AUSTRALIAN TRANSPORT SAFETY BUREAU

AVIATION SAFETY

Aviation Safety Indicators 2002

A report on safety indicators relating to Australian aviation

AUSTRALIAN GOVERNMENT - DEPARTMENT OF TRANSPORT AND REGIONAL SERVICES

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Table of contents

About the Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an operationally independent body within the Federal Department of Transport and Regional Services and is Australia's prime agency for transport safety investigations. The bureau is entirely separate from transport regulators and service providers. The ATSB's objective is safe transport. Its mission is to maintain and improve transport safety and public confidence through excellence in:

- independent transport accident and incident investigation;
- safety data analysis and research;
- safety communication and education.

The ATSB performs its functions in accordance with the provisions of the Transport Safety Investigation Act 2003 (TSI Act). Section 7 of the TSI Act indicates that the object of the Act is to improve transport safety through, among other things, independent investigations of transport accidents and incidents and the making of safety action statements and recommendations that draw on the results of those investigations. It is not the purpose of ATSB investigations to lay blame or provide a means for determining liability.

Executive summary

Data concerning Australian aviation activity, the aviation industry and aviation accidents are presented highlighting broad trends and developments in aviation safety. The data are presented graphically in time series figures and some data were tested for statistical significance using simple regression.

In preparing this document, consultation was undertaken with staff from the Department of Transport and Regional Services, Civil Aviation Safety Authority and Airservices Australia. A draft report was also released publicly for comment and a number of suggestions were incorporated. Some suggestions made were not incorporated because of the need to verify the techniques proposed and the workload entailed. These may be utilised in a future report.

This report finds that:

- By far the greatest growth in activity in Australian aviation has been in the regular public transport sector, primarily as the result of a significant increase in activity in the high capacity regular public transport sector
- High capacity regular public transport hours flown increased by 30 per cent between 1993 and 2002. Over the same period, high capacity regular public transport departures increased by 20 per cent and the number of passengers carried on high capacity regular public transport increased by 41 per cent
- Total activity in the general aviation sector, as measured by hours flown and the number of departures, was relatively flat over the decade, with no significant trends in any of the types of operation within the sector
- There were no fatalities recorded for high capacity regular public transport between 1993 and 2002 and a total of 17 fatalities were recorded in low capacity regular public transport operations
- There is no significant trend evident in fatalities in low capacity regular public transport operations
- There were 200 fatal accidents recorded in the general aviation sector from 1993 to 2002, representing approximately 99 per cent of all general aviation and regular public transport fatal accidents for the period
- The general aviation annual accident rate (accidents per 100,000 departures) declined significantly from 9.1 in 1993 to 4.8 in 2002
- The general aviation annual fatal accident rate (fatal accidents per 100,000 departures) declined from 1.6 in 1993 to 0.8 in 2002, although there was significant fluctuation in the rate during the period.

The main conclusions of this report are that:

- Australian aviation is, by world standards, extremely safe

- Growth in aviation activity overall was driven primarily by increases in high capacity regular public transport operations, which have maintained a zero fatality rate since the 1960s[1]
- The accident rate in the regular public transport sector remains very low and stable
- Reported accidents have decreased significantly in the general aviation sector
- Fatal accidents and fatalities have fluctuated substantially in the general aviation sector although there is some evidence of a downward trend
- Variations over time in the reporting and recording do not permit reliable time series analysis of incident trends and developments
- While the data suggests an improvement in Australian aviation safety over the decade, there is no reason for complacency. For example, one major fatal high capacity RPT accident would have a dramatic negative impact on the fatality data.

[1] The last high capacity regular public transport fatal accident occurred in 1968 at Port Hedland Western Australia and resulted in 26 fatalities. Australia has not had a RPT jet fatal accident.

Explanation of acronyms

ASI:	Aviation safety indicators
ATSB:	Australian Transport Safety Bureau
BASI:	Bureau of Air Safety Investigation
CASA:	Civil Aviation Safety Authority
DOTARS:	Department of Transport and Regional Services
ESIR:	Electronically submitted incident report
GA:	General aviation
GAAP:	General aviation airport procedures
HCRPT:	High capacity regular public transport
LCRPT:	Low capacity regular public transport
OASIS:	Occurrence analysis and safety information system (ATSBs aviation database)
RPT:	Regular public transport

Introduction and background

Aviation Safety Indicators (ASI) were first produced in 1996 in response to the "Plane Safe" report published in 1995 by the House of Representatives Standing Committee on Transport, Communications and Infrastructure. Produced jointly by the Civil Aviation Safety Authority (CASA), the then Department of Transport and Regional Development and the then Bureau of Air Safety Investigation (BASI), the first ASI contained 22 safety indicators. Indicators were divided into activity, industry, accident and incident. The same three agencies published ASI again in 1997, when 25 indicators were produced in the same four categories.

Due to other priorities, a further integrated publication has not been developed until now. This report is the result of a recognised need to consider the type of aviation safety data presently being collected and to provide a benchmark to stakeholders of the safety of Australian aviation.

This report is solely the responsibility of the Australian Transport Safety Bureau (ATSB), although in developing the ASI, the ATSB has consulted with other Australian government organisations, including CASA, Airservices Australia and the Department of Transport and Regional Services (DOTARS).

A draft version of the report was published as a discussion paper on the web by the ATSB at www.atsb.gov.au with a notification inviting public comment by 12 September 2003. The comments received by the ATSB resulted in a number of changes being incorporated into this final report and the Bureau is grateful to those who took the time to provide comments. Some comments suggested more fundamental additional analysis and this will be considered in the context of a future publication.

The objectives of this report are to:

- Provide objective, statistical measures of the safety of Australian aviation (excluding sport and military)
- Provide a document that highlights broad trends and developments that have occurred in aviation safety
- Provide a document that offers a basis to compare aspects of Australian aviation safety against the safety of aviation in other countries
- Deliver the above using a process acceptable to stakeholders.

This report commences with an explanatory note describing in brief the nature of aviation in Australia, followed by the methods of data collection and analysis. Some limitations of the conclusions of this report are discussed. The ASI are presented, divided into activity indicators, industry indicators and accident indicators. Finally, the report outlines conclusions based on the ASI.

Summary of the indicators

There have been considerable changes made to the ASI since they were last published in 1997. Notably, incident indicators have been removed altogether because of data changes in various years and inconsistency in reporting across industry sectors and types of operation. For example, the ATSB believes that reporting of incidents is considerably more rigorous in high capacity regular public transport operations (HCRPT) than in any other type of operation, particularly general aviation (GA).

Most of the industry indicators presented in the 1997 publication have also been removed. The reasons for this are that:

- Some of the information in previous industry indicators, such as aircraft load factors and airline market share was considered to be better suited to economic discussion of the aviation industry
- Other information, such as aircraft maintenance engineer licences and flight crew licences, was now considered to have a lesser direct impact on overall aviation safety, partly because of the increasing globalisation of aircraft maintenance and operations.

These ASI are somewhat different from the ASI published in 1997 in terms of activity and accident indicators. In these ASI, data are analysed primarily on the basis of the split between regular public transport (RPT) and GA with far less emphasis on the split between single engine and multi engine or fixed wing and rotary wing. This shift in emphasis is primarily because of data limitations.

The indicators are explained briefly below:

Activity indicators

The four activity indicators show hours flown by industry sectors, departures by the two major types of RPT operation and general aviation, scheduled airline passenger movements (by definition only available for RPT) and aircraft movements at major airports and aerodromes around Australia (not necessarily complete for GA when towers are closed). Activity indicators provide contextual information on activity or risk exposure against which trends can be considered.

Industry indicators

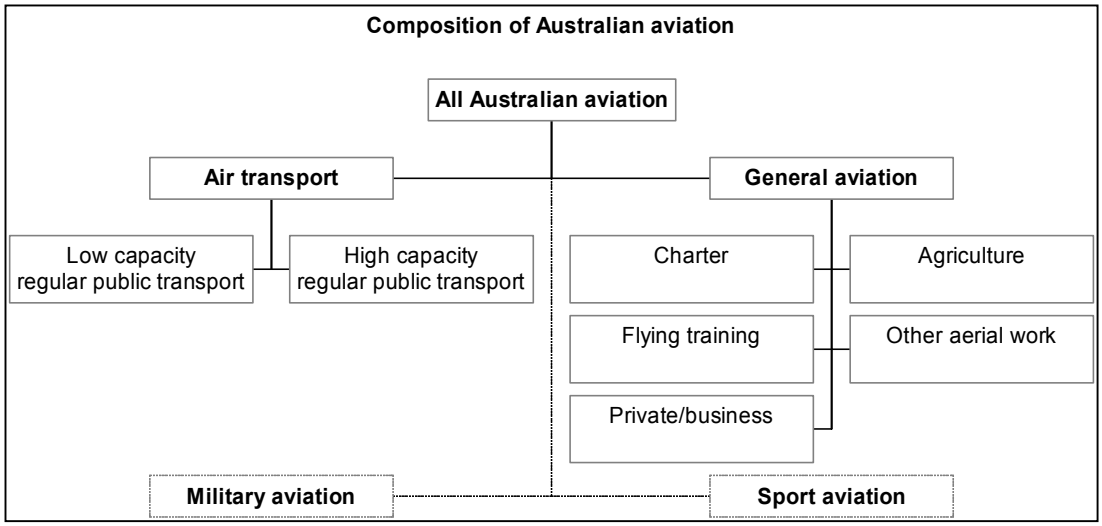
There are four industry indicators, all of which relate to the year of manufacture for Australian-registered aircraft. The purpose of these indicators is to provide an indication of the age of the Australian aircraft fleet.

Accident indicators

There are nine accident indicators – these centre around accidents (rates and numbers), fatalities (rates and numbers) and fatal accidents (rates and numbers). These indicators demonstrate the trends that have occurred since 1993.

Explanatory note

Australian aviation can be divided into four main industry sectors: general aviation (GA), regular public transport (RPT), sport aviation and military aviation. Sport aviation is not included in most ATSB statistics and is not considered in this report because there is an inherently higher risk, and more importantly, an acceptance of that risk, associated with it. Military aviation is not included in ATSB statistics or considered in this report because it is overseen by military safety authorities. The ATSB's focus is based on Chicago Convention international obligations (including Annex 13) and Government emphasis on fare-paying passenger aviation.



Regular public transport is broadly defined as flight operations performed for remuneration and conducted to fixed schedules over specific routes, and on which seats and/or cargo space are available to the general public.

General aviation is defined as all non-scheduled flying activity in aircraft, with Australian registered aircraft allocated a VH-registration by CASA, but excluding VH-registered sailplanes (powered and non-powered). Ultralight aircraft, non VH-registered military aircraft, hang gliders, balloons and autogyros are also excluded.

Regular public transport is further divided into high capacity regular public transport (HCRPT) and low capacity regular public transport (LCRPT). A HCRPT aircraft fits the RPT description above and also has a maximum seating capacity exceeding 38 seats. A LCRPT aircraft also fits the RPT description above, but has a maximum seating capacity less than or equal to 38 seats or a maximum payload less than or equal to 4,200 kg.

General aviation is divided further into charter, flying training, agriculture, other aerial work and private/business. Charter is defined as carriage of cargo or passengers on non-scheduled operations by the operator (or the operator's employees) in trade or commerce, but excluding regular public transport operations.

Flying training is defined as flying under instruction for the issue or renewal of a licence or rating, aircraft type endorsement or conversion training. Flying training includes solo navigation exercises conducted as part of a course of applied flying training. Agriculture operations are defined as operations involving the carriage and/or spreading of chemicals, seed, fertiliser or other substances for agricultural purposes, including operation for the purpose of pest and disease control.

Other aerial work includes all aerial survey and photography, spotting, aerial stock mustering, search and rescue, ambulance, towing (including glider, target and banner towing) and other aerial work, including advertising, cloud seeding, fire fighting, parachute dropping and coastal surveillance. Private/business covers flying by the aircraft owner, the operator's employees or the hirer of the aircraft for business or professional reasons but not directly in trade or commerce. It also includes flying for private pleasure, sport or recreation or personal transport not associated with a business or profession.

Four main government organisations are involved in Australian aviation: CASA, Airservices Australia, DOTARS and the ATSB. CASA is the regulatory body, responsible for conducting the safety regulation of civil aviation operations in Australia and the operation of Australian aircraft overseas. Among other functions, CASA is also responsible for maintaining the register of Australian civil aircraft, or VH registered aircraft. Airservices Australia is responsible for providing air traffic control, air navigation support and aviation rescue and fire fighting services at specific airports.

DOTARS is responsible for aviation security oversight and regulation, for environmental regulation of aircraft noise and for oversight of aerodromes. DOTARS also collects aviation economic and activity data and provides advice on aviation policy and on the governance of CASA and Airservices Australia to the Minister for Transport and Regional Services. The International Air Services Commission secretariat is also located within DOTARS. The ATSB is responsible for independent no-blame investigation into aviation accidents and incidents, research and analysis and reporting on aviation safety.

Formed on 1 July 1999, the ATSB is an operationally independent multi-modal body located within DOTARS. Maintaining a clear organisational separation from transport regulators and other bodies that may be investigated, the role of the ATSB under the *Transport Safety Investigation Act 2003* is to investigate, analyse and report openly on transport safety matters free of any external pressure or conflict of interest. Transport safety investigation and analysis of safety data are conducted rigorously and without fear or favour, in accordance with International Civil Aviation Organization (ICAO) Annex 13 Standards and Recommended Practices.

Methodology

Data collection

Data were collected through four sources:

- ATSB accident and incident database (OASIS) – all aviation accidents and incidents reported to the ATSB and meeting defined criteria are entered into OASIS. This includes all fatal accidents and fatalities.
- DOTARS Avstats, which collects activity data from airline operators and aircraft owners under the authority of Air Navigation Regulation 12
- Airservices Australia, which collects data through air traffic control service delivery
- The CASA aircraft register, which contains all VH registered aircraft.

Data analysis

Data presented in this report are descriptive and have been subjected to statistical analysis to determine the existence (or otherwise) of statistically significant trends. In those instances, linear regression analysis has been used with significance determined at the 95 per cent level of confidence.

Rates have been computed using hours flown or aircraft departures as the denominator, primarily to enable comparison between years and among different industry sectors and types of operation.

Data have been presented in this report with the intention of identifying any trends or changes in variables – as such, the data are (where possible) in time series. In all cases, there is only one independent and one dependent variable. The independent variable in all cases is the calendar year. Where appropriate, data have been presented graphically.

Limitations

In preparing this report, two limitations were particularly important:

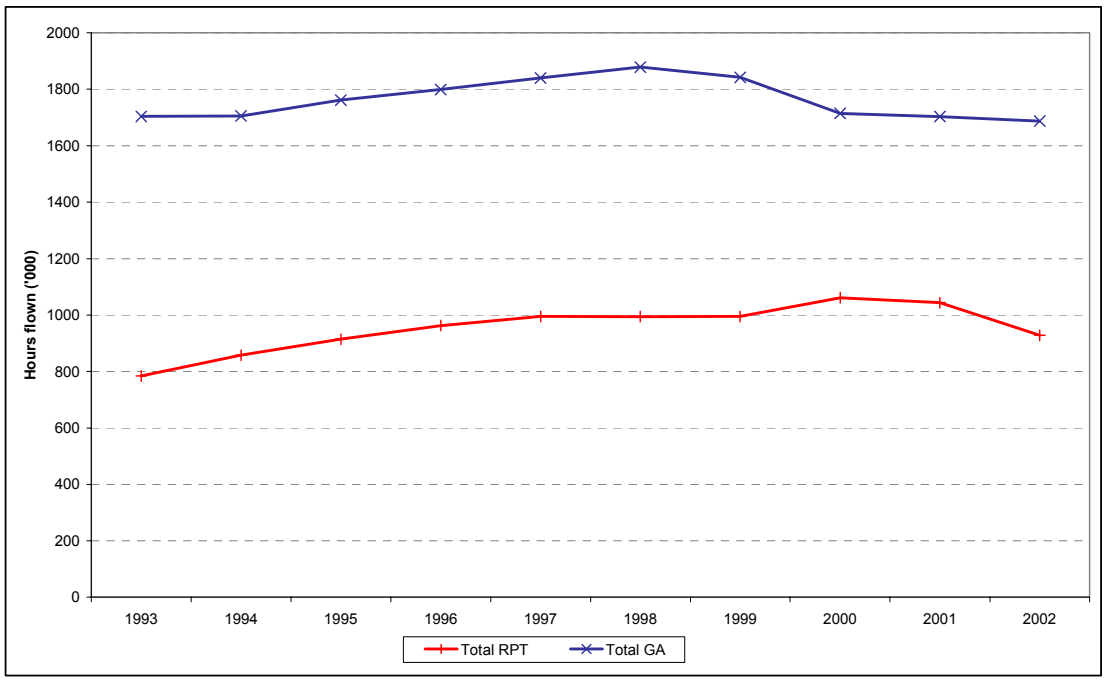
- The limitations of the ATSB database with regard to enabling consistent time series analysis for incidents
- The small numbers involved which, in many cases made it difficult to identify trends.

As noted earlier, incident data are too variable for reliable time series analysis. This is primarily the result of changes in the reporting regime, in particular the introduction by Airservices Australia in 1997 of electronically submitted incident reporting (ESIR). The introduction of ESIR was partly responsible for a jump in incidents reported between 1997 and 1998, as part of improvements in RPT reporting, and further changes to ESIR were implemented in 2000. Further, the then BASI and later the ATSB changed the categorisation of incidents in several years, including data such as bird strikes, resulting in additional data consistency problems. A final point regarding the accuracy of the activity and safety information is that the ATSB can only record that which is reported to it; it is, therefore, important to note the possibility of inconsistent accident and incident reporting and the consequent impact on the accuracy of any conclusions drawn.

Australian aviation is, by world standards, extremely safe – in relation to this report, this means that the numbers of accidents and fatalities are relatively small. While this is unquestionably a positive situation, it creates data analysis problems because the “small base” problem makes it more difficult to identify trends.

Activity indicators

FIGURE 1:
Total hours flown by industry sector – 1993 to 2002



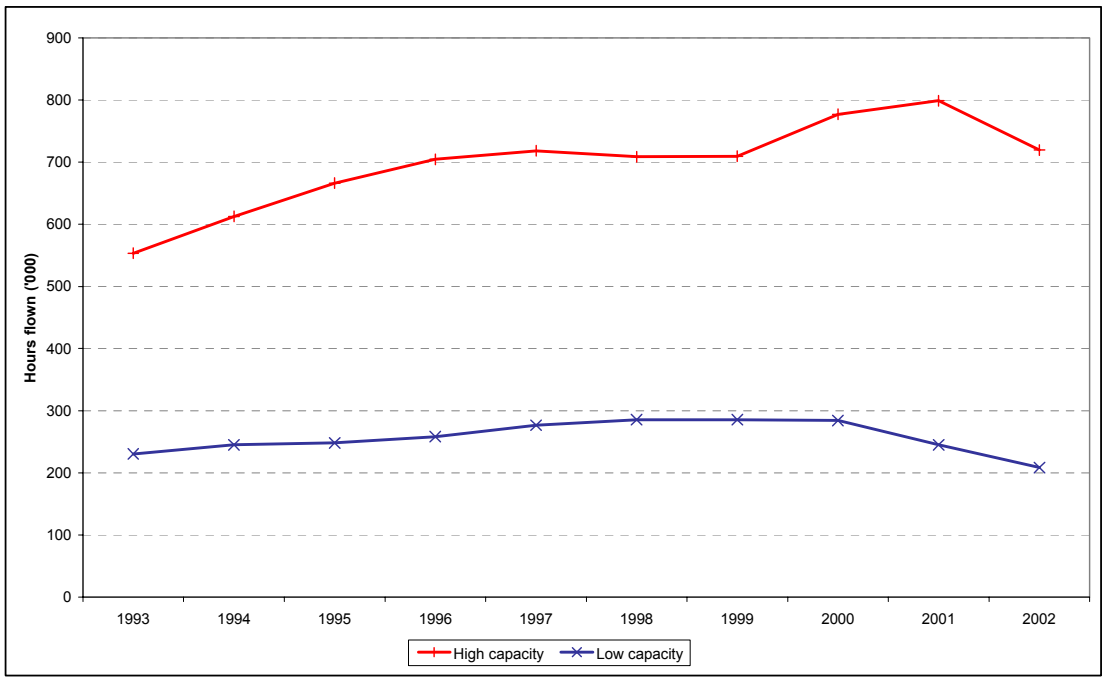
Source: DOTARS AvStats

Figure 1 shows annual hours flown by all Australian registered aircraft from 1993 to 2002, divided between RPT and GA (see also Appendix, Table A1). This and all subsequent figures (except where otherwise indicated), include fixed wing and rotary wing aircraft but exclude sport and military aviation.

Between 1993 and 2002, there has been a significant increase in annual hours flown in the RPT sector. Hours flown in the RPT sector increased by an average of 1.9 per cent annually. In 1993, 783,900 hours were flown in the RPT sector. By 2002, this number had increased by 18 per cent to 927,800 hours.

By contrast, the GA sector did not exhibit any significant trend during the ten-year period, with hours flown in 2002 being 1 per cent lower than flown in 1993. Hours flown in the GA sector did increase from 1993 to 1998 from 1,703,900 to 1,877,900 but then dropped to 1,687,700 by 2002.

FIGURE 2:
Regular public transport hours flown by industry sector – 1993 to 2002

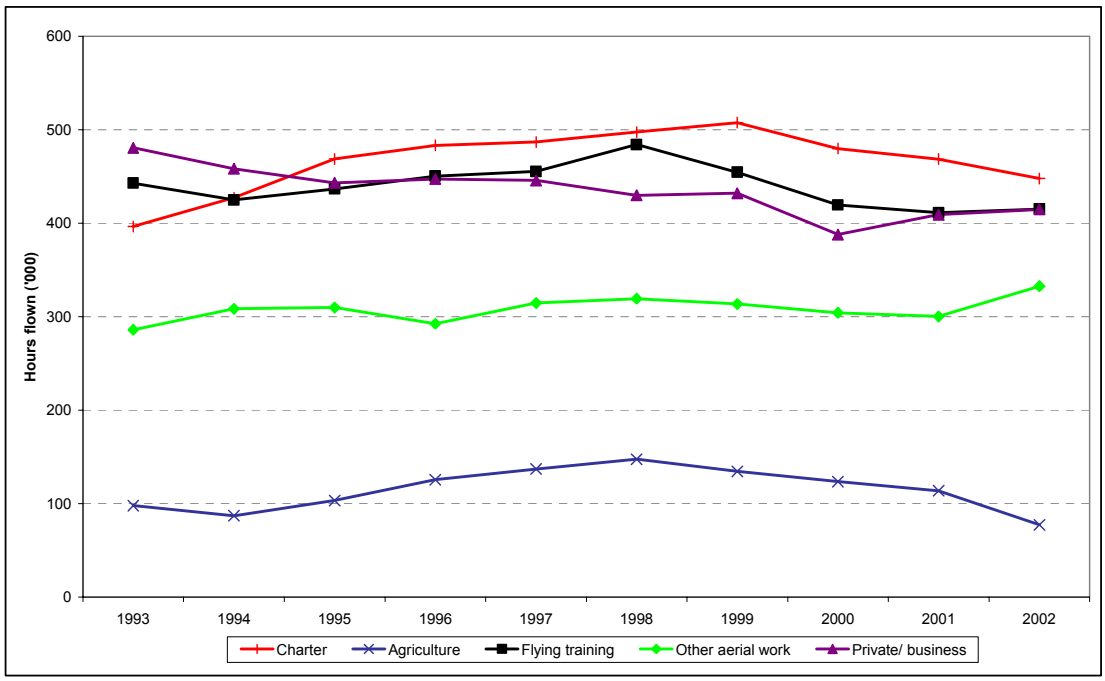


Source: DOTARS AvStats

Figure 2 shows annual hours flown in the RPT sector from 1993 to 2002, divided between the two major types of RPT operation. In this period, HCRPT operations recorded a significant increase in hours flown. LCRPT hours flown rose every year between 1993 and 1999, but declined in 2001 and 2002- hours flown in 2002 were 10 per cent lower than in 1993.

Hours flown in HCRPT operations surged by 30 per cent over the period, an average annual increase of 3 per cent (despite a decline in 2002 following the cessation of Ansett Airlines) – this is, therefore, the major factor underpinning the increase in the RPT sector.

FIGURE 3:
General aviation hours flown by industry sector – 1993 to 2002



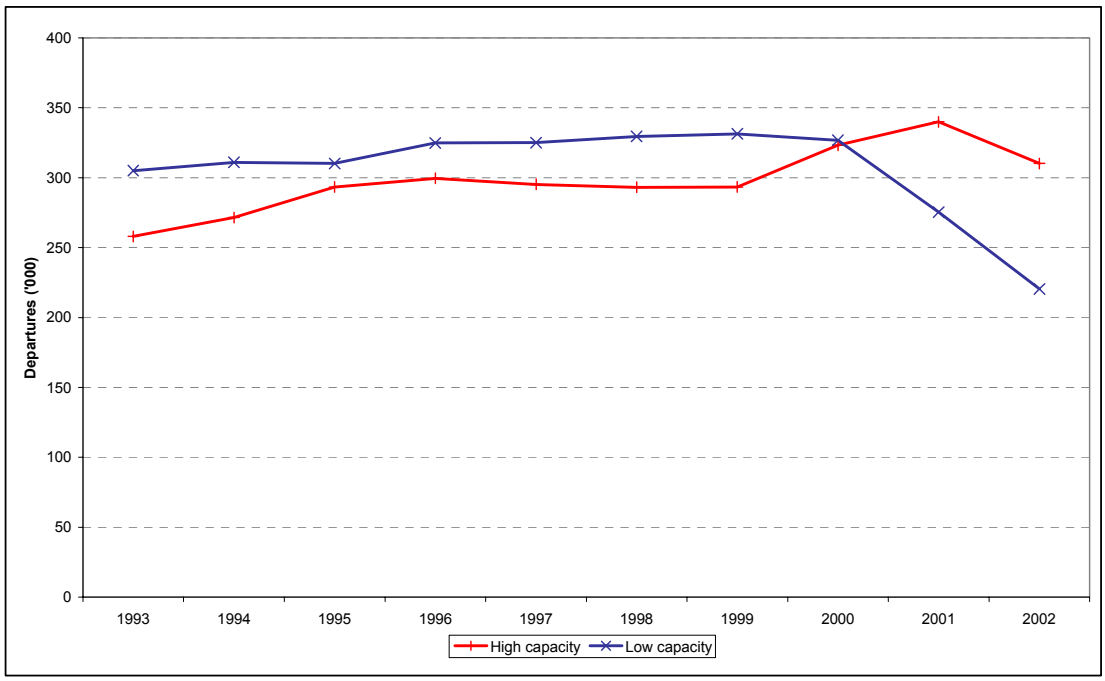
Source: DOTARS AvStats

Figure 3 shows annual hours flown in the GA sector from 1993 to 2002, divided among major types of operation (see also Appendix, Table A1).

Within GA, no industry sector showed any strong trend. Charter operations increased by 13 per cent over the period. This growth resulted primarily from a surge between 1993 and 1995 – following this period, growth slowed and hours flown declined slightly in 2000, 2001 and 2002. Other aerial work remained relatively unchanged during the period with an increase from 300,300 in 2001 to 332,500 in 2002, an increase of 11 per cent.

In contrast, agriculture operations showed the greatest fall in hours flown, despite increases in the first half of the period. Private/business recorded a steady decline, averaging a decrease of 2.4 per cent annually, resulting in hours flown dropping from 480,700 in 1993 to 414,800 in 2002.

FIGURE 4:
Regular public transport departures by industry sector – 1993 to 2002



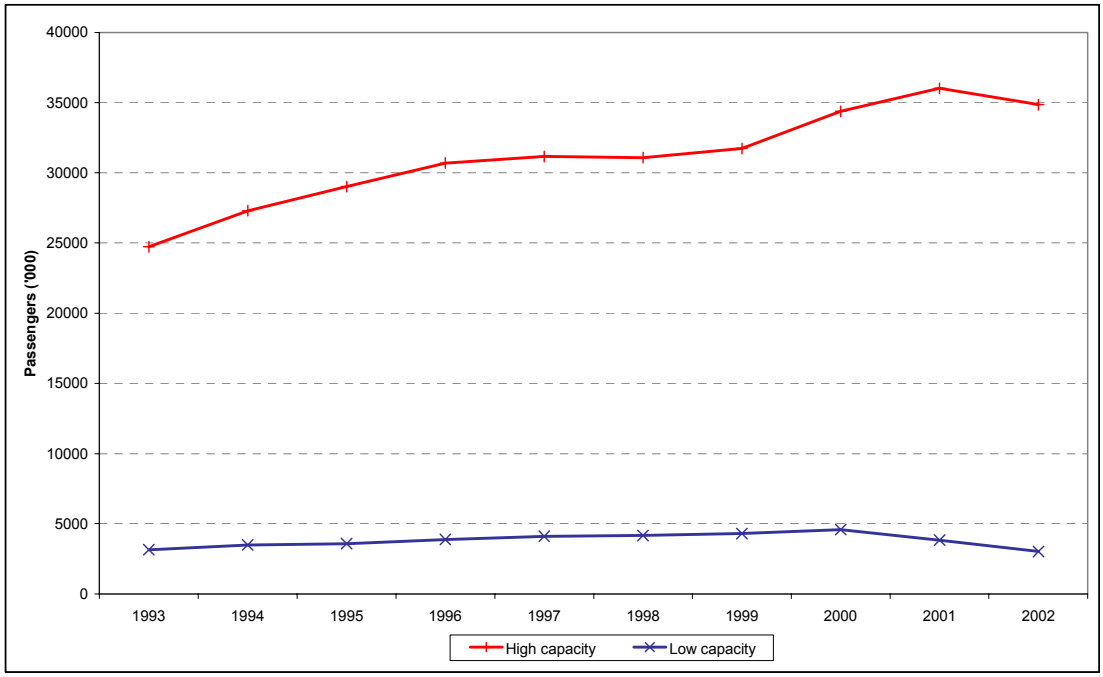
Source: DOTARS AvStats

Figure 4 shows annual total departures recorded from 1993 to 2002 for the RPT sector (see also Appendix, Table A2).

Consistent with the significant increase in hours flown, HCRPT operations have shown a significant increase in departures. HCRPT departures increased by an average of 2.0 per cent annually, from 258,500 in 1993 to 310,100 in 2002. This increase, coupled with the fall in LCRPT departures, meant that in 2001 the number of HCRPT departures actually exceeded the number of LCRPT departures for the first time in the period. As figure 4 illustrates, there was a further decline in LCRPT departures in 2002.

Fairly stable until 2000, LCRPT departures declined sharply in 2001 and 2002 dropping from 326,700 in 2000 to 220,400 in 2002, a decrease of 33 per cent. This followed an increase during the first half of the decade (particularly 1995 to 1996).

FIGURE 5:
Regular public transport passengers carried by industry sector – 1993 to 2002



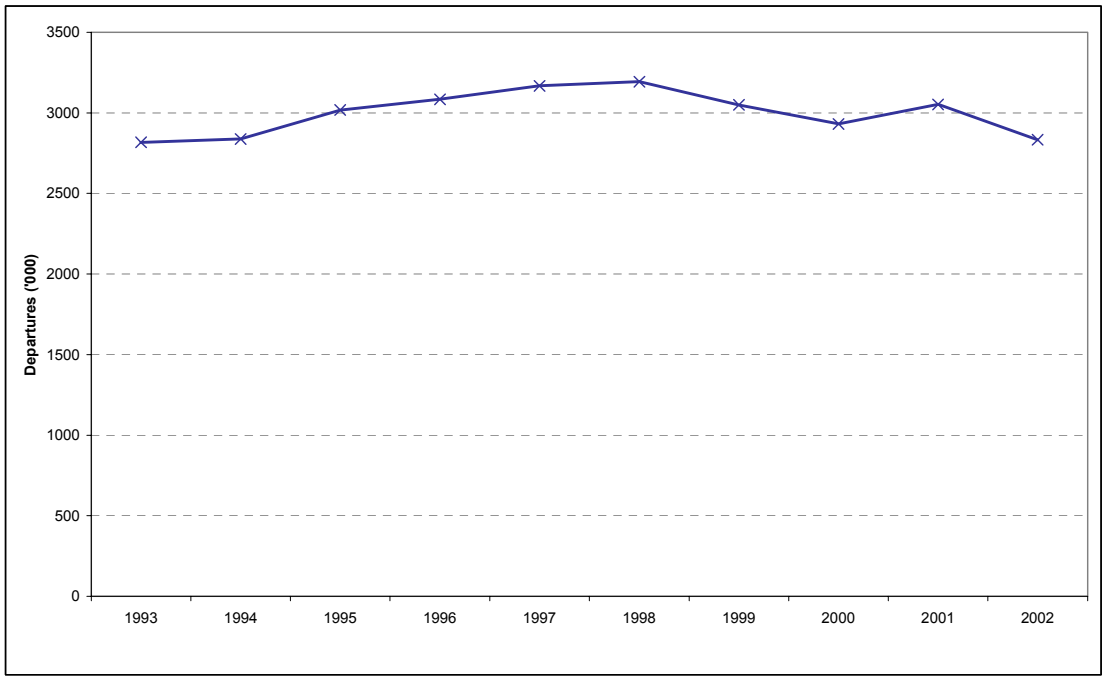
Source: DOTARS AvStats

Figure 5 shows the annual total number of passengers carried on RPT flights by sector from 1993 to 2002 (see also Appendix, Table 3A).

Passengers carried on LCRPT operations exhibited no significant trend, but passengers carried on HCRPT operations increased significantly – by an average of 3.9 per cent annually, despite a small drop in 2002.

The increase in passengers carried by HCRPT operations and decrease in passengers carried by LCRPT operations are consistent with the trends in hours flown and departures for those types of operation.

FIGURE 6:
General aviation departures – 1993 to 2002

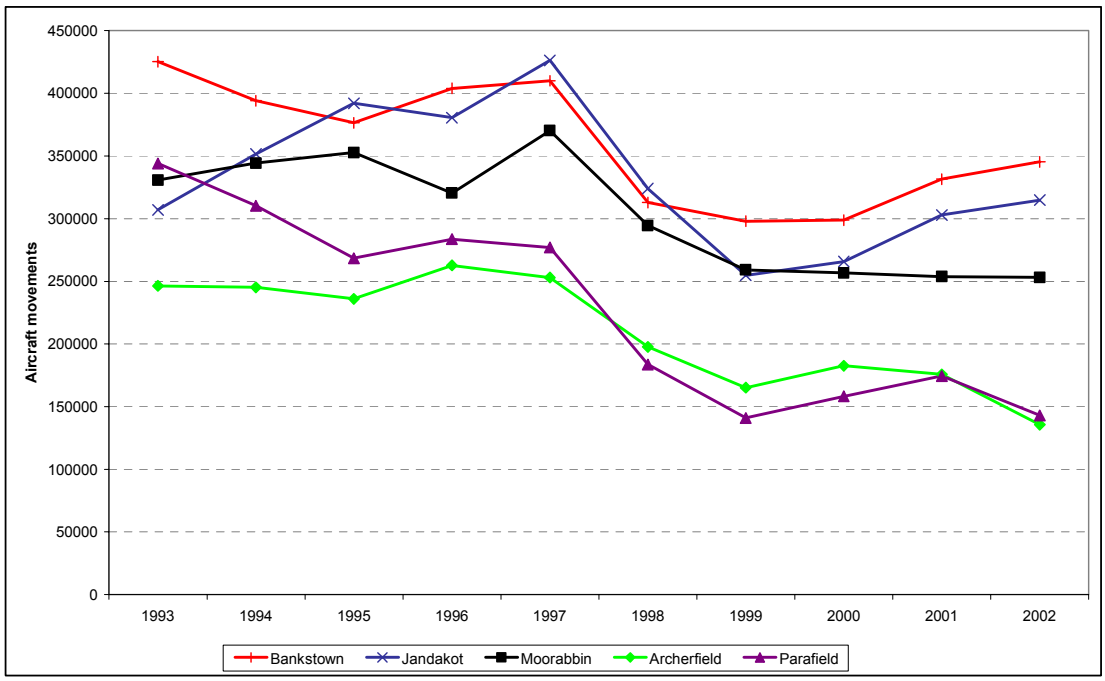


Source: DOTARS AvStats

Figure 6 shows annual total departures recorded from 1993 to 2002 for the GA sector (see also Appendix, Table A2).

Consistent with the trend in hours flown, the number of GA hours flown did not exhibit any significant trend during the ten-year period, with hours flown in 2002 being 1 per cent lower than flown in 1993. There were 2,816,600 GA departures in 1993. GA departures increased every year to 1998, peaking at 3,194,400 then decreased to 2,832,900 in 2002.

FIGURE 7:
Aircraft movements at GAAP aerodromes – 1993 to 2002



Source: Airservices Australia

Figure 7 shows total aircraft movements at the general aviation airport procedures (GAAP) aerodromes from 1993 to 2002. Movements at GAAP aerodromes primarily relate to GA activity.

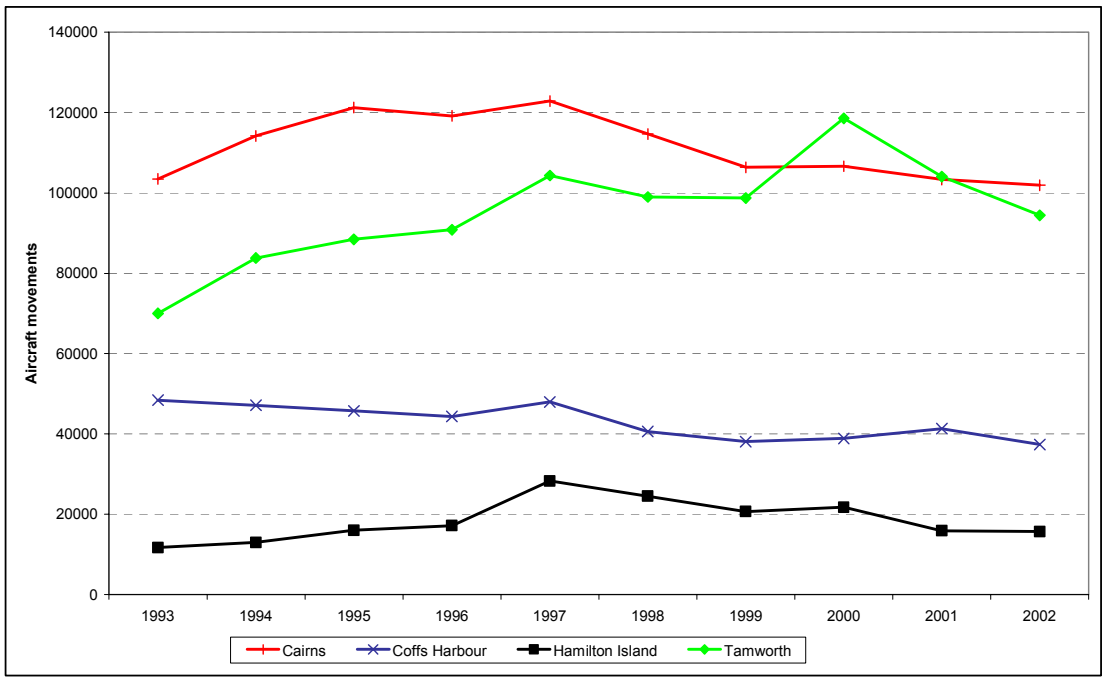
All GAAP aerodromes recorded a net decline in activity over the period, except Jandakot, at which there were 3 per cent more movements in 2002 than in 1993. Similarly, all GAAP aerodromes, without exception, recorded a large drop in activity between 1997 and 1999. A large proportion of this decrease is attributed to changes in reporting procedures implemented in 1998[2]. The accuracy of movement data since 1998 is thought to have improved considerably.

The drop in movements appear to have been largely reversed between 2000 and 2002 at Jandakot and Bankstown, but not at any of the other GAAP aerodromes.

The greatest decline over the period was at Parafield, which recorded 58 per cent fewer movements in 2002 than in 1993. This significant fall in activity meant that in 2002 Parafield recorded 143,080 movements – less than half the number of movements recorded in 1993.

[2] Australian National Audit Office, *Air Traffic Data Collection*, Performance Audit Report No. 48, June 2001

FIGURE 8:
Aircraft movements at major regional airports – 1993 to 2002



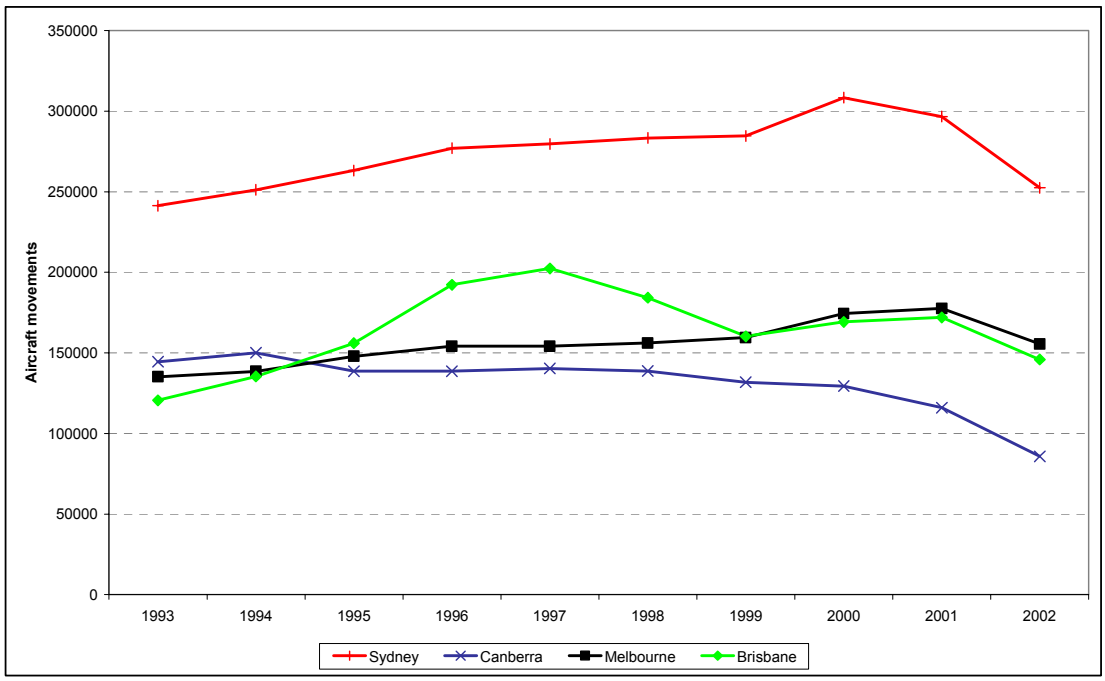
Source: Airservices Australia

Figure 8 shows total aircraft movements at selected major regional airports from 1993 to 2002.

Similar to GAAP aerodromes, these four airports all recorded a drop in activity between 1997 and 1999, although it was not as pronounced. Activity increased significantly at Tamworth in the period, but the other three airports did not show a significant trend.

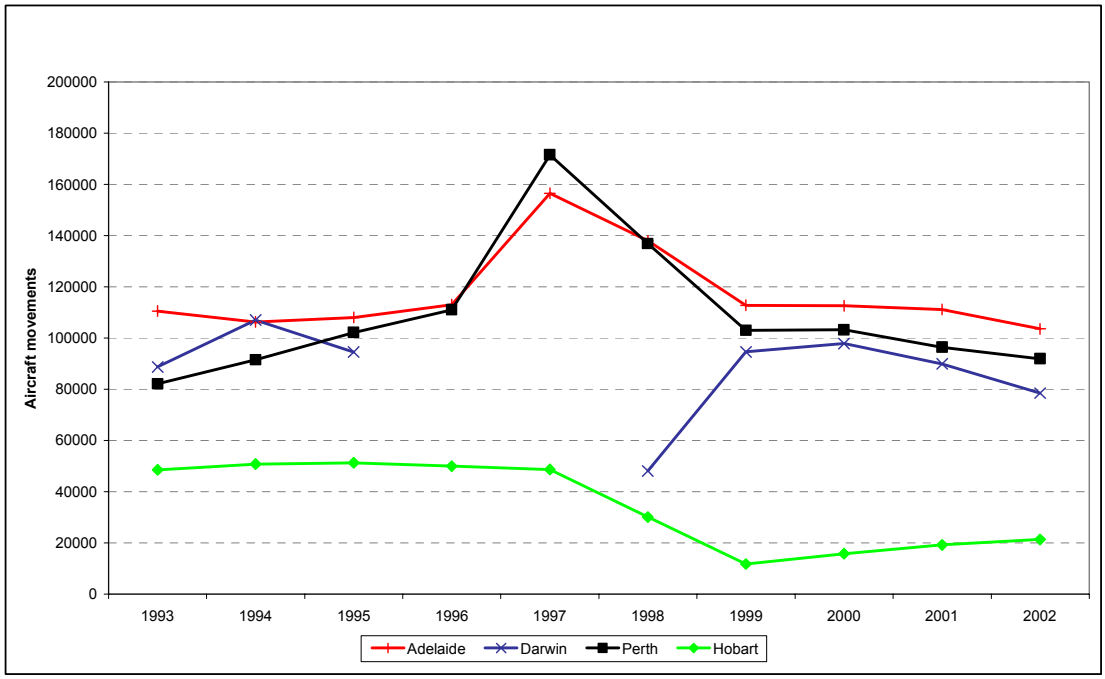
At Cairns and Tamworth, activity grew strongly in the first half of the decade before flattening and then declining slightly in the second half; however, Cairns finished 2 per cent lower at the end of the decade while Tamworth finished 35 per cent higher. Although activity at Hamilton Island did not exhibit a significant trend, there were 34 per cent more movements in 2002 than in 1993.

FIGURE 9a:
Aircraft movements at capital city airports - 1993 to 2002



Source: Airservices Australia

FIGURE 9b:
Aircraft movements at capital city airports - 1993 to 2002



Source: Airservices Australia

Figures 9a and 9b show total aircraft movements at the capital city primary airports from 1993 to 2002. Information for Darwin for 1996 and 1997 is not available. Aircraft activity at these airports comprises a mixture of RPT, GA and military activity.

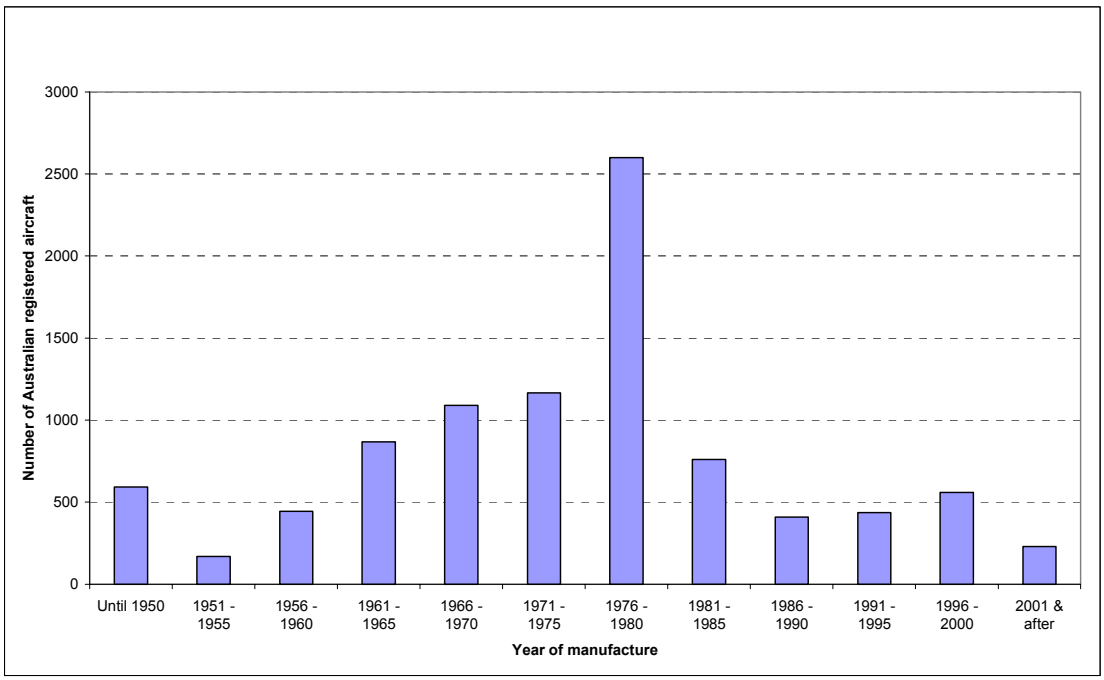
Sydney remained the busiest airport throughout the period, with movements steadily increasing and peaking in 2000. However, movements at Sydney declined in 2001 and 2002, finishing the period 5 per cent higher than at the beginning.

Steady growth in aircraft movements was also recorded at Brisbane, Melbourne and Perth. Movements at Hobart and Canberra declined over the period, while neither Darwin nor Adelaide showed significant trends.

With the exception of Hobart, all airports experienced a decline in activity in 2002.

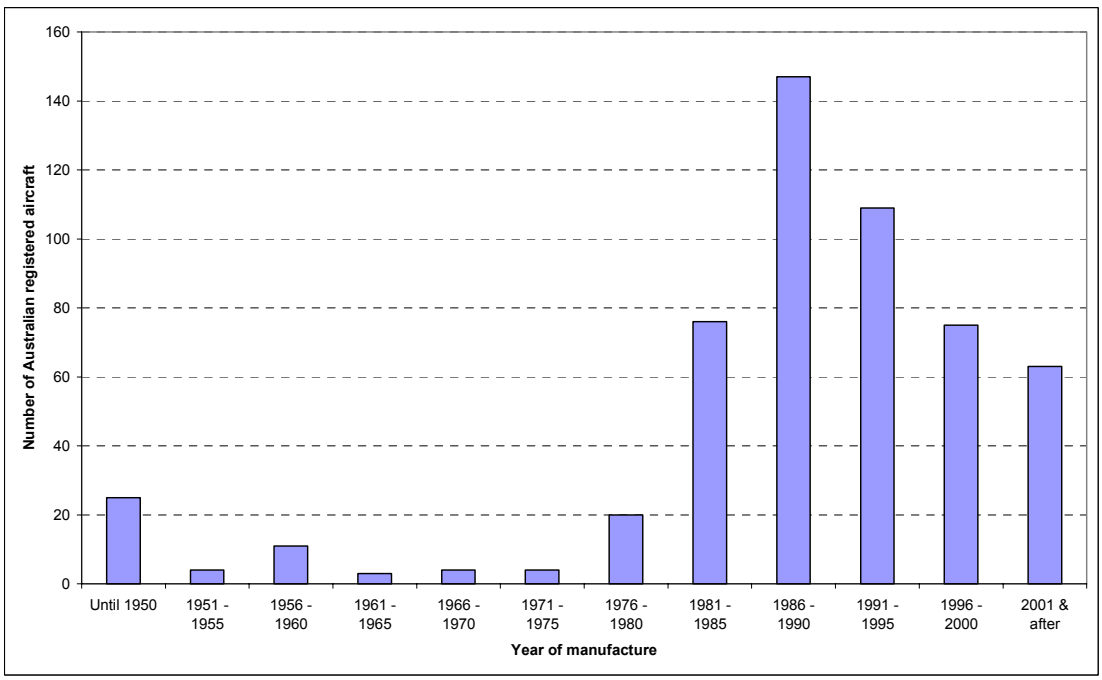
Industry indicators

FIGURE 10:
Year of manufacture - fixed wing aircraft - as at 31 December 2002



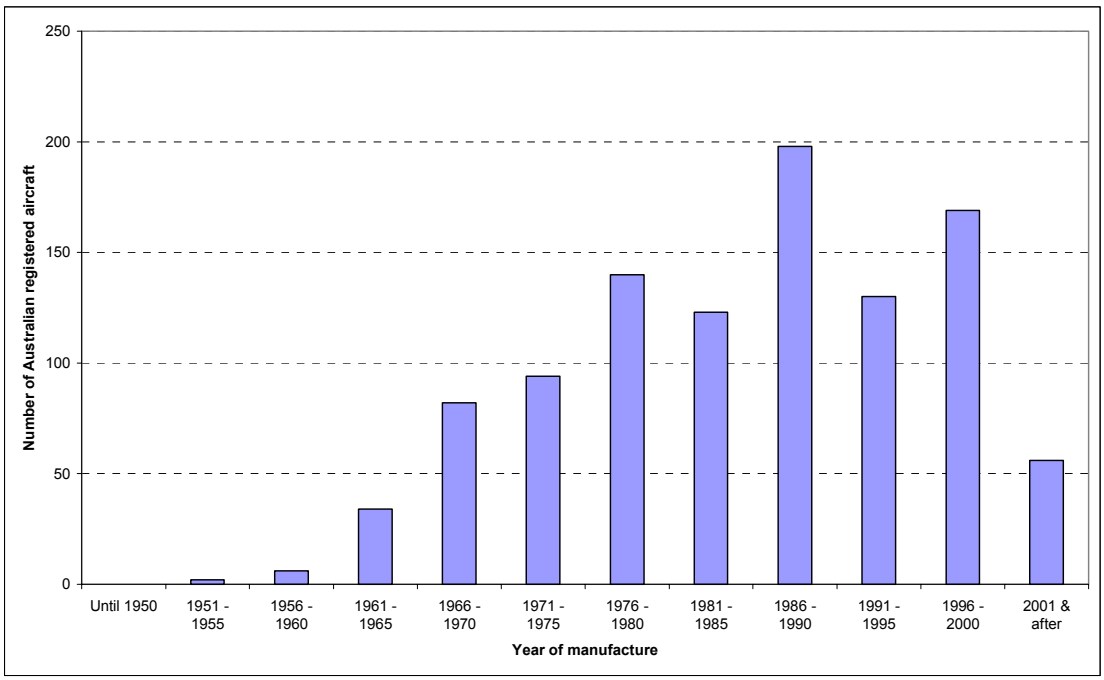
Source: CASA aircraft register

FIGURE 11:
Year of manufacture - fixed wing aircraft - transport category - as at 31 December 2002



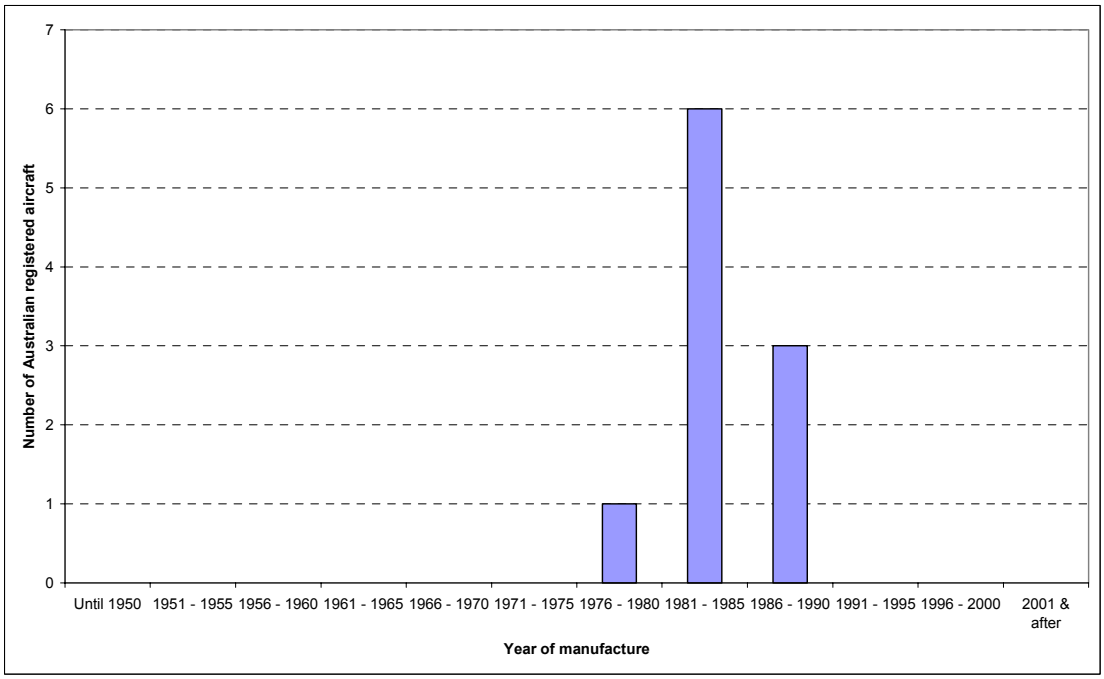
Source: CASA aircraft register

FIGURE 12:
Year of manufacture - rotary wing aircraft - as at 31 December 2002



Source: CASA aircraft register

FIGURE 13:
Year of manufacture - rotary wing aircraft - transport category - as at 31 December 2002



Source: CASA aircraft register

Figure 10 shows the year of manufacture for all 8,691 fixed wing aircraft registered in Australia (excluding sport and military aircraft) as at the end of December 2002.

More than half of the registered fixed wing aircraft were manufactured after 1976 but almost 7 per cent of aircraft on the register were manufactured prior to 1950.

Figure 11 shows the year of manufacture for transport category fixed wing aircraft, a subset of all fixed wing aircraft. These are of a size usually used for regular public transport operations. There were 540 aircraft of this type registered as at 31 December 2002.

While these aircraft are, in general, much newer with the median for year of manufacture being in the late 1980s, about 12 per cent were manufactured in or before 1980.

Figure 12 shows the year of manufacture for the 1,033 rotary wing aircraft registered in Australia (excluding sport and military) as at 31 December 2002. Compared with fixed wing aircraft, the average rotary wing aircraft is much newer – more than half were manufactured after 1980.

Figure 13 shows data for the 10 ‘transport’ category helicopter aircraft. The average age of these aircraft is not significantly different from that of other helicopters on the register.

Accident indicators

- TABLE 1:
  Regular public transport accidents, fatal accidents and fatalities
- TABLE 2:
  General aviation accidents
- TABLE 3:
  General aviation fatal accidents
- TABLE 4:
  General aviation fatalities
- TABLE 5:
  General aviation accidents, fatal accident and fatalities per 100,000 departures
- Source: ATSB
- TABLE 6:
  General aviation accidents, fatal accidents and fatalities per 100,000 hours flown
- FIGURE 14:
  General aviation accidents per 100,000 departures
- FIGURE 15.
  General aviation accidents per 100,000 hours flown
- FIGURE 16:
  General aviation fatal accidents per 100,000 departures
- FIGURE 17:
  General aviation fatal accidents per 100,000 hours flown
- FIGURE 18:
  General aviation fatalities per 100,000 departures
- FIGURE 19:
  General aviation fatalities per 100,000 hours flown
- FIGURE 20a:
  General aviation fatality rates per 100,000 hours flown by industry sector
- FIGURE 20b:
  General aviation fatality rates per 100,000 hours flown by industry sector

TABLE 1:
Regular public transport accidents, fatal accidents and fatalities by type of operation - 1993 to 2002

	High capacity			*Low capacity*		
	Accidents	***Fatal accidents***	***Fatalities***	***Accidents***	***Fatal accidents***	***Fatalities***
1993	1	0	0	5	1	7
1994	2	0	0	4	0	0
1995	1	0	0	4**	1**	2**
1996	1	0	0	2	0	0
1997	0	0	0	0	0	0
1998	1	0	0	2	0	0
1999	7*	0	0	3	0	0
2000	3	0	0	3	1	8
2001	3	0	0	3	0	0
2002	1	0	0	4	0	0

** Includes 5 accidents where aircraft were on the ground with passengers on board.*
*** Includes 1 RPT training flight with two fatalities.*

Source: ATSB

Table 1 shows the number of accidents, fatal accidents and fatalities that occurred in the RPT sectors between 1993 and 2002.

Table 1 shows that accidents were relatively uncommon within the HCRPT sector, with all years except 1999 recording between 0 and 3 accidents. There were no fatal HCRPT accidents recorded within the period.

Accidents were also low in the LCRPT sector, with a maximum of 5 accidents recorded in any one year. There were three fatal accidents over the reported period, resulting in a total of 17 fatalities.

The numbers are too small and susceptible to chance fluctuation for any clear trends to emerge. Rates were not computed for HCRPT and LCRPT for the same reason. It should be noted that a single major crash in either HCRPT or LCRPT would significantly alter any trends or rates. This is illustrated in the low capacity data where the numbers jump from 0 in 1999 to 8 in 2000.

TABLE 2:
General aviation accidents – 1993 to 2002

Year	Agriculture	Charter	Flying training	Other aerial work	Private/ business	Total
1993	24	44	37	35	117	257
1994	16	49	28	27	86	206
1995	29	42	36	19	90	216
1996	33	34	26	27	83	203
1997	34	49	38	34	74	229
1998	35	41	24	17	91	208
1999	24	21	32	18	71	166
2000	21	26	34	27	79	187
2001	16	32	19	25	84	176
2002	10	19	23	15	69	136

Source: ATSB

TABLE 3:
General aviation fatal accidents – 1993 to 2002

Year	Agriculture	Charter	Flying training	Other aerial work	Private/ business	Total
1993	1	4	0	3	14	22
1994	4	6	2	4	9	25
1995	2	3	1	4	12	22
1996	4	6	0	4	9	23
1997	5	4	0	1	7	17
1998	2	2	1	2	16	23
1999	0	3	2	1	15	21
2000	3	3	0	2	8	16
2001	1	4	2	4	10	21
2002	0	3	1	2	4	10

Source: ATSB

TABLE 4:
General aviation fatalities – 1993 to 2002

Year	Agriculture	Charter	Flying training	Other aerial work	Private/ business	Total
1993	1	8	0	4	33	46
1994	4	22	4	5	16	51
1995	2	8	1	6	20	37
1996	4	13	0	5	21	43
1997	6	8	0	2	12	28
1998	2	7	1	3	33	46
1999	0	10	2	2	26	40
2000	3	11	0	6	9	29
2001	1	10	2	8	19	40
2002	0	8	1	5	10	24

Source: ATSB

Tables 2, 3 and 4 show the number of accidents, fatal accidents and fatalities respectively that occurred in the GA sector between 1993 and 2002.

Although it is difficult to identify a strong trend, the numbers of accidents and fatalities in the GA sector appear to be decreasing. Additionally, these numbers

show that the greatest proportion of accidents and fatal accidents occurred among the charter and private/business sectors.

TABLE 5:
General aviation accidents, fatal accident and fatalities per 100,000 departures – 1993 to 2002

	Accident rate	*Fatal accident rate*	*Fatality rate*
1993	9.1	0.8	1.6
1994	7.3	0.9	1.8
1995	7.2	0.7	1.2
1996	6.6	0.7	1.4
1997	7.2	0.5	0.9
1998	6.5	0.7	1.4
1999	5.4	0.7	1.3
2000	6.4	0.5	1.0
2001	5.8	0.7	1.3
2002	4.8	0.4	0.8

Source: ATSB

TABLE 6:
General aviation accidents, fatal accidents and fatalities per 100,000 hours flown – 1993 to 2002

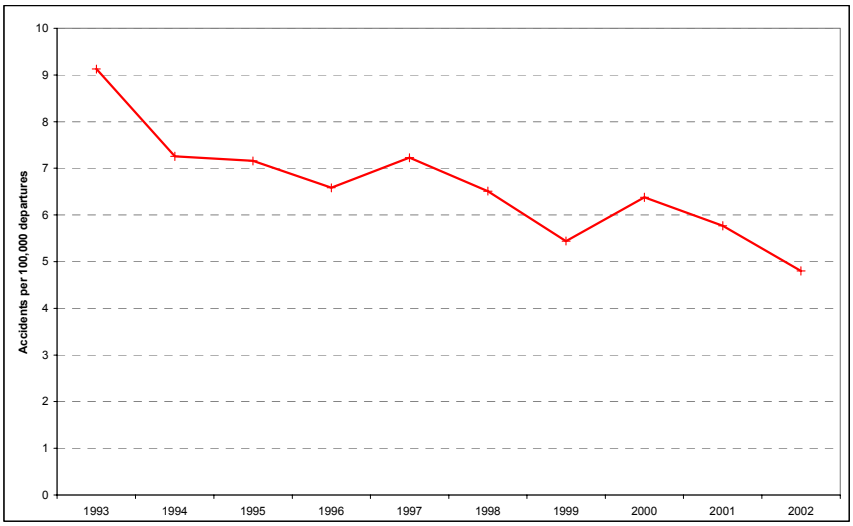
	Accident rate	*Fatal accident rate*	*Fatality rate*
1993	15.1	1.3	2.7
1994	12.1	1.5	3.0
1995	12.3	1.2	2.1
1996	11.3	1.3	2.4
1997	12.5	0.9	1.5
1998	11.1	1.2	2.4
1999	9.0	1.1	2.2
2000	10.9	0.9	1.7
2001	10.3	1.2	2.3
2002	8.1	0.6	1.4

Source: ATSB

Tables 5 and 6 show the annual accident, fatal accident and fatality rates per 100,000 departures and 100,000 hours flown within the GA sector for the period 1993 to 2002.

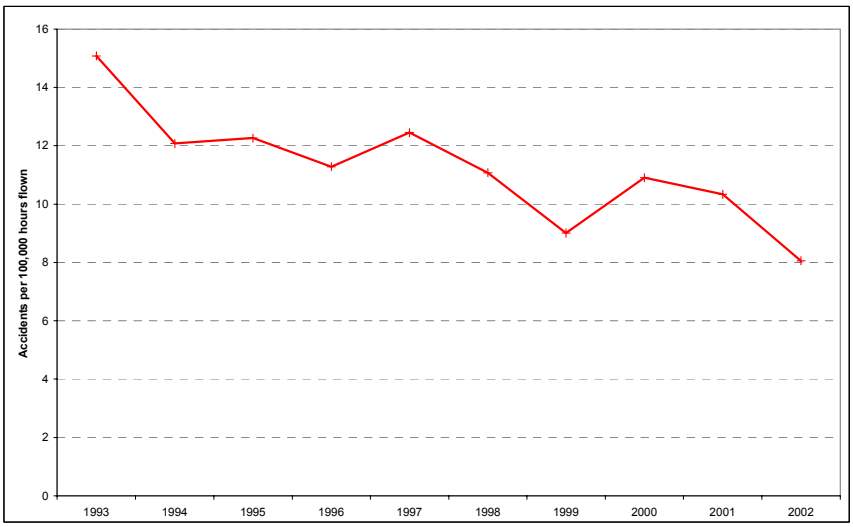
Rates per 100,000 departures and per 100,000 hours flown are both presented, as there are arguments for using both denominators. The majority of aviation accidents take place during the take-off, the initial climb, the landing approach and the landing phases of flight. Using flight hours could therefore potentially distort the rates, as the number of flight hours vary significantly from flight to flight while the number of take-offs and landings do not. Despite this limitation, flight hours are still presented, as it is a common measure of GA safety.

FIGURE 14:
General aviation accidents per 100,000 departures – 1993 to 2002



Source: ATSB

FIGURE 15.
General aviation accidents per 100,000 hours flown – 1993 to 2002

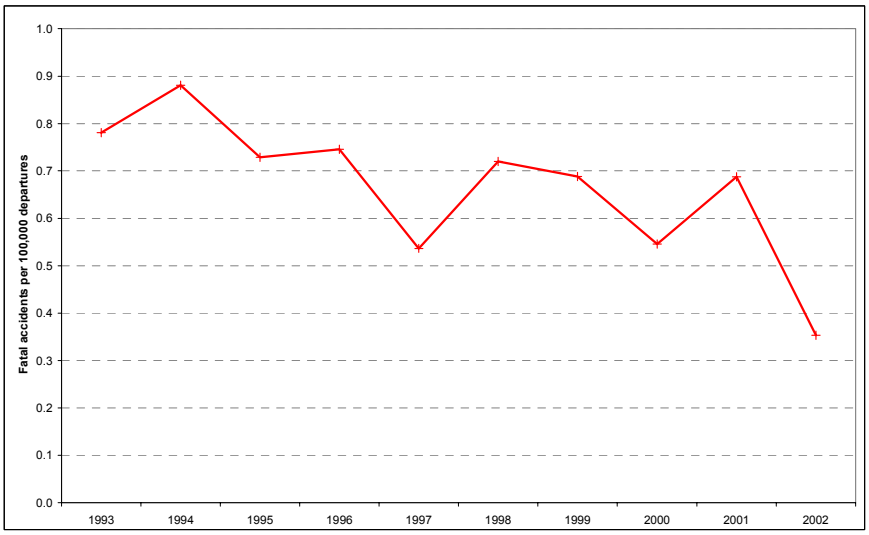


Source: ATSB

Figures 14 and 15 show the number of accidents per 100,000 departures and per 100,000 hours flown in the GA sector between 1993 and 2002.

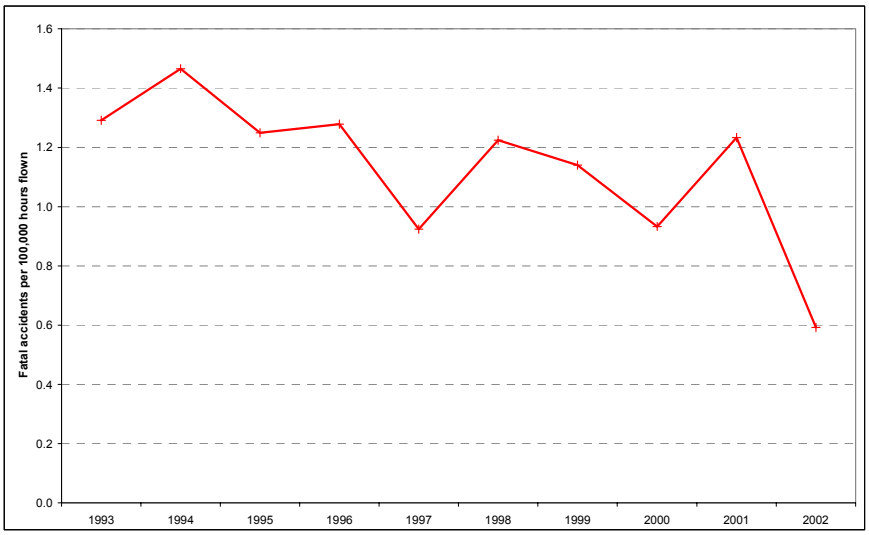
The figures show that general aviation accidents declined significantly between 1993 and 2002 both in terms of accidents per 100,000 departures and accidents per 100,000 flight hours. The rate of decline using both exposure measures was very similar. The annual rate of decline per 100,000 departures and per 100,000 flight hours is approximately 7 per cent annually.

FIGURE 16:
General aviation fatal accidents per 100,000 departures – 1993 to 2002



Source: ATSB

FIGURE 17:
General aviation fatal accidents per 100,000 hours flown – 1993 to 2002



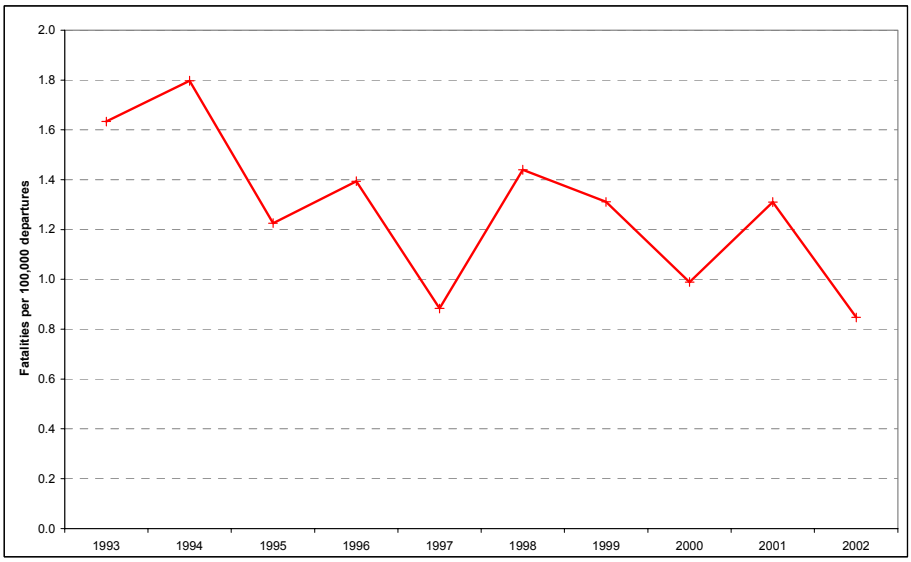
Source: ATSB

Figures 16 and 17 show the number of fatal accidents per 100,000 departures and per 100,000 hours flown in the GA sector between 1993 and 2002.

GA fatal accidents account for 99 per cent of all fatal accidents among GA and RPT operations. The figures show that there was a significant decline in general aviation fatal accidents between 1993 and 2002 both in terms of fatal accidents per 100,000 departures and fatal accidents per 100,000 flight hours. There was significant fluctuation in the numbers from year to year.

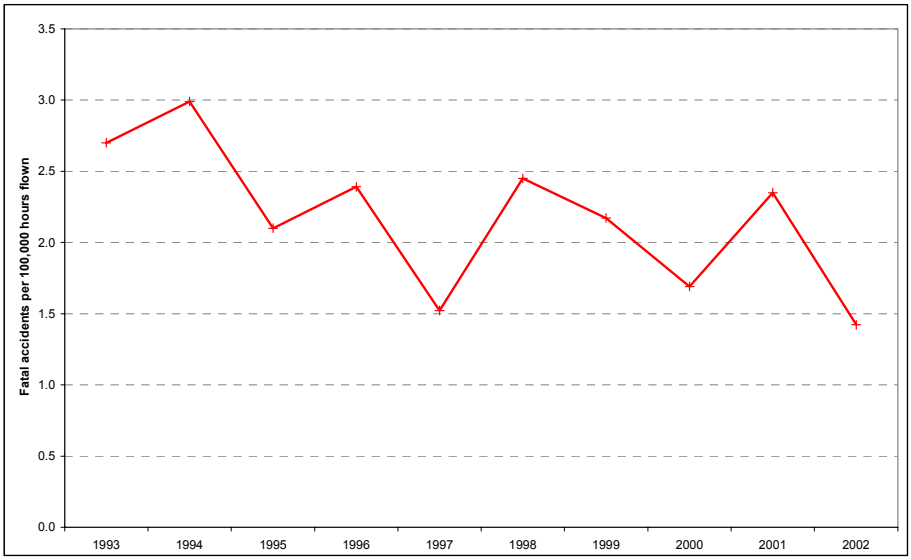
The rate of decline using both exposure measures was very similar. The annual rate of decline per 100,000 departures and per 100,000 flight hours is approximately 8 per cent annually. However, if the number of fatal accidents in 2003 was similar to 2001 rather than 2002, much of the trend would dissipate.

FIGURE 18:
General aviation fatalities per 100,000 departures – 1993 to 2002



Source: ATSB

FIGURE 19:
General aviation fatalities per 100,000 hours flown – 1993 to 2002



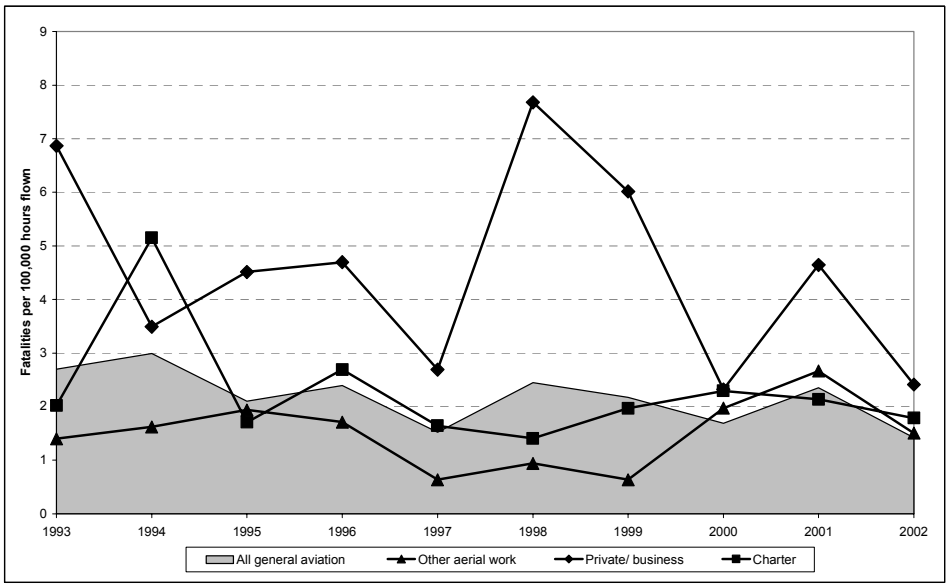
Source: ATSB

Figures 18 and 19 show the number of fatalities per 100,000 departures and per 100,000 hours flown in the GA sector between 1993 and 2002.

The figures show that there was a significant decline in general aviation fatalities between 1993 and 2002 both in terms of fatal accidents per 100,000 departures and fatal accidents per 100,000 flight hours. As for fatal accidents, there was significant fluctuation in the numbers from year to year.

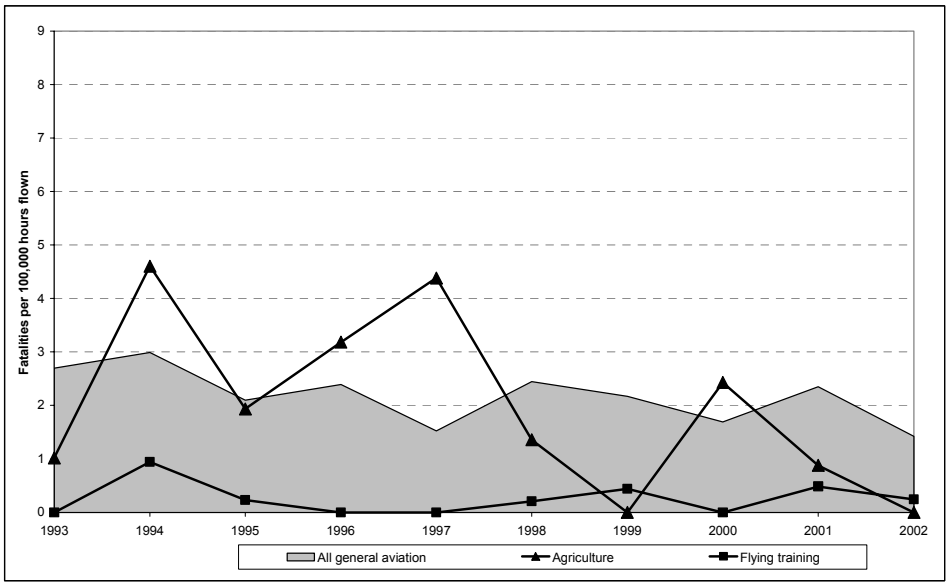
The rate of decline using both exposure measures was very similar. The annual rate of decline per 100,000 departures and per 100,000 flight hours is approximately 7 per cent annually. However, if the number of fatal accidents in 2003 was similar to 2001 rather than 2002, much of the trend would dissipate.

FIGURE 20a:
General aviation fatality rates per 100,000 hours flown by industry sector – 1993 to 2002



Source: ATSB

FIGURE 20b:
General aviation fatality rates per 100,000 hours flown by industry sector – 1993 to 2002



Source: ATSB

Figures 20a and 20b show the annual accident rates per 100,000 hours flown by all major types of operations within the GA sector between 1993 and 2002 (see also Appendix, Tables A7, A8 and A9).

The numbers in GA operations are erratic and it is difficult to identify a trend in any individual type of operation. Agriculture operations and private/business operations have consistently had the highest accident rates. It is not possible to identify any statistically significant trends because of the relatively small numbers involved.

Conclusions

While there has been slight growth in overall aviation activity, it has been driven primarily by increases in HCRPT operations. There was little change in activity within the LCRPT and general aviation sectors.

HCRPT operations have maintained a zero fatality rate (since the 1960s) and the number of accidents has remained low and stable.

LCRPT fatal crashes were relatively low throughout the period, with seven years of the nine years reported recording zero fatalities. Accidents in the LCRPT sector have remained low and stable. Rates were not calculated for the RPT sector due to the relatively small numbers involved and consequent volatility.

Accident, fatal accident and fatality rates for GA all showed declines. The GA accident rate exhibited the sharpest decrease. The GA accident rate per 100,000 departures was 47 per cent lower in 2002 than in 1993.

Current information holdings do not permit reliable analysis of incident trends and developments based on time series data. This is due, principally, to variations over time in the reporting of incidents – which has come about through the introduction of ESIR, bird strike reporting, changes in reporting completeness and category changes within the ATSB.

Overall the data suggest that Australian aviation is, by world standards, extremely safe and there was an improvement in safety in the decades to 31 December 2002. However, there is no room for complacency. If the number of GA fatal accidents and fatalities in 2003 was similar to that in 2001 rather than 2002, much of the downward trend would dissipate. One major high capacity RPT fatal accident would have a dramatic negative impact on the fatality rate.

Appendix

TABLE A1:
Annual hours flown ('000) by industry sector & type of operation - 1993 to 2002

Sector	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Regular public transport										
High capacity	553.5	612.5	666.1	704.5	718.2	708.5	709.5	777.2	798.8	719.3
Low capacity	230.4	244.9	248.1	258.2	276.7	285.5	285.4	285.7	249.2	208.5
Total	783.9	857.4	914.2	962.7	994.9	994.0	994.9	1062.9	1048.1	927.8
General aviation										
Agriculture	97.9	86.9	103.2	125.6	136.9	147.4	134.5	123.6	113.8	77.3
Charter	396.5	427.2	468.8	483.3	486.7	497.5	507.5	479.7	468.6	448.0
Flying training	442.7	424.9	436.5	450.4	455.3	484.0	454.4	419.4	411.1	415.2
Other aerial work	286.1	308.5	309.7	292.5	314.6	319.3	313.6	304.2	300.3	332.5
Private/ business	480.7	458.2	443.2	447.3	445.7	429.7	432.1	387.9	409.2	414.8
Total	1703.9	1705.7	1761.3	1799.0	1839.3	1877.9	1842.2	1714.8	1702.9	1687.7

Source: DOTARS AvStats

TABLE A2:
Annual aircraft departures ('000) by industry sector - 1993 to 2002

Sector	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Regular public transport										
High capacity	258.5	271.5	293.4	299.6	295.1	293.1	293.4	323.2	339.9	310.1
Low capacity	305.1	311.1	310.1	324.8	325.0	329.5	331.3	326.7	275.4	220.4
Total	563.6	582.6	603.5	624.4	620.2	622.6	624.7	649.9	615.2	530.5
General aviation	2816.6	2838.3	3017.7	3084.7	3168.6	3194.4	3050.0	2931.4	3052.7	2832.9

Source: DOTARS AvStats

TABLE A3:
Annual regular public transport passengers carried (‘000) by industry sector – 1993 to 2002

	1993	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
High capacity	24728	27288	29017	30686	31163	31082	31724	34375	36013	34858
Low capacity	3157	3496	3581	3881	4112	4162	4301	4587	3835	3027
Total	27885	30784	32598	34568	35275	35243	36025	38962	39848	37885

Source: DOTARS AvStats

TABLE A4:
Annual accidents by industry sector – 1993 to 2002

Sector	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Regular public transport										
High capacity	1	2	1	1	0	1	7*	3	3	1
Low capacity	5	4	4	2	0	2	3	3	3	4
Total	6	6	5	3	0	3	10*	6	6	5
General aviation										
Agriculture	24	16	29	33	34	35	24	21	16	10
Charter	44	49	42	34	49	41	21	26	32	19
Flying training	37	28	36	26	38	24	32	34	19	23
Other aerial work	35	27	19	27	34	17	18	27	25	15
Private/ business	117	86	90	83	74	91	71	79	84	69
Total	257	206	216	203	229	208	166	187	176	136

** Includes 5 accidents where aircraft were on the ground with passengers on board.*
Source: ATSB

TABLE A5:
Annual fatal accidents by industry sector – 1993 to 2002

Sector	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Regular public transport										
High capacity	0	0	0	0	0	0	0	0	0	0
Low capacity	1	0	1*	0	0	0	0	1	0	0
Total	1	0	1*	0	0	0	0	1	0	0
General aviation										
Agriculture	1	4	2	4	5	2	0	3	1	0
Charter	4	6	3	6	4	2	3	3	4	3
Flying training	0	2	1	0	0	1	2	0	2	1
Other aerial work	3	4	4	4	1	2	1	2	4	2
Private/ business	14	9	12	9	7	16	15	8	10	4
Total	22	25	22	23	17	23	21	16	21	10

** Includes 1 RPT training flight with two fatalities.*
Source: ATSB

TABLE A6:
Annual fatalities by industry sector – 1993 to 2002

Sector	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Regular public transport										
High capacity	0	0	0	0	0	0	0	0	0	0
Low capacity	7	0	2*	0	0	0	0	8	0	0
Total	7	0	2*	0	0	0	0	8	0	0
General aviation										
Agriculture	1	4	2	4	6	2	0	3	1	0
Charter	8	22	8	13	8	7	10	11	10	8
Flying training	0	4	1	0	0	1	2	0	2	1
Other aerial work	4	5	6	5	2	3	2	6	8	5
Private/ business	33	16	20	21	12	33	26	9	19	10
Total	46	51	37	43	28	46	40	29	40	24

** Includes 1 RPT training flight with two fatalities.*
Source: ATSB

TABLE A7:
General aviation accident rates per 100,000 hours flown – 1993 to 2002

Sector	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Agriculture	24.5	18.4	28.1	26.3	24.8	23.7	17.8	17.0	14.1	12.9
Charter	11.1	11.5	9.0	7.0	10.1	8.2	4.1	5.4	6.8	4.2
Flying training	8.4	6.6	8.2	5.8	8.3	5.0	7.0	8.1	4.6	5.5
Other aerial work	12.2	8.8	6.1	9.2	10.8	5.3	5.7	8.9	8.3	4.5
Private/ business	24.3	18.8	20.3	18.6	16.6	21.2	16.4	20.4	20.5	16.6
Total	15.1	12.1	12.3	11.3	12.5	11.1	9.0	10.9	10.3	8.1

Source: ATSB

TABLE A8:
General aviation fatal accident rates per 100,000 hours flown – 1993 to 2002

Sector	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Agriculture	1.0	4.6	1.9	3.2	3.7	1.4	0.0	2.4	0.9	0.0
Charter	1.0	1.4	0.6	1.2	0.8	0.4	0.6	0.6	0.9	0.7
Flying training	0.0	0.5	0.2	0.0	0.0	0.2	0.4	0.0	0.5	0.2
Other aerial work	1.0	1.3	1.3	1.4	0.3	0.6	0.3	0.7	1.3	0.6
Private/ business	2.9	2.0	2.7	2.0	1.6	3.7	3.5	2.1	2.4	1.0
Total	1.3	1.5	1.2	1.3	0.9	1.2	1.1	0.9	1.2	0.6

Source: ATSB

TABLE A9:
General aviation fatality rates per 100,000 hours flown – 1993 to 2002

Sector	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Agriculture	1.0	4.6	1.9	3.2	4.4	1.4	0.0	2.4	0.9	0.0
Charter	2.0	5.1	1.7	2.7	1.6	1.4	2.0	2.3	2.1	1.8
Flying training	0.0	0.9	0.2	0.0	0.0	0.2	0.4	0.0	0.5	0.2
Other aerial work	1.4	1.6	1.9	1.7	0.6	0.9	0.6	2.0	2.7	1.5
Private/ business	6.9	3.5	4.5	4.7	2.7	7.7	6.0	2.3	4.6	2.4
Total	2.7	3.0	2.1	2.4	1.5	2.4	2.2	1.7	2.3	1.4

Source: ATSB

Glossary of terms

These definitions are in accordance with the ICAO *International Standards and Recommended Practices, Aircraft Accident and Incident Investigation, Annex13 to the Convention on International Civil Aviation*.

Accident

An occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight until such time as all persons have disembarked, in which:

a) a person is fatally or seriously injured as a result of:
   - ⇒ being in the aircraft,
   - ⇒ direct contact with any part of the aircraft including parts which have become detached from the aircraft, or
   - ⇒ direct exposure to a jet blast.

except when the injuries are from natural causes, self inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or

b) the aircraft incurs substantial damage or is destroyed; or

c) the aircraft is missing or is completely inaccessible.

NOTE: An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.

Agriculture operations

Operations involving the carriage and/or spreading of chemicals, seed, fertiliser or other substances for agricultural purposes, including operation for the purpose of pest and disease control.

Aircraft movement

A take-off (aircraft departure) or a landing (arrival) is recorded as one aircraft movement. A 'touch and go' operation is counted as two movements.

Charter operations

Carriage of cargo or passengers on non-scheduled operations by the aircraft operator, or the operator's employees, in trade or commerce, but excluding regular public transport operations.

Departure

A take-off, recorded by Airservices Australia, by an aircraft from an airport or aerodrome.

Domestic airline

Operators of scheduled domestic RPT services, excluding charter (non-scheduled) and regional airline services. These include those airlines performing RPT services and those whose fleets contain high capacity aircraft.

Flying training

Flying under instruction for the issue or renewal of a licence or rating, aircraft type endorsement or conversion training. Includes solo navigation exercises conducted as part of a course of applied flying training.

General aviation (GA)

For the purposes of this document, general aviation has been defined as all non-scheduled flying activity in aircraft, with Australian registered aircraft allocated a VH-registration by CASA, excluding VH-registered sailplanes (powered and non-powered). Ultralight aircraft, hang gliders, balloons and autogyros are also excluded.

High capacity regular public transport (HCRPT)

A high capacity RPT aircraft is defined as an aircraft that is certified as having a maximum seating capacity exceeding 38 seats or a maximum payload exceeding 4,200 kg.

Hours flown

Hours flown are calculated on a ‘chock to chock’ (wheel start to wheel stop) basis, and therefore includes taxiing time

Incident

An occurrence, other than an accident, associated with the operation of an aircraft that affects or could affect the safety operation of the aircraft.

International airline

Operators of scheduled international RPT, excluding charter traffic.

Low capacity regular public transport (LCRPT)

A low capacity RPT aircraft is defined as being certified as having a maximum seating capacity less than or equal to 38 seats or maximum payload less than or equal to 4,200 kg.

Other aerial work

Includes all aerial survey and photography, spotting, aerial stock mustering, search and rescue, ambulance, towing (including glider, target and banner towing) and other aerial work, including advertising, cloud seeding, fire fighting, parachute dropping, and coastal surveillance.

Passenger movement

A passenger arrival or departure.

Private/business flying

Encompasses flying by the aircraft owner, the operator's employees or the hirer of the aircraft for business or professional reasons, but not directly in trade or commerce and; flying for private pleasure, sport or recreation, or personal transport not associated with a business or profession.

Regional airline

Operators of scheduled regional RPT services, excluding charter services. This includes those airlines performing RPT services and whose fleets contain exclusively low capacity aircraft.

Regular public transport (RPT)

All air service operations in which aircraft are available for the transport of members of the public, or for use by members of the public for the transport of cargo (freight and/or mail), for in trade or commerce and which are conducted in accordance with fixed schedules to and from fixed terminals over specific routes with or without intermediate stopping places between terminals. Charter or other non-scheduled operations are excluded.

VH-registered aircraft

Any aircraft certified by CASA to appear on the civil aviation register.