Australian Government
Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT
AVIATION RESEARCH PAPER
B2005/0388

Analysis of Fatality Trends involving Civil Aviation Aircraft in Australian Airspace between 1990 and 2005

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Analysis of fatality trends involving civil aviation aircraft in Australian airspace between 1990 and 2005

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Abstract

The research paper examined fatal accidents and fatalities involving civil aviation aircraft in Australian airspace between 1990 and 2005. The purpose of the paper was to provide accurate data to industry and the public by identifying key trends and characteristics. Specifically, the objectives of the paper were to (1) identify trends for fatal accidents and fatalities from 1990 to 2005, (2) examine the number of fatal accidents from 1990 to 2005 by pilot licence type, type of operation, level of proficiency, and aircraft type, and (3) examine the number of fatalities from 1990 to 2005 by pilot licence type, type of operation, level of proficiency and aircraft type. The ATSB aviation database was searched to identify all fatal accidents involving civil aviation aircraft operating in Australian airspace from 1 January 1990 to 31 December 2005. It was found that the number of reported fatal accidents and fatalities declined significantly between 1990 and 2005, with the highest number of fatal accidents and fatalities in 1990. The number of fatal accidents and fatalities reported in 2005 was below the annual average calculated for the 16-year period. Fatal accidents associated with both professional and non-professional pilots declined significantly between 1990 and 2005. In relation to type of operation, the findings show that both commerical and non-commerical operations experienced a significant decrease in the number of fatal accidents between 1990 and 2005. For commercial operations, 2004 was the lowest for the 16-year period for both fatal accidents and fatalities. An elevated fatality rate for 2005 was primarily because of a fatal accident at Lockhart River in Queensland, which involved 15 fatalities. The fatal accident and fatality rates for commercial and non-commercial operations in Australian airspace have been very low.

EXECUTIVE SUMMARY

In November and December 2005 the Australian media carried reports that the commercial aviation fatal accident rate in Australia was increasing and may now be the worst ever. In addition, it was suggested that the number of aviation fatalities involving professional pilots in Australia over the last three years was very high compared with the years since 1990 and possibly represented the world's worst record (see Annex A). This was surprising because previous studies had shown that aviation safety in Australia was at or near best practice in the developed world. The Executive Director of the ATSB therefore commissioned a research paper to review and test these claims.

This research paper examines data on fatal accidents and fatalities involving civil aviation aircraft in Australian airspace from 1990 to 2005. The purpose of this paper is to provide accurate data to industry and the public by identifying key trends and characteristics associated with fatal accident data for Australia. A subsequent paper, comparing Australian fatality rates with similar international rates, will be released later in 2006.

The ATSB aviation accident and incident database was searched to identify all fatal accidents involving civil aviation aircraft operating in Australian airspace from 1 January 1990 to 31 December 2005. Fatal accidents involving foreign registered aircraft that occurred in Australian airspace were included in the dataset. Military and sport operations were excluded. The number of fatal accidents and fatalities was then examined to identify trends in the 16 year period. In addition, the number of fatal accidents and fatalities were examined across pilot licence type, type of operation, and aircraft type.

Overall, the number of reported fatal accidents and fatalities declined significantly in the period from 1990 to 2005. The largest number of fatal accidents (30) and fatalities (64) was recorded in 1990. The lowest number of fatal accidents (10 and 11) and fatalities (24 and 23) occurred in 2002 and 2004. In 2005 there was an increase in the number of fatal accidents and fatalities to 13 and 34 respectively compared with 2004. But the number of fatal accidents and fatalities reported in 2005 was below the annual average (20 and 40 respectively) for the 16-year period.

Australia continues to have the best international record in high capacity regular public transport (RPT) with no hull losses or fatal accidents involving passenger jet aircraft.

There were four low capacity RPT fatal accidents involving 32 fatalities recorded in the ATSB database from 1990 to 2005 including a 1995 training accident in which there were no passengers on board. The other three low capacity RPT accidents were Monarch (1993), Whyalla (2000) and Lockhart River (2005).

Using the broadest definition of commercial aviation to include both RPT and General Aviation except for business/private and sport aviation still shows a significant decrease in the number of fatal accidents between 1990 and 2005. Although there was an increase and fatalities for commercial operations during 2005, the preceding year was the lowest recorded for the period examined for each of these measures.

The definition of a 'professional pilot' can be somewhat confusing because in addition to the highest category Air Transport Pilot Licence (ATPL), a Commercial Pilot Licence (CPL) category includes pilots of single pilot aircraft and multi-pilot private or aerial work aircraft. There were 44 pilots holding an ATPL or CPL

licence who were involved in a fatal accident that required a lower licence rating. This included accidents associated with business or private operations.

From 1990 to 2005 there were 32 fatal accidents associated with ATPL licence holders, 143 involving CPL holders and 115 with holders of a Private Pilot Licence (PPL). From 1990 to 2005 there were 97 fatalities associated with ATPL licence holders, 300 involving CPL holders and 214 with holders of a Private Pilot Licence (PPL). These raw data do not reflect the hours flown which are much greater for ATPL holders in particular and likely to also be the case for CPL holders. While there was no trend among ATPL licence holders from 1990 to 2005, there was a downward trend in fatal accidents among both CPL and PPL licence holders.

Using the broadest definition of professional pilot to include all ATPL and CPL licence holders, the data from 1990 was examined to see if fatal accidents and fatalities had increased in recent years in trend terms and also by comparison with private pilots. The data show no significant trend in fatalities involving professional pilots from 1990 to 2005 but a significant decline in the fatal accident trend. The data indicates that fatal accidents and fatalities involving professional pilots were much higher compared with private pilots in 1993, 1994 and 2000 than in 2003, 2004 and 2005. Accordingly, the gap is neither recent nor growing. It is also likely to reflect professional pilots' much higher flying hours.

Between 1990 and 2004 (the last year for which activity data is available) commercial operations recorded an average of 0.6 fatal accidents per 100,000 hours flown compared with an average of 2.4 fatal accidents per 100,000 hours flown for non-commercial operations.

While any aviation fatality is a tragedy, in terms of aviation safety data the results of the ATSB's analysis demonstrate that the fatal accident rate for both commercial and non-commercial operations is very low and has declined significantly between 1990 and 2005.

These findings are consistent with previous studies and do not support reports in the media suggesting a worsening of aviation safety in recent years.

ABBREVIATIONS

ATSB	Australian Transport Safety Bureau
BTRE	Bureau of Transport and Regional Economics
CASA	Civil Aviation Safety Authority
CFIT	Controlled Flight into Terrain
DOTARS	Australian Government Department of Transport and Regional Services
GA	General Aviation
ICAO	International Civil Aviation Organization
RPT	Regular Public Transport
UFIT	Uncontrolled Flight into Terrain

1 INTRODUCTION

1.1 The Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal body located within the Australian Government Department of Transport and Regional Services (DOTARS). The role of the ATSB is to investigate, analyse and report on transport safety matters under the *Transport Safety Investigation Act 2003* and regulations. Transport safety investigations and analyses of safety data are conducted in accordance with International Civil Aviation Organization (ICAO) Annex 13 Standards and Recommended Practices.

The ATSB's mission is to maintain and improve transport safety and public confidence through:

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

The ATSB investigates aircraft accidents and incidents (occurrences) to identify contributing factors and make safety recommendations. The ATSB also maintains a database of aviation safety occurrences involving Australian registered aircraft (occurring both in Australia and overseas) and occurrences in Australia involving foreign-registered aircraft.

1.2 Background to the Paper

In November and December 2005 the Australian media carried reports that the commercial aviation accident rate in Australia was increasing and may be the worst commercial fatality rate ever (see Annex A). In addition, it was suggested that the number of aviation fatalities involving 'professional' pilots in Australia over the last three years was very high compared with the years since 1990 and possibly represented the world's worst record. The Executive Director of the ATSB commissioned a research paper to review and test these claims.

1.3 Objective of this Research Paper

The purpose of this research paper was to examine fatal accidents and fatalities involving civil aviation aircraft in Australian airspace from 1990 to 2005 to provide accurate data to industry and the public by identifying key trends and characteristics. Specifically, the objectives of the paper were to:

- identify trends for fatal accidents and fatalities from 1990 to 2005;
- examine the number of fatal accidents from 1990 to 2005 by pilot licence type, type of operation, level of proficiency, and aircraft type; and
- examine the number of fatalities from 1990 to 2005 by pilot licence type, type of operation, level of proficiency, and aircraft type.

2 BACKGROUND INFORMATION

2.1 The Australian Aviation Industry

The Australian aviation industry can be divided into four main categories, including regular public transport (RPT), general aviation (GA), sport aviation, and military aviation (Figure 1). RPT and GA comprise the two largest groups of the industry and are the focus of this report.

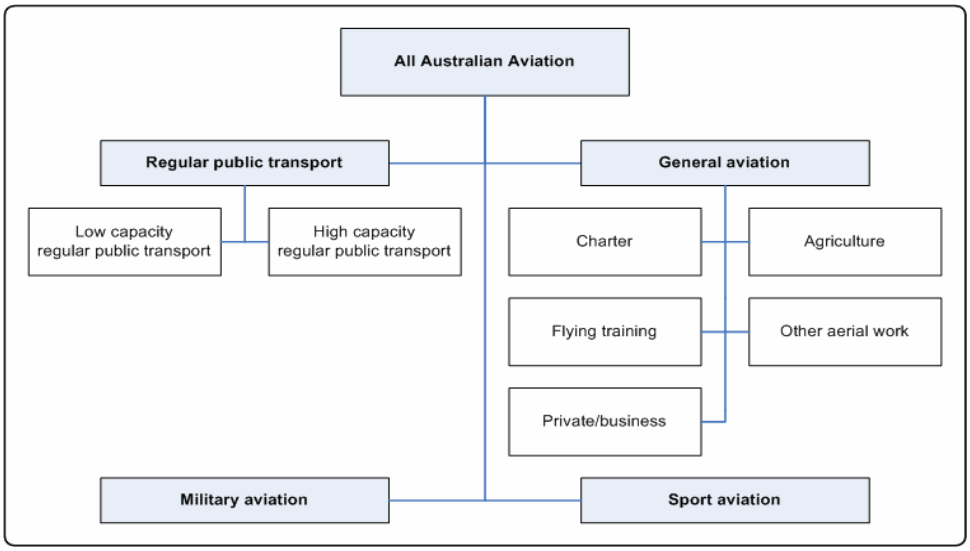
Regular Public Transport

'Regular public transport' refers to 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. RPT can be further divided into high capacity RPT and low capacity RPT operations, where high capacity RPT aircraft have a maximum seating capacity exceeding 38 seats or a maximum payload exceeding 4,200kg. In contrast, a low capacity RPT aircraft has a maximum seating capacity less than or equal to 38 seats and a maximum payload not exceeding 4,200kg.

General Aviation

'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). Also excluded are ultralight aircraft, non VH-registered military aircraft, hang gliders, balloons and autogyros. GA operations can be further divided into commercial and non-commercial operations. Commercial operations include charter, agriculture, flying training, and other aerial work. Non-commercial refers to private and business operations.

Figure 1. The composition of the Australian aviation industry



2.2 ATSB Accident and Incident Database

The ATSB is responsible for the independent investigation of accidents and incidents involving civil aircraft in Australia. This focus is reflected in the ATSB's aviation accident and incident database, which captures data predominantly from accidents and incidents involving regular public transport (RPT) and general aviation (GA) aircraft. Detailed data on sport aviation, including gliding, is generally not included in the database. In addition, data on military operations is generally not included, because it is overseen by military safety authorities.

For statistical purposes, the RPT and GA sectors of the Australian aviation industry can be further divided into a number of operational categories[1]. These include:

- **High Capacity Regular Public Transport** - A high capacity RPT aircraft is an aircraft that is certified as having a maximum seating capacity exceeding 38 seats or a maximum payload exceeding 4,200 kg.
- **Low Capacity Regular Public Transport** - A low capacity RPT aircraft is an aircraft that is certified as having a maximum seating capacity less than or equal to 38 seats or maximum pay load less than or equal to 4,200 kg.
- **Charter operations** - the carriage of cargo or passengers on non-scheduled operations by the aircraft operator, or the operators' employees, in trade or commerce, excluding regular public transport operations.
- **Agricultural operations** - operations involving the carriage and/or spreading chemicals, seed, fertilizer or other substances for agricultural purposes. It includes operations for the purpose of pest and disease control. Agricultural operations are a component of Aerial Work but are usually separated for reporting purposes.
- **Flying training** - flying under instruction for the issue or renewal of a license, rating, aircraft type endorsement or conversion training, including solo navigation exercises conducted as part of course of applied flying training. Flying training is a component of Aerial Work but is usually separated for reporting purposes.
- **Other Aerial Work** - Includes operations conducted for the purposes of aerial work other than 'flying training' and 'agricultural operations'. Operations classified as other aerial work include aerial surveying and photography, spotting, aerial stock mustering, search and rescue, ambulance, towing (including glider, target and banner towing), advertising, cloud seeding, fire fighting, parachute dropping, and coastal surveillance.
- **Business** - flying associated with a business or profession but not directly for hire and reward.
- **Private** - flying for recreation or personal transport that is not associated with a business or profession.

1 These definitions are based on the aviation statistical definitions used by the Bureau of Transport and Regional Economics (BTRE), Department of Transport and Regional Services. Further information is available from the BTRE website at http://www.btre.gov.au/statistics/aviation/definitions_download.aspx

For the purposes of this report, the number of fatal accidents and the number of fatalities that have occurred in Australian airspace between 1990 and 2005 will be examined across RPT and GA (commercial and non-commercial) operations.

2.3 Types of Licences Held by Pilots

The Civil Aviation Safety Authority (CASA) is responsible for the issuing of flight crew licences for all civilian pilots. The issuing of a licence to a pilot indicates that the holder has achieved a required level of training, skill and knowledge. There are various classes of licences that can be obtained by pilots wanting to operate a fixed wing or rotary wing aircraft. These classes and the prerequisites for obtaining a licence for each class are outlined below[2]:

- **Student Pilot Licence** – The student licence is a permit to learn to fly. To be eligible for a student licence, the applicant must be at least 16 years of age and able to speak, read and understand the English language. Student pilots can fly 'solo', but are restricted to their local training area and must obtain authorisation by their instructor. After students have completed further training and examination, they may act as pilot in command of an aircraft carrying passengers.

- **Private Pilot Licence (PPL)** – To be eligible for a PPL, the applicant must be at least 17 years of age and able to speak, read and understand the English language. In addition, applicants need to hold a flight radiotelephone operator licence, have passed a written examination and a flight test, and have a total of 40 hours of flight time across a number of specified conditions. Private pilots may fly themselves or passengers anywhere in Australia for recreational purposes and do not have to obtain prior authorisation from their instructor.

- **Commercial Pilot Licence (CPL)** – To be eligible for a CLP, the applicant must be at least 18 years of age and able to speak, read and understand the English language, and hold a flight radiotelephone operator licence. Applicants also need to have passed a written examination and flight test for CPL and have either passed a CASA approved theory and flying CPL training course or have acquired at least 200 hours flight time across a number of specified conditions. Commercial pilots are authorised to fly as pilot in command for a single pilot aircraft engaged in any operation and a multi pilot aircraft engaged in private or aerial work.

- **Air Transport Pilot Licence (ATPL) -** To be eligible for a ATPL, the applicant must be at least 21 years of age and able to speak, read and understand the English language, and hold a flight radiotelephone operator licence. Applicants also need to have passed a written examination and have held or hold a command multi-engine instrument rating. In addition, applicants need to have a total of 1500 hours flight time across a number of specified conditions. Air transport pilots may fly an aeroplane as pilot in command or co-pilot in any operation, including a large airline type aircraft.

In this report, the number of fatal accidents and the number of fatalities that have occurred in Australian airspace between 1990 and 2005 will be examined by the

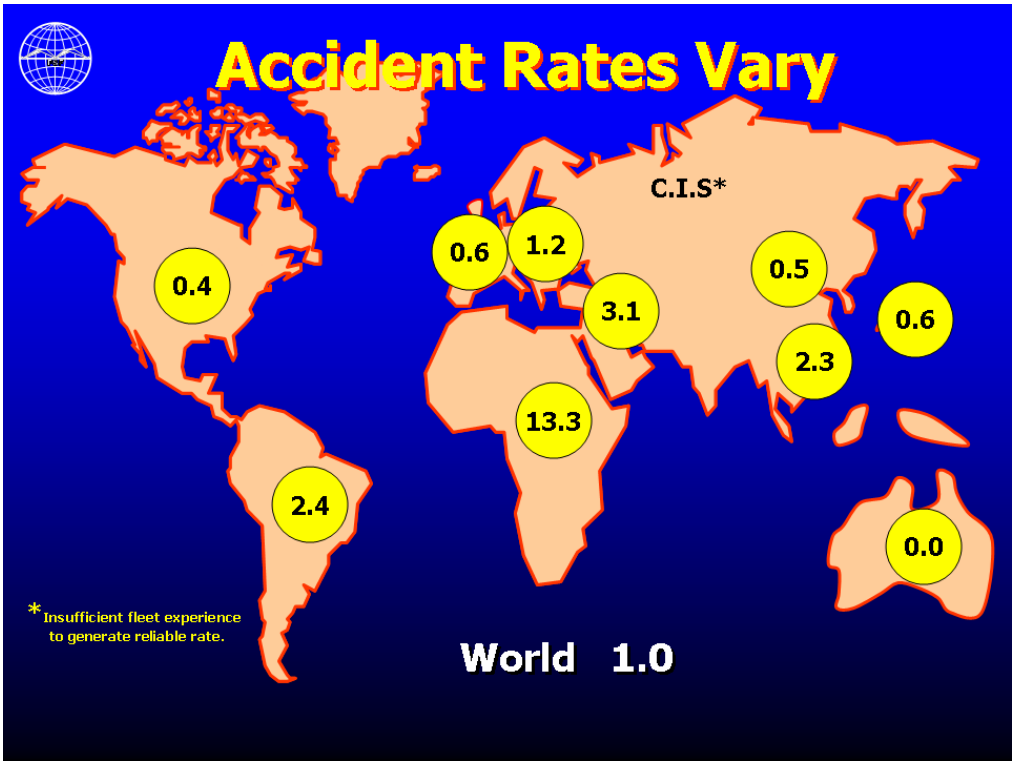
2 More detailed information on pilot licences, requirements and ratings is available from the CASA website, at http://www.casa.gov.au/fcl/licenrat.htm

highest level of licence attained by the pilot in command. As a result, it may not reflect that actual type of operation that was being conducted at the time of the accident. This places an upper limit on the data that can be attributed to the pilot's licence (ie an upper limit on the category 'professional pilot').

3 LITERATURE REVIEW

Previous examination of the ATSB aviation occurrence database has indicated that the number of fatal accidents in RPT operations involving Australian registered aircraft is relatively low by international standards. Most accidents identified have been associated with low capacity operations. This is not surprising, given that Australia has not experienced a high capacity RPT fatal accident since 1968 and has never had a fatal accident involving an RPT jet aircraft. As shown in the diagram below sourced from the Washington DC based Flight Safety Foundation, this record makes Australia one of the world leaders in aviation safety (Matthews, 2005).

Figure 2. Hull loss accidents per million departures for western built jets, 1994 – 2003



Source: Matthews (2005) Flight Safety Foundation

The ATSB has published a number of research reports including statistics on fatal accidents in recent years. The findings of three reports relevant to the current analysis are briefly reviewed here.

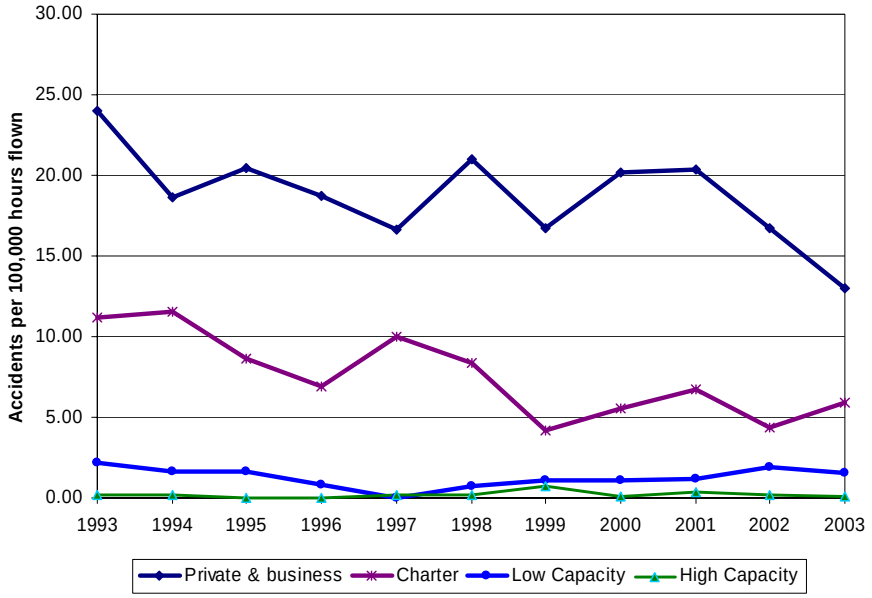
3.1 Aviation Safety Indicators

In June 2005 the ATSB published a report on aviation safety indicators relating to Australian aviation (ATSB, 2005b). Data on aviation accidents and incidents, aviation activity, and the aviation industry was collected from a number of sources, including the ATSB aviation occurrence database, the BTRE, CASA and Airservices Australia. Examination of the data provided the basis of an in-depth analysis of trends and developments in aviation safety, including trends in RPT and GA fatal accidents and fatalities for 1993-2003.

Among the indices examined was the accident rate for both fatal and non-fatal accidents for all major aviation industry categories (i.e. private and business,

charter, low capacity, and high capacity RPT). The rate of accidents was calculated as the number of accidents per 100,000 hours flown. As shown in Figure 3, the accident rate for high capacity and low capacity RPT operations remained low across the reported period (ATSB, 2005a).

Figure 3. Accidents per 100,000 hours flown by industry category, 1993 – 2003



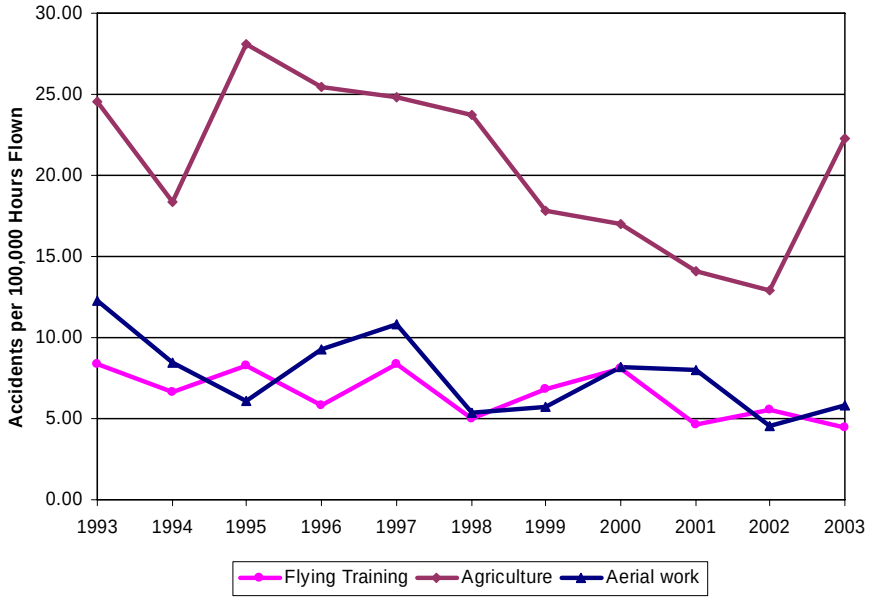
In relation to RPT accidents, the findings revealed that the number of accidents involving high capacity operations in Australian airspace were relatively rare. No high capacity RPT accidents were reported in 1995, 1996 and 1997. Furthermore, no high capacity RPT fatal accidents or fatalities were reported between 1993 and 2003. Accidents were also low in the low capacity RPT category, with a maximum of five accidents recorded in any one year.

The number of reported GA accidents was higher than the number of reported RPT accidents throughout the 1993-2003 period. The highest number (n = 255) of accidents occurred in 1993 and generally declined across the period to the lowest number (n = 130) in 2003. In total, there were 411 fatalities recorded during the period, with the highest number (n = 51) occurring in 1994.

Further examination of the GA accident rates indicated that the highest rates of accidents occurred in the private/business and agricultural categories (Figures 3 and 4). In 2003 there were 13.0 accidents per 100,000 hours of private/business operations and 22.3 accidents per 100,000 hours flown of agricultural operations. Despite some variations in annual rates, private/business operations recorded a slight overall downward trend recording 24.0 accidents per 100,000 hours in 1993 compared with 13.0 in 2003[3].

3 The ATSB's *2005 Annual Review* showed that there continued to be a downward trend in total accidents recorded in GA to the end of 2005 (ATSB, 2005a).

Figure 4. General aviation accidents per 100,000 hours flown by industry category, 1993 – 2003



3.2 General Aviation Fatal Accidents (1991-2000)

Prior to the aviation safety indicators report, the ATSB conducted an extensive examination of fatal accidents involving Australian registered GA aircraft between 1991 and 2000 (ATSB, 2004). In total, there were 215 fatal accidents identified over the 10-year period (Table 1). All but two of the accidents occurred within Australia.

Table 1. General aviation fatal accidents and fatal accidents per 100,000 hours flown, 1991 – 2000

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	1991-2000
Fatal Accidents	21	26	22	25	22	23	16	23	21	16	215
Rate	1.2	1.6	1.3	1.5	1.3	1.3	0.9	1.2	1.1	0.9	1.2

According to the annual fatal accident rate (defined as the number of fatal accidents per 100,000 hours flown), the number of fatal accidents decreased from 1.6 fatal accidents per 100,000 hours flown in 1991 to 0.9 in 2000. However, the decrease was not found to be statistically significant.

Further examination of the data indicated that the 215 accidents resulted in 414 fatalities. As shown in Table 2, the highest number of fatalities (n = 51) occurred in 1995 and the lowest number (n = 26) occurred in 1997.

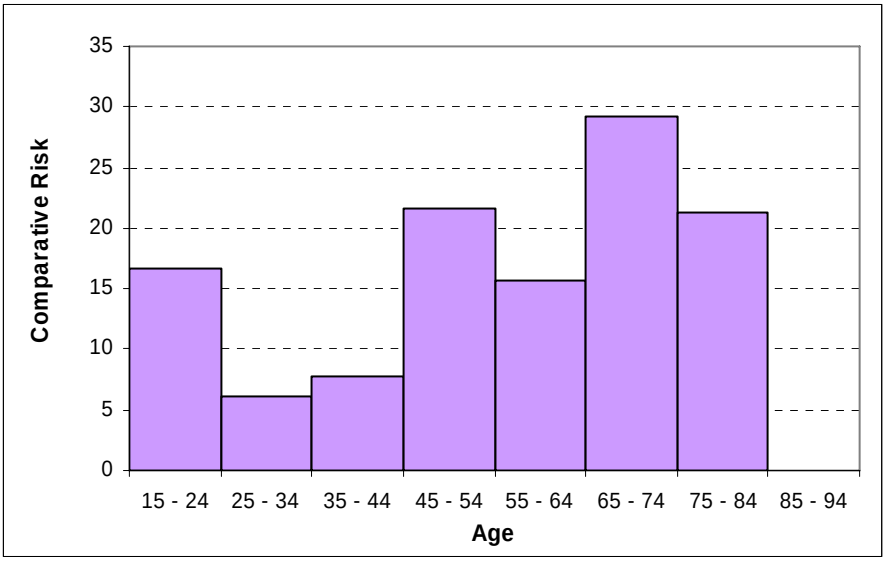
Table 2. Table 1. General aviation fatalities, 1991 – 2000

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	1991-2000
Crew	22	23	20	26	23	21	14	22	20	17	208
Passenger	23	26	25	25	14	22	12	24	20	12	203
Third Party	0	1	1	0	0	0	0	0	0	0	2
Total	45	50	46	51	37	43	26	46	40	29	413

Examination of the characteristics of the fatal accidents indicated that there were 163 occurrences involving at least one fixed wing aircraft and 52 involving a helicopter. The largest category of fatal accidents (56 per cent) involved non-commercial operations flown by the private/business group. The remaining accidents involved aircraft undertaking commercial operations (44 per cent), and included charter, agriculture, other aerial work and flying training operations. The two main reasons for the fatal accidents were uncontrolled flight into terrain (UFIT), which accounted for 46 per cent of the accidents and controlled flight into terrain (CFIT), which accounted for 30 per cent[4].

In relation to pilot age, the report found that there was a relatively high risk of a fatal accident per hour flown for pilots aged between 15 and 24. As shown in Figure 5, the risk then dropped for pilots aged between 25 and 34. The highest level of risk per hour flown was associated with pilots in the 65 – 74 age group.

Figure 5. Comparative risk of a fatal accident per hour flown by age group[5]

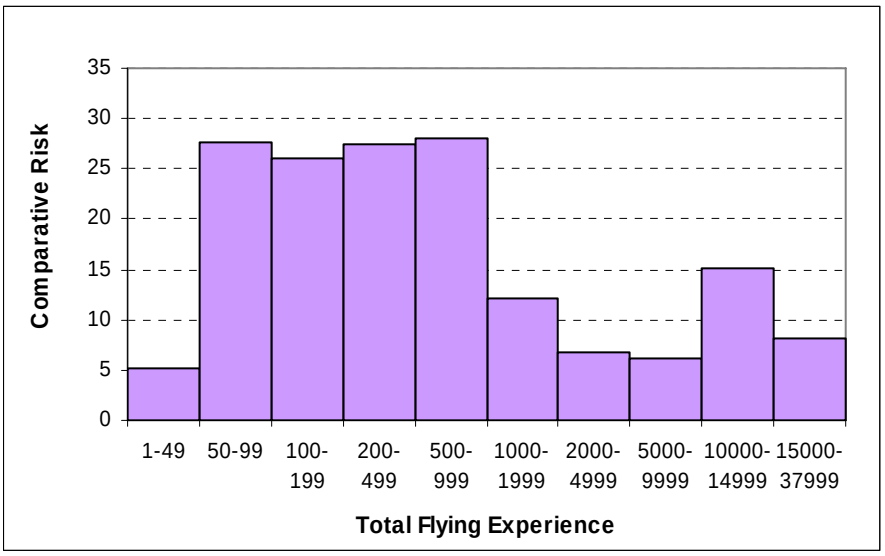


The report also found that pilots with 1 – 49 hours of flying experience had a low risk of a fatal accident per hour flown. Furthermore, the risk of a fatal accident per hour flown was greater from 50 to 999 hours than from 1000 hours and upwards.

4 The ATSB has highlighted the dangers of CFIT accidents in a number of aviation investigation reports, including the Raytheon Beech 200C near Mt Gambier, SA in December 2001 (BO/200105769) and the Ilyushin IL-76 TD near Baucau, Timor Leste in January 2003 (BO/200300263).

5 Ratio of fatal accident pilots to active general aviation pilots sorted by age group, divided by the average hours flown by that age group in the previous six months and multiplied by 100,000.

Figure 6. Comparative risk of a fatal accident per hour flown by total flying experience[6]



3.3 Comparison of General Aviation Fatal Accidents with International Data

In an earlier report, the ATSB compared fatal accident trends in Australia with similar trends in the US and Canada, from 1990 and 2000 (ATSB, 2001). The purpose of this report was to provide a benchmark with which to examine Australia's GA safety record with that of other countries. The two benchmarking measures used were fatal accidents and fatalities.

The findings for reported GA fatal accidents per 100,000 flights hours for 1990-2000 are presented in Figure 7. The findings for reported GA fatalities per 100,000 flight hours for 1990 – 2000 are presented in Figure 8. In summary, the main findings indicated that:

- Australia's GA fatal accident rate declined from 1.41 fatal accidents per 100,000 flight hours in 1990 to 1.00 fatal accidents per 100,000 flight hours in 2000[7].
- Australia's GA fatal accident rate per 100,000 flight hours for the year 2000 was the lowest of the three countries reported.
- Australia's GA fatal accident rate per 100,000 flight hours was below the Canadian and US rate for all years except for 1994 and 1998.
- Australia's GA fatality rate per 100,000 flight hours was below the Canadian and US rate for all years except for 1990 and 1999.
- The Canadian and US fatal accident and fatality rates both improved towards the end of 1990-2000 and were closer to Australia's rates.

6 Ratio of fatal accident pilots to active general aviation pilots sorted by flying experience, divided by the average hours flown by that age group in the previous six months and multiplied by 100,000.

7 The ATSB estimated hours flown data for the year 2000.

Figure 7. General aviation fatal accidents per 100,000 flight hours, 1990 – 2000

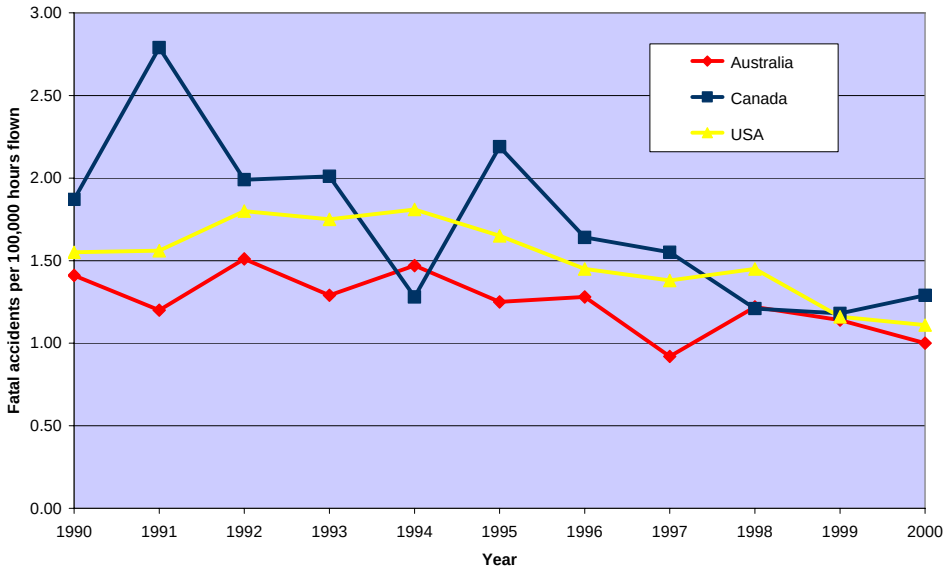
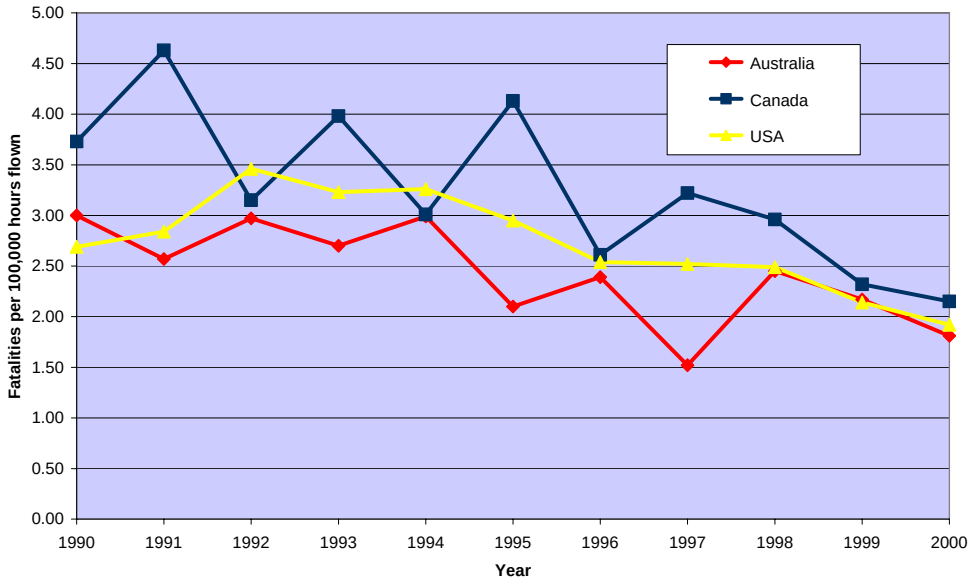


Figure 8. General aviation fatalities per 100,000 flight hours, 1990 – 2000



3.4 Summary of Previous Findings

The ATSB occurrence database is dynamic and subject to minor change due to data re-coding and re-classification. The analysis of fatal accidents and fatalities presented in this report examines the most recent data to date, and where possible, data up to and including 2005.

Together, the findings of previous ATSB reports examining fatal accident data provide an important insight into statistical measures of aviation safety and safety trends in the Australian aviation industry. The main focus of analysis has been on GA operations. This is not surprising, given that most fatal accidents that have occurred since the early 1990s have fallen within this category. The ATSB has, of course, also investigated RPT and other accidents and incidents over the period and reported the results publicly in the interest of future safety.

In summary, the key findings relating to fatal accidents indicate that:

- There were no fatal accidents or hull losses involving high capacity RPT operations in Australia, between 1994 and 2003 (or from 1990 to 2005).
- There was a total of three fatal accidents reported for low capacity RPT operations in Australia between 1993 and 2003 including a non-passenger training flight in 1995 (the Lockhart River accident in 2005 was therefore the fourth).
- Non-commercial operations flown by the private/business GA sub-sector in Australia represented the largest category of fatal accidents between 1991 and 2000.
- Australia's GA fatal accident and fatality rates were generally lower that the Canadian and US rate, from 1990 to 2000.

4 METHODOLOGY

4.1 Data Sources

Information on fatal accidents and fatalities was extracted from the ATSB accident and incident database. The number of hours flown for all operations was provided by the BTRE. This data was used to calculate fatal accident rates for all civil aviation operations in Australian airspace.

4.2 Method of Analysis

The ATSB aviation and incident database was searched to identify all fatal accidents involving civil aviation aircraft operating in Australian airspace from 1 January 1990 to 31 December 2005. The definition of an 'accident' was based on the definition provided in Annex 13 to the Convention on International Civil Aviation, published by the International Civil Aviation Organization (ICAO). Annex 13 states:

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

  a) a person is fatally or seriously injured as a result of:
  - being in the aircraft, or
  - direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or
  - direct exposure to 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 sustains damage or structural failure which:
  - adversely affects the structural strength, performance or flight characteristics of the aircraft, and
  - would normally require major repair or replacement of the affected component,

  except for engine failure or damage, when the damage is limited to the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennas, tires, brakes, fairings, small dents or puncture holes in the aircraft skin; or

  c) the aircraft is missing or is completely inaccessible.

  Note 1. For statistical uniformity only an injury resulting in death within thirty days of the date of the accident is classified as a fatal injury by ICAO.

  Note 2. An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.

Fatal accidents involving foreign registered aircraft that occurred in Australian airspace were included in the dataset. All fatal accidents involving sport aviation aircraft including gliders were excluded from the dataset.

The fatal accidents were subsequently examined in relation to: (1) the number of fatal accidents, and (2) the number of fatalities that occurred between 1990 and 2005.

1. Fatal accidents were examined across:

- pilot experience
- time on type
- type of licence
- type of aircraft operation
- level of pilot proficiency
- weight of aircraft

2. Fatalities were examined across:

- occupants
- type of licence
- type of aircraft operation
- level of pilot proficiency
- weight of aircraft

4.3 Explanatory Notes

- The ATSB accident and incident database is dynamic and subject to change. Recent data changes may result in differences between the current report and previously published figures.
- The paper used data for complete calendar years.
- The most recent data for the number of hours flown for all operations was 2004.
- The level of analysis did not take into account the level of activity within the licence categories due to the lack of suitable data.
- Where appropriate, data was presented graphically. Linear trend lines were only included if there was a statistically significant increase or decrease in the data. Trend analyses were not performed when cell numbers were low.
- Civil aviation referred to all non-military aviation operations in Australian airspace, including operations involving foreign-registered aircraft but excluding sport.
- Demographic information on the pilot's age, flying experience and time on type was not available for all fatal accidents.
- References to the pilot refer to the pilot in command at the time of the accident.
- Pilot licence data referred to the highest level of licence held by the pilot in command at the time of the accident as opposed to the type of licence required for the operation. Therefore, an accident involving a pilot holding an ATPL licence that was involved in a fatal accident during a private operation would be categorised as an accident involving an ATPL licence.
- Reference to professional pilots referred to pilots holding an ATPL or CPL licence. Reference to non-professional pilots referred to pilots holding a PPL or student licence. It also referred to one flight that was conducted by an unlicensed pilot.
- Where there were multiple aircraft involved and only one aircraft experienced fatalities, the details of the pilot of this aircraft were included in the analysis.
- Where appropriate, data were adjusted for activity using aircraft hours flown. This was the most suitable activity data available for all operation categories.

5 RESULTS

5.1 Trends in Fatal Accidents and Fatalities

Fatal Accidents

Figure 9 shows the number of fatal accidents reported to the ATSB between 1990 and 2005. The highest number of fatal accidents occurred in 1990 (n = 30) and the lowest number occurred in 2002 (n = 10). There was a significant decline in fatal accidents in the 1990-2005 period ($r^2 = 0.70$, $p = 0.00$).

The number of fatal accidents for 2005 was 13. This number was substantially lower than the average number of accidents for 1990 – 2005, which was 20 per year. The number of fatal accidents increased by two between 2004 and 2005.

Figure 9. Fatal accidents reported to the ATSB, 1990 – 2005

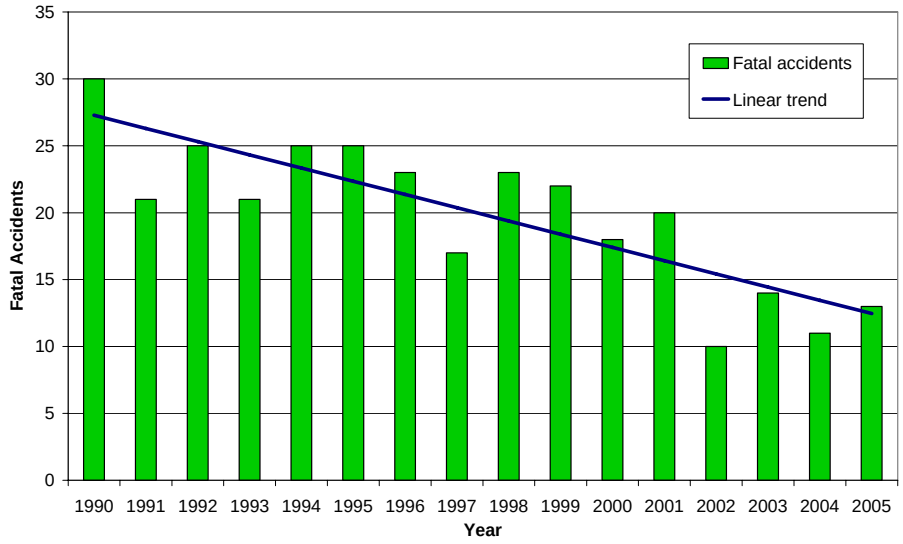
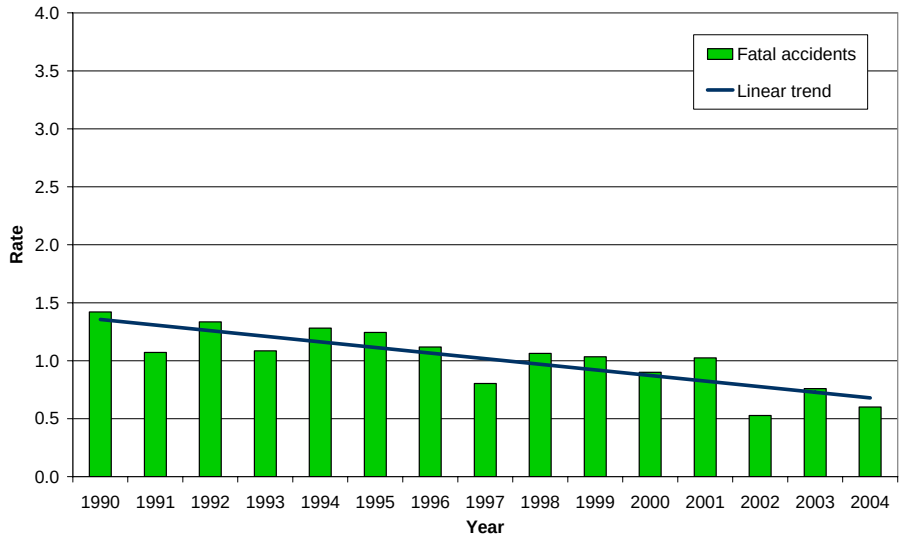


Figure 10 shows the number of fatal accidents per 100,000 hours flown between 1990 and 2004. The highest rate was recorded in 1990, where 1.4 fatal accidents occurred per 100,000 hours flown. In contrast, the lowest rate was recorded in 2002 where 0.5 fatal accidents occurred per 100,000 hours flown. There was a significant decline in the rate in the 1990 – 2004 period ($r^2 = 0.69$, $p = 0.00$).

Figure 10. Fatal accidents per 100,000 hours flown, 1990 – 2004.



Fatalities

The number of fatalities reported to the ATSB between 1990 and 2005 is presented in Figure 11. The highest number of fatalities occurred in 1990 (n = 64) and the lowest number occurred in 2004 (n = 23). There was a significant decline in fatalities in the 1990 – 2005 period (r^2 = 0.63, p = 0.00).

The number of fatalities for 2005 was 34. This is lower than the average annual number of fatalities between 1990 and 2005, which was 40. The number of fatalities increased by 11 between 2004 and 2005. There were 13 fatal accidents that contributed to this figure.

Figure 11. Fatalities, 1990 – 2005

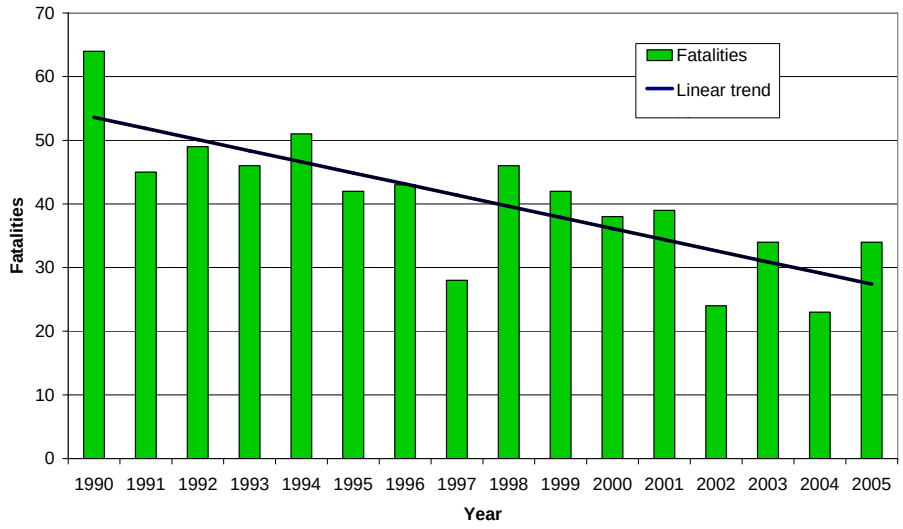
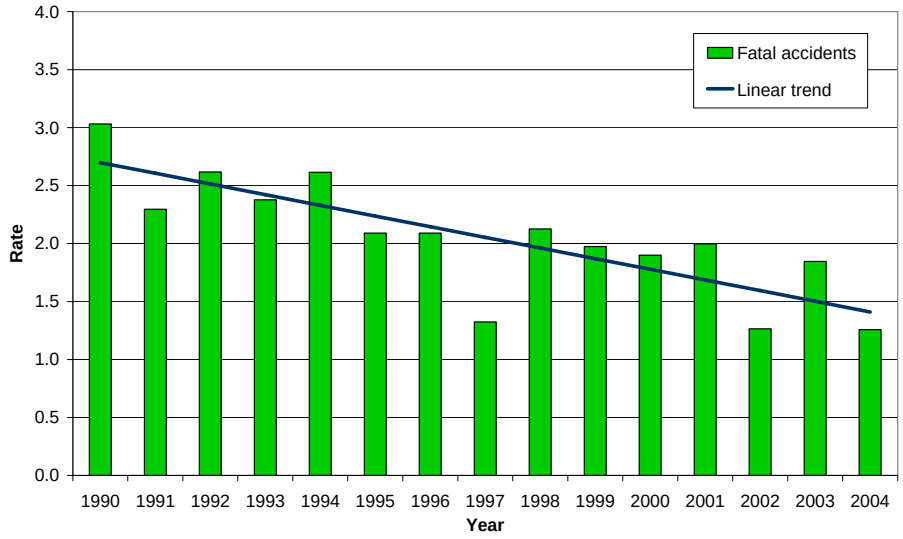


Figure 12 shows the number of fatalities per 100,000 hours flown between 1990 and 2004. The highest rate was recorded in 1990, where 3.0 fatal accidents occurred per 100,000 hours flown. In contrast, the lowest rate was recorded in 1997, 2002 and 2004, where 1.3 fatalities occurred per 100,000 hours flown. There was a significant decline in the rate in the 1990 – 2004 period ($r^2 = 0.65$, $p = 0.00$).

Figure 12. Fatalities per 100,000 hours flown, 1990 – 2004.



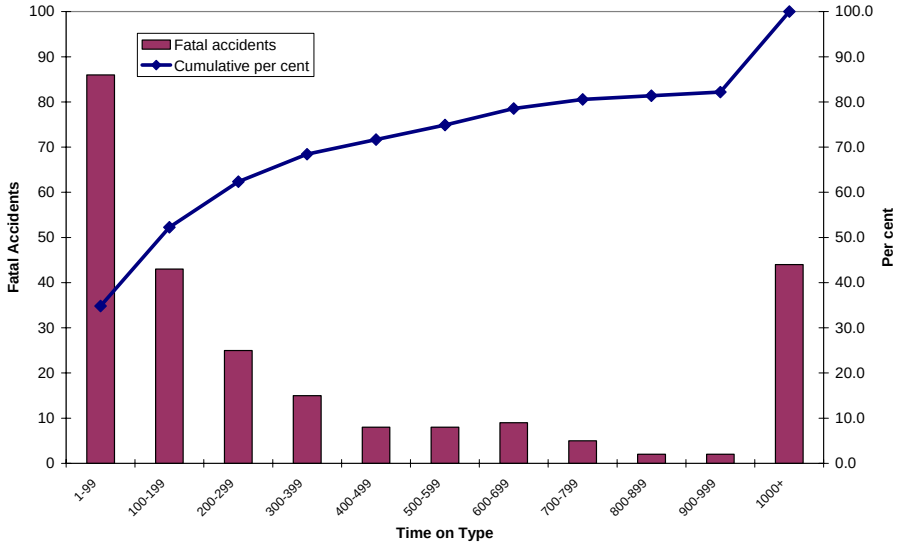
5.2 Fatal Accidents

5.2.1 Flying Experience

Flying experience measured by the total number of hours flown was established for 280 pilots. As shown in Figure 13, the highest number of pilots involved in fatal accidents was in the 1 – 499 hours flown category. This category comprised 27 per cent of the fatal accidents.

This cumulative per cent line shows that 78 per cent of pilots involved in fatal accidents had less than 5000 hours flying experience. Furthermore, 44 per cent of pilots had less than 1000 hours flying experience.

Figure 13. Fatal accidents by hours flown by pilot in command, 1990 – 2005

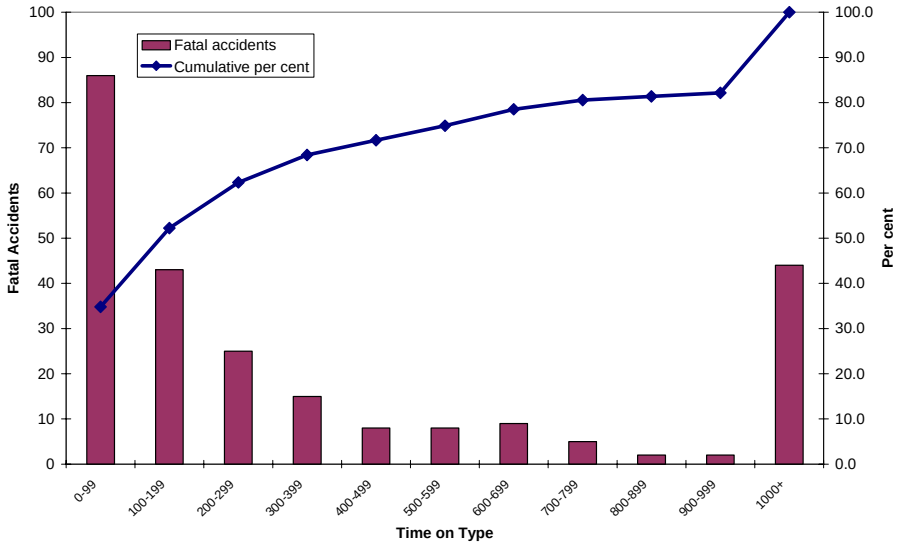


5.2.2 Time on Type

Time on type referred to the number of hours flown on the type of aircraft involved in the accident. Time on type was determined for 247 pilots identified in the dataset. As presented in Figure 14, the highest number of pilots involved in fatal accidents had between 1 – 99 hours on type. This comprised 35 per cent of the accidents where the pilot's time on type was known. The lowest number of pilots involved in fatal accidents had between 800 – 899 and 900 – 999 hours on type, and both comprised less than 1 per cent of the dataset.

According to the cumulative percentage line, 72 per cent of pilots had less than 500 hours on the aircraft type involved in the fatal accident. Furthermore, 52 per cent had less than 200 hours on the aircraft type.

Figure 14. Fatal accidents by time on type flown by pilot in command, 1990 – 2005



5.2.3 Type of Licence

Table 3 shows the number of fatal accidents by the highest level of licence attained by the pilot. The largest number of fatal accidents involved CPL-rated pilots (n = 143). This was followed by pilots with a PPL (n = 115) and an ATPL (n = 32).

Table 3. Fatal accidents by highest level of licence attained, 1990 – 2005

Year	ATPL	CPL	PPL	Student	No Licence	Foreign	Unknown	Total
1990	1	17	9	1	1	0	1	30
1991	0	6	10	1	0	0	4	21
1992	0	8	15	0	0	0	2	25
1993	3	13	5	0	0	0	0	21
1994	6	11	8	0	0	0	0	25
1995	3	10	10	0	0	0	2	25
1996	2	13	8	0	0	0	0	23
1997	2	9	6	0	0	0	0	17
1998	1	9	11	1	0	0	1	23
1999	2	9	9	1	0	0	1	22
2000	2	11	3	0	0	1	1	18
2001	3	7	7	2	0	0	1	20
2002	1	6	3	0	0	0	0	10
2003	5	5	3	0	0	0	1	14
2004	0	6	4	0	0	0	1	11
2005	1	3	4	0	0	0	5	13
Total	*32*	*143*	*115*	*6*	*1*	*1*	*20*	*318*

Figures 15, 16 and 17 show the number of fatal accidents across the three major types of pilot licences, including ATPL, CPL and PPL, for 1990 – 2005. Figure 15 shows that the number of fatal accidents involving an ATPL-rated pilot was less than 10 each year, with an average number of two per year.

Figure 16 shows that the highest number of fatal accidents involving a CPL-rated pilot was 17 in 1990 and the lowest number was 3 in 2005. The average number of fatal accidents was nine. There was a significant decrease in the number of fatal accidents involving a CPL-rated pilot across the 1990 – 2005 period ($r^2 = 0.45$, $p = 0.01$).

Figure 17 indicates that the highest number of number of fatal accidents involving a PPL-rated pilot was 15 in 1992 and the lowest number was 3 in 2000, 2002 and 2003. The average number of fatal accidents was eight. Similar to CPL-rated pilots, there was a significant decrease in the number of fatal accidents involving a PPL-rated pilot across the 1990 – 2005 period ($r^2 = 0.47$, $p = 0.03$).

In comparison to Figures 16 and 17, Figure 15 shows that the number of fatal accidents involving ATPL-rated pilots is much lower. Furthermore, there is no trend to indicate a decline in fatal accidents between 1990 and 2005. There were no reported fatal accidents for ATPL-rated pilots for 1991, 1992 and 2004.

Figure 15. Fatal accidents where the pilot held an ATPL, 1990 – 2005

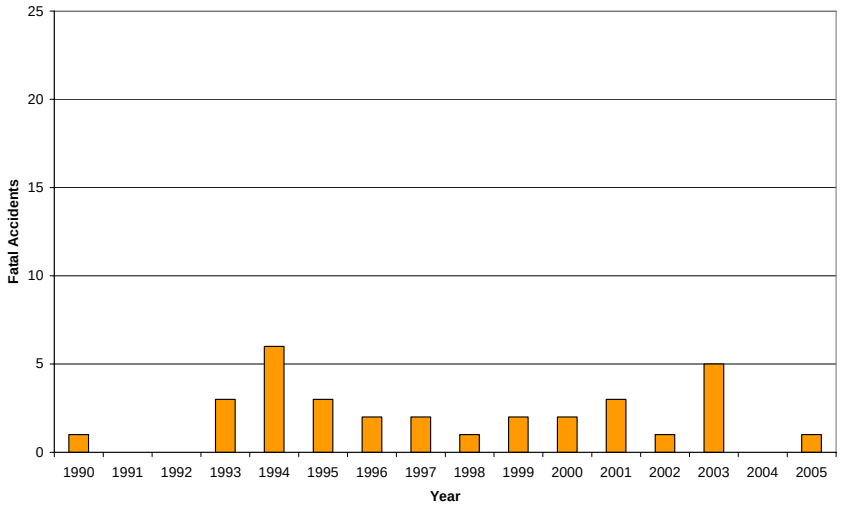


Figure 16. Fatal accidents where pilot in command held a CPL, 1990 – 2005

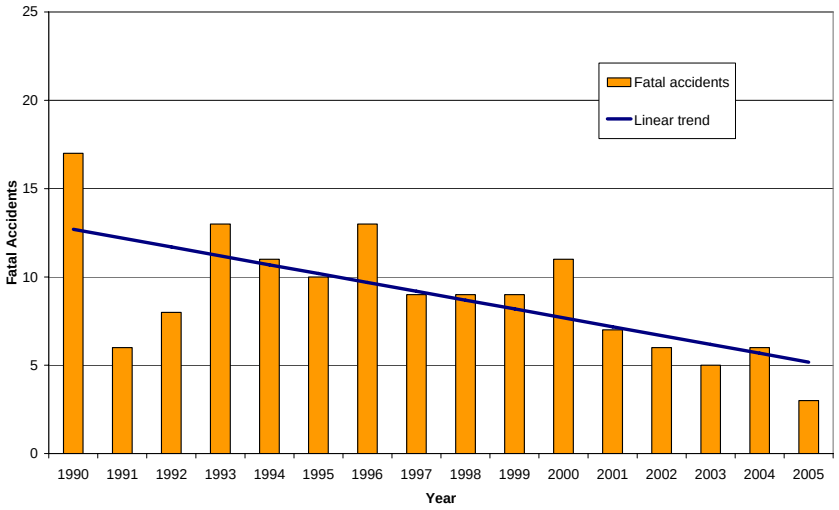
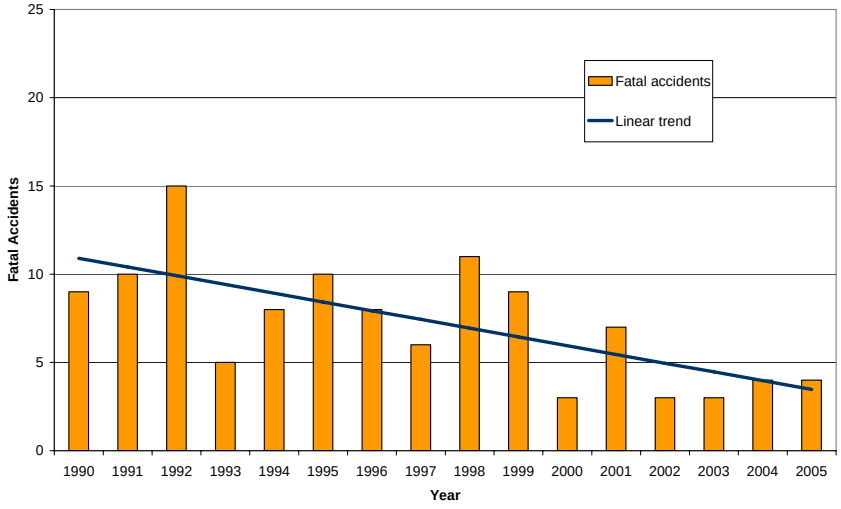


Figure 17. Fatal accidents where pilot in command held a PPL, 1990 – 2005



5.2.4 Type of Operation

Table 4 shows the number of fatal accidents by the operation category being conducted at the time of the accident. The operation category involved in the largest number of fatal accidents was private (n = 152). This was followed by charter (n = 50) and other aerial work (n = 44). The lowest number of fatal accidents involved low capacity RPT (n = 4) operations.

Table 4. Fatal accidents by operation category, 1990 – 2005

Year	COMMERCIAL					NON-COMMERCIAL		Total
	Low Capacity RPT	Charter	Flying Training	Agriculture	Other Aerial Work	Business	Private	
1990	0	5	4	2	9	2	8	30
1991	0	2	3	1	1	1	13	21
1992	0	2	1	3	1	0	18	25
1993	1	4	0	1	3	0	12	21
1994	0	6	2	4	4	0	9	25
1995	1	3	1	2	4	3	11	25
1996	0	6	0	4	4	2	7	23
1997	0	4	0	5	1	1	6	17
1998	0	2	1	2	2	3	13	23
1999	0	3	2	0	1	2	14	22
2000	1	3	0	3	2	0	9	18
2001	0	4	2	1	4	0	9	20
2002	0	3	1	0	2	0	4	10
2003	0	2	5	0	3	0	4	14
2004	0	0	1	1	2	1	6	11
2005	1	1	0	1	1	0	9	13
Total	*4*	*50*	*23*	*30*	*44*	*15*	*152*	*318*

Figures 18 and 19 show the number of fatal accidents grouped according to commercial and non-commercial operations. As shown in Figure 18, the highest number of commercial fatal accidents occurred in 1990 (n = 20). The lowest number of fatal accidents occurred in 2004 and 2005 (n = 4). There was a significant decrease in commercial fatal accidents between 1990 and 2005 (r^2 = 0.31, p = 0.02).

Figure 19 shows that the highest number of non-commercial fatal accidents occurred in 1992 (n = 18). The lowest number of fatal accidents occurred in 2002 and 2003 (n = 4). There was a significant decline in non-commercial fatal accidents between 1990 and 2005 (r^2 = 0.30, p = 0.03).

Figure 18. Fatal accidents for commercial operations, 1990 – 2005

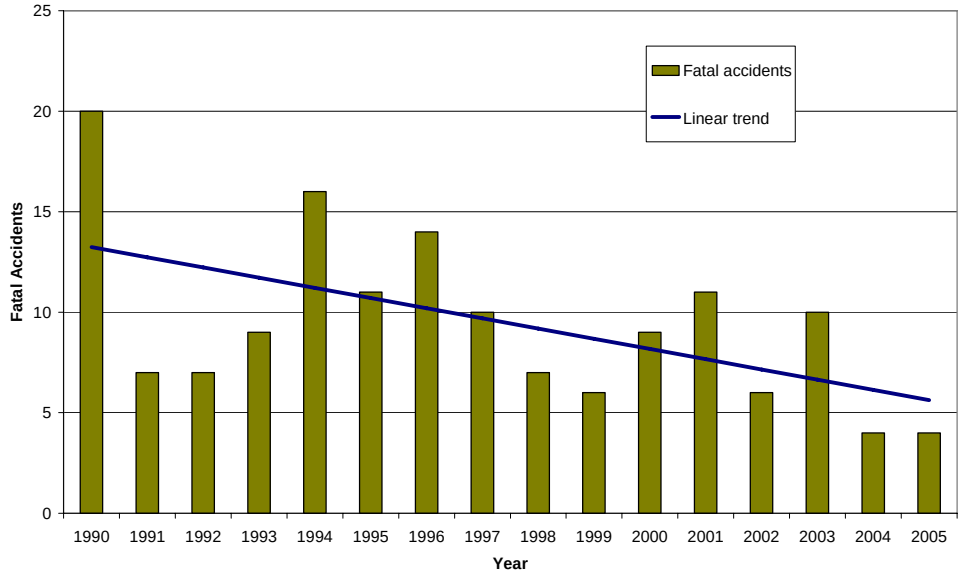


Figure 19. Fatal accidents for non-commercial operations, 1990 – 2005

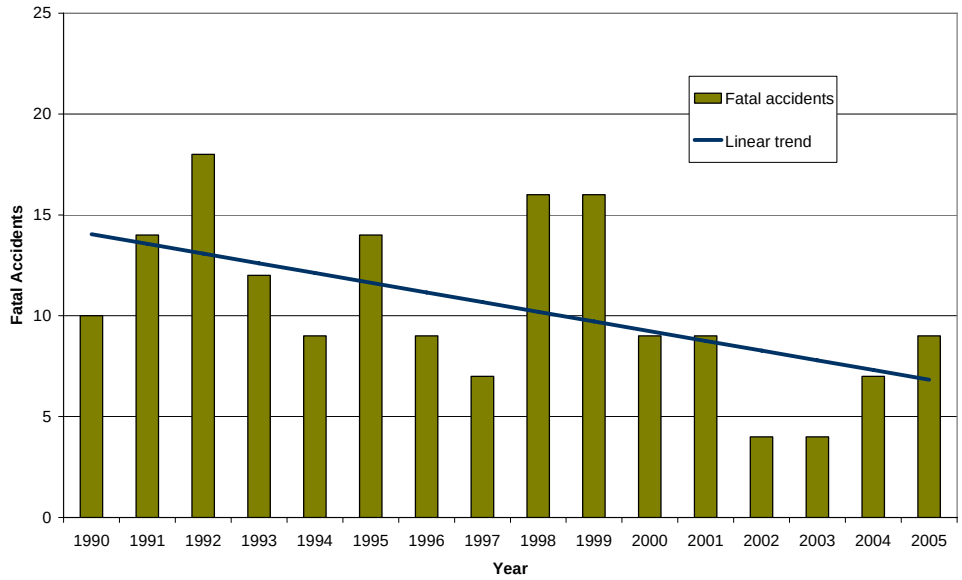


Table 5 shows the number of fatal accidents per 100,000 hours flown by type of operation between 1990 and 2005. Figure 20 shows the rate of commercial fatal accidents for this period. The highest rate was recorded in 1990, where 1.3 fatal accidents occurred per 100,000 hours flown. In contrast, the lowest rate was recorded in 2004, where 0.3 fatal accidents occurred per 100,000 hours flown. No significant trend was identified.

Figure 21 depicts the rate of non-commercial fatal accidents between 1990 and 2004. The highest rate was recorded in 1992, where 3.9 fatal accidents occurred per 100,000 hours flown. The -lowest rate was recorded in 2002 and 2003, where 1.0 fatal accidents occurred per 100,000 hours flown. Similar to commercial operations, no significant trend was identified.

A comparison of commercial and non-commercial rates indicates that commercial operations had a lower rate in every year between 1990 and 2004. Commercial operations recorded an average of 0.6 fatal accidents per 100,000 hours flown compared with non-commercial, which recorded an average of 2.4.

Table 5. Fatal accidents per 100,000 hours flown by type of operation, 1990 – 2004

Year	COMMERCIAL					NON-COMMERCIAL
	Low Capacity Operations	Charter	Flying Training	Agriculture	Other Aerial Work	Private and Business
1990	0.0	1.2	0.8	1.2	3.0	1.7
1991	0.0	0.5	0.7	0.9	0.3	2.8
1992	0.0	0.5	0.2	3.3	0.4	3.9
1993	0.4	1.0	0.0	1.0	1.0	2.5
1994	0.0	1.4	0.5	4.6	1.3	2.0
1995	0.4	0.6	0.2	1.9	1.3	3.2
1996	0.0	1.2	0.0	3.2	1.4	2.0
1997	0.0	0.8	0.0	3.7	0.3	1.6
1998	0.0	0.4	0.2	1.4	0.6	3.7
1999	0.0	0.6	0.4	0.0	0.3	3.7
2000	0.4	0.6	0.0	2.4	0.7	2.3
2001	0.0	0.9	0.5	0.9	1.3	2.2
2002	0.0	0.7	0.2	0.0	0.6	1.0
2003	0.0	0.5	1.2	0.0	0.9	1.0
2004	0.0	0.0	0.3	1.1	0.6	1.8

Figure 20. Fatal accidents for commercial operations per 100,000 hours flown, 1990 – 2004

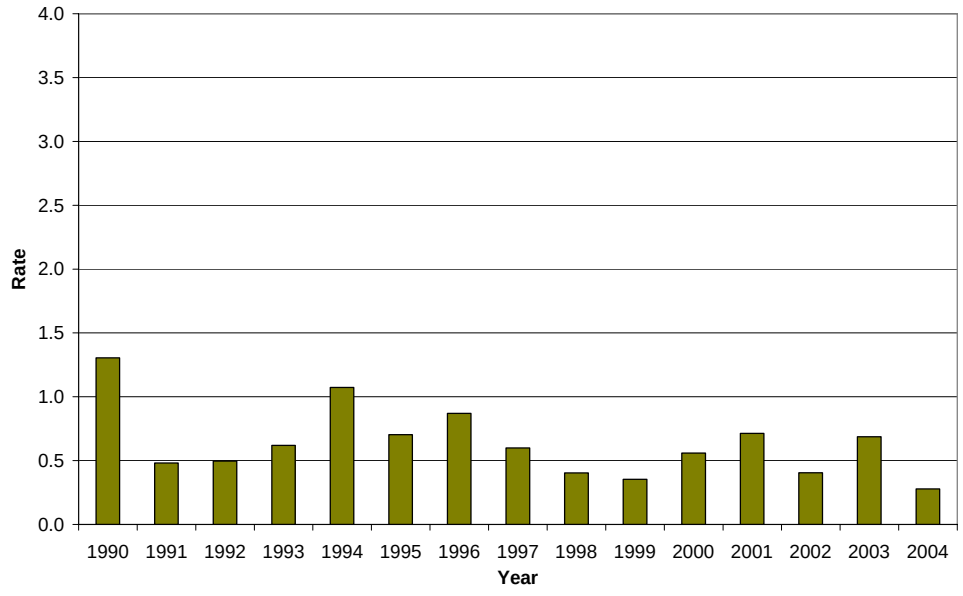
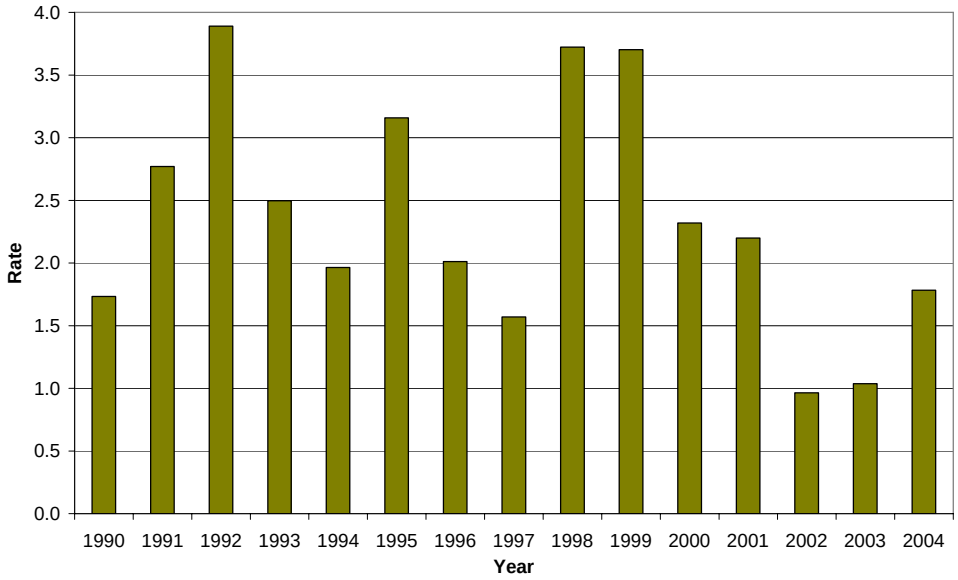


Figure 21. Fatal accidents for non-commercial operations per 100,000 hours flown, 1990 – 2004



5.2.5 Type of Operation by Licence Type

Table 6 shows the number of fatal accidents by the highest level of licence attained by the pilot by operation type for 1990 – 2005. The highest number of fatal accidents were related to private operations flown by PPL-rated pilots (n = 97). This was followed by charter operations flown by CPL-rated pilots (n = 36).

It was noted that there were a number of fatal accidents that occurred in the private and business sectors of the industry by pilots holding a licence higher than that required for the type of operation involved in the accident. That is, the pilot may have held either an ATPL or CPL licence but have been conducting business or private flights. Of the 175 fatal accidents involving ATPL and CPL-rated pilots, 44 fatal accidents occurred during business or private operations.

Table 6. Fatal accidents by highest level of licence attained by type of operation, 1990 – 2005

Operation Type	ATPL	CPL	PPL	Student	No Licence	Foreign	Unknown	Total
Low Capacity RPT	2	2	0	0	0	0	0	4
Charter	12	36	0	0	0	0	2	50
Agriculture	1	26	1	0	0	0	2	30
Flying Training	2	10	3	6	0	0	2	23
Other Aerial Work	6	34	2	0	0	0	2	44
Business	1	2	12	0	0	0	0	15
Private	8	33	97	0	1	1	12	152
Total	*32*	*143*	*115*	*6*	*1*	*1*	*20*	*318*

5.2.6 Level of Proficiency

Table 7 shows the number of fatal accidents by the level of pilot proficiency. There were 175 fatal accidents involving professional pilots and 122 involving non-professional pilots. There were 21 fatal accidents excluded from the analysis because the pilot's level of proficiency was not known.

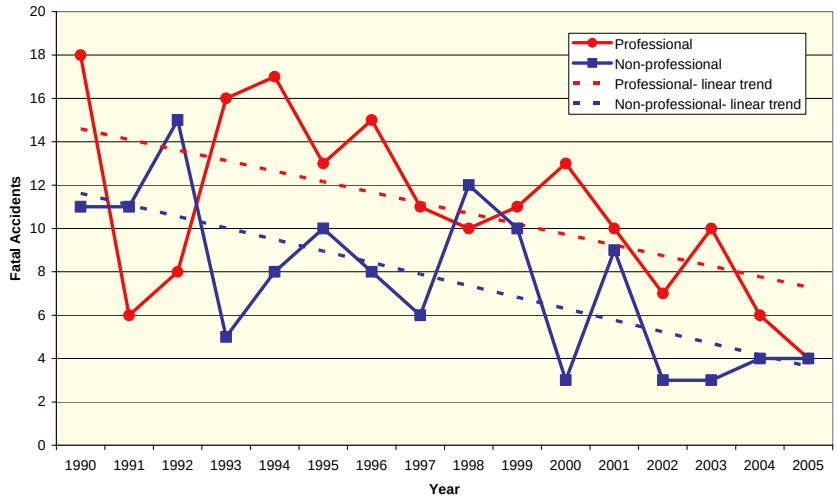
Table 7. Fatal accidents by level of pilot proficiency, 1990 – 2005

Year	Professional	Non-professional	Total
1990	18	11	29
1991	6	11	17
1992	8	15	23
1993	16	5	21
1994	17	8	25
1995	13	10	23
1996	15	8	23
1997	11	6	17
1998	10	12	22
1999	11	10	21
2000	13	3	16
2001	10	9	19
2002	7	3	10
2003	10	3	13
2004	6	4	10
2005	4	4	8
Total	*175*	*122*	*297*

Figure 22 shows the number of fatal accidents grouped by level of pilot proficiency. The highest number of fatal accidents involving professional pilots occurred in 1990 (n = 18). The lowest number of fatal accidents occurred in 1991 and 2004 (n = 4). There was an average of 11 fatal accidents per year and a significant decrease in fatal accidents between 1990 and 2005 ($r^2 = 0.31$, $p = 0.03$).

The highest number fatal accidents associated with non-professional pilots occurred in 1992 (n = 15). The lowest number of fatal accidents occurred in 2000 and 2002 (n = 3). The average number of fatal accidents per year was 8. Similar to professional pilots, there was a significant decline in non-commercial fatal accidents between 1990 and 2005 ($r^2 = 0.46$, $p = 0.00$).

Figure 22. Fatal accidents by level of pilot proficiency, 1990 – 2005



5.2.7 Weight of Aircraft

Table 8 shows the number of fatal accidents by aircraft weight and pilot licence, between 1990 and 2005. The highest number of fatal accidents was related to aircraft weighing 2250 kg or less and operated by PPL-rated pilots (n = 109). The second highest number of fatal accidents was associated with the same aircraft weight, but operated by CPL-rated pilots (n = 106).

Table 8. Fatal accidents by aircraft weight and pilot licence, 1990 – 2005

Weight	ATPL	CPL	PPL	Student	No Licence	Foreign	Unknown	Total
0-2250 kg	14	106	109	6	1	1	16	253
2250-5700 kg	15	36	6	0	0	0	3	60
5700-27000 kg	3	1	0	0	0	0	1	5
Total	*32*	*143*	*115*	*6*	*1*	*1*	*20*	*318*

5.3 Fatalities

5.3.1 Occupants

Table 9 shows the number of fatalities involved in the 318 fatal accidents identified in the database, between 1990 and 2005. In total, there were 319 pilots, 325 passengers and 3 people on the ground fatally injured during this period. The highest number of pilots fatally injured were flying private operations (n = 149). Private operations were also associated with the greatest number of passenger fatalities (n = 157).

The second highest category of operations associated with pilot fatalities was other aerial work (n = 46), whereas the second highest category for passengers was charter (n = 94). Not surprisingly, there were few passenger fatalities associated with flying training and agricultural operations, since passenger are not usually on board the aircraft.

Table 9. Fatalities by type of occupant, across operation type, 1990 – 2005

Year	COMMERCIAL					NON-COMMERCIAL		Total
	Low Capacity RPT	Charter	Flying Training	Agriculture	Other Aerial Work	Business	Private	
Crew	7	45	30	28	46	14	149	319
Passenger	25	94	2	2	26	19	157	325
Ground	0	0	0	2	1	0	0	3
Total	32	139	32	32	73	33	306	647

5.3.2 Type of Licence

Table 10 shows the number of fatalities by the highest level of licence attained by the pilot. The largest number of fatalities involved accidents where the pilot held a CPL (n = 300). This was followed by pilots with a PPL (n = 214) and an ATPL (n = 97).

Table 10. Fatalities by licence type, 1990 – 2005

Year	ATPL	CPL	PPL	Student	No licence	Foreign	Unknown	Total
1990	11	32	16	1	3	0	1	64
1991	0	20	17	1	0	0	7	45
1992	0	18	29	0	0	0	2	49
1993	6	32	8	0	0	0	0	46
1994	15	25	11	0	0	0	0	51
1995	7	15	18	0	0	0	2	42
1996	3	21	19	0	0	0	0	43
1997	4	14	10	0	0	0	0	28
1998	1	20	23	1	0	0	1	46
1999	3	20	16	1	0	0	1	41
2000	9	24	3	0	0	1	1	38
2001	7	14	15	2	0	0	1	39
2002	2	14	8	0	0	0	0	24
2003	14	12	7	0	0	0	1	34
2004	0	13	9	0	0	0	1	23
2005	15	6	5	0	0	0	8	34
Total	*97*	*300*	*214*	*6*	*3*	*1*	*26*	*647*

Figures 23, 24 and 25 show the number of fatalities across the three main types of pilot licences, including ATPL, CPL and PPL. Figure 23 shows that the number of fatalities involving an ATPL rated pilot averaged six per year. The highest number of fatalities occurred in 1994 and 2005 (n = 15). There were no fatalities in 1991, 1992 and 2004.

Figure 24 shows that the highest number of fatalities associated with accidents involving a CPL-rated pilot was 32 in 1990 and 1993 and the lowest number was six in 2005. The average number of fatalities was 19. There was a significant decline in the number of fatalities involving a CPL-rated pilot across the 1990 – 2005 period ($r^2 = 0.53$, $p = 0.00$).

Figure 25 indicates that the highest number of fatalities associated with accidents involving a PPL-rated pilot was 29 in 1992 and the lowest number was three in 2000. The average number of fatalities was 14. There was a significant decline in the number of fatalities involving a PPL-rated pilot across the 1990 – 2005 period ($r^2 = 0.31$, $p = 0.03$).

In comparison to Figures 24 and 25, Figure 23 shows that the number of fatalities involving ATPL-rated pilots is much lower.

Figure 23. Fatalities where the pilot held an ATPL, 1990 – 2005

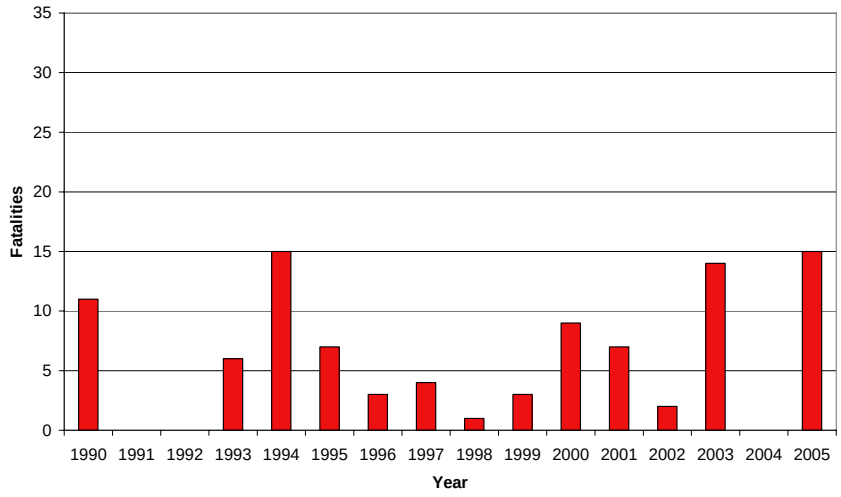


Figure 24. Fatalities where the pilot held a CPL, 1990 – 2005

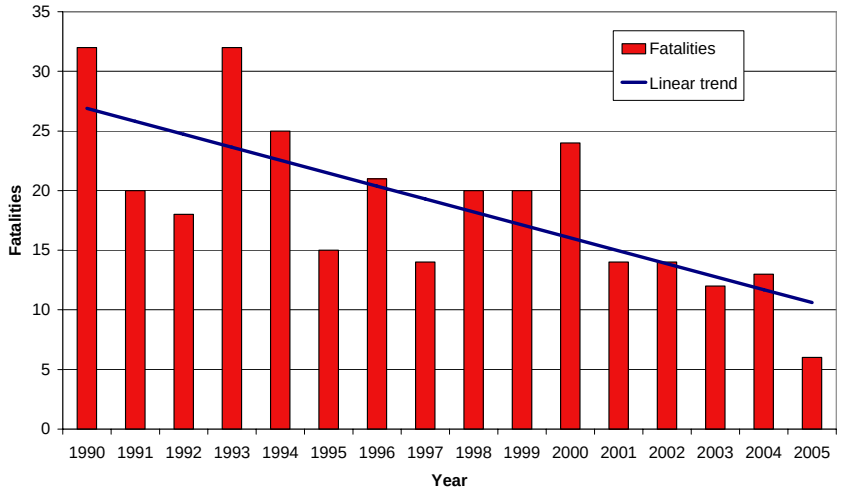
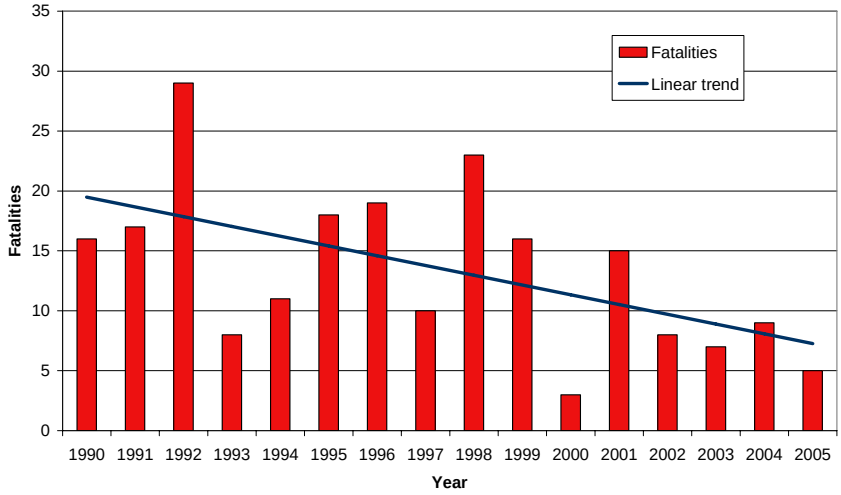


Figure 25. Fatalities where the pilot held a PPL, 1990 – 2005



5.3.3 Type of Operation

Table 11 shows the number of fatalities by the operation category being conducted at the time of the accident. The operation category involved in the largest number of fatalities was private (n = 306). This was followed by charter (n = 139) and other aerial work (n = 73). The lowest number of fatalities involved low capacity RPT, training and agriculture operations (n = 32).

Table 11. Fatalities by operation category, 1990 – 2005

Year	COMMERCIAL					NON-COMMERCIAL		Total
	Low Capacity RPT	Charter	Flying Training	Agriculture	Other Aerial Work	Business	Private	
1990	0	18	6	2	14	7	17	64
1991	0	3	4	2	1	1	34	45
1992	0	2	2	3	1	0	41	49
1993	7	8	0	1	4	0	26	46
1994	0	22	4	4	5	0	16	51
1995	2	8	1	2	6	6	17	42
1996	0	13	0	4	5	4	17	43
1997	0	8	0	6	2	1	11	28
1998	0	7	1	2	3	6	27	46
1999	0	10	2	0	2	2	25	41
2000	8	11	0	3	6	0	10	38
2001	0	10	2	1	8	0	18	39
2002	0	8	1	0	5	0	10	24
2003	0	8	7	0	7	0	12	34
2004	0	0	2	1	3	6	11	23
2005	15	3	0	1	1	0	14	34
Total	*32*	*139*	*32*	*32*	*73*	*33*	*306*	*647*

Figures 26 and 27 show the number of fatalities grouped according to commercial and non-commercial operations. As shown in Figure 26, the highest number of commercial fatalities occurred in 1990 (n = 40). The lowest number of fatalities occurred in 2004 (n = 6).

Figure 27 shows that the highest number of non-commercial fatalities occurred in 1992 (n = 41). The lowest number of fatalities occurred in 2000 and 2002 (n = 10). There was a significant decline in non-commercial fatalities for 1990 – 2005 (r^2 = 0.41, p = 0.01).

Figure 26. Fatalities for commercial operations, 1990 – 2005

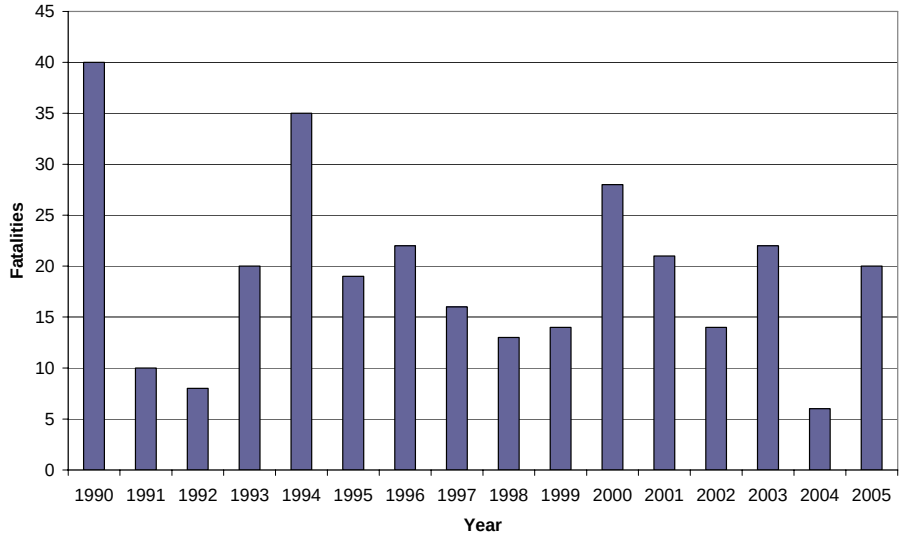
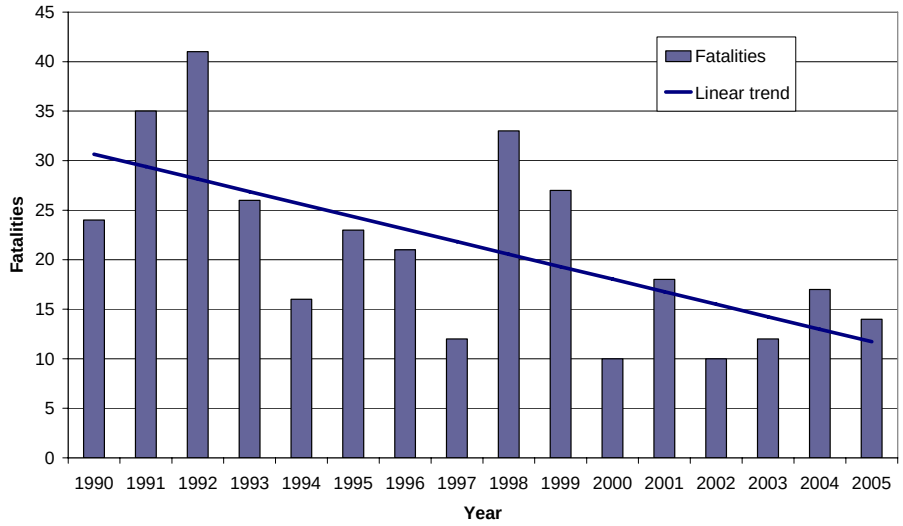


Figure 27. Fatalities involving non-commercial operations, 1990 – 2005



5.3.4 Level of Proficiency

Table 12 shows the number of fatalities by the level of pilot proficiency. There were 397 fatalities where the flight was conducted by a professional pilot and 223 where the flight was conducted by a non-professional pilot. There were 27 fatalities excluded from the analysis because the pilot's level of proficiency was not known.

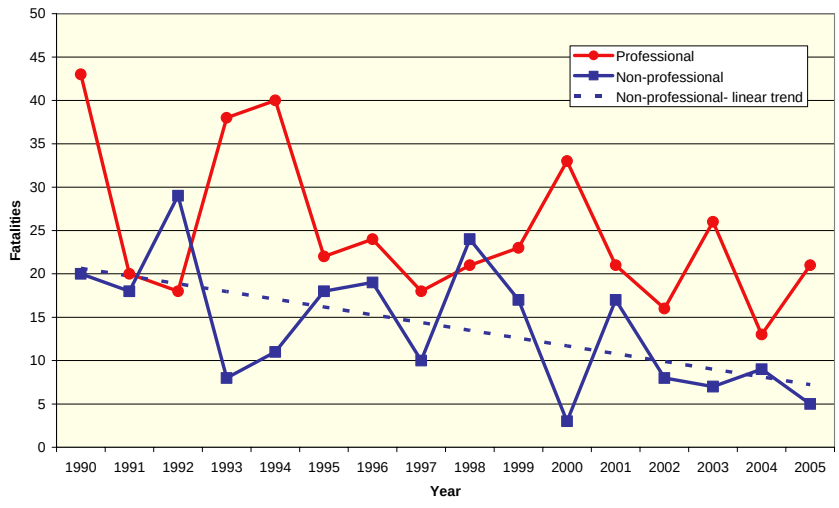
Table 12. Fatalities by level of pilot proficiency, 1990 – 2005

Year	Professional	Non-professional	Total
1990	43	20	63
1991	20	18	38
1992	18	29	47
1993	38	8	46
1994	40	11	51
1995	22	18	40
1996	24	19	43
1997	18	10	28
1998	21	24	45
1999	23	17	40
2000	33	3	36
2001	21	17	38
2002	16	8	24
2003	26	7	33
2004	13	9	22
2005	21	5	26
Total	*397*	*223*	*620*

Figure 28 shows the number of fatalities grouped by level of pilot proficiency. The highest number of fatalities involving professional pilots occurred in 1990 (n = 43). The lowest number of fatalities occurred in 2004 (n = 13). There was an average of 25 fatalities per year.

The highest number fatalities associated with non-professional pilots occurred in 1992 (n = 29). The lowest number of fatalities occurred in 2000 (n = 4). The average number of fatalities per year was 14. There was a significant decline in non-commercial fatalities for 1990 – 2005 ($r^2 = 0.34$, $p = 0.02$).

Figure 28. Fatalities by level of pilot proficiency, 1990 – 2005



5.3.5 Weight of Aircraft

Table 13 shows the number of fatalities by aircraft weight and pilot licence, between 1990 and 2005. The highest number of fatalities was related to aircraft weighing 2250 kg or less and operated by PPL-rated pilots (n = 205). The second highest number of fatalities was associated with the same aircraft weight, but operated by CPL-rated pilots (n = 200).

Table 13. Fatalities by aircraft weight and pilot licence, 1990 – 2005

Weight	ATPL	CPL	PPL	Student	No Licence	Foreign	Unknown	Total
0-2250 Kg	24	200	205	6	3	1	19	458
2250-5700 Kg	53	99	9	0	0	0	6	167
5700-27000 Kg	20	1	0	0	0	0	1	22
Total	*97*	*300*	*214*	*6*	*3*	*1*	*26*	*647*

6 DISCUSSION

The purpose of this research paper was to use the ATSB accident and incident database to provide an initial examination of fatal accidents and fatalities involving civil aviation aircraft in Australian airspace for 1990 – 2005 and to identify key trends. To explore the characteristics of fatality data, the number of fatal accidents and fatalities were examined across pilot licence type, type of operation, and aircraft type. In addition, demographic detail on the pilot involved in a fatal accident was examined in relation to age, flying experience and time on aircraft type.

Examination of the trends for fatal accidents and fatalities between 1990 and 2005 revealed some similarities between the two measures. In general, the number of reported fatal accidents and fatalities declined significantly between 1990 and 2005. The largest number of fatal accidents and fatalities was recorded in 1990. The number of fatal accidents and fatalities reported in 2005 was well below the average annual number calculated for the 16 year period.

The 34 fatalities in 2005 were attributed to 13 accidents. This included the following three accidents:

- Lockhart River, Queensland. The accident involved a Fairchild Metroliner, which was conducting a low capacity operation. In total, the accident involved 15 fatalities, including the pilot in command, the co-pilot and 13 passengers (BO/200501977).
- Condobolin, NSW. The accident involved a Piper PA31-350, which was conducting a private operation to Swan Hill, Victoria. The accident involved four fatalities, including the pilot in command and three passengers (BO/200506266).
- Mount Hotham, Victoria. The accident involved a Piper PA31-350, which was conducting a charter operation to Mount Hotham. The accident involved three fatalities, including the pilot in command and two passengers (BO/200303265).

The relatively high number of fatalities associated with the accident at Lockhart River contributed substantially to the elevated number of fatalities observed for 2005.

A comparison of the results between commercial and non-commercial fatal accident and fatality data revealed several interesting findings. Both operations experienced a significant decrease in the number of fatal accidents between 1990 and 2005. Non-commercial operations also experienced a significant decrease in the number of fatalities over this period. Although there was an increase in fatalities for commercial operations during 2005, the preceding year was the lowest recorded for the period examined for each of these measures (Figures 18 and 26).

The level of pilot proficiency was also examined. The results indicated that fatal accidents associated with both professional and non-professional pilots declined significantly from 1990 to 2005. In general, there were more fatal accidents associated with professional pilots. The results also indicated that flights being operated by non-professional pilots were associated with a significant decrease in the number of fatalities from 1990 to 2005. In contrast, there was no trend identified in relation to operations by professional pilots. For both groups, the number of fatal accidents and fatalities for 2005 was below the average number per year calculated for the 16 year period.

In relation to pilot licences, the results showed that CPL-rated pilots involved in either commercial or non-commercial operations was the most common licence type represented in both fatal accidents and fatalities. However, there were 44 pilots holding an ATPL or CPL licence that were involved in a fatal accident that required a lower licence rating. This included one accident where the pilot held an ATPL licence and was conducting a private flight in a Piper Aztec aircraft. The aircraft lost control shortly after takeoff from Mareeba in Queensland, and rapidly descended to the ground. The aircraft was destroyed by impact forces and fire, killing all five occupants on board (BO/200304091).

The results relating to pilot licence data need to be interpreted with some caution. As indicated in the methodology section (Section 4.3), fatal accidents and fatalities were examined using the highest level of licence attained by the pilot at the time of the accident. Consequently, the licence level may not correspond with the type of operation being conducted at the time of the accident.

The data do not show that fatal accidents and fatalities involving professional pilots have been growing in trend terms or compared with those involving private pilots.

In October 2005, the ATSB Executive Director presented a keynote address to Safeskies which included that: “Australia has an excellent aviation safety record which is, overall, among the world’s best and particularly good with respect to high capacity jet aircraft. … I believe this is the result of both good luck and good safety management throughout the system. Certainly there is no room for complacency.” (Bills, 2005).

World-wide during 2005 there has been an increase in the number of fatal high capacity passenger jet accidents compared with recent years. While none of these were in Australia, official representatives from Australia will be active participants at the special meeting of Directors-General of Civil Aviation to be held at the International Civil Aviation Organization (ICAO) in Montreal from 22 March 2006 to seek ways to further improve aviation safety.

7 CONCLUSION

Overall, the number of reported fatal accidents and fatalities declined significantly in the period from 1990 to 2005. The largest number of fatal accidents (30) and fatalities (64) was recorded in 1990. The lowest number of fatal accidents (10 and 11) and fatalities (24 and 23) occurred in 2002 and 2004. In 2005 there was an increase in the number of fatal accidents and fatalities to 13 and 34 respectively compared with 2004. But the number of fatal accidents and fatalities reported in 2005 was below the annual average (20 and 40 respectively) for the 16-year period.

Australia continues to have the best international record in high capacity regular public transport (RPT) with no hull losses or fatal accidents involving passenger jet aircraft.

There were four low capacity RPT fatal accidents involving 32 fatalities recorded in the ATSB database from 1990 to 2005 including a 1995 training accident in which there were no passengers on board. The other three low capacity RPT accidents were Monarch (1993), Whyalla (2000) and the recent accident at Lockhart River. The safety of low capacity RPT operations in Australia is believed to be similar to best practice in Europe and North America in terms of fatal accidents and fatalities per 100,000 flying hours and hull losses as a proportion of fleet size, but the data on this has yet to be sourced and analysed.

Using the broadest definition of commercial aviation to include both RPT and General Aviation except for business/private and sport aviation still shows a significant decrease in the number of fatal accidents between 1990 and 2005. Although there was an increase in fatal accidents and fatalities for commercial operations during 2005, the preceding year was the lowest recorded for the period examined for each of these measures.

The definition of a ‘professional pilot’ can be somewhat confusing because in addition to the highest category Air Transport Pilot Licence (ATPL), a Commercial Pilot Licence (CPL) category includes pilots of single pilot aircraft and multi-pilot private or aerial work aircraft. There were 44 pilots holding an ATPL or CPL licence who were involved in a fatal accident that required a lower licence rating. This included accidents associated with business or private operations.

From 1990 to 2005 there were 32 fatal accidents associated with ATPL licence holders, 143 involving CPL holders and 115 with holders of a Private Pilot Licence (PPL). From 1990 to 2005 there were 97 fatalities associated with ATPL licence holders, 300 involving CPL holders and 214 with holders of a Private Pilot Licence (PPL). These raw data do not reflect the hours flown which are much greater for ATPL holders in particular and likely to also be the case for CPL holders. While there was no trend among ATPL licence holders from 1990 to 2005, there was a downward trend in fatal accidents among both CPL and PPL licence holders.

Using the broadest definition of professional pilot to include all ATPL and CPL licence holders, the data from 1990 was examined to see if fatal accidents and fatalities had increased in recent years in trend terms and also by comparison with private pilots. The data show no significant trend in fatalities involving professional pilots from 1990 to 2005 but a significant decline in the fatal accident trend. The data indicates that fatal accidents and fatalities involving professional pilots were much higher compared with private pilots in 1993, 1994 and 2000 than in 2003, 2004 and 2005. Accordingly, the gap is neither recent nor growing. It is also likely to reflect professional pilots’ much higher flying hours.

Between 1990 and 2004 (the last year for which activity data is available) commercial operations recorded an average of 0.6 fatal accidents per 100,000 hours flown compared with an average of 2.4 fatal accidents per 100,000 hours flown for non-commercial operations.

While any aviation fatality is a tragedy, in terms of aviation safety data the results of the ATSB's analysis demonstrate that the fatal accident rate for both commercial and non-commercial operations is very low and has declined significantly between 1990 and 2005.

These initial findings are consistent with previous studies and do not support reports in the media suggesting a worsening of aviation safety in recent years.

8 REFERENCES

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ANNEX A

Dick Smith's 'Unsafe Skies' paper and media comments

23/12/05 Dick Smith in *The Australian*: Mr Smith said he believed the ATSB's analysis and conclusions were incorrect but he could not check them because of problems with the bureau's website[8]. He said his claim of about 78 fatalities involving commercial pilots in the past three years was based on ATSB data. He was suspicious of the pre-Christmas timing of the release and the fact that it ignored his claims about the need for more radar and controlled airspace.

"Unfortunately, the ATSB is a political organisation and not an independent investigator"[9], Mr Smith said.

13/12/05 Media Release on DickSmithFlyer: "Figures from the Australian Transport Safety Bureau website show that in the period between September 1990 and December 1993 there were 24 people killed in aviation accidents by commercial pilots. Twelve years later what do we have? The fatality rate over the same period has more than trebled to 78 fatalities from commercial pilots, however the number of general aviation hours has actually reduced from 1.7 million hours in 1993 to 1.6 million hours in 2003[10]."

8/12/05 Dick Smith on 2CC radio with Mike Welsh: "instead of the ATSB announcing that there's been a major increase in fatalities with planes flown by professional pilots, they haven't said a word[11]."

7/12/05 Dick Smith on 6PR radio with Howard Sattler: "I'm very concerned there's been a gradual rise. I mean, in the last three years there's been 78 fatalities all in planes flown by professional pilots. Ten year ago, it was about 24 fatalities in the same time. … I blame basically the Government[12], it's completely lost the plot. The Civil Aviation Safety Authority is quite dysfunctional."

7/12/05 Media Release on DickSmithFlyer: "Details of the fatalities. Actually 78 in slightly over a 3 year period. This information has been taken from the ATSB website."

5/12/05 Dick Smith on Radio 2 Big Aussie Breakfast radio: "in the last three years alone there's been 70 fatalities all from professional pilots. And I think that would be the world's worst record. … I think it's a systemic problem with the Civil Aviation Safety Authority where they've gone

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8 The ATSB has had some problems with migration of its website to a new departmental platform but Mr Smith's normal practice of seeking data from the ATSB to ensure it was accurate was not followed for his 'Unsafe Skies' paper.

9 On 14/12/05 Mr Smith wrote a letter stating: "I realise that the ATSB is an independent body …"

10 The ATSB's data actually shows 119 fatalities using Mr Smith's broad professional/commercial pilot definition in the four years from 1990 to 1993 and 76 fatalities in the four years from 2002 to 2005. Many of the flying hours were in regular public transport not general aviation. A number of the accidents involved the better qualified pilots in aircraft with which they were not as familiar (eg a fixed wing professional pilot learning in a helicopter).

11 All ATSB reports are made public on the ATSB website and often include a media release to highlight key safety messages. There was no increase in fatalities involving professional pilots.

12 Here Mr Smith seeks to blame the fatalities on the Government. In forums on 5 December 2005 he blames CASA regulation (prescriptive rules) but states that 'most of the fatalities have been caused by weather'. On 20 November 2005 Mr Smith asserts that the fatalities are 'basically because the radar's not used' implicitly blaming Airservices Australia.

down to what they call a very prescriptive rule … the Australian Transport Safety Bureau is once again, seems to be manned by the pilots who are having the accidents, in other words the same type of pilot who resists change."

5/12/05 Media Release on DickSmithFlyer: "70 fatalities in 3 years all with professional pilots – highest fatality rate ever – 'who will be next?' asks Dick Smith. … In just over a three year period, there have been 70 fatalities from air crashes flown by professional pilots. In the same period there have only been 9 fatalities in aircraft flown by private pilots. … 'I believe the rising commercial accident rate is because the Government authorities responsible for aviation safety and investigation have become dysfunctional.' … 'Most of the fatalities have been caused by weather.' … 'I wonder how long the media will keep this highest fatality rate ever[13] a secret?' said Dick Smith."

29/11/05 Dick Smith on PPRuNe[14]: "… in relation to the tower at Proserpine, I don't have my Board papers on hand from 15 years ago, however I have agreed that I introduced the US style establishment and disestablishment criteria for Class D towers. I'm happy to accept that the Board made the decision in relation to Proserpine Tower. However this was a decision in relation to manning the tower when traffic levels had dropped…."

29/11/05: Dick Smith in the *Courier Mail*: … about the closure of the tower at Queensland's Proserpine Airport, a shutdown for which he has repeatedly blamed the Federal Government, the reporter asked whether there was a Civil Aviation Authority meeting in March 1991 when Mr Smith was Chairman and he signed off on closing the Proserpine tower. Mr Smith responded: "Yes, first of all, that's crap but secondly, why would you … what really gets me about you is you're ringing up, running once again the policy of the people who don't want to … who (shouting) … you are just so stupid, you are a complete idiot. First of all find the date when I left the board, it was before that date, but what (screaming) really upsets me is you're gonna kill your family, you're so stupid. You are so stupid. Because what you are doing is running a line of disinformation instead of saying why don't we do something about fixing the airspace and in the last 15 years that's what reporters do all the time."

23/11/05: DickSmithFlyer 45 page publication 'Unsafe Skies'. Refers to Qantas 737 terrain incident on 24 July 2004 near Canberra and that after five months the ATSB published its final report and "made no recommendation on the major safety deficiency – that is, airspace design and radar utilisation in Australia. … Everyone on board was descending towards their deaths. … This near crash – with a possible 87 fatalities – was kept hidden for some five weeks[15]. … The sad thing is that there is just the possibility that if publicity had been given to the Canberra incident the next day, and air crews had been advised that they would not receive any proper radar service if they drifted off course in mountainous areas south of Canberra, six people [re Benalla Piper Cheyenne] may be alive today[16].…This is a total of 24 people dead in commercial aviation accidents in just over 12 months. … People are dying and nothing is being done. It is incredibly

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13 Even if Mr Smith's early 1990s data was correct, most industry observers would know that the recent data would not represent the highest fatality rate 'ever' because of the high accident rate in the early years of commercial aviation. Given the poor record in some developing countries, it would be clear to most observers that the 5/12/05 claim of being 'the world's worst record' was highly improbable.

14 The Professional Pilots Rumour Network website.

15 The ATSB included the incident in its weekly summary of occurrences published in early August and released a preliminary report on 22 September 2004 and a final report on 18 May 2005.

16 As noted in the Crikey newsletter of September 2004, initially the details of this incident were not clear and the ATSB's final reports on the Benalla accident (report 200402979) and south of Canberra incident (report 200402747) do not support Mr Smith's contention. For example, the ATSB Benalla report indicates that the 'RAM' alerts indicating that the pilot was off course should have been passed by the air traffic controller to the accident aircraft pilot.

frustrating. Notice how there is hardly a word in the media about this spate of accidents. This is probably the worst commercial fatality rate ever. … it will be noted that there is no longer a Class D tower at Proserpine. 'What happened to the tower?' I wondered. It was certainly there when I was Chairman of the CAA. … I feel sorry for the people of Proserpine and the passengers who fly there. They have been let down by our Government. … The Coalition Government has one prime aviation policy, and that is 'keep aviation out of the media' … and the Australian Transport Safety Bureau – have complied with this direction to the hilt. Anything that may bring media attention to aviation is stifled[17]."

20/11/05 Dick Smith on ABC radio 'Australia All Over' with Ian McNamara: "in the last 13 months there's been 24 fatalities, all perfectly good planes flown into the ground by professional pilots. I think it's the first time ever that we've had more fatalities from professional pilots than from private pilots. And it's basically because the radar's not used".

17 See footnote 4 about the ATSB's use of media releases. The ATSB also calls media conferences for major report and recommendation releases and often provides access for media interview upon request.

MEDIA RELEASE

ATSB RESEARCH REPORT ON FATAL ACCIDENTS AND FATALITIES FROM 1990 TO 2005

An Australian Transport Safety Bureau study covering 16 years, from 1990 to 2005, has shown a fall in the number of fatal commercial aviation accidents in Australia.

The ATSB report *Analysis of Fatality Trends involving Civil Aviation Aircraft in Australian Airspace between 1990 and 2005* was released today.

Using the broadest definition of commercial aviation to include both regular public transport (RPT) and general aviation except for business/private and sport aviation, the report shows a significant decrease in the number of fatal accidents between 1990 and 2005 (Fig 1).

There was an increase in fatal accidents and fatalities for commercial operations during 2005, compared with 2004, which was the lowest recorded for the period examined for each measure.

Even using the broadest definition of professional pilot, the data show no significant trend in fatalities involving professional pilots from 1990 to 2005 but a significant decline in the fatal accident trend (Fig 2).

Fatal accidents and fatalities involving professional pilots were much higher compared with private pilots in 1993, 1994 and 2000 than in 2003, 2004 and 2005. The gap (related to hours flown) is neither recent nor growing, the report concludes.

Between 1990 and 2004 (the last year for which activity data is available) commercial aviation operations recorded an average of 0.6 fatal accidents per 100,000 hours flown compared with an average of 2.4 fatal accidents per 100,000 hours flown for non-commercial operations.

There were four low capacity RPT fatal accidents involving 32 fatalities recorded in the ATSB database from 1990 to 2005 including a 1995 training accident in which there were no passengers on board. The other three low capacity RPT accidents were Monarch (1993), Whyalla (2000) and the recent (2005) accident at Lockhart River.

The ATSB found that the total number of fatal accidents and fatalities declined significantly in the period from 1990 to 2005. The largest number of fatal accidents (30) and fatalities (64) was recorded in 1990. The lowest number of fatal accidents (10 and 11) and fatalities (24 and 23) occurred in 2002 and 2004. In 2005 there was an increase in the number of fatal accidents and fatalities to 13 and 34 respectively compared with 2004. But the number of fatal accidents and fatalities reported in 2005 was below the annual average (20 and 40 respectively) for the 16-year period.

While any aviation fatality is a tragedy and must never be complacent, the ATSB's analysis show that the fatal accident rate for both commercial and non-commercial operations is very low and has declined significantly between 1990 and 2005.

The report notes that Australia still has the best international record in high capacity regular public transport (RPT) with no hull losses or fatal accidents involving passenger jet aircraft.

Analysis of Fatality Trends involving Civil Aviation Aircraft in Australian Airspace between 1990 and 2005 is available on the ATSB website at www.atsb.gov.au

Figure 1. Fatal accidents for commercial operations, 1990–2005

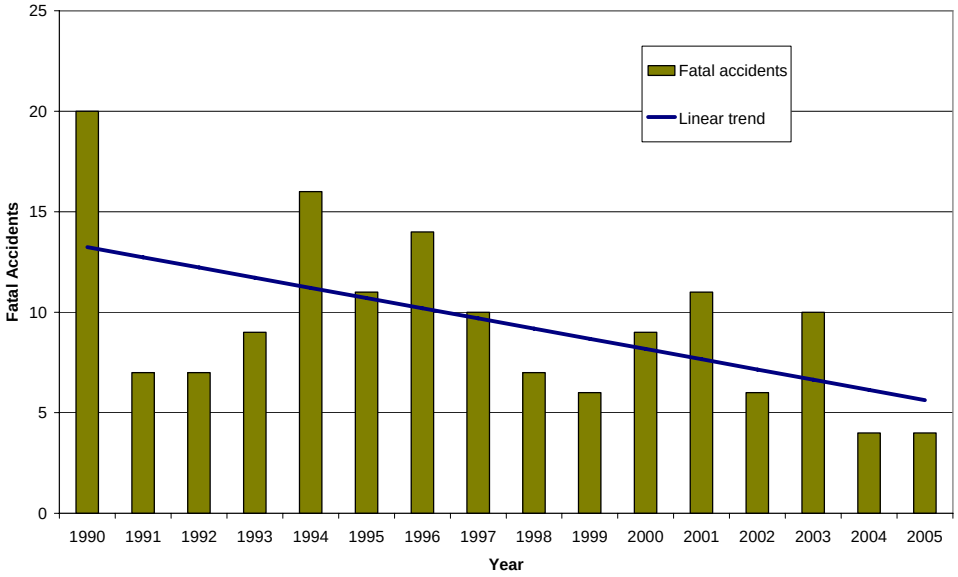

Figure 2. Fatal accidents by level of pilot proficiency, 1990 – 2005