of travel associated with rural regions.

Table IV.8 shows that the component of general aviation visits from bases in rural NTS regions varied quite markedly between the States.

In Victoria and, to a lesser extent, South Australia, the majority of travel by general aviation was performed from bases in the capital city NTS regions. Moreover, in those States only a minority of visits from bases in rural areas were to places in rural areas. Thus, it may be inferred that travel by general aviation from bases in Victoria and South Australia was more closely associated with travel to capital cities than was travel from bases in other States. The converse applied to New South Wales and Queensland. In these States, the majority of places

TABLE IV.1 - GENERAL AVIATION TRAVEL DISTRIBUTION - NEW SOUTH WALES[a] - 1978-79

(Number of visits)

Base NTS Region		NTS Region Visited																		
No.	Name	101	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	Total NSW	Inter-state	Total
101	ACT	-	-	1	10	-	-	2	119	5	40	131	-	-	-	139	1	-	448	6	454
201	Lismore	-	141	33	-	-	-	-	-	-	-	-	-	-	-	29	42	17	262	318	580
202	Armidale	10	10	2688	170	-	-	-	-	1	-	-	444	-	20	226	6	12	3587	255	3842
203	Dubbo	12	-	86	601	18	4	-	18	187	1	-	2	-	-	350	6	-	1285	38	1323
204	Broken Hill	-	-	7	24	360	-	-	7	-	-	-	-	-	-	2	-	-	400	109	509
205	Deniliquin	4	-	-	32	7	518	52	1022	-	2	-	-	-	3	17	-	-	1657	219	1876
206	Albury	16	-	-	15	1	23	168	23	1	-	3	-	-	10	20	-	1	281	82	363
207	Wagga	84	-	9	56	12	15	63	243	25	5	8	-	-	-	158	-	10	688	126	814
208	Bathurst	37	-	4	209	-	-	17	30	360	2	-	5	-	3	291	1	-	959	37	996
209	Goulburn	49	-	-	11	-	-	-	35	-	25	-	-	-	19	90	-	-	229	3	232
210	Cooma	27	-	-	-	-	3	604	1004	9	21	25	-	-	-	110	-	-	1803	88	1891
211	Newcastle	-	18	459	87	-	2	-	-	31	-	-	137	-	2	1019	93	19	1867	121	1988
212	Gosford	8	2	5	6	-	-	-	4	-	-	-	100	6	-	110	11	5	257	14	271
213	Wollongong	12	-	-	29	-	-	-	12	25	40	9	6	-	8	86	-	8	235	35	270
214	Sydney	226	14	561	453	18	20	14	442	516	129	122	810	8	130	983	129	385	4960	2619	7579
215	Grafton	-	194	34	35	-	-	5	19	6	-	-	10	-	-	142	11	101	557	90	647
216	Taree	-	-	172	4	-	1	-	-	-	-	-	348	3	-	326	30	464	1348	22	1370
Total NSW		485	379	4059	1742	416	586	925	2978	1166	265	298	1862	17	195	4098	330	1022	20823	4182	25005
Interstate		764	182	2107	227	229	248	737	1077	38	5	142	316	54	28	1921	67	5	6247		
TOTAL		1249	561	4266	1969	645	834	1662	4055	1204	270	440	2178	71	223	6019	397	1027	27070		

(a) Includes ACT.

Source: General Aviation Survey 1979.

TABLE IV.2 - GENERAL AVIATION TRAVEL DISTRIBUTION - VICTORIA - 1978-79

(Number of visits)

Base NTS Region		NTS Region Visited													
No.	Name	301	302	303	304	305	306	307	308	309	310	311	Total Vic.	Inter-state	Total
301	Geelong	4	25	-	6	11	1	-	-	-	-	1199	1246	32	1278
302	Warrnambool	7	70	29	13	6	1	-	-	3	13	170	312	58	370
303	Ballarat	-	4	29	-	20	5	25	-	-	9	315	407	103	510
304	Horsham	-	11	12	26	18	19	-	-	2	-	197	285	78	363
305	Mildura	-	-	4	34	300	16	36	-	2	-	115	507	1948	2455
306	Bendigo	8	7	15	4	233	77	69	2	4	-	222	641	64	705
307	Shepparton	-	4	5	-	113	8	54	3	-	-	690	877	191	1068
308	Wangaratta	-	-	4	-	4	-	15	20	-	-	134	177	107	284
309	Sale	-	-	-	-	2	-	-	-	85	5	69	161	26	187
310	Moe	-	-	3	-	-	1	-	-	60	154	238	456	64	520
311	Melbourne	47	208	260	379	737	271	408	15	1088	117	3899	7429	5464	12893
Total Vic		66	329	361	462	1444	399	607	40	1244	298	7248	12498	8135	20633
Interstate		6	10	57	25	245	23	21	10	15	20	1550	1982		
TOTAL		72	339	418	487	1689	422	628	50	1259	318	8798	14480		

Source: General Aviation Survey 1979.

TABLE IV.3 - GENERAL AVIATION TRAVEL DISTRIBUTION - QUEENSLAND - 1978-79

(Number of visits)

Base NTS Region		NTS Region Visited														
No.	Name	401	402	403	404	405	406	407	408	409	410	411	412	Total Qld	Inter-state	Total
401	Brisbane	1456	381	136	253	287	222	28	348	175	81	198	206	3771	236	4007
402	Gold Coast	296	106	10	59	30	11	-	-	-	10	5	88	615	523	1138
403	Nambour	581	19	51	170	14	10	-	6	-	3	5	33	892	39	931
404	Bundaberg	344	15	101	357	115	-	44	-	-	-	-	16	992	15	1007
405	Rockhampton	45	7	35	32	618	216	16	-	9	45	67	79	1169	58	1227
406	Mackay	118	30	-	25	574	2262	38	1	5	-	-	-	3053	-	3053
407	Townsville	-	-	-	-	23	37	629	22	71	33	27	16	858	27	885
408	Cairns	16	-	-	12	8	8	126	459	94	-	-	-	723	-	723
409	Mt Isa	-	-	-	-	-	-	21	-	668	60	10	-	759	-	759
410	Longreach	6	6	-	-	99	32	4	-	63	358	96	-	664	24	688
411	Roma	44	2	6	-	2	-	16	-	-	9	184	38	301	54	355
412	Toowoomba	231	-	-	37	3	-	-	-	-	6	31	237	545	40	585
Total Qld		3137	566	339	945	1773	2798	922	836	1085	605	623	713	14342	1016	15358
Interstate		683	478	86	40	92	45	20	63	54	32	87	713	2393		
TOTAL		3820	1044	425	985	1865	2843	942	899	1139	637	710	1426	16735		

Source: General Aviation Survey 1979.

TABLE IV.4 - GENERAL AVIATION TRAVEL DISTRIBUTION - SOUTH AUSTRALIA - 1978-79

(Number of visits)

Base NTS Region		NTS Region Visited											
No.	Name	501	502	503	504	505	506	507	508	509	Total S.A.	Inter-state	Total
501	Adelaide	536	173	84	153	8	1570	106	20	833	3483	356	3839
502	Port Lincoln	88	60	-	12	-	6	-	6	12	184	43	227
503	Kadina	50	3	-	-	-	1	-	-	-	54	50	104
504	Whyalla	535	78	-	302	-	12	-	-	46	973	50	1023
505	Gawler	52	-	-	1	12	-	2	1	-	68	8	76
506	Victor Harbour	384	5	-	16	-	38	30	3	22	498	77	575
507	Murray Bridge	338	-	1	9	-	20	33	5	-	406	772	1178
508	Mount Gambier	184	10	-	-	-	-	-	69	14	277	49	326
509	Woomera	35	12	-	11	-	6	2	1	20	87	38	125
Total S.A.		2202	341	85	504	20	1653	173	105	947	6030	1443	7473
Interstate		999	26	-	13	2	-	8	245	56	1349		
TOTAL		3201	367	85	517	22	1653	181	350	1003	7379		

TABLE IV.5 - GENERAL AVIATION TRAVEL DISTRIBUTION - WESTERN AUSTRALIA - 1978-79

(Number of visits)

Base NTS Region		NTS Region Visited											
No.	Name	601	602	603	604	605	606	607	608	609	Total W.A.	Inter-state	Total
601	Albany	135	3	-	74	-	-	4	186	-	402	35	437
602	Bunbury	31	143	6	4	-	-	14	361	-	559	-	559
603	Kalgoorlie	1	-	339	41	75	-	-	209	50	715	15	730
604	Northam	13	7	15	104	8	-	22	351	6	526	18	544
605	Port Hedland	-	-	-	8	242	30	4	9	19	312	8	320
606	Derby	-	-	-	-	34	274	-	3	6	317	26	343
607	Geraldton	-	-	1	40	6	7	145	199	54	452	8	460
608	Perth	63	96	92	151	329	51	1536	751	70	3139	102	3241
609	Carnarvon	6	22	-	-	140	9	16	45	348	586	-	586
Total W.A.		249	271	453	422	834	371	1741	2114	553	7008	212	7220
Interstate		-	-	23	8	59	82	-	50	120	342		
TOTAL		249	271	476	430	893	453	1741	2164	673	7350		

Source: General Aviation Survey 1979.

TABLE IV.6 - GENERAL AVIATION TRAVEL DISTRIBUTION - TASMANIA - 1978-79

(Number of visits)

Base NTS Region		NTS Region Visited						
No.	Name	701	702	703	704	Total Tas	Inter-state	Total
701	Hobart	24	107	64	1	196	-	196
702	Burnie	39	92	59	-	190	11	201
703	Launceston	3	22	186	-	211	52	263
704	Queenstown	-	-	-	-	-	-	-
Total Tas.		66	221	309	1	597	63	660
Interstate		19	1811	987	3	2820		
TOTAL		85	2032	1296	4	3417		

Source: General Aviation Survey 1979.

TABLE IV.7 - GENERAL AVIATION TRAVEL DISTRIBUTION - NORTHERN TERRITORY - 1978-79

(Number of visits)

Base NTS Region		NTS Region Visited				
No.	Name	801	802	Total N.T.	Inter-state	Total
801	Darwin	663	13	676	102	778
802	Alice Springs	-	171	171	196	367
Total N.T.		663	184	847	298	1145
Interstate		96	120	216		
TOTAL		759	304	1063		

Source: General Aviation Survey 1979.

TABLE IV.8 - DISTRIBUTION OF TRAVEL ORIGINS BETWEEN CAPITAL CITY REGIONS AND RURAL REGIONS - 1978-79

Location of Base		Places Visited					
		All Regions Containing Capital Cities		All Rural Regions		Total	
		Number	Per cent	Number	Per cent	Number	Per cent
NSW[a]	Rural Regions	3 904	23	13 068	77	16 972	100
	Whole State	6 881	28	18 124	72	25 005	100
Vic	Rural Regions	4 721	61	3 019	39	7 740	100
	Whole State	9 637	47	10 996	53	20 633	100
Qld	Rural Regions	1 816	16	9 535	84	11 351	100
	Whole State	3 328	22	12 030	78	15 358	100
SA	Rural Regions	2 471	68	1 163	32	3 634	100
	Whole State	3 050	41	4 423	59	7 473	100
WA	Rural Regions	1 393	35	2 586	65	3 979	100
	Whole State	2 192	30	5 028	70	7 220	100
Tas[b]	Rural Regions	97	21	367	79	464	100
	Whole State	121	18	539	82	660	100
NT[c]	Rural Regions	57	5	1 088	95	1 145	100
Australia	Rural Regions	14 459	32	30 826	68	45 285	100
	Total	25 266	33	52 228	67	77 494	100

(a) Includes ACT as a capital city.

(b) Because of the unique circumstances (no land transport) associated with travel to and from Tasmania, the capital city - rural visit breakdown should not be compared directly with those for the other States.

(c) The NTS region containing Darwin also contains about half of the Northern Territory. Thus it is impossible to make any meaningful distinctions between rural and capital city based operations and in Table IV.8 all visits in the Northern Territory are taken to be bases in rural regions.

Source: General Aviation Survey 1979.

visited by general aviation were places in rural NTS regions, and the majority of these places were visited from bases in rural NTS regions.

In this regard, it was interesting to note the association between the proportions of visits from bases in rural NTS regions and the proportion of these visits which had rural destinations. It appeared that in New South Wales and Queensland, general aviation has had a more significant role in communication between rural areas than in Victoria and South Australia. The survey indicated that visits in Victoria and South Australia occurred mainly between rural areas and the capital cities. This pattern tends to reflect the general rural population distribution in each of the States. In South Australia, there are large areas with extremely low population densities and with no significant population centres. In these circumstances, travel is likely to be oriented towards the capital city. In Victoria, the smaller distances between rural centres of population do not tend to be suited to general aviation travel. Hence, general aviation operations from rural areas will again be oriented towards travel to the capital cities. On the other hand, in New South Wales and Queensland, significant rural populations occur, and are separated by distances appropriate to general aviation operations. Similar characteristics apply in Western Australia.

DISTRIBUTION OF VISIT DISTANCES

By analysing the reports of bases and principal places visited in the General Aviation Survey 1979, and by relating these bases and places visited to their respective LGAs, distances between bases and the places visited most frequently were calculated[1]. Table

(1) The calculations actually involved the distances between the population centroids of the respective LGAs. These distances were used as approximate measures of actual visit distances.

IV.9 presents the frequency distribution of the resulting trip distances. The corresponding cumulative frequency distribution is shown in Figure IV.1. The 77 494 visits reported in the survey had a mean distance of 275 km. However 64 per cent of visits covered distances of less than this value.

The relatively short median[1] distance of 190 kilometres was not unexpected in that general aviation provides air travel over distances not generally economic for RPT services. The rise in the frequency of visits to places which are between 700 and 800 km from the base of operations may have been due to the fact that this distance approximated the intercity distances (Adelaide to Melbourne, Melbourne to Sydney and Sydney to Brisbane).

ANALYSIS OF SHORT-DISTANCE VISITS

The most commonly reported visits in the survey were to places in LGAs whose population centroids were less than 50 km[2] from the population centroid of the LGA containing the base of the operator making the visit. These visits accounted for 18 per cent of all visits. In many ways, this result was somewhat surprising, since it may be considered that other travel modes would be more efficient over such small distances. Equally, the finding that almost 30 per cent of visits involved travel between LGAs whose centroids were separated by less than 100 km was rather surprising.

An attempt was made by the BTE to identify the types of operators making the very short-distance visits (less than 50 kms), and to identify the locations of the bases and places visited.

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(1) The median visit distance is the value below which 50 per cent of the observations occur.

(2) This included all intra-LGA visits whose distances could not be calculated using the method indicated previously.

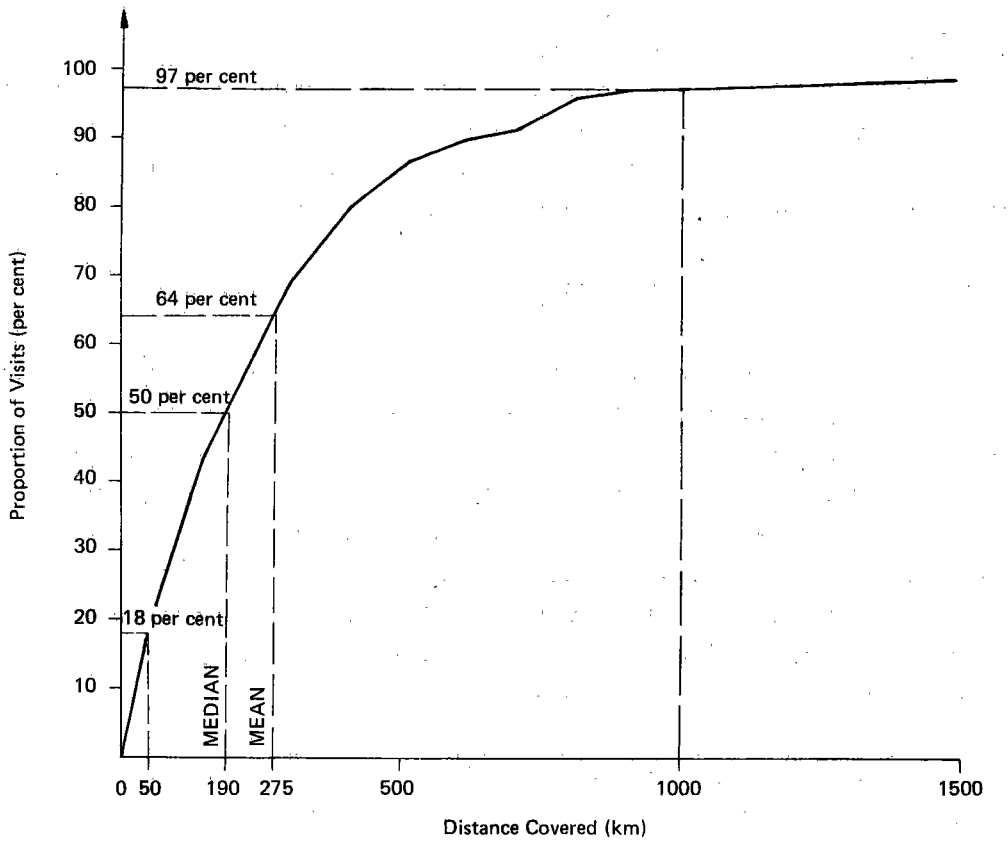

FIGURE IV.1 – PROPORTION OF VISITS TO PLACES LESS THAN GIVEN DISTANCES FROM BASE – GENERAL AVIATION SURVEY 1979

TABLE IV.9 - GENERAL AVIATION TRAVEL DISTANCE DISTRIBUTION - 1978-79

Visit Distance (km)	Visits		
	Number	Per cent	Cumulative per cent
Intra-LGA	1 459	2.0	2.0
Less than 50	12 601	16.1	18.1
50 - 100	8 872	11.4	29.5
100 - 150	10 813	14.0	43.5
150 - 200	6 541	8.4	52.9
200 - 300	12 836	16.6	68.5
300 - 400	8 504	11.0	79.5
400 - 500	5 200	6.7	86.2
500 - 600	2 709	3.5	89.7
600 - 700	1 314	1.7	91.4
700 - 800	2 687	3.5	94.9
800 - 900	1 093	1.4	96.3
900 - 1000	363	0.5	96.8
1000 - 1500	1 609	2.1	98.9
1500 - 2000	523	0.7	99.6
2000 - 3000	259	0.3	99.9
More than 3000	111	0.1	100.0
Total	77 494	100.0	-

Source: General Aviation Survey 1979.

Operator Characteristics

In order to examine the characteristics of operators undertaking short-distance visits, it was decided to examine all operators who (in Question 5 of the survey) named an airfield frequently visited which was in an LGA less than 50 kms from the LGA of the stated base in Question 4. There were 421 such operators,

and their average hours flown by category of flying activity (from Question 3 of the survey questionnaire) are shown in Table IV.10.

For all of these operators, the proportion of hours flown in the training category (32 per cent) was much higher than the proportion for this category overall (19 per cent). Correspondingly, the operators had a much lower proportion of hours flown in the categories of aerial agriculture and scheduled commuter. Further differences occurred in the business and the private categories, where the short-distance operators had higher proportions of hours flown than for the survey as a whole, and in the charter category, where the proportion was lower. Hours flown by short-distance operators were predominantly in the categories of training, business and private operations.

A more positive pattern emerged when the 421 operators involved in 14 060 short-distance visits were separated into single-aircraft operators and multiple-aircraft operators. The proportions of hours flown by category for each of these two groups are also shown in Table IV.10. The multiple-aircraft operators (57 operators) accounted for 44 per cent of the short-distance visits (6182 visits). They had a very much higher proportion of hours in training as compared to the proportion for all operators represented in the survey, and a slightly higher proportion in charter operations. Aerial agriculture represented a much lower proportion, as did all other categories except for other aerial work. The single-aircraft operators (364 operators) accounted for 56 per cent of the short-distance visits (7878 visits) and had very high proportions of hours flown in the private and the business categories. All other categories were lower than average, except for hired-out aircraft.

There appeared to be no systematic relationship between fleet size and number of short-distance visits made by operators. For the single-aircraft fleets, 60 per cent of the aircraft accounted for 56 per cent of the short-distance visits. For fleets of size 2 to

TABLE IV.10 - CHARACTERISTICS OF OPERATORS UNDERTAKING SHORT-DISTANCE TRAVEL - 1978-79

Category of Flying Activity[c]	Short-distance Operators[a]						All Operators	
	Single-Aircraft Fleets		Multiple-Aircraft Fleets		All Fleets			
	Number	Per cent[b]	Number	Per cent[b]	Number	Per cent[b]	Number	Per cent[b]
	(Average hours flown[d])							
Flying Training	16	12^{-}	619	46^{+}	98	32^{+}	123	19
Business	46	34^{+}	167	12^{-}	63	21^{+}	113	18
Charter	5	4^{-}	249	18^{+}	38	13^{-}	94	15
Aerial Agriculture	5	4^{-}	26	2^{-}	8	3^{-}	74	12
Private	42	31^{+}	92	7^{-}	49	16^{+}	73	12
Commuter	1	0^{-}	41	3^{-}	7	2^{-}	42	7
Hired-out Aircraft	12	9^{+}	75	6	21	7^{+}	40	6
Other Aerial Work	7	5	77	6^{+}	16	5	31	5
Aerial Ambulance	1	1^{-}	2	0^{-}	1	0^{-}	25	4
Other Community Welfare	1	0^{-}	7	0^{-}	2	1^{-}	16	2
Search and Rescue	0	0	1	0	0	0	2	0
All categories	136	100	1 356	100	303	100	633	100

(a) These operators are defined here as those operators who reported visiting a place less than 50 km from that base of operation.

(b) Rounded to the nearest whole per cent.

(c) In order of average hours flown by all operators.

(d) '+' or '-' indicates that the proportion of average hours flown in that category was greater or less (respectively) than the proportion of average hours flown in that category for 'All Operators' and for all visits regardless of distance.

Source: General Aviation Survey 1979.

4, 17 per cent of the aircraft accounted for 20 per cent of the short-distance visits, and in the fleets of 5 or more, 23 per cent of the aircraft accounted for 23 per cent of the short-distance visits.

Location of Short-distance Visits

As with types of operators, the geographic characteristics of short-distance visits were expected to vary with fleet size. Operators making short-distance visits were separated (by fleet size) into three groups, and the 14 060 short-distance visits were assigned to the categories in Table IV.11.

Sixty-seven per cent of the short-distance visits by single-aircraft operators were evenly divided between within-capital city visits (31 per cent) and within-rural region visits (36 per cent). Operators with fleet sizes between 2 and 4 undertook a majority (52 per cent) of their short-distance visits within capital cities and a large proportion (36 per cent) to, from and between islands.

Eighty-seven per cent of the short-distance visits carried out by large operators[1] originated at bases on capital city airfields, and 64 per cent of these visits were to airfields in the same capital city.

(1) Defined here as having 5 or more aircraft.

TABLE IV.11 - RELATIONSHIP BETWEEN FLEET SIZE AND LOCATION OF SHORT-DISTANCE[a] VISITS - 1978-79

(Number of Visits)

Type of Visit	Fleet Size			
	1	2 to 4	5 or more	All fleets
Between Airfields in the Same Capital City[b]	2 412	1 545	1 771	5 728
From a Capital City[c] Base to All Other Places	1 307	7	998	2 312
From All Other Places to a Capital City	431	129	110	670
Between Non-Capital City Centres	2 839	230	308	3 377
To, from and between Islands	889	1 084	-	1 973
Total Trips	7 878	2 995	3 187	14 060
Number of Operators	364	38	19	421

(a) Short-distance visits are those involving travel between LGAs whose population centroids are separated by less than 50 km.

(b) That is, between airfields in the Metropolitan area of the capital city.

(c) Short-distance visits cannot include visits between capital cities.

Source: General Aviation Survey 1979.

APPENDIX V - DEFINITION OF GEOGRAPHIC REMOTENESS

Chapter 3 of this Paper contained a discussion of the geographic distribution of general aviation in Australia, and attempted to relate this distribution to various factors. One of these factors involved the general concept of 'remoteness' of the population of various parts of Australia. This Appendix outlines some of the major factors involved in defining remoteness, and also gives the background to development of an indicator of remoteness.

GENERAL IMPLICATIONS OF REMOTENESS

Considerations relating to the remoteness of a population often are raised in a number of situations involving questions of social and economic equity. Most considerations of remoteness relate to the limited access which certain groups in the national population have to facilities generally found only in urban areas[1]. In this sense, remoteness encompasses both distance of elements of the population from major (and generally urban) facilities, and the quality of the transport available for travelling to these facilities.

Although the remoteness of the population in various regions of Australia is often raised in connection with the need for special considerations for these regions[2], no totally satisfactory quantitative index for remoteness exists. The Australian Taxation Office defines two remote area allowance zones in Australia (Zone A and Zone B), within which residents may claim

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(1) As used here, remoteness is defined comparatively narrowly. In a more general sense, urban populations may regard themselves as being remote from natural surroundings. Alternatively, the population in inland centres may be regarded as being remote from the seaside. However, the narrower concept of remoteness as described above seems to be most appropriate in the present context.

(2) Usually, these considerations relate to some form of financial assistance to the population in remote regions in partial compensation for their remoteness from urban facilities.

rebates on their income tax payments. These Zones were described in Chapter 3. However, the basis on which these two zones are defined is unclear[1] and, in particular, the relevance of these zones to the general question of regional remoteness is not established.

As a result, is was decided to examine remoteness from an empirical point of view, and, in the process, to derive a so-called 'remoteness indicator' for each LGA in Australia. The details of the formulation of this index are outlined in the following Section.

REMOTENESS INDICATOR

To be successful, a quantitative measure of regional remoteness must encompass both the degree to which a region is self-sufficient in terms of certain facilities for its population and the degree to which its population has access to facilities in other regions. A particular difficulty in deriving an index of this type relates to the quantitative assessment of the facilities in a region. The term facilities (as used here) connotes a wide variety and quality of services[2]. Some of these may require a population of a given size in a limited area to justify their provision or establishment.

A rigorous approach to defining a remoteness indicator would require careful analysis of the facilities available in all significant centres of population, while at the same time incorporating some assessment of the relative degree of accessibility to those facilities[3]. Such a detailed approach was not possible in the context of the BTEs general aviation study. Rather, the BTE adopted a far more aggregate and indicative approach.

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(1) Observation of the geographic boundaries of these zones indicates some relationship to population densities.

(2) The range of services includes for example those associated with health, education, transport, entertainment, recreation, retailing and so on.

(3) As measured for example by the transport services or infrastructure serving the centres of population.

In defining a remoteness indicator for an LGA, some assessment of the facilities in that LGA and all other LGAs was required. It was decided by the BTE that a reasonably appropriate empirical measure of the availability of facilities would be given by the population density in each LGA[1]. This measure is, of course, very much an approximation, and is not intended to be an absolute reflection of the facilities available in any particular LGA. Rather, it is to be considered as a general relative measure of facilities in the broad sense. While it seems reasonable to assume that facilities and services develop as the population in a limited area grows sufficiently to justify their provision, the arbitrary nature of the boundaries of the regions considered (in this case, LGAs) may introduce some distortion. In particular, the services and facilities may not be provided in an LGA with a high population density, but in an LGA which is close and easily accessible[2]. In the present study, it has not been possible to account for such effects, and it is explicitly recognised that it would require considerable effort to take them into consideration. The proxy of LGA population density has therefore been accepted as the measure of available facilities in an LGA for the present purposes[3].

As noted above, the remoteness of an LGA is not only a function of the facilities available in the LGA. It also depends on

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(1) The size of the population per se in each LGA would not be appropriate. An examination of LGA populations indicates that there are LGAs which have similar populations, but which vary greatly in any reasonable measure of the facilities which they have available. An example of this can be found in the Western Australian LGAs of Albany, East Fremantle, East Pilbara and Esperance, all of which have comparable populations. However, there is a very large disparity between these LGAs in terms of facilities.

(2) But which itself may not have high population density.

(3) The BTE also did not consider the effects of alternative geographic population formations within LGAs. Again, this is a very complex issue, and detailed analysis requires in-depth study of such measures as 'Harris Classifications' (Harris 1975).

facilities available in other LGAs. The influence of other LGAs on the measure of remoteness for a particular LGA is, of course, dependent on the degree of access to the facilities in those other LGAs from the LGA in question. One indication of the degree of access of one LGA from another is given by the distance between the two. This distance (or some function of it) tends to represent the generalised cost of securing access between the two LGAs.

Using the two concepts discussed above[1], a remoteness indicator can be formulated. Clearly such an index should decrease as the facilities available increase, and should increase, the further the travel distance involved in travelling to these facilities. In principle, from any particular LGA all other LGAs are accessible to a greater or lesser degree. Hence, it is appropriate that the remoteness indicator of an LGA should take account of the facilities available in all other LGAs[2].

Taking all these considerations into account the basic remoteness indicator was formulated as follows:

$$I_j = 3000 \left[\sum_i \frac{D_i}{(d_{ij})^{1.22}} \right]^{-1} \qquad (V.1)$$

where

I_j is the remoteness indicator for LGA j,

D_i is the population density for LGA i,

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(1) These concepts are the measure of facilities in an LGA (as assessed by its population density), and the generalised cost of gaining access to these facilities (as measured by some function of the distance involved).

(2) This is the basis of the classical gravity model of travel distribution between a set of origins and destinations. Such a model represents travel between any origin and destination as a function of the characteristics of the origin and destination and the distance between them.

and d_{ij} is the great circle distance between the population centroids of the ith LGA and the jth LGA.

The standardising factor 3000 was introduced to scale the results to suitable integral values. Since the main thrust of I_j is concerned with non-urban populations, the exponent 1.22 for d_{ij} was determined from an earlier BTE calibration of a gravity model for non-urban travel (Aplin and Flaherty 1976). The sum in Equation (V.1) is taken over all LGAs, including the LGA which is itself under consideration (that is, where i = j). In this case, d_{ii} is set (arbitrarily) to 5 km as an estimate of the average distance which urban populations need to travel to reach facilities and services[1].

Using the formulation specified by Equation (V.1), a remoteness indicator was calculated for each recognised LGA in Australia. The general results and implications of this analysis have been presented and discussed in Chapter 3. However, representative values are shown in Table V.1. That Table also shows the relative contribution which each LGA itself makes to the total amenity[2] which is available to it. This latter characteristic is some measure of the sense in which a particular LGA could be regarded as self-sufficient, at least in terms of the types of facilities considered in the analysis.

It should be stressed that this remoteness indicator is arbitrary and empirical, and has been designed with the primary aim of providing an objective quantitative assessment of the relative accessibility of the population in an LGA to essential facilities and services. It has the advantage of providing an objective indication of those LGAs which should be given comparable

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(1) It is worth noting that this problem is only of importance for LGAs with reasonably high population densities. Low population densities do not contribute significantly to the sum in Equation (V.1). Hence, the value of d_{ii} assumed in these cases would not be critical.

(2) In this sense, 'amenity' for an LGA is effectively the inverse of its remoteness indicator value.

attention in any matters relating to their remoteness. Drawing implications beyond this general consideration of relativity would be unwarranted.

TABLE V.1 - REPRESENTATIVE REMOTENESS INDICATOR VALUES

LGA Name	State	Remoteness Indicator Value	LGAs Own Contribution to Amenity (per cent)
Ashfield	NSW	0.4	11
Botany	NSW	0.5	3
Bourke	NSW	15.9	<<1
Broken Hill	NSW	13.5	27
Daly River	WA	33.5	<<1
Esperance	WA	54.3	<<1
Gormanston	Tas	20.0	<<1
Melbourne	Vic	0.4	4
Mirboo	Vic	6.0	<1
Portland	Vic	12.1	<1
Proserpine	Qld	29.7	<1
Tiwi	WA	1.0	1

APPENDIX VI - DESCRIPTION OF NTS REGIONS

Some of the results presented in this Paper have been aggregated on an NTS region basis. This Appendix presents maps (Figures VI.1 to VI.7) indicating the boundaries of these regions, which were originally devised for the BTEs National Travel Survey (Aplin and Hirsch 1978).

Table VI.1 lists the regions by State, and the region name and region code have been included. In addition, an estimate of the population of each region is provided, together with approximate population centroid co-ordinates and the population density.

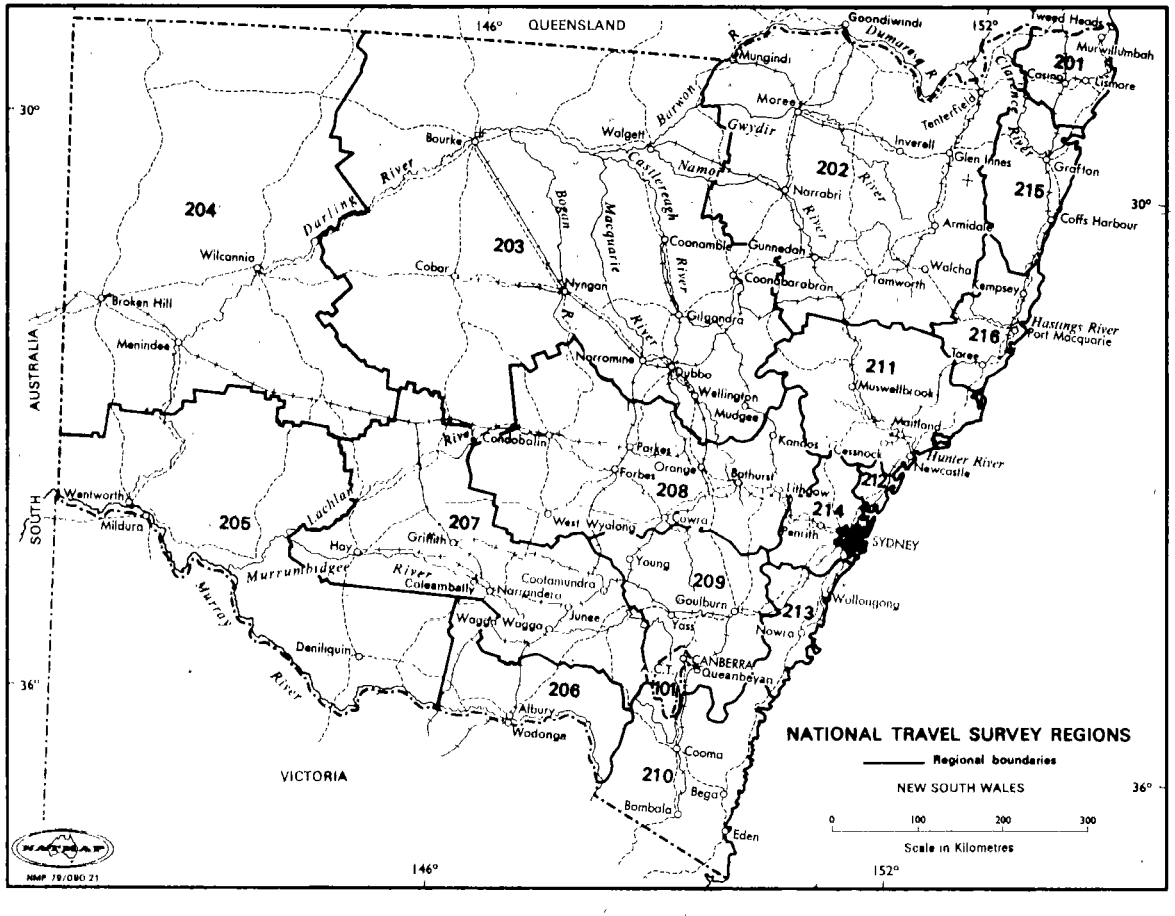

FIGURE VI.1 – NATIONAL TRAVEL SURVEY REGIONS – NEW SOUTH WALES AND AUSTRALIAN CAPITAL TERRITORY

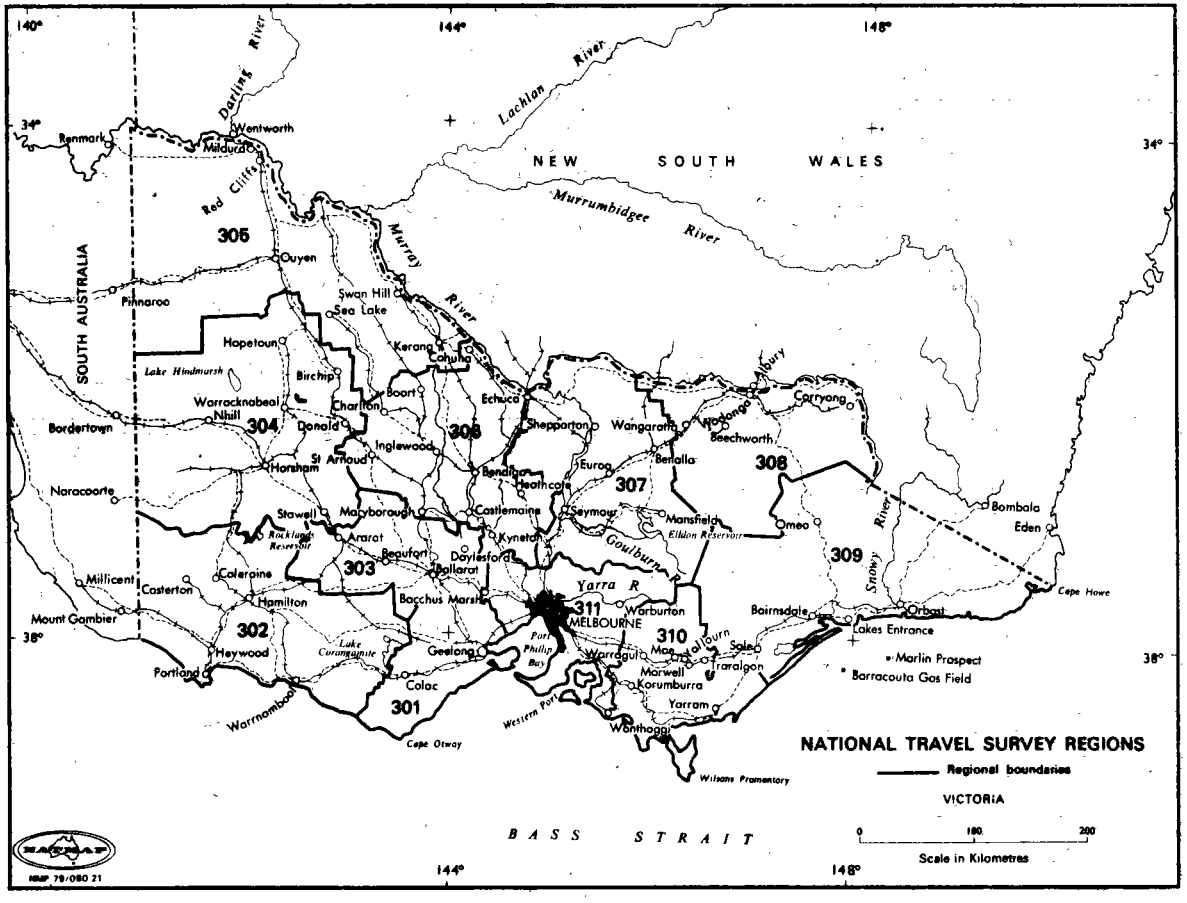

FIGURE VI.2 – NATIONAL TRAVEL SURVEY REGIONS – VICTORIA

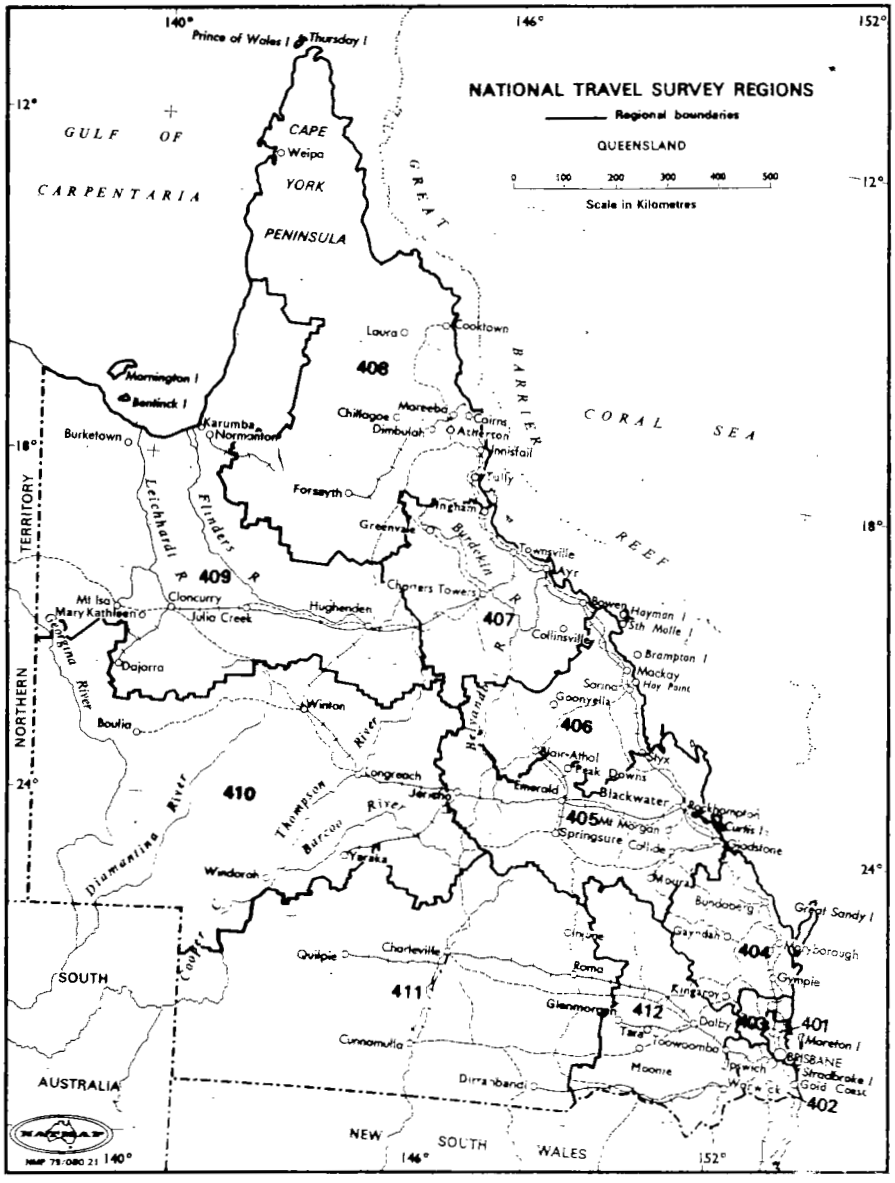

FIGURE VI.3 – NATIONAL TRAVEL SURVEY REGIONS – QUEENSLAND

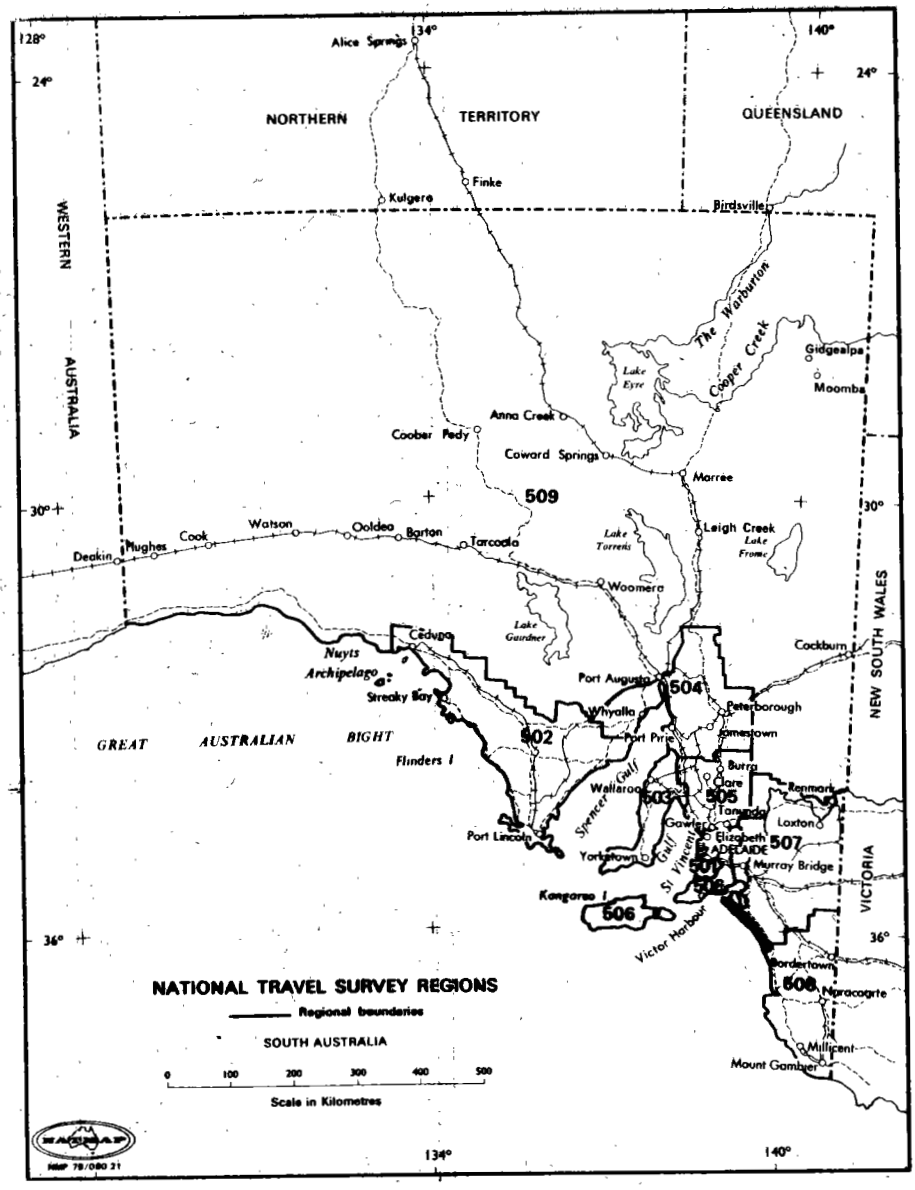

FIGURE VI.4 – NATIONAL TRAVEL SURVEY REGIONS – SOUTH AUSTRALIA

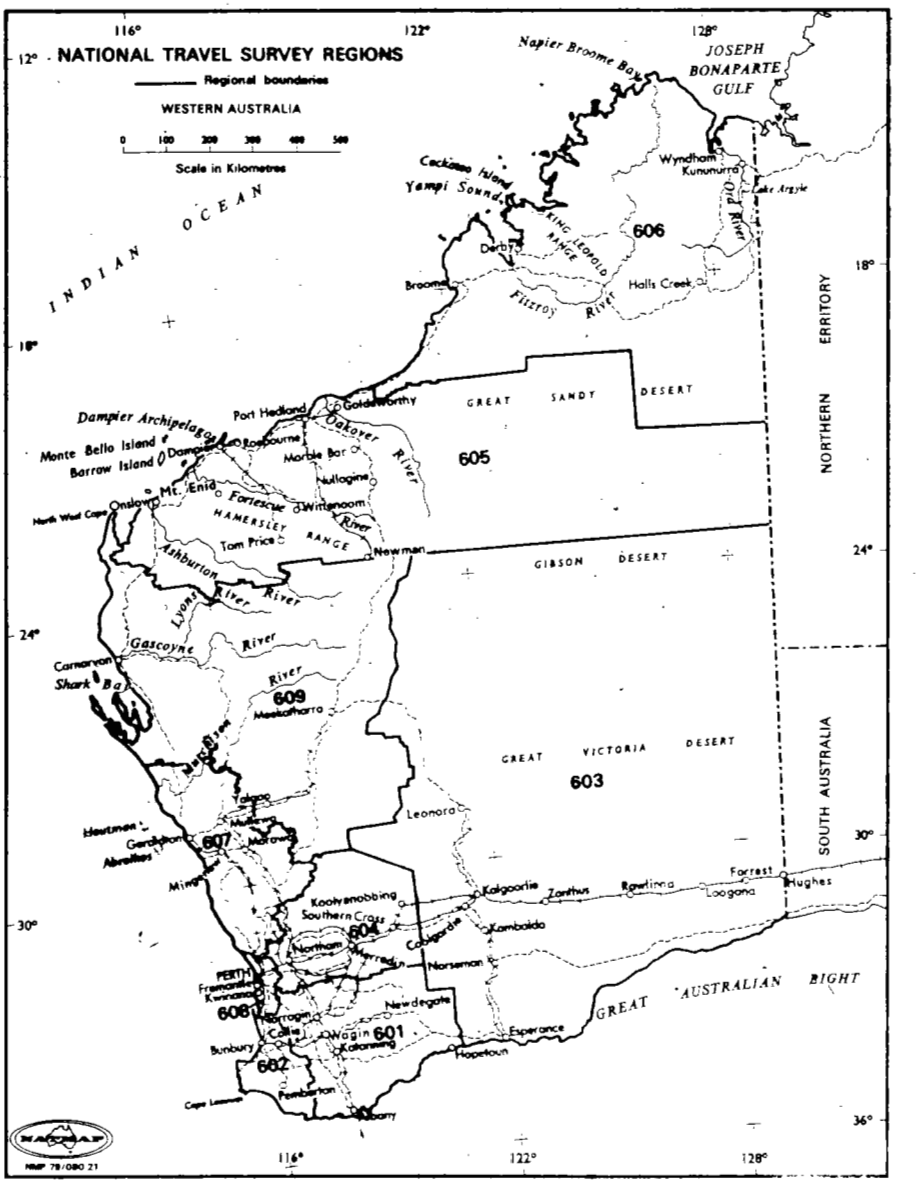

FIGURE VI.5 – NATIONAL TRAVEL SURVEY REGIONS – WESTERN AUSTRALIA

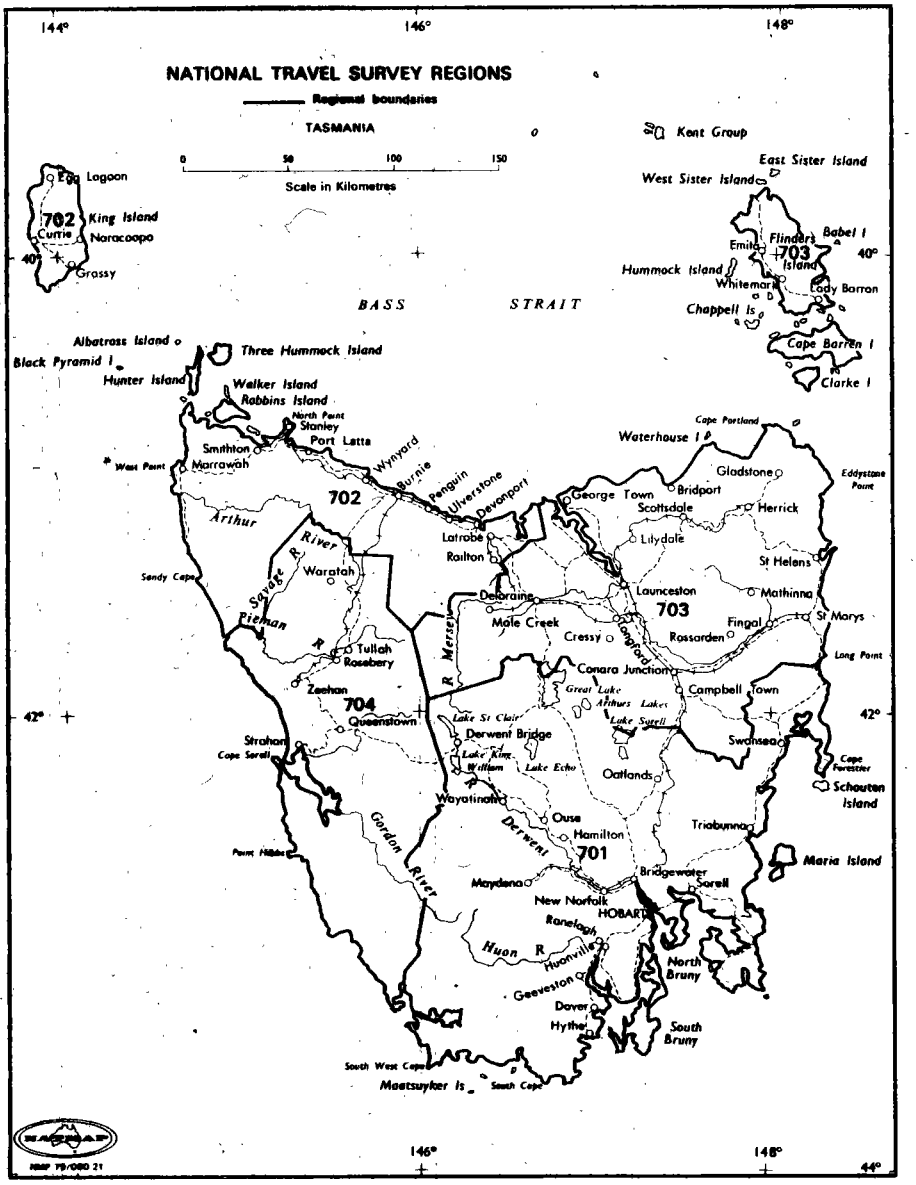

FIGURE VI.8 – NATIONAL TRAVEL SURVEY REGIONS – TASMANIA

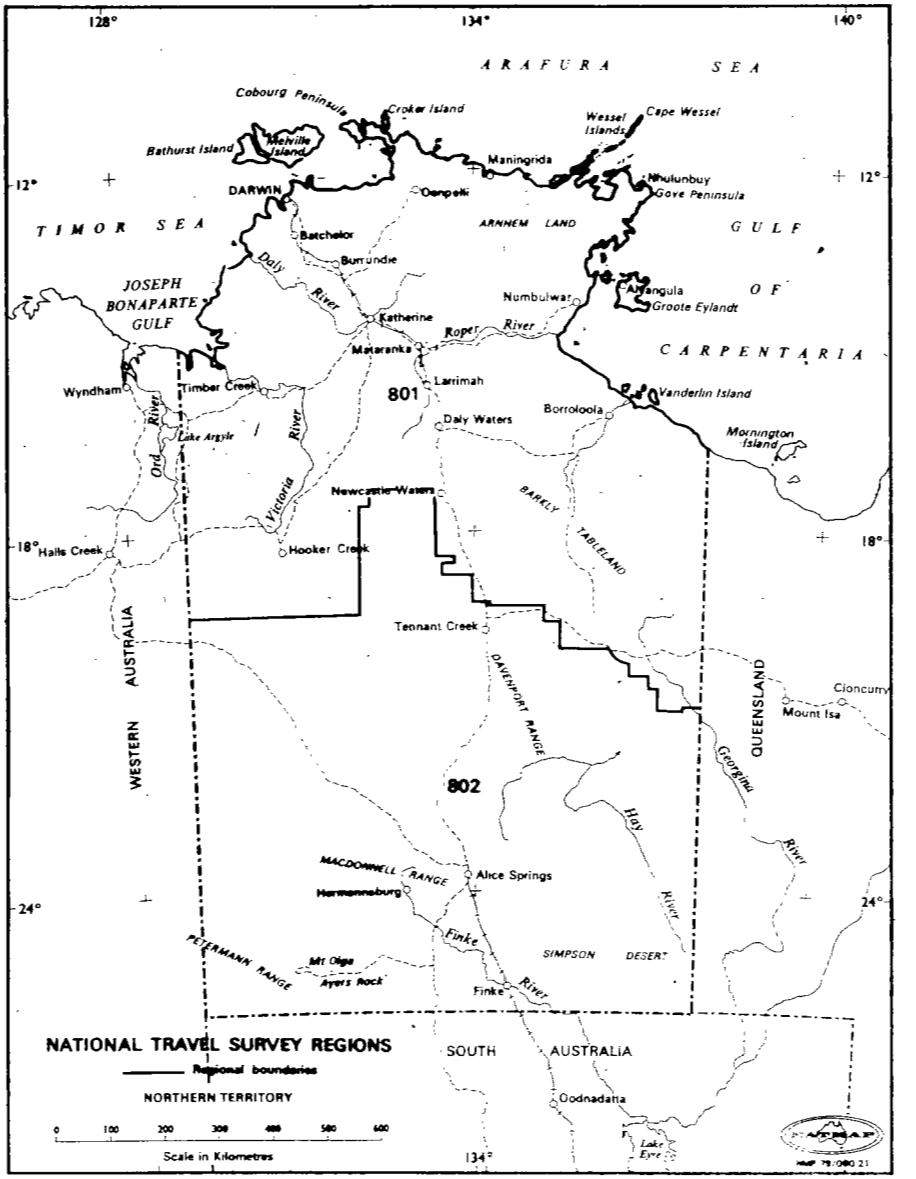

FIGURE VI.7 – NATIONAL TRAVEL SURVEY REGIONS – NORTHERN TERRITORY

TABLE VI.1 - DETAILS OF NTS REGIONS

State or Territory	Region Name	Region Number	Population[a]	Co-ordinates of Centroid[b] Latitude (Degrees)	Co-ordinates of Centroid[b] Longitude (Degrees)	Population Density (Persons per square km)
ACT	Australian Capital Territory	101	196 935	35.25 S	149.25 E	83.4
NSW	Lismore	201	106 180	28.67 S	153.08 E	10.9
	Armidale	202	168 015	30.10 S	150.75 E	1.4
	Dubbo	203	99 004	30.75 S	148.00 E	0.5
	Broken Hill	204	32 386	31.67 S	142.25 E	0.2
	Deniliquin	205	36 537	35.50 S	147.33 E	0.5
	Albury	206	54 439	35.00 S	144.00 E	3.4
	Wagga	207	134 737	34.67 S	147.42 E	2.1
	Bathurst	208	155 462	33.50 S	149.33 E	2.4
	Goulburn	209	80 741	35.00 S	149.17 E	2.9
	Cooma	210	47 210	36.33 S	149.50 E	1.9
	Newcastle	211	419 612	32.67 S	150.90 E	12.7
	Gosford	212	120 774	33.40 S	151.50 E	65.4
	Wollongong	213	270 127	34.75 S	150.80 E	31.6
	Sydney	214	2 901 208	33.75 S	151.00 E	274.7
	Grafton	215	73 259	31.50 S	153.75 E	6.7
	Taree	216	71 665	29.80 S	153.25 E	6.5
Victoria	Geelong	301	181 008	38.25 S	144.20 E	22.2
	Warrnambool	302	95 779	38.25 S	142.50 E	4.0
	Ballarat	303	103 456	37.50 S	143.75 E	8.5
	Horsham	304	54 456	36.60 S	142.40 E	1.6
	Mildura	305	68 605	34.80 S	143.00 E	1.9
	Bendigo	306	130 134	36.60 S	144.50 E	6.1
	Shepparton	307	120 720	36.50 S	154.60 E	5.2
	Wangaratta	308	72 201	36.40 S	146.70 E	4.0
	Sale	309	56 513	37.85 S	147.60 E	1.9
	Moe	310	113 270	38.30 S	146.30 E	10.7
	Melbourne	311	2 649 134	38.00 S	145.00 E	239.4
Queensland	Brisbane	401	696 740	27.50 S	153.20 E	584.7
	Gold Coast	402	310 130	27.80 S	153.00 E	33.2
	Nambour	403	164 110	26.80 S	152.85 E	17.2
	Bundaberg	404	152 095	25.25 S	152.58 E	3.0
	Rockhampton	405	126 395	23.75 S	150.92 E	1.1
	Mackay	406	77 038	21.34 S	149.00 E	1.2
	Townsville	407	145 460	19.50 S	146.80 E	1.5
	Cairns	408	124 661	17.32 S	147.75 E	0.5
	Mount Isa	409	41 058	20.75 S	140.00 E	0.1
	Longreach	410	14 063	23.92 S	145.00 E	0.0
	Roma	411	27 876	27.42 S	148.25 E	0.1
	Toowoomba	412	155 313	27.50 S	151.65 E	1.7
South Australia	Adelaide	501	903 003	34.92 S	138.83 E	389.2
	Port Lincoln	502	31 425	34.25 S	134.92 E	0.8
	Kadina	503	21 579	34.17 S	137.92 E	2.5
	Whyalla	504	82 727	32.58 S	137.83 E	3.9
	Gawler	505	38 504	34.25 S	138.67 E	3.0
	Victor Harbour	506	34 914	35.42 S	138.42 E	4.1
	Murray Bridge	507	58 591	35.00 S	139.42 E	2.8
	Mount Gambier	508	57 698	35.55 S	139.42 E	1.7
	Woomera	509	14 948	29.50 S	135.70 E	0.0
Western Australia	Albany	601	63 355	33.42 S	118.17 E	0.6
	Bunbury	602	68 335	33.83 S	116.00 E	2.8
	Kalgoorlie	603	39 691	30.30 S	122.00 E	0.4
	Northam	604	39 569	31.25 S	117.00 E	0.5
	Port Hedland	605	38 687	20.50 S	117.00 E	0.1
	Derby	606	15 130	15.75 S	125.00 E	0.0
	Geraldton	607	45 219	29.50 S	115.50 E	0.6
	Perth	608	819 078	32.17 S	115.92 E	111.3
	Carnarvon	609	13 128	24.00 S	117.58 E	0.0
Tasmania	Hobart	701	191 296	42.75 S	147.25 E	7.6
	Burnie	702	88 861	41.17 S	146.00 E	8.7
	Launceston	703	109 569	41.42 S	147.00 E	5.3
	Queenstown	704	12 565	41.83 S	145.50 E	1.0
Northern Territory	Darwin	801	71 737	14.00 S	133.00 E	0.1
	Alice Springs	802	24 785	23.40 S	133.50 E	0.0

(a) These population figures were obtained from the Census of Population and Housing conducted by the Australian Bureau of Statistics on 30 June 1976.

(b) The co-ordinates of population centroids of the NTS regions are estimates obtained after detailed examination of the relevant maps, together with a knowledge of the population centres in each region.

Source: Aplin and Hirsch (1978).

NOTATION AND ABBREVIATIONS

MATHEMATICAL SYMBOLS

D_i Population density for LGA i

I_j Remoteness indicator for LGA j

N Total number of passengers in a particular category

d_{ij} Great circle distance between the population centroids of LGA i and LGA j

n Number of sampled passengers in a particular category

$\hat{p}$ Value of a proportion as estimated from a sample

$\hat{r}$ Estimated relative error

$\hat{x}$ Estimated value of a quantity x

$\hat{\sigma}_{\hat{p}}$ Estimated value of the standard error of the estimated proportion p

$\hat{\sigma}_{\hat{x}}$ Estimated value of the standard error of a statistical estimate x

ABBREVIATIONS

AAA	Ansett Airlines of Australia
AANSW	Ansett Airlines of New South Wales
AASA	Airlines of South Australia
ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
ADF	Automatic Direction Finding
AIP	Aeronautical Information Publication
ALA	Authorised Landing Areas
ANA	Australian National Airways
ANC	Air Navigation Charges
ANR	Air Navigation Regulation
AVGAS	Aviation Gasolene
AVTUR	Aviation Turbine Fuel
BTE	Bureau of Transport Economics
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CLR	Commonwealth Law Report
DME	Distance Measuring Equipment
DOT	Department of Transport
EWA	East-West Airlines
IFR	Instrument Flight Rules
ILS	Instrument Landing System
LAME	Licensed Aircraft Maintenance Engineer
LGA	Local Government Area
MMA	MacRobertson Miller Airlines
NDB	Non-Directional Beacon
NOTAM	Notice to Airmen
NSW	New South Wales
NT	Northern Territory
NTS	National Travel Survey
Qld	Queensland
RFACA	Royal Federation of Aero Clubs of Australia
RPT	Regular Public Transport
SA	South Australia
TAA	Trans-Australia Airlines

Tas	Tasmania
VAR	Visual Aural Range
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VOR	VHF Omnidirectional Range
Vic	Victoria
WA	Western Australia
kg	Kilogram
km	Kilometre
lb	Pound
m	Metre