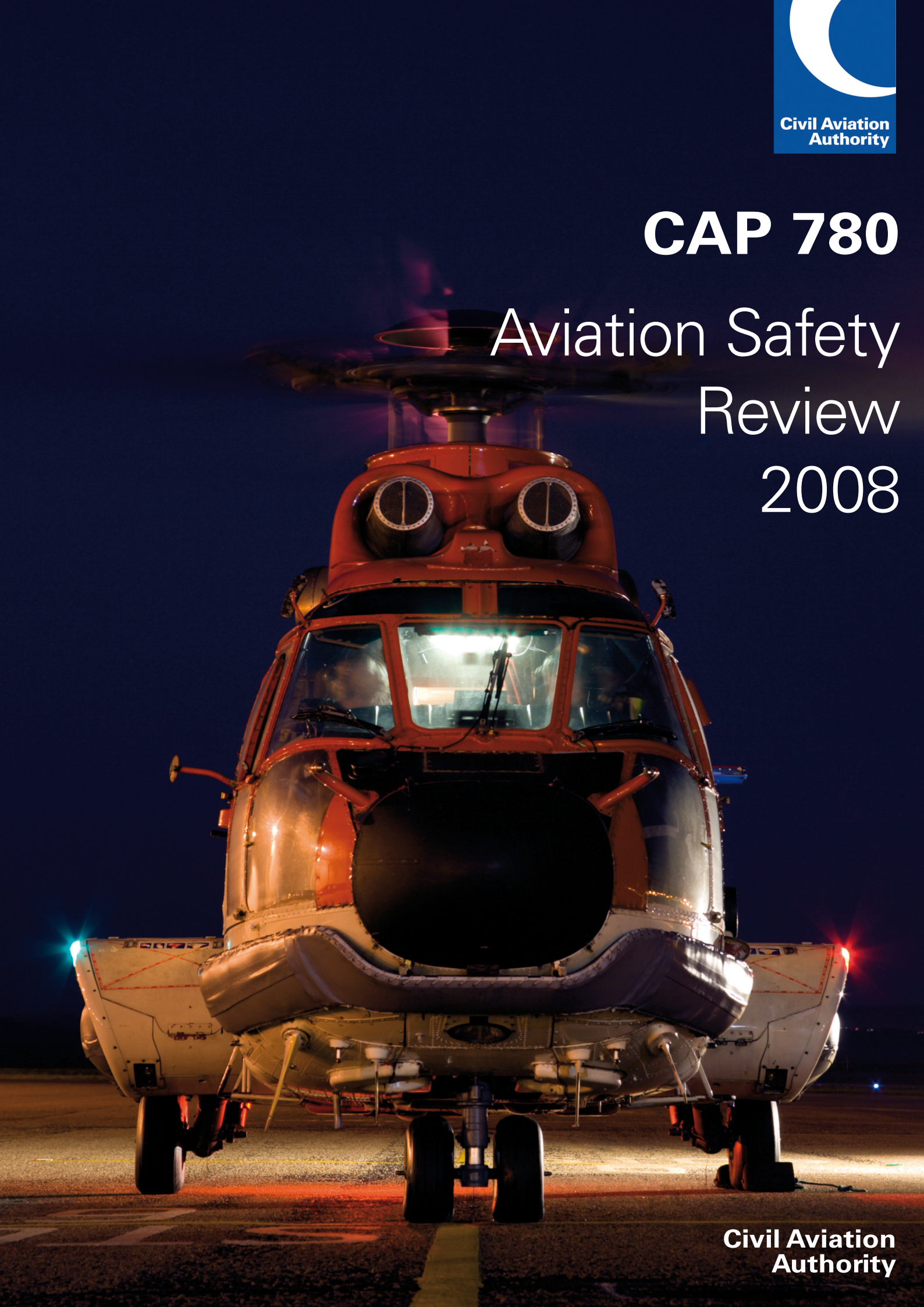

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Executive Summary

This document examines the safety of aviation in the UK, Europe and worldwide. Key statistics relating to reportable and fatal accidents, serious incidents and incidents are provided. Collectively, these safety events are referred to as "occurrences".

The CAA offers this document to the UK aviation community as a statistical reference. The CAA has deliberately avoided providing interpretation of the statistics in this document in terms of their significance, or any comments regarding trends. Readers are invited to make their own interpretations and conclusions.

Worldwide Literature Review

A literature review of worldwide aviation safety studies and statistics was conducted in the autumn of 2007. The major safety concerns of aviation regulators, aviation safety organisations, aircraft manufacturers and trade organisations have been summarised.

The most prevalent risk areas identified were:

- controlled flight into terrain;
- approach and landing accidents;
- loss of control in flight;
- in-flight fire;
- runway excursions; and
- runway incursions.

Controlled flight into terrain (CFIT) describes an unintentional collision with terrain during the normal operation of an aircraft. By definition the aircraft will be airworthy and the pilot will be in control of the aircraft, but unaware of the impending disaster. This commonly occurs in areas of high terrain and poor visibility. The number of accidents of this type has been greatly reduced through the introduction of terrain awareness and warning systems: the International Civil Aviation Organisation (ICAO) measured a reduction in CFIT-related fatalities of almost 40%, from 1,818 fatalities in the period 1997-2001 to 1,143 fatalities in the period 2002-2006.

The characteristics of approach and landing accidents were examined and found to result from factors such as high-energy approaches (where an aircraft is too high, too fast, or both) and decisions by crew not to initiate missed approaches. Studies showed that cargo, ferry and positioning flights are more likely to be involved in an approach or landing accident than passenger flights. In addition, commercial aircraft flying non-precision approaches were found to be more likely to be involved in an approach and landing accident than commercial aircraft flying precision approaches.

ICAO data for the period 2002-2006 indicated that loss of control in-flight claimed more lives than any other accident category. Other organisations concluded that this type of occurrence still presents a high risk, with a high proportion of these accidents resulting in fatalities and hull losses.

Runway excursions occur during either take-off or landing, and involve an aircraft either over-running the end of the runway or veering off to one side of the runway. Studies showed that runway excursions were the most common type of accident in 2007. Approximately a third of commercial jet accidents in the period 1995-2007 involved a runway excursion.

Runway incursions are the incorrect presence of an aircraft, vehicle or person on a runway. The use of a runway by definition involves aircraft coming into much closer proximity to one another than during normal flight. Hence, the risk of two aircraft colliding prompts many organisations to consider as a priority, reducing the number of runway incursions. One study concluded that increasing the amount of air traffic at an airport disproportionately increases the risk of runway incursions.

In-flight fires do not have the high rate of fatalities that the accident categories described above experience. Nevertheless, they contribute to a number of cabin smoke events and to numerous diversions. This type of accident can include occurrences as diverse as fuel tank explosions, fires from high energy density batteries (such as laptop batteries), or other electronic equipment.

Worldwide Aviation Safety

Worldwide aviation safety statistics for the period 1998-2007 have been compiled using the work of ICAO's Safety Indicators Study Group. There were 1,420 reportable accidents during the period analysed.

Accidents most commonly occurred during the landing phase of flight, although the cause of the accident may have originated during another phase of the flight. Runway excursions were the most common type of accident, although controlled flight into terrain was the most common type of fatal accident.

Worldwide fatal accidents between 1998 and 2007 were analysed by the CAA's Accident Analysis Group (AAG). In total, there were 247 fatal accidents involving large transport aeroplanes. Jet aeroplanes accounted for 45% of fatal accidents, compared to 84% of hours flown. The fatal accident rate for jet aeroplanes in the period analysed was 0.2 per million hours, compared to 1.5 per million hours for turboprop aeroplanes.

When analysed according to the region in which the aeroplane's operator was located, Africa had the highest rate of fatal accidents, followed by the region "Central and South America and Caribbean". The region with the lowest fatal accident rate was North America, followed by Oceania.

Comparing passenger and cargo operations, passenger operations accounted for the highest number of fatal accidents, but cargo operations had the highest fatal accident rate, some six times higher than the passenger operations fatal accident rate.

During the analysis process, AAG assign causal and circumstantial factors to the accidents, in addition to consequences. The most common primary causal factors in fatal accidents were flight crew-related, as were the causal factors. However, it should be acknowledged that although flight crew-related causal factors were most common, this does not imply either blame or fault. Whilst flight crew factors may trigger an accident, these may be precipitated by organisational issues and other factors affecting crew performance such as commercial pressure, training and support.

The most common circumstantial factor was poor visibility or lack of external visual reference. The most likely consequence or outcome of a fatal accident was a post-crash fire, followed by controlled flight into terrain.

Aviation Safety in the European Union

The safety of large aeroplanes operated by European Union (EU) member countries between 1998 and 2007 was analysed, using AAG as the source data. During the period analysed the membership of the EU expanded, therefore accidents involving operators from new member countries have only been included if they occurred after the country concerned had joined the EU.

Between 1998 and 2007, there were 24 fatal accidents involving large EU-operated aeroplanes. The majority of these accidents (13) involved turboprops. The most common phase of flight in which accidents occurred was the approach phase, followed by landing, although the cause of the accident may have originated earlier in the flight.

As with worldwide fatal accidents, the most common causal factor category was flight crew and the most common outcome was a post-crash fire, followed by controlled flight into terrain. The most common circumstantial factor was non-fitment of presently available safety equipment.

In total, there were 520 fatalities, compared to 1,164 people that were on board the aircraft when the accidents occurred. In 15 of the 24 fatal accidents, there were no survivors.

A total of 54.4 million flights and 103.9 million hours were completed by European operators between 1998 and 2007. The three-year moving average fatal accident rate has reduced from 0.5 per million hours in the period 1998-2000, to 0.1 per million hours in the period 2005-2007.

Safety of UK Public Transport Worldwide

The safety of UK-registered aircraft and UK AOC holder operated aircraft was analysed for the period 1998-2007. Public transport operations are those involving ambulance, cargo, passenger, police support, or search and rescue (SAR).

Large Aeroplanes

There were 132 reportable accidents involving large UK public transport aeroplanes between 1998 and 2007. The most common type of reportable accident was ground collision, where an aircraft collides with another aircraft, a vehicle or an object during manoeuvres on the ground. There were five fatal accidents involving this category of aircraft, resulting in a total of eight fatalities to aircraft occupants. There was one reportable accident involving a third party fatality.

The reportable accident rate for large UK public transport aeroplanes between 1998 and 2007 was 4.8 per million hours and the corresponding fatal accident rate was 0.2 per million hours.

There were 155 serious incidents involving large UK public transport aeroplanes between 1998 and 2007. The most common type of serious incident was engine-related, followed by smoke/fumes on the flight deck.

There were over 42,000 occurrences reported to the CAA's Mandatory Occurrence Reporting Scheme (MORS) in the period 1998-2007 involving large UK public transport aeroplanes. The three-year moving average occurrence rate, per million hours, has increased by 30% in the period analysed. By contrast the three-year moving average rate for high-severity occurrences has decreased by 70% over the same period.

Small Aeroplanes

There were 22 reportable accidents involving small UK public transport aeroplanes, the majority of which involved piston aeroplanes. Of these 22 reportable accidents, two were fatal. One of these fatal accidents involved a passenger flight that suffered an engine failure after take-off, the other was an ambulance flight that crashed into the River Mersey. A total of 13 fatalities occurred in these two fatal accidents. The reportable accident rate in this category was 53.0 per million hours and the fatal accident rate was 4.8 per million hours.

There were 10 serious incidents involving small UK public transport aeroplanes: by class of aircraft, the majority of these serious incidents were piston aeroplanes; by nature of flight, the majority of these serious incidents were passenger operations.

There were approximately 650 occurrences reported to MORS during the period 1998-2007. 1.5% of these occurrences were considered to be high severity. The rate of occurrences increased by 85% between 1998 and 2007, by contrast the high severity occurrence rate decreased by 31% over the same period.

Helicopters

UK public transport helicopters may be viewed in three parts: emergency services operations; offshore helicopter operations; and the remainder, which is mostly comprised of passenger operations. There were 25 reportable accidents involving public transport helicopters in the period 1998-2007, the majority involving twin-turbine helicopters.

Four of the 25 accidents were fatal, resulting in a total of 22 fatalities on board the helicopters. Two of these fatal accidents were during emergency services flights and two were during offshore flights. Between 1998 and 2007, the reportable accident rate for public transport helicopters was 19.1 per million hours and the fatal accident rate was 3.1 per million hours.

There were 11 serious incidents involving public transport helicopters between 1998 and 2007. All of these serious incidents involved twin-turbine aircraft and the majority involved offshore operations.

Over 2,400 occurrences involving UK public transport helicopters were reported to MORS. 1.9% of helicopter occurrences were considered to be high severity; the three-year moving average rate of these high severity occurrences has not changed significantly between the periods 1998-2000 and 2005-2007.

Balloons

There were 27 reportable accidents involving UK public transport balloons in the period 1998-2007. None of these reportable accidents was fatal, although there were 10 serious injuries and 41 minor injuries.

There were no serious incidents involving UK public transport balloons in the period 1998-2007. There were 100 occurrences, of which two were considered to be high severity. No utilisation data are available for UK public transport balloon operations; therefore rates of accident, serious incident and occurrence cannot be calculated.

Safety of UK Non-public Transport Worldwide

The safety of UK-registered aircraft and UK AOC holder operated aircraft was analysed for the period 1998-2007. Non-public transport operations include aircraft not engaged in ambulance, cargo, passenger, police support, or search and rescue (SAR) operations. In cases where the nature of flight could not be ascertained, the flight has been assumed to be non-public transport.

Large Aeroplanes

There were 21 reportable accidents involving large non-public transport aeroplanes in the period 1998-2007. The most common type of reportable accident was a ground collision, which was also the case for large public transport aeroplanes. Two of the 21 reportable accidents were fatal, resulting in a total of three fatalities. One of these fatal accidents involved a Hunter aircraft, which crashed following an engine failure and in-flight fire and the other involved a Vampire aircraft, which crashed after suffering loss of control during a flying display.

Large non-public transport aeroplanes were involved in 12 serious incidents in the period 1998-2007. Nine of the 12 serious incidents involved jet aircraft and three involved turboprop aircraft.

There were approximately 6,700 occurrences reported to MORS involving large UK non-public transport aeroplanes in the period 1998-2007. 0.5% of these were considered to be high severity. No utilisation data are available for UK non-public transport large aeroplane operations; therefore rates of accident, serious incident and occurrence cannot be calculated.

Small Conventional Aeroplanes

Conventional aeroplanes may be defined as: landplanes, seaplanes and self-launching motorgliders. In the period 1998-2007, there were approximately 1,500 reportable accidents involving small conventional aeroplanes (not exceeding 5,700kg MTWA). Single piston aeroplanes were involved in 89% of the reportable accidents, while single turboprop aeroplanes were involved in 8% of the reportable accidents.

There were 96 fatal accidents involving small conventional aeroplanes between 1998-2007. In total, there were 163 fatal, 105 serious and 241 minor injuries in the period analysed.

The overall reportable accident rate for small conventional aeroplane non-public transport in the period 1998-2007 has been estimated to be 179.0 per million hours and the fatal accident rate has been estimated to be 11.7 per million hours.

Small Helicopters

Small helicopters may be defined as those with a maximum take-off weight not exceeding 2,730kg. There were 213 reportable accidents involving small helicopters in the period 1998-2007. 71% of reportable accidents in this category involved single piston helicopters, 25% involved single turbine helicopters and 5% involved twin turbine helicopters.

Of the 213 reportable accidents, 24 were fatal, resulting in 56 fatalities to occupants of the helicopters. A further two fatalities occurred to the occupants of a microlight that collided with a small helicopter. There were also 17 serious injuries and 80 minor injuries in the period analysed. The overall reportable accident rate between 1998 and 2007 has been estimated to be 127.4 per million hours. The corresponding fatal accident rate has been estimated to be 14.4 per million hours.

Small 'Other' Aircraft

Small 'other' aircraft are UK registered or operated airships, balloons, gliders, gyroplanes and microlights engaged in non-public transport flights. Responsibility for the safety of these aircraft types has been delegated by the CAA to their representative bodies (apart from gyroplanes).

Between 1998 and 2007, there was only one reportable accident involving a UK registered airship and there were no injuries. In the same period, there were 21 reportable accidents involving UK non-public transport balloons. None of these accidents resulted in a fatal injury, however there were 10 serious injuries and 10 minor injuries.

Safety statistics for gliders are provided by the British Gliding Association (BGA). The BGA analyse their data using the calendar year 1st October – 30th September. Between 1st October 1997 and 30th September 2007, there were 436 reportable accidents involving UK gliders, 36 of which resulted in fatalities. There were also two accidents involving third party fatalities, resulting in a total of two third party injuries.

In the period 1998-2007, there were 25 reportable accidents involving UK-registered gyroplanes, of which eight were fatal, resulting in nine fatalities. During the same period, there were 320 reportable accidents involving UK-registered microlights, 23 of which were fatal, resulting in 31 fatalities. However, the fatal accident rate per million hours for gyroplanes in the period 1998-2007 was some 18 times greater than the combined average for airships, balloons, gliders and microlights.

Safety of UK Airspace and Aerodromes

The safety of UK airspace and aerodromes was examined for the period 1998-2007, relating to any aircraft, regardless of the nature of flight or country of registration.

Foreign-Registered Aircraft in UK Airspace

The safety of foreign-registered or operated aircraft in UK airspace was analysed. It was found that there had been 203 reportable accidents involving this category of aircraft in the period 1998-2007. 76% of the 203 reportable accidents involved non-public transport aircraft and 24% involved public transport aircraft.

There were 20 fatal accidents involving foreign-registered aircraft in UK airspace in the period 1998-2007, resulting in 40 fatalities. One of these fatal accidents involved a large public transport aeroplane, which crashed on take off from Stansted and was destroyed by impact and fire, resulting in four fatalities. In addition to the 40 fatalities on-board foreign registered aircraft, there was one fatality on-board a UK-registered aircraft involved in a mid-air collision with a foreign-registered aircraft. There were also 17 serious injuries and 78 minor injuries.

There were 65 serious incidents in the period 1998-2007 involving foreign-registered aircraft in UK airspace. 83% of these involved public transport aircraft and 17% involved non-public transport aircraft.

There were nearly 11,000 occurrences involving foreign-registered aircraft in UK airspace in the period 1998-2007. This figure includes the UK reportable accidents and serious incidents previously discussed, which form 2.5% of the total number of occurrences. 1.1% of occurrences involving foreign-registered aircraft in UK airspace were considered to be high-severity.

ATC Occurrences in UK Airspace

Occurrences with an Air Traffic Control (ATC) involvement that occurred within UK airspace were examined for the period 1998-2007. The data exclude Airprox, which are reviewed separately by the UK Airprox Board (UKAB).

In the period 1998 to 2007, there were over 21,000 ATC occurrences in UK airspace (excluding Airprox) involving at least one civil aircraft. The majority of these occurred in controlled airspace. 49% of ATC occurrences involved UK registered aircraft, 33% involved foreign registered aircraft and 18% involved aircraft where the registration was unknown or not applicable. 58% of ATC occurrences involved public transport operations, whereas 42% involved non-public transport. 68 ATC occurrences were considered to be high-severity, corresponding to 0.3% of all ATC occurrences.

Runway incursions are one of the specific groups of ATC occurrence that the CAA examines in detail. In total, there were 956 runway incursions in the period 1998-2007, of which 4.8% were considered to be high-severity.

An altitude deviation or "level bust" is defined as when an aircraft deviates from its ATC-assigned flight level by 300 feet or more. In doing so, an aircraft can subsequently experience further problems, such as a loss of separation from another aircraft or even a mid-air collision. There were approximately of 4,500 level busts in the period 1998-2007, of which 572 resulted in a loss of separation (this corresponds to 12.7% of the total).

UK Airprox

An Airprox is defined as a situation in which, in the opinion of a pilot or controller, the distance between aircraft as well as their relative positions and speed was such that the safety of the aircraft involved was or may have been compromised.

Between 1998 and 2007, there were 1,031 Airprox involving civil aircraft only and a further 656 between civil and military aircraft. There were 833 Airprox involving commercial air transport and 1,184 involving general aviation.

UK Aerodromes

Aerodrome related occurrences involving civil aircraft at UK licensed aerodromes were examined for the period 1998-2007. Aerodrome occurrences are considered to be those that are associated with an aerodrome's personnel or infrastructure.

There were over 5,400 aerodrome occurrences at UK licensed aerodromes in the period 1998-2007. Common types of aerodrome occurrence include: the state of the ramp, taxiway or runway; jet or rotor blast; ramp services errors (such as loading, marshalling or deicing); or collisions involving aircraft whilst manoeuvring around the airfield. 46 aerodrome occurrences were high-severity.

There were approximately 750 aerodrome occurrences involving an aircraft collision or damage in the period 1998-2007. The most common collisions or damage involved aircraft-vehicle collisions. During the same period, there were approximately 800 loading errors at UK licensed aerodromes involving UK-registered or operated aircraft.

High-Severity Events

Occurrences received through the UK MOR scheme are subject to a risk grading system. This system assesses the severity of the event (using criteria such as aircraft damage or injury to occupants) and the likelihood of the event recurring.

In Chapter 7, a narrative has been provided for high-severity events that have a UK interest. A UK interest may be: events occurring in UK airspace; involving UK licensed pilots; or the state of registry, design, manufacture or operation.

The narratives are extremely brief and are intended to provide the reader only with a snapshot of the occurrence itself. The UK Air Accidents Investigation Branch (AAIB) provides full reports of UK reportable accidents and serious incidents, made available on their website: http://www.aaib.dft.gov.uk/

CAA MOR Scheme

The majority of the occurrence data used in the Aviation Safety Review are sourced from the CAA's Mandatory Occurrence Reporting Scheme (MORS). The scheme was created in January 1976, with the aim of preventing accidents and incidents by ensuring that relevant safety information is reported, collected, stored, protected and disseminated throughout industry. The scheme requires UK aviation professionals and approved and licensed organisations to report to the CAA all incidents which endangered or, if not corrected, would have endangered an aircraft, its occupants or any other person.

Over 95,500 MORs were received during the period 1998-2007, and the annual number of reports has more than doubled, from approximately 6,000 in 1998 to nearly 13,000 in 2007.

UK MORs are defined as those involving UK-registered or operated aircraft, or occurrences in UK airspace. 78,000 of these were reported to the UK CAA and graded as 'reportable' in the period 1998-2007. Approximately 1,200 UK occurrences were considered to be high-severity, corresponding to 1.6%. In the period analysed, the rate of high-severity occurrences has decreased.

Approximately 2,600 reportable accidents and 300 serious incidents occurred during the period 1998-2007, involving UK-registered or operated aircraft or occurring in UK airspace. There was no significant change in the rate of reportable accidents and serious incidents during this time.

Comparison with the Previous Aviation Safety Review (CAP 763)

Where possible, comparisons have been made with the previous edition of the aviation safety review, CAP 763. While this current edition has examined the period 1998-2007, the previous edition examined the period 1995-2004. It should be noted that in the case of the chapter on aviation safety in the European Union, the content is substantially different and therefore a comparison cannot be made.

Worldwide Aviation Safety

The average number of reportable accidents worldwide between 1995 and 2004 was 170 per year, whereas between 1998 and 2007, this figure had reduced to 142 per year. This reduction is also reflected in the average number of fatal accidents and fatalities per year and in all three classes of aircraft (jets, business jets and turboprops).

Safety of UK Public Transport Aircraft Worldwide

The number of occurrences involving large UK public transport aeroplanes has increased, from 32,000 between 1995-2004, to 42,400 between 1998-2007. However, the number of reportable accidents has reduced from 162 to 132 in the same period and the number of fatal accidents has remained the same. A comparison of the three-year moving average reportable accident rates at the end of the two time periods examined shows an overall reduction: in the three-year period ending 2004, the rate was 6.7 reportable accidents per million hours, whereas in the three-year period ending 2007 the rate was 3.1 reportable accidents per million hours.

There was an increase in the number of reported occurrences involving small UK public transport aeroplanes, from 500 in the period 1995-2004, to 650 in the period 1998-2007. By contrast, the number of reportable accidents has remained the same (22) and the number of fatal accidents has reduced from five to two. Comparing the three-year moving average reportable accident rates for the period ending 2004 to the period ending 2007, there has been a reduction from 50.3 reportable accidents per million hours to 44.3 reportable accidents per million hours.

The number of reported occurrences involving UK public transport helicopters has risen from 2,200 in the period 1995-2004, to 2,400 in the period 1998-2007. The number of reportable accidents in the same periods decreased, from 31 to 25 and the number of fatal accidents remained the same (four). The three-year moving average reportable accident rate in 2004 was 17.7 per million hours, but by 2007 this figure had reduced to 11.8 per million hours. Similarly, the three-year moving average fatal accident rate reduced from 2.5 in the period ending 2004 to 2.4 in the period ending 2007.

The number of public transport balloon occurrences reported to the CAA has remained the same, at 100 occurrences in both time periods. The number of reportable accidents increased from 26 in the period 1995-2004 to 27 in the period 1998-2007. There had been one fatal accident in the period 1995-2004, but there were none between 1998 and 2007.

Safety of UK Non-public Transport Aircraft Worldwide

Large non-public transport aeroplanes were involved in approximately 6,700 occurrences in both of the time periods examined. The number of reportable accidents increased from 19 between 1995 and 2004, to 21 between 1998 and 2007. The number of fatal accidents decreased from three between 1995 and 2004, to two between 1998 and 2007.

The number of reportable accidents involving small conventional aeroplanes decreased from 1,600 between 1995 and 2004, to 1,500 between 1998 and 2007. The number of fatal accidents also decreased between the same time periods, from 102 to 96. The three-year moving average reportable accident rate per million hours in the period ending 2004 was 175.3, by the period ending 2007 this had reduced to 164.9.

Small non-public transport helicopters were involved in 214 reportable accidents between 1995 and 2004, compared to 213 in the period 1998-2007. The number of fatal accidents over the same two time periods reduced from 27 to 24. The three-year moving average reportable accident rate per million hours in the period ending 2004 was 134.7, this figure had reduced to 102.4 by the period ending 2007. Similarly, the three-year moving average fatal accident rate in the period ending 2004 was 20.4 per million hours, compared to 8.7 per million hours in the period ending 2007.

There was only one reportable accident involving an airship in either period, and no fatal accidents occurred. Non-public transport balloons were involved in 23 reportable accidents in the period 1995-2004, compared to 21 reportable accidents in the period 1998-2007. There were no fatal accidents involving non-public transport balloons.

Gliders were involved in 430 reportable accidents between 1st October 1994 and 30th September 2004. This figure has changed very little between the two Reviews; there were 436 reportable accidents involving gliders between 1st October 1997 and 30th September 2007. Over the same time periods, the number of fatal accidents reduced from 38 to 36. The three-year moving average reportable accident rate in the period ending 2004 was 285.4 per million hours, compared to 318.0 in the period ending 2007. The three-year moving average fatal accident rate decreased from 25.5 per million hours in the period ending 2004, to 19.4 per million hours in the period ending 2007.

The number of reportable accidents involving gyroplanes has decreased from 31 between 1995 and 2004, to 25 between 1998 and 2007. The number of fatal accidents in the two periods is the same (eight). The three-year moving average reportable accident rate in the period ending 2004 was 1,785.2 per million hours, however this had reduced to 645.8 per million hours by the period ending 2007. The three-year moving average fatal accident rate has also reduced, from 595.1 per million hours in the period ending 2004, to 161.5 in the period ending 2007.

There were 251 reportable accidents involving microlights between 1995 and 2004, compared to 320 between 1998 and 2007. The number of fatal accidents involving microlights in the two time periods was the same (23). The three-year moving average reportable accident rate in the period ending 2004 was 285.5 per million hours, compared to 368.1 per million hours in the period ending 2007. The corresponding three-year moving average fatal accidents rates were 20.2 per million hours and 25.3 per million hours respectively.

Safety of UK Airspace and Aerodromes

The number of occurrences involving foreign-registered aircraft in UK airspace has increased, from 4,700 between 1995 and 2004, to 11,000 between 1998 and 2007. Over the same two time periods, the number of reportable accidents increased, from 198 to 203, while the number of fatal accidents also increased from 19 to 20.

The total number of ATC occurrences (excluding Airprox) has increased from 16,500 between 1995 and 2004, to 21,000 between 1998-2007. Over the same period level busts increased from 3,300 to 4,500. The definition of a runway incursion was expanded in 2007 to include the incorrect presence of an aircraft, vehicle or person on a runway, instead of their unplanned or unauthorised presence. Had this change not taken place, the number of runway incursions would have increased from 504 in the period 1995-2004, to 902 in the period 1998-2007. When the new definition has been taken into account, from January 2007 onwards, the number of runway incursions between 1998 and 2007 was 956.

The number of aerodrome-related occurrences at UK licensed aerodromes in the period 1995-2004 was 4,300. This had increased to 5,400 by the period 1998-2007. Reports of damage caused by ground collisions (such as with other aircraft, or ground obstacles) decreased from 775 between 1995 and 2004, to 750 between 1998 and 2007. The number of loading errors increased from 621 between 1995 and 2004, to 800 between 1998 and 2007.

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Introduction

The Aviation Safety Review, CAP 780, provides an update to previous reviews (CAPs 763, 735 and 701) and covers the ten-year period 1998-2007. The document includes a brief overview of worldwide and European Union aviation safety statistics, before concentrating in more detail on UK aviation safety.

The document has been divided into the following chapters: worldwide literature review, worldwide accidents, European Union fatal accidents, UK public transport, UK non-public transport, UK airspace and aerodromes, UK high-severity events, and the UK mandatory occurrence reporting scheme.

The intention is for this document to be used as a statistical reference for the UK aviation community, allowing common and consistent safety statistics to be used by all. The CAA has deliberately avoided drawing conclusions from the statistics produced, and invites readers to draw their own inferences.

There may be slight differences between the data presented in this Aviation Safety Review and previous versions. The reasons for these differences include:

- more accurate information becoming available;
- definitions of data vary slightly between documents;
- data may have been reclassified, for example following the publication of an investigation's final report. This can happen many months or even years after an accident.

Definitions of the terms used in the Aviation Safety Review may be found in Appendix 1 and a glossary is provided in Appendix 2. An in-depth explanation of the terms and analysis techniques used in this document is provided in Appendix 3.

The data for this Review has been derived from a variety of sources: worldwide accident statistics have been supplied by the International Civil Aviation Organisation (ICAO); European Union fatal accident statistics and worldwide utilisation have been derived from Ascend data; UK accident, serious incident and occurrence data is sourced from the CAA Mandatory Occurrence Reporting Scheme; UK utilisation is supplied by the CAA Air Transport Statistics Department, CAA Aircraft Register, NATS, Eurocontrol and the British Gliding Association; Airprox statistics are provided by the UK Airprox Board. Sources external to the CAA have been referenced in this document and are hereby acknowledged for the information supplied.

The CAA welcomes comments on the Aviation Safety Review and suggestions for how future versions may be improved. If you have any comments or questions regarding this review, then please email safety.analysis@caa.co.uk.

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Chapter 1 Worldwide Literature Review

1 Introduction

1.1 This Chapter summarises a literature review of worldwide aviation safety, conducted by the CAA in autumn 2007. The time periods discussed vary and may not necessarily match the statistical analyses presented in the rest of the Aviation Safety Review.

1.2 Not included in this literature review is the CAA's own analysis of worldwide fatal accidents, published as CAP 776 Global Fatal Accident Review 1997-2006. CAP 776 summarises the findings of the CAA's analysis of fatal accidents to jet and turboprop aeroplanes above 5,700 kg engaged in passenger, cargo and ferry/ positioning flights for the ten-year period 1997 to 2006. It was found that post crash fire, and loss of control in-flight were the two most frequently identified accident categories, each appearing in approximately 40% of all fatal accidents. Controlled flight into terrain was the third most common accident category, accounting for 25% of all fatal accidents. [1]

1.3 There are numerous organisations and safety initiatives such as the Flight Safety Foundation (FSF), the Commercial Aviation Safety Team (CAST), the European Strategic Safety Initiative (ESSI), and the Pan-American Aviation Safety Team (PAAST) that are consistently working to improve aviation safety.

1.4 This literature review records some of the safety concerns of different major organisations and safety initiatives around the world. It focuses on large public transport aeroplane operations, providing a sample of the statistical data that has been published in the major accident categories, and risk areas of:

- Controlled Flight Into Terrain (CFIT)
- Approach and Landing Accidents
- Loss of Control In-Flight
- Fire (Post-Impact and In-Flight)
- Runway Excursions
- Runway Incursions

2 CFIT and Approach and Landing Accidents

2.1 Controlled flight into terrain can be defined as an accident that occurs when an airworthy aircraft, under the control of a pilot, is flown into terrain (water or obstacles) with inadequate awareness on the part of the pilot of the impending disaster. [2]

2.2 Historically, CFIT has been a major concern for many international organisations. Boeing statistics of worldwide commercial jet accidents from 1997-2006 attribute 20 fatal accidents and 1,655 onboard fatalities to this type of accident [3]. In 2007, CFIT accounted for 5% of global accidents. 80% of these accidents were fatal, and all resulted in a hull loss[1]. [4]

2.3 International Civil Aviation Organisation (ICAO) data notes that the CFIT accident category has shown the greatest decrease in the number of fatalities in recent years. There were 1,143 fatalities as a result of CFIT accidents in commercial aviation from 2002-2006. This was a reduction of nearly 40% from the previous five-year time period of 1997-2001, in which there were 1,818 CFIT-related fatalities. [5]

1. Applies to commercial airline passenger, cargo and ferry operations only, involving jets of a MTOW exceeding 15 metric tonnes, and Turboprops of MTOW exceeding 3.9 metric tonnes.

2.4 Although the number and threat of CFIT accidents has been greatly reduced through the implementation of Terrain Awareness and Warning System (TAWS) equipment, safety activity still continues in this area. ICAO has expressed concern over the risks posed by a complacent attitude towards this readily available and proven technology. Failure to link TAWS to global navigation satellite systems, or to promptly update the software and databases these equipment rely on, can lead to false, delayed, or even no warnings being given, thereby giving flight crews a false sense of confidence in these systems. Furthermore ICAO-quoted industry sources state that 62% of false warnings arise from database errors, 16% from flight management system errors and 13% from altitude errors, most of which can be prevented by employing simple updates. [6]

2.5 The Flight Safety Foundation (FSF) list CFIT and approach and landing accidents among their prime safety concerns. The Flight Safety Foundation's data shows that many CFIT accidents occur during the approach and landing phase of flight. In most of these accidents, the aircraft was lined up with the runway [7]. The Australian Transport Safety Bureau analysed CFIT accidents from 1996 to 2005 involving Australian civil registered aircraft within Australian territory, engaged in regular public transport and general aviation operations. Their analysis revealed that the highest number (63%) of CFIT accidents and incidents occurred in the approach phase of flight. [8]

2.6 The FSF's Approach and Landing Accident Reduction Task Force has studied numerous approach and landing accidents and serious incidents. Major findings of their studies point to a general lack of risk assessment. Case studies revealed that 83% of flight crews did not conduct go-arounds or missed approaches when necessary, 30% of accidents and serious incidents were fast or high on approach, 42% involved 'press-on-itis,' where crews continued the approach and landing despite cues indicating that a go-around or a missed approach was appropriate.

2.7 From their studies on approach and landing accidents, the FSF have additionally concluded that: [9]

- the approach and landing accident rate for cargo, ferry and positioning flights is eight times higher than the rate for passenger flights;
- commercial aircraft flying a non-precision approach have an accident risk five times greater compared to those flying a precision approach;
- the approach and landing phase of flight, only accounts for approximately 4% of the average flight time, yet 45% of hull losses.

3 Loss of Control In-Flight

3.1 Loss of control in-flight can be defined as the loss of aircraft control during an airborne phase of flight. [10]

3.2 The European Aviation Safety Agency (EASA) worldwide fatal accident statistics from 1997-2006 show that loss of control in-flight was the top accident category in terms of the number of fatal accidents[1]. The average rate of fatal accidents to aircraft registered in EASA member states[2] involving loss of control in-flight was stable from 2000-2006, at approximately 0.27 accidents per million flights. [11]

1. Involving aircraft used in public transport operations, or general aviation turbine powered, fixed wing aircraft over 5,700 kg MTOM. Applicable to accidents involving aircraft registered in EASA member states, as well as non-EASA registered aircraft
2. To fixed wing aircraft over 2,250kg MTOM, registered in Europe, public transport operations

3.3 ICAO data indicate that loss of control in-flight claimed the most number of lives in commercial aviation from 2002-2006 compared to other types of accidents. ICAO attributes 1,391 fatalities to loss of control in-flight from 2002-2006. Lives lost due to accidents from loss of control in-flight in the period 2002-2006 have decreased compared to the period 1997-2001. [12]

3.4 The Commercial Aviation Safety Team (CAST) have identified loss of control in-flight as the accident category that globally still has the highest proportion of risk (from hull loss/ fatal/ security accidents) to be reduced. [13]

3.5 The International Air Transport Association's (IATA) 2007 safety report, attribute 13% of accidents in 2007 to loss of control in-flight[1]. All these accidents led to hull losses, and 85% were fatal. IATA believe the major risk factors in a loss of control event are: environmental, such as meteorological or birds and foreign objects; aircraft malfunctions; and maintenance events. [14]

4 Fire (Post-Impact and In-Flight)

4.1 Post-impact fire can be described as fire or smoke in or on the aircraft, resulting from an impact. [15]

4.2 EASA worldwide fatal accident statistics from 1997-2006 show post-impact fire to be the third highest accident category in terms of the number of fatalities[2]. Directly following an impact, fire and/ or smoke inhalation represent a significant hazard to the survival of aircraft occupants. Research conducted for Transport Canada, suggests that rapid fire progression is by far the most significant reason for the majority of non-impact injured passengers failing to evacuate the aircraft. Almost all are attributable to fuel fed fires. [16]

4.3 In-flight fire can be described as fire or smoke in or on the aircraft during flight, which is not the result of an impact. [17]

4.4 In-flight fire is a significant accident category, which is often overlooked in international published statistics, compared to other categories such as controlled flight into terrain, loss of control in-flight or even post impact fires. Historical data shows in-flight fires to have been within the four highest accident categories in terms of the number of fatalities [18]. Fatal accident data on worldwide commercial jet aircraft from 1997-2006 attributes 110 on board fatalities to in-flight fires in this time period; this more recent data puts in-flight fire events within the top 10 CAST/ ICAO accident categories. [19]

4.5 It is estimated that more than 1,000 in-flight smoke events occur annually resulting in over 350 unscheduled or precautionary landings. [20] Most in-flight fires are in unprotected areas. Boeing conducted a study on in-flight smoke, fumes, fire and overheating events in pressurised areas on Boeing aircraft between November 1992 and June 2000. The analysis found that 64% of the smoke events had an electrical source. [21]

4.6 A study conducted for the US Federal Aviation Administration (FAA), of 101 survivable airliner accidents where fatalities or aircraft destruction occurred, found approximately 70% involved a fire. [22]

1. Applies to commercial airline passenger, cargo and ferry operations only, involving jets of a MTOW over 15 metric tonnes, and Turboprops of MTOW over 3.9 metric tonnes
2. Involving aircraft used in public transport operations, or general aviation turbine powered, fixed wing aircraft over 5,700 kg MTOM. Applicable to accidents involving aircraft registered in EASA member states, as well as non-EASA registered aircraft

4.7 The US National Transportation Safety Board (NTSB) has been involved in the investigation of fuel tank explosions for several years, and has long been an advocate of the use of fuel tank inerting technologies. To 'eliminate flammable fuel/ air vapours in fuel tanks on transport category aircraft' is listed on the NTSB's 2008 "most wanted" list of aviation safety improvements. [23] 13 worldwide accidents to transport category aircraft were identified during the period 1966-1995 that may have involved a fuel tank explosion. [24]

4.8 Fire suppression and detection systems in cargo compartments, crew response to hidden fires, and more recently, high energy density batteries in portable electronic equipment are key fire safety concerns of the NTSB. [25]

5 Runway Excursions

5.1 Runway excursions include overruns and veer-offs, in which an aircraft goes off the end or side of the runway respectively.

5.2 Runway excursions are the most common type of runway safety accident, representing approximately 80% of fatal runway accidents and 75% of fatalities [26].

5.3 The International Federation of Air Line Pilots' Associations (IFALPA) believe that runway excursions are among the most serious threats to aviation safety. IFALPA state that over the last 20 years, runway excursions occurred at an average rate of approximately 4 per month. [27]

5.4 IATA data shows that 48% of accidents in 2007 occurred during the landing phase[1]. The majority of these accidents involved a runway excursion, making runway excursion the single largest accident category of 2007. There were 26 runway excursion accidents in 2007, an accident rate of 0.73 accidents per million sectors flown for all aircraft types. [28]

5.5 FSF analysis has shown that there were 379 runway excursion accidents involving all (western and eastern built) commercial turbojet and turboprop aircraft from 1995-2007. This equates to 28.5% of total world accidents. Approximately one in three commercial jet accidents are an excursion; the excursion accident rate for turboprops is one in four. Turboprops have a higher risk of veer-offs, whereas jets have a higher risk of overruns. From 1991-2002, 25.1% of business jet accidents were excursions. [29]

5.6 IFALPA-quoted National Aerospace Laboratory (NLR) data of runway excursion accidents to multiple engine commercial aircraft from 1997-2005 found that 75% of runway excursion accidents occurred during landing, with the remaining 25% following a rejected take-off. 53% were veer-offs and 47% overruns. While approximately 10% of movements were on wet or contaminated runways, 51% of the landing accidents occurred on a wet or contaminated runway. [30]

5.7 NLR analysis of worldwide accident data show that the risk of overruns during landing is significantly increased if one or more of the factors listed below is present. The risk factor to a landing overrun is shown in brackets.

- Non-precision approach (25 times higher risk than a precision approach);
- Long landing - touch down far beyond runway threshold (55 times higher risk than when landing is not long);

1. Applies to commercial airline passenger, cargo and ferry operations only, involving jets of a MTOW over 15 metric tonnes, and Turboprops of MTOW over 3.9 metric tonnes

- Excess approach speed (38 times higher risk than when there was no excess approach speed);
- Visual approach (27 times higher than when flying a precision approach);
- Significant tailwind (tailwind of 5 knots or more increases risk by factor of five);
- High on approach (26 times higher risk);
- Wet/flooded or contaminated runway (10 times higher for wet/ flooded runway, 14 times higher for snow/ice/slush on runway).

5.8 There was found to be a factor of three reduction in the landing overrun accident rate over the 35-year period 1970-2004. The decrease in the accident rate can most likely be attributed to advancements in braking devices, improvements in understanding of runway friction issues, and safety awareness campaigns. [31]

6 Runway Incursions

6.1 The ICAO definition of a runway incursion is: "any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft".

6.2 There were no accidents involving a runway incursion in 2007[1]. However, many incidents were reported worldwide. [32]

6.3 A runway incursion was a significant contributing factor to the most severe accident in aviation history (in terms of the number of onboard fatalities). Over 560 lives were claimed when two Boeing 747s collided at Los Rodeos Airport, Tenerife in 1977. [33] The threat of collision posed by a runway incursion makes addressing them a high priority to many organisations and regulators worldwide. Improving runway safety, including giving warnings of possible collisions and incursions, is listed as one of the NTSB's "most wanted" list of aviation safety improvements. [34]

6.4 The US Federal Aviation Administration's analysis of runway incursions from 2003-2006, found that pilot deviation, operational errors/deviations and vehicle/pedestrian deviations accounted for 54%, 29% and 17% of runway incursions respectively. [35]

6.5 A Transport Canada study on runway incursions concluded that a 20% increase in traffic volume at an aerodrome causes a 140% increase in runway incursion potential. The study also found that:

a) as traffic volumes increase, runway incursion potential increases more rapidly when capacity-enhancing procedures, such as simultaneous intersecting runway operations and intersection departures, are in effect than when they are not in effect; and

b) if traffic volume remains unchanged, the potential for runway incursions will increase when capacity-enhancing procedures are implemented.

6.6 The Transport Canada study cited traffic volume, capacity-enhancing procedures, airport layouts, complexity and human performance as contributing factors to the increase in runway incursions. [36]

1. Applies to commercial airline passenger, cargo and ferry operations only, involving jets of a MTOW over 15 metric tonnes, and Turboprops of MTOW over 3.9 metric tonnes

7 Other Significant Accident Categories

7.1 Although mid-air collision accidents are rare in public transport operations, when they do occur the number of fatalities involved are very high. Mid-air collisions and near collisions, are listed as the fifth highest accident category in terms of number of fatalities in worldwide commercial jet fatal accident data from 1997-2006 [37]. IATA list mid-air collision as a top safety issue, citing contributing factors such as level busts and ATC-pilot communication as issues needing to be actively reduced. [38]

7.2 Almost 20% of accidents in 2007 related to ground damage[1]. 26% of these resulted in hull losses [39]. The FSF estimate that globally there are 27,000 ramp accidents and incidents, and 243,000 injuries every year. Ground accidents and incidents are thought to cost the airline industry US$4.2 billion annually. [40]

7.3 Fatal accident data on worldwide commercial jet aircraft from 1997-2006 attributes 546 on board fatalities to "System/ Component Failure or Malfunction Non-Powerplant", making it the third highest accident category in terms of the number of fatalities. [41]

7.4 The rate of accidents[2] related to aircraft systems/components/engine failures per million departures to European registered public transport operations was stable from 2002 to 2006 resulting from a stable number of fatal accidents in this category. [42]

7.5 The ESSI Commercial Aviation Safety Team consider Safety Management Systems and Ground Handling as their priority areas of intended action.

8 Conclusion

8.1 Although sometimes differing in order, loss of control in-flight, controlled flight into terrain, and post-impact fire are among the top accident categories resulting in the highest number of fatalities in commercial aviation. The controlled flight into terrain accident category has had the greatest decrease in the number of fatalities in recent years. The implementation of terrain awareness and warning system equipment has played a significant role in the reduction of controlled flight into terrain accidents.

8.2 Runway excursions are the most common type of runway safety accident, representing approximately 80% of fatal runway accidents. There were no accidents involving a runway incursion in 2007, however, there were many incidents reported worldwide.

8.3 Globally, there is much safety activity by organisations and initiatives in the areas of loss of control in-flight, controlled flight into terrain, in-flight and post-impact fire and runway safety issues. Through methods such as analysis of accidents, research, working groups, and the production of toolkits and publications, efforts to improve aviation safety are continuous.

1. Applies to commercial airline passenger, cargo and ferry operations only, involving jets of a MTOW over 15 metric tonnes, and Turboprops of MTOW over 3.9 metric tonnes
2. To fixed wing aircraft, over 2,250kg MTOM, registered in Europe, public transport operations

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Chapter 2 Worldwide Aviation Safety

1 Introduction

1.1 This Chapter contains information on the safety of aviation worldwide. The Chapter is divided into reportable accidents and fatal accidents. The data for reportable accidents is sourced from the International Civil Aviation Organisation (ICAO) whereas fatal accident data is sourced from the CAA Accident Analysis Group (AAG)'s fatal accident database.

2 Reportable Accidents

2.1 This section uses data sourced from ICAO, which is a specialised agency of the United Nations. ICAO was created through the 1944 Chicago Convention and came into being on 4th April 1947, when 26 states had ratified the convention. The original purpose of ICAO, as described in the 1944 convention was to:

- ensure the safe and orderly growth of international civil aviation throughout the world;
- encourage the arts of aircraft design and operation for peaceful purposes;
- encourage the development of airways, airports and air navigation facilities for international civil aviation;
- meet the needs of the peoples of the world for safe, regular, efficient and economical air transport;
- prevent economic waste caused by unreasonable competition;
- ensure that the rights of Contracting States are fully respected and that every Contracting State has a fair opportunity to operate international airlines;
- avoid discrimination between Contracting States;
- promote safety of flight in international air navigation;
- promote generally the development of all aspects of international civil aeronautics.[1]

2.2 ICAO operates a Safety Indicators Study Group (SISG) which meets on an annual basis to analyse worldwide reportable accidents involving large transport aircraft. An expert nominated by the UK CAA attends the group, as do members of other national aviation authorities.

2.3 A reportable accident is defined by Annex 13 to the Convention on International Civil Aviation (Aircraft Accident and Incident Investigation) and may be broadly described as damage to an aircraft or injuries to an aircraft's occupants. A full definition may be found in Appendix 1. It should be noted that reportable accident statistics include fatal accidents.

2.4 Reportable accidents in the period 1998-2007 have been analysed by SISG and presented in this section. Each of the reportable accidents included in the dataset must have involved at least one public transport aeroplane with a maximum take-off weight authorised (MTWA) exceeding 5,700kg.

1. Memorandum on ICAO, available at http://www.icao.int/icao/en//m_about.html

2.5 It should be noted that there are some aeroplanes where the weight of the original type is below 5,700kg MTWA, but where subsequent variants have exceeded this weight. An example is the Embraer EMB110 Bandeirante. For consistency across the dataset, all variants are categorised using the weight limit of the original type. A list of public transport aeroplane types is available in Appendix 5, showing the weight groups and classes of aeroplane that have been used.

2.6 Number of Accidents Per Year

2.6.1 Figure 1 shows the number of reportable accidents involving large transport aircraft worldwide. A rate of reportable accidents has been calculated, however the utilisation data used does not include business jets, therefore the figure should be treated with caution. In total, there were 1,420 reportable accidents in the period analysed.

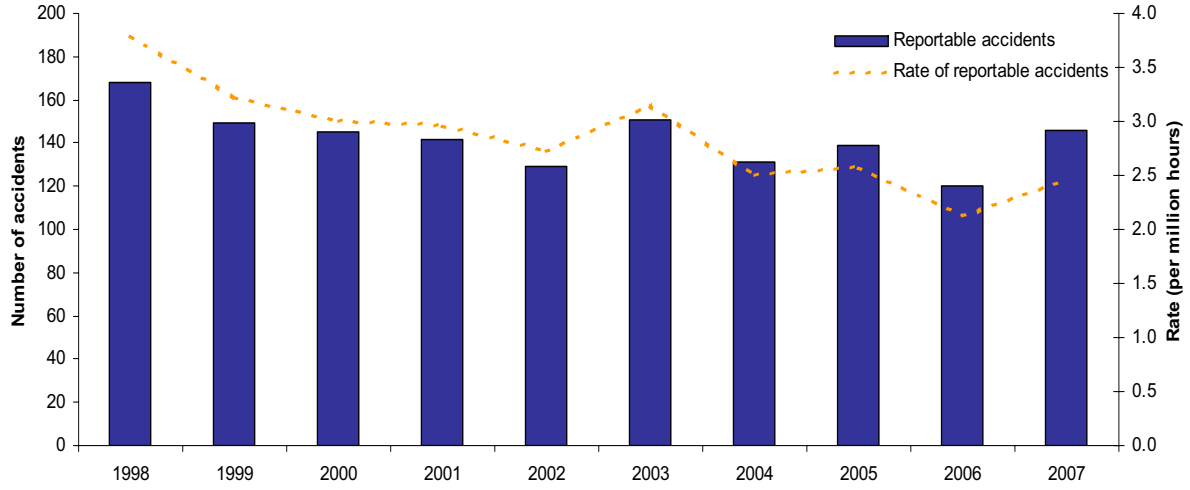

Figure 1 Worldwide reportable accidents involving large transport aircraft

2.7 Phase of Flight

2.7.1 Figure 2 shows the phase of flight during which the accident occurred. It can be seen that approach and landing form a significant proportion of the number of reportable accidents. However, it should be noted that the cause of the accident may have occurred during another phase of flight.

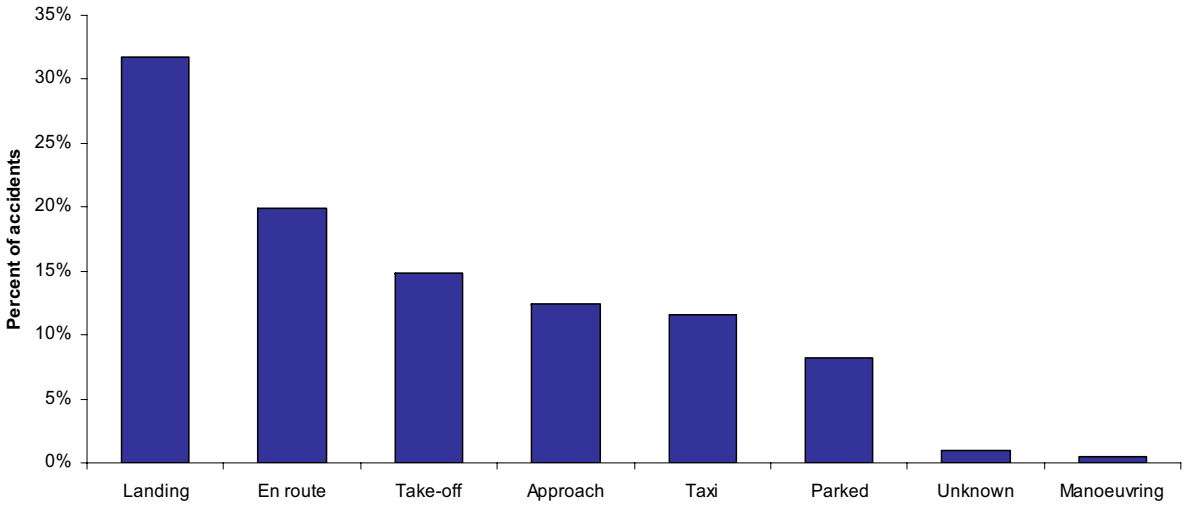

Figure 2 Worldwide reportable accidents by phase of flight

2.8 Accident Types

2.8.1 The SISG uses a list of occurrence categories, produced by the CAST/ICAO Common Taxonomy Team (CICTT). During the analysis process, SISG assigns at least one of these occurrence categories to each accident. The ten most common occurrence categories assigned to reportable accidents between 1998 and 2007 are shown in Figure 3.

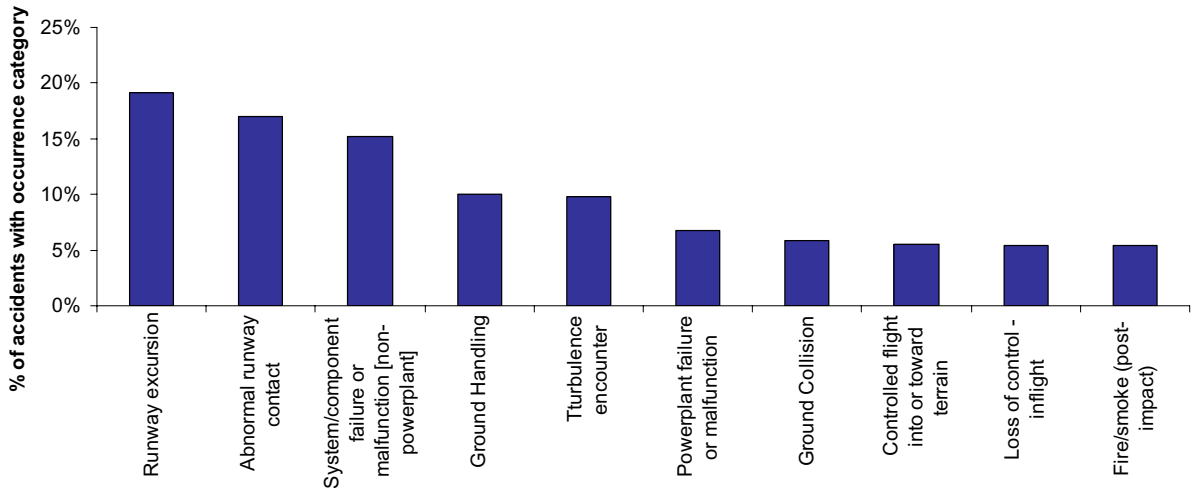

Figure 3 Worldwide reportable accidents by occurrence category

2.8.2 Figure 4 shows the same occurrence classification for fatal accidents, as assigned by SISG. This shows that although the categories assigned in Figure 3 may be the most common, they are not necessarily the most deadly. It should be noted that due to the different sources and analysis processes, Figure 4 may differ slightly when compared to fatal accident statistics in section 3 of this Chapter.

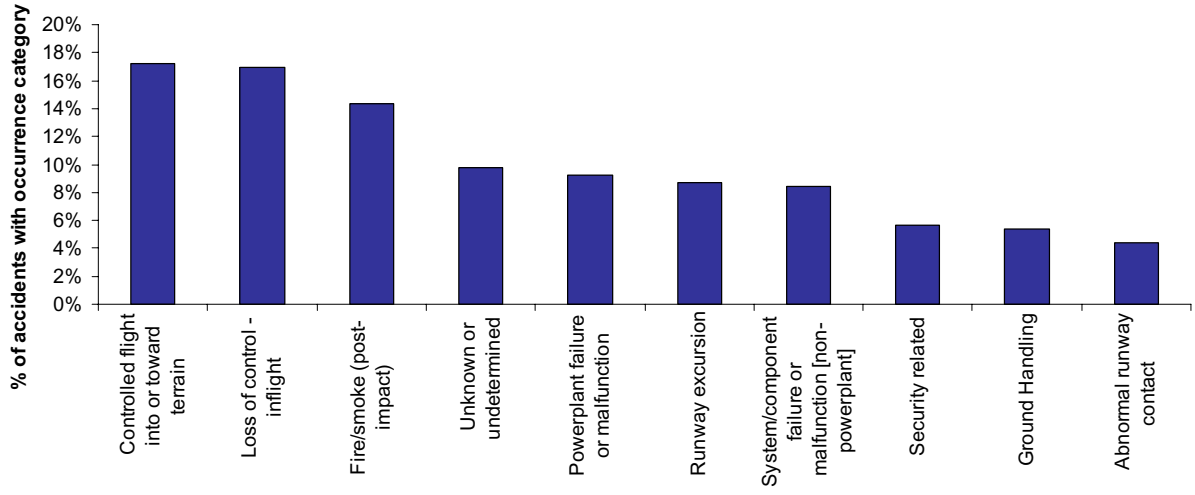

Figure 4 Worldwide fatal accidents by occurrence category

2.9 Injury Data

2.9.1 The annual number of fatal, serious and minor injuries, as classified by ICAO, is shown in Table 1. In total, there were over 8,700 fatalities, 1,100 serious injuries and 2,000 minor injuries between 1998 and 2007. Also shown is the annual number of people on board aircraft involved in a reportable accident who were not injured.

Table 1 Injury data for worldwide reportable accidents

Injury Type	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Fatalities	1,208	593	1,109	1,069	1,013	645	530	1,041	814	737
Seriously injured	150	182	141	91	124	96	155	74	75	76
Minor injuries	245	474	224	247	121	142	68	200	89	202
No injury	9,258	9,207	7,828	7,175	6,459	9,005	6,228	7,847	5,384	8,858

3 Fatal Accidents

3.1 This section examines data from the AAG's fatal accident database. A systematic review process for fatal accidents has been developed by the CAA to apply to large transport aeroplanes involved in passenger and cargo operations. This differs from the SISG analysis in two respects:

a) It only analyses fatal accidents, as these highlight the issues likely to result in a catastrophic loss; and

b) Accidents are classified not only by outcome, but also by the causal and circumstantial factors involved.

3.2 The raw data used in the review process originate from Ascend and are then supplemented by accident briefs and reports from other sources. The utilisation data also originate from Ascend.

3.3 Once compiled, the accident data are assessed by the AAG. The AAG is made up of a team of technical experts, covering the key areas of commercial civil aviation operations. In addition to CAA members, the AAIB and UKAB also attend. AAG meet annually to analyse the accidents that have occurred in the previous year, assigning causal and circumstantial factors and also the consequences of the accident.

3.4 Causal factors are those events that form the direct chain of events leading to an accident. Circumstantial factors are those events that did not directly lead to the event, but that may have contributed in some way to the accident. Consequences are the outcomes of the accident and the accident itself, for example a runway excursion or post-crash fire.

3.5 The taxonomy used by the AAG to analyse accidents consists of 68 causal factors, 23 circumstantial factors and 15 consequences. An accident may be assigned as many factors and consequences as are appropriate, hence the categories are not mutually exclusive.

3.6 Data in this section include fatal accidents involving aircraft with an MTWA exceeding 5,700kg on passenger or cargo operations. Fatal incidents that are known to have resulted from an act of terrorism or sabotage are not analysed by AAG and are therefore not included in this section. In addition, ferry/positioning flights, test flights, military operations and third-party only fatalities are excluded.

3.7 It should be noted that there are some aeroplanes where the weight of the original type is below 5,700kg MTWA, but where subsequent variants have exceeded this weight. An example is the Embraer EMB110 Bandeirante. For consistency across the dataset, all variants are categorised using the weight limit of the original type. A list of public transport aeroplane types is available in Appendix 5, showing the weight groups and classes of aeroplane that have been used.

3.8 **Fatal Accidents by Class of Aircraft**

3.8.1 There were 247 fatal accidents involving large transport aeroplanes between 1998 and 2007. Figure 5 shows the annual number of fatal accidents, categorised by class of aircraft.

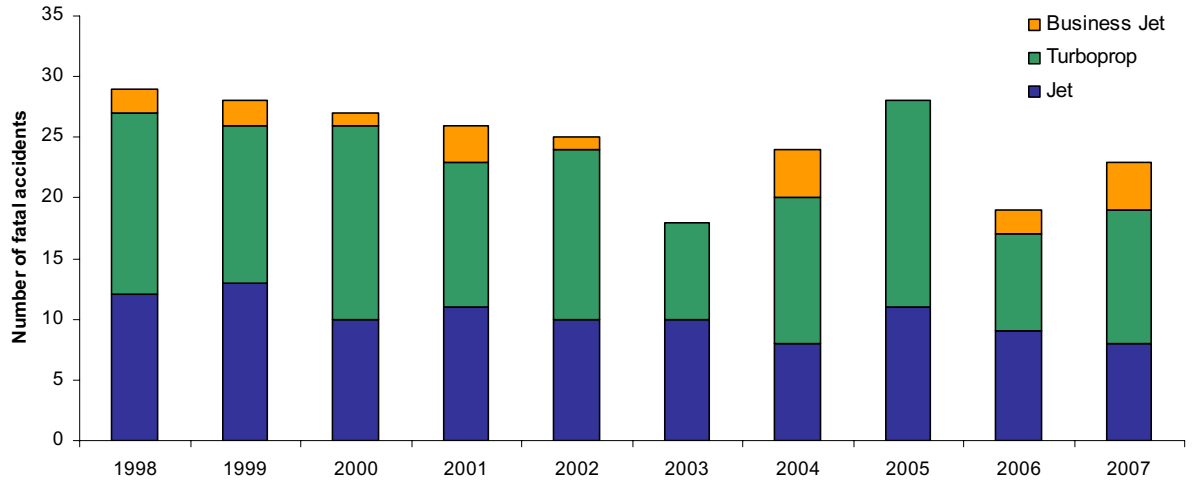

Figure 5 Worldwide fatal accidents per year by class of aircraft

3.8.2 Jets were involved in 102 fatal accidents between 1998 and 2007, an average of 10.2 per year. Comparing jets and turboprops only, jets formed 45% of the fatal accidents, compared to 70% of flights and 84% of hours.

3.8.3 Turboprops were involved in 126 fatal accidents between 1998 and 2007, an average of 12.6 per year. Comparing turboprops and jets only, turboprops formed 55% of the fatal accidents, compared to 30% of flights and 16% of hours.

3.8.4 Business jets were involved in 19 fatal accidents between 1998 and 2007, an average of 1.9 per year. Worldwide utilisation data is not readily available for business jets.

3.8.5 Table 2 shows a summary of the number of fatal accidents and fatal accident rates between 1998 and 2007, broken down by class of aircraft.

Table 2 Number and rate of fatal accidents by class of aircraft

Class of Aircraft	Number of fatal accidents 1998-2007	Fatal accident rate (per million hours) 1998-2007
Jet	102	0.2
Turboprop	126	1.5
Total	228	0.5
Business Jet	19	–

3.8.6 Figure 6 shows the fatal accident rates for jets and turboprops, along with three-year moving average fatal accident rates. Because business jet utilisation is not available, a rate cannot be calculated for this class of aircraft. Business jets are not included in the jet category.

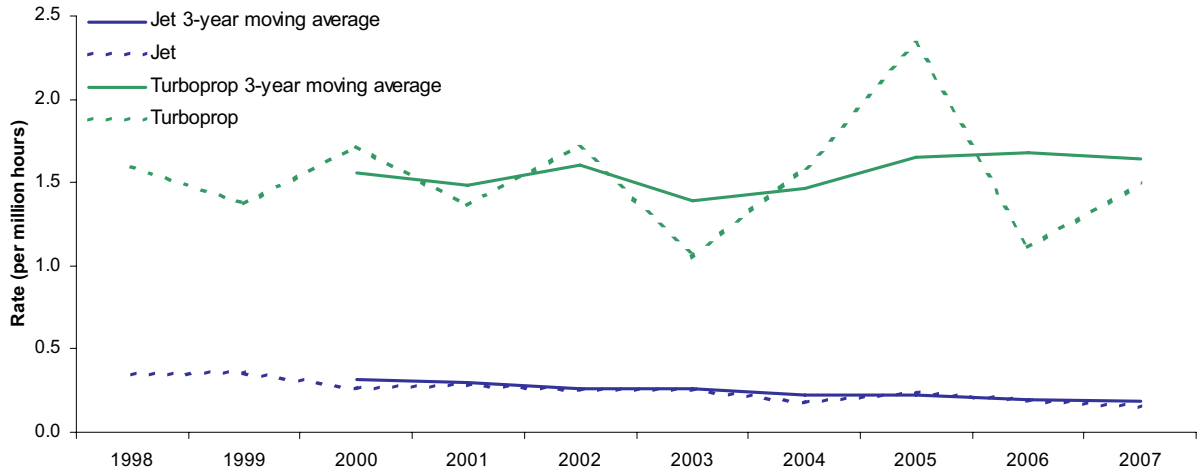

Figure 6 Fatal accident rate (per million hours) for jets and turboprops

3.9 Fatalities by Class of Aircraft

3.9.1 Figure 7 shows the annual number of on board fatalities by class of aircraft for the period 1998-2007. It should be noted that there are small differences between the CAA data presented here and the ICAO data presented previously, due to differing definitions and data sources.

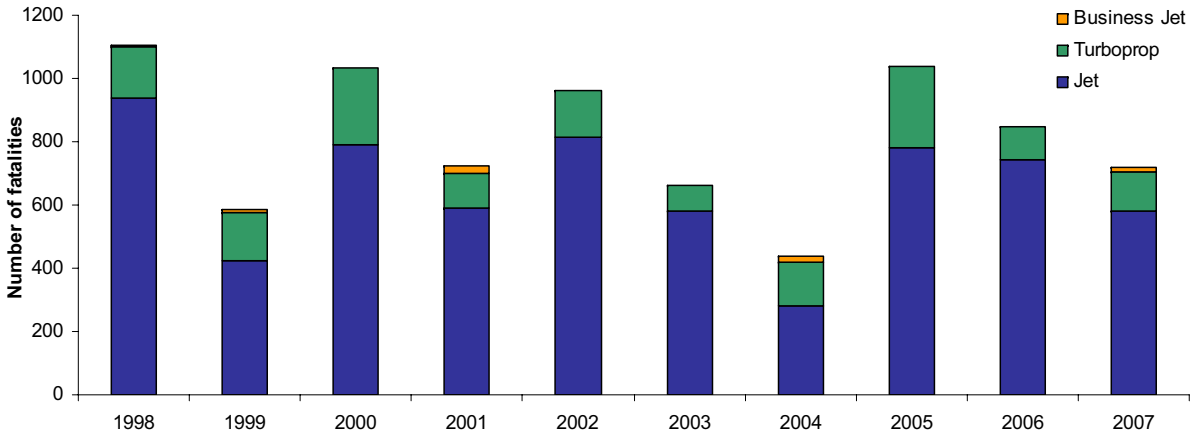

Figure 7 Worldwide fatalities by class of aircraft

3.9.2 There were 6,530 fatalities involving jet aircraft in the period 1998-2007. Comparing jets and turboprops, 81% of fatalities involved jet aircraft, compared to 70% of flights and 84% of hours.

3.9.3 There were 1,508 fatalities involving turboprop aircraft in the period 1998-2007. Comparing turboprops and jets, 19% of fatalities occurred involved turboprop aircraft, compared to 30% of flights and 16% of hours.

3.9.4 Table 3 shows the number of fatalities and fatality rate, broken down by class of aircraft for the period 1998-2007. As has been explained previously, no utilisation data is available for business jets, therefore a fatality rate for this class of aircraft cannot be calculated. Business jets have not been included in the jet category.

Table 3 Number and rate of fatalities by class of aircraft

Class of Aircraft	Number of fatalities 1998-2007	Fatality rate (per million hours) 1998-2007
Jet	6,530	15.5
Turboprop	1,508	18.4
Total	8,038	15.9
Business Jet	72	-

3.9.5 Figure 8 shows the fatality rates for jets and turboprops, along with three-year moving average fatality rates. Because business jet utilisation is not available, a rate cannot be calculated for this class of aircraft. Business jets are not included in the jet category.

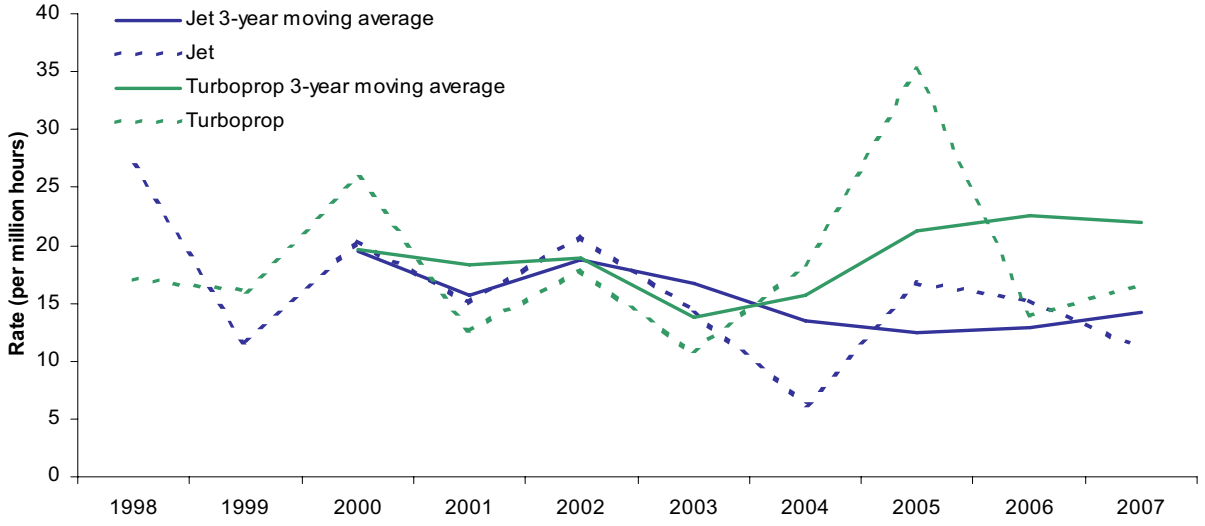

Figure 8 Worldwide fatality rate (per million hours) by class of aircraft

3.10 Fatal Accidents By Operator Region

3.10.1 Figure 9 shows the number of fatal accidents broken down by the operator region, that is the region in which the operator of the aircraft is located. The data has been divided into two periods: 1998-2002 and 2003-2007.

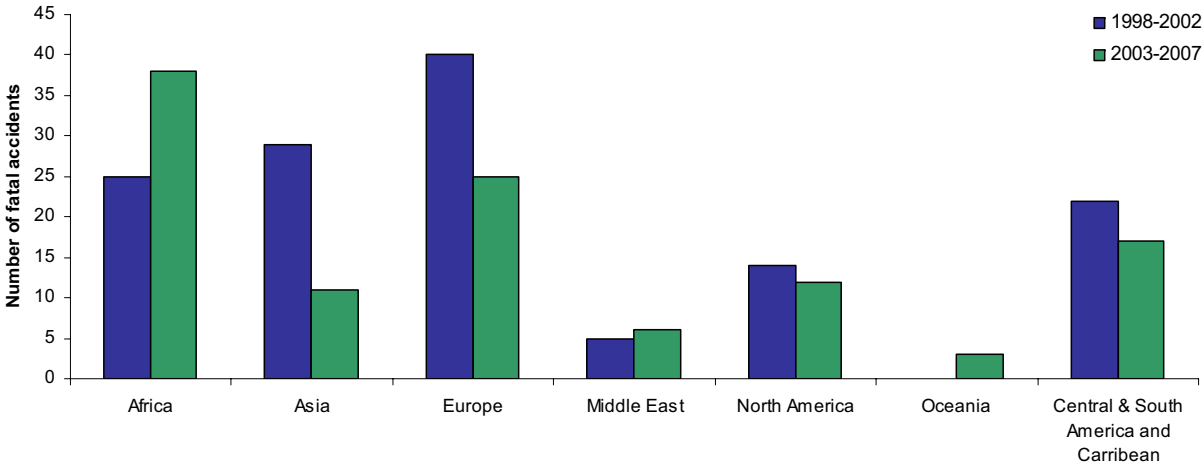

Figure 9 Worldwide fatal accidents by operator region

3.10.2 Figure 10 shows the fatal accident rate by operator region. In addition to the fatal accident rate, a 95% confidence limit has been calculated. Notes on the use of 95% confidence limits are available in Appendix 2. Because business jet utilisation is not available, these aircraft are not included.

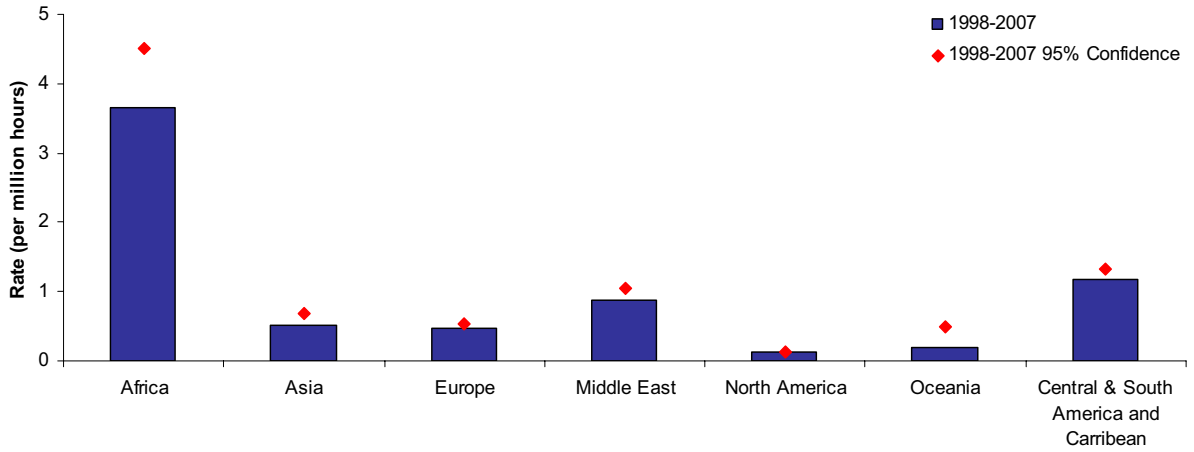

Figure 10 Worldwide jet and turboprop fatal accident rate by operator region

3.11 Fatal Accidents by Location

3.11.1 Figure 11 shows the number of fatal accidents in the region in which they occurred. Comparing Figure 11 with Figure 9, it may be seen that a number of fatal accidents have occurred when the aircraft is outside of the region from which the operator originates.

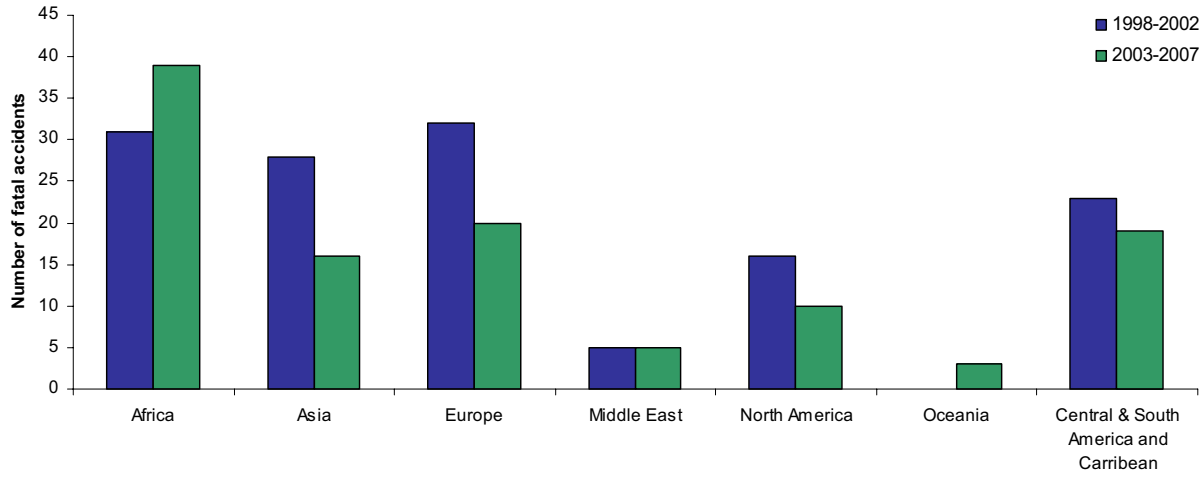

Figure 11 Worldwide fatal accidents by location of accident

3.12 Fatal Accidents by Type of Service

3.12.1 Figure 12 shows the number of fatal accidents for jets and turboprops divided by the type of service provided.

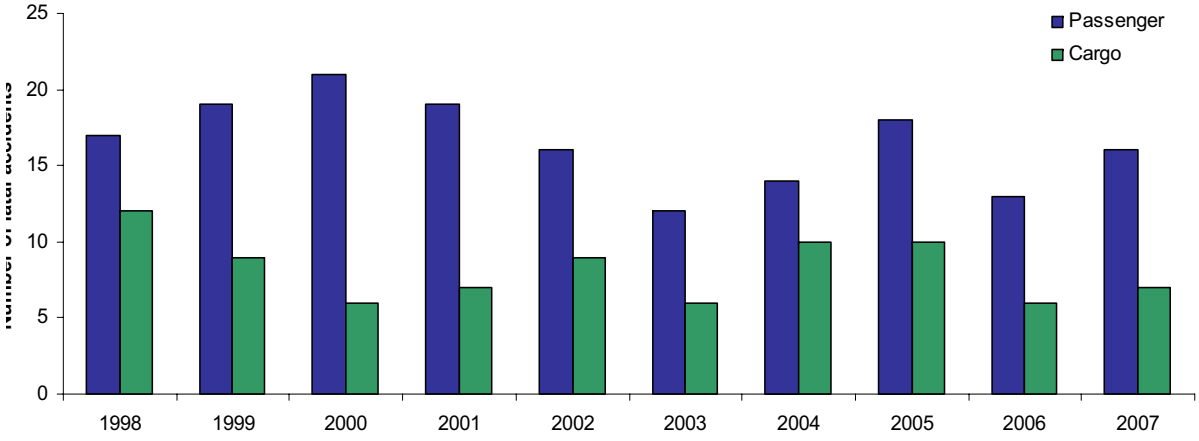

Figure 12 Worldwide jet and turboprop fatal accidents by type of service

3.12.2 Figure 13 shows the fatal accident rate for jets and turboprops by type of service, with a three-year moving average calculated. Because business jet utilisation is not available, these have been excluded. It may be seen that although there have been a greater number of fatal passenger accidents (Figure 12), the fatal accident rate for cargo aircraft is almost six times higher (Figure 13).

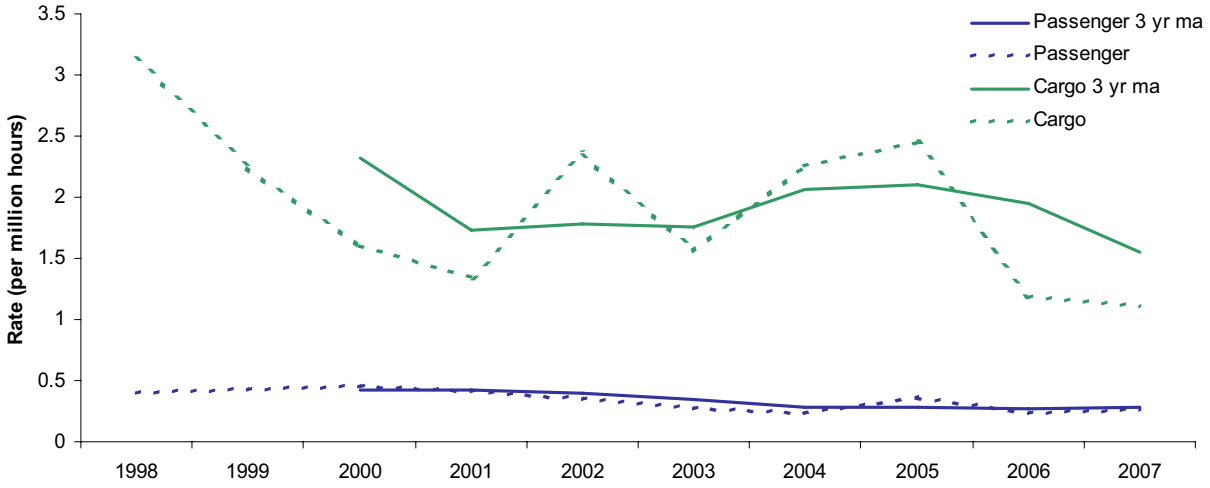

Figure 13 Worldwide jet and turboprop fatal accident rate by type of service

3.13 Causal Factors and Primary Causal Factors

3.13.1 Causal factors are allocated by AAG where the factor was a direct part of the chain of events leading to an accident. Many different causal factors may be assigned to a given accident, however where sufficient information is available a primary causal factor is assigned. The data in this section cover causal factors (many permitted per accident) and primary causal factors (one permitted per accident).

3.13.2 The 68 causal factors, which describe the events leading to an accident, are grouped into 12 broader categories, for example the factor "Fire due to aircraft systems" is part of the "Fire" category and "Flight handling" is part of the "Flight crew" category.

3.13.3 At least one causal factor was allocated to 88% of fatal accidents. Table 4 shows the five most common causal factors assigned in fatal accidents; these factors were present in 67% of fatal accidents.

3.13.4 It should be noted that whilst flight crew are identified as 'causal' in a high proportion of accidents, this should not be regarded as attributing 'blame' to the crew. It is well accepted that while flight crew factors may trigger an accident, these may be precipitated by organisational issues and other factors affecting crew performance such as commercial pressure, usability of equipment, training and support.

Table 4 Five most common causal factor categories

Causal factor	Percent of accidents with factor
Crew - Omission of action/inappropriate action	36%
Crew - Flight handling	28%
Crew - Lack of positional awareness – in air	25%
Crew - Failure in CRM (cross check/co-ordinate)	22%
Crew - Poor professional judgement/airmanship	20%

3.13.5 Table 5 shows the five most common causal factor groups allocated. The five causal factor groups shown were present in 83% of fatal accidents.

Table 5 Five most common causal factor groups

Causal Factor Group	Percent of accidents with group
Flight Crew	74%
Engine	17%
Aircraft Performance/Control	17%
Fire	15%
Aircraft Systems	12%

3.13.6 A primary causal factor was allocated to 85% of fatal accidents that occurred in the period 1998-2007. In the remaining 15%, there was insufficient information to assign a primary causal factor. Figure 14 shows the distribution of primary causal factors in their broader categories in the period 1998-2007. As mentioned in 3.13.4, where AAG assign flight crew causal factors this is not attributing blame to the flight crew.

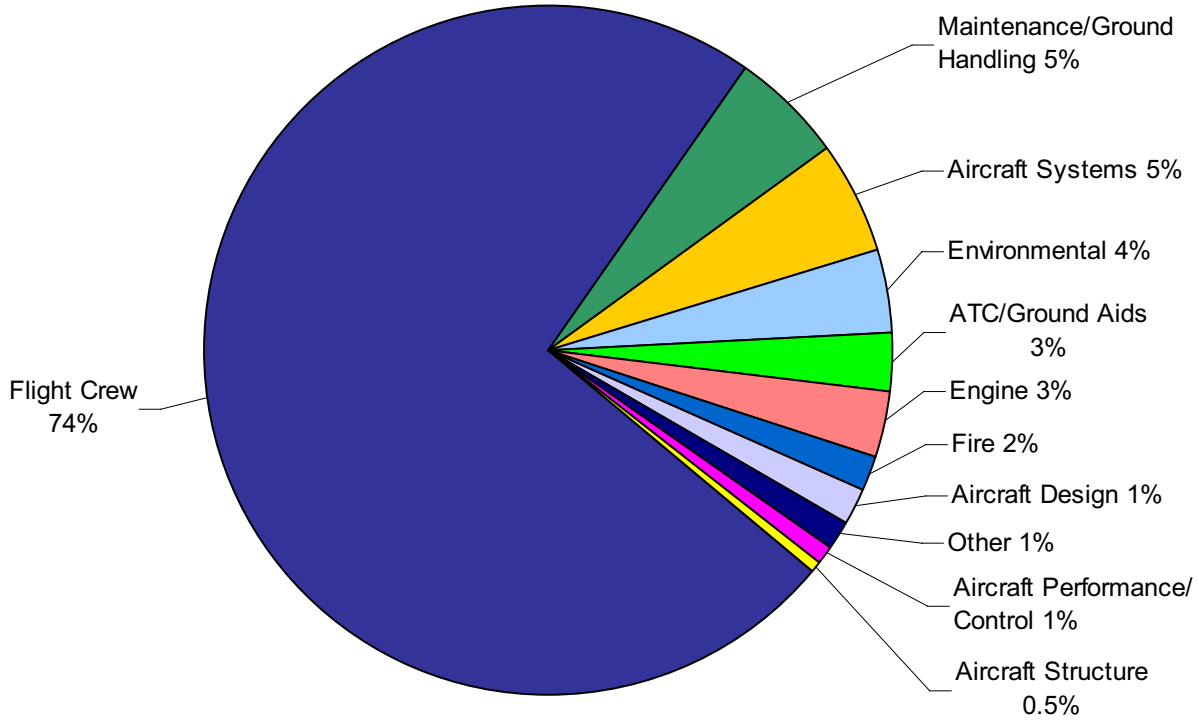

Figure 14 Primary causal factor categories

3.13.7 The five most common primary causal factor categories are shown in descending order in Table 6. The five categories shown were present in approximately 91% of fatal accidents where a primary causal factor had been assigned.

Table 6 Five most common primary causal factor categories

Primary causal factor category	Percent of accidents with category
Flight Crew	74%
Maintenance/Ground Handling	5%
Aircraft Systems	5%
Environmental	4%
ATC/Ground Aids	3%

3.14 Circumstantial Factors

3.14.1 A circumstantial factor is assigned where the factor's presence may have influenced the outcome of the accident, but where it was not directly implicated in the chain of events leading to the accident. There are 23 available circumstantial factors, of which as many as are appropriate are assigned to each fatal accident.

3.14.2 At least one circumstantial factor was assigned in 80% of fatal accidents between 1998-2007.

3.14.3 Table 7 shows the five most commonly assigned circumstantial factors in the period 1998-2007. These five factors were present in approximately 71% of fatal accidents.

Table 7 Five most common circumstantial factors

Circumstantial factor	Percent of accidents with factor
Environmental – Poor visibility or lack of external visual reference	30%
Aircraft Systems – Non-fitment of presently available safety equipment	30%
Infrastructure – Company management failure	26%
Environmental – Weather	26%
Infrastructure – Inadequate regulatory oversight	24%

3.15 Consequences

3.15.1 The consequences assigned by AAG are the accident or event types that have been judged to be the immediate outcome of a fatal accident. More than one consequence may be assigned to any given fatal accident.

3.15.2 At least one consequence was allocated to 98% of fatal accidents between 1998 and 2007.

3.15.3 Table 8 shows the five most common consequences of fatal accidents. These five consequences were present in approximately 71% of fatal accidents.

Table 8 Five most common consequences

Consequence	Percent of accidents with consequence
Post crash fire	42%
Controlled flight into terrain (CFIT)	23%
Loss of control in-flight, following technical failure	17%
Loss of control in-flight, following non-technical failure	16%
Runway excursion or overrun	12%

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Chapter 3 Aviation Safety in the European Union

1 Introduction

1.1 This Chapter contains information on the safety of aviation in the European Union (EU) between 1998 and 2007. The accident statistics are based on the country of operator, not the country of aircraft registration nor location of the accident. Because the membership of the EU has expanded during the period analysed, the data presented only include accidents involving operators from the point at which the country concerned joined the EU.

1.2 The fifteen countries that were members of the EU at the start of the ten-year period analysed are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom.

1.3 The following list shows the point at which new members have joined the EU during the period 1998-2007:

- 1st May 2004: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia.
- 1st January 2007: Bulgaria and Romania.

1.4 The data presented cover fatal accidents involving fixed-wing passenger and cargo aircraft exceeding 5,700kg maximum take-off weight authorised (MTWA) and exclude military operations.

1.5 It should be noted that there are some aeroplanes where the weight of the original type did not exceed 5,700kg MTWA, but where subsequent variants have exceeded this weight. An example is the Embraer EMB110 Bandeirante. For consistency across the dataset, all variants are categorised using the weight limit of the original type. A list of public transport aeroplane types is available in Appendix 5, showing the weight groups and classes of aeroplane that have been used.

1.6 The accident data in this Chapter covers fatal accidents only and, along with utilisation data, is sourced from the Ascend Client Aviation System Enquiry database. Further analysis of causal and circumstantial factors is provided through the CAA's Accident Analysis Group (AAG).

1.7 A description of the AAG causal and circumstantial factors and consequences is available in section 3 of Chapter 2 "Worldwide Aviation Safety".

2 Number of Fatal Accidents

2.1 Between 1998 and 2007, there were 24 fatal accidents involving fixed wing aircraft above 5,700kg MTWA. Of these, four involved business jets, 13 involved turboprops and seven involved jet aircraft. Figure 15 shows the number of fatal accidents per year, divided into class of aircraft.

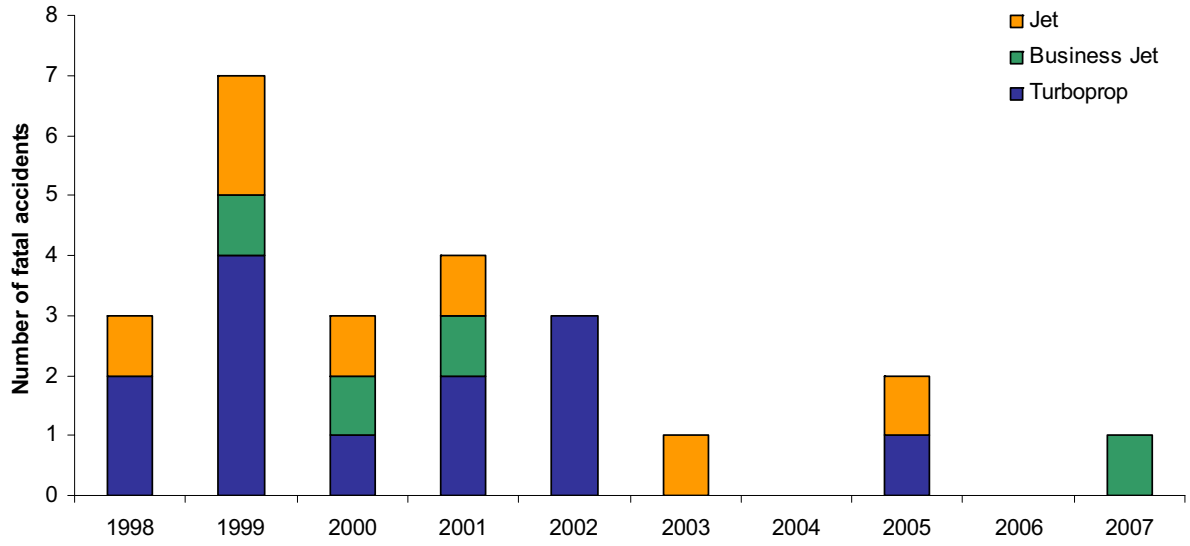

Figure 15 Number of fatal accidents per year by class of aircraft

3 Phase of Flight

3.1 The phase of flight in which the accident occurred is shown in Figure 16. It is clear that the accidents involving EU operators over the ten-year period analysed most commonly occurred during the approach phase. However, it should be noted that the causal factor for the accident may have occurred before the approach phase.

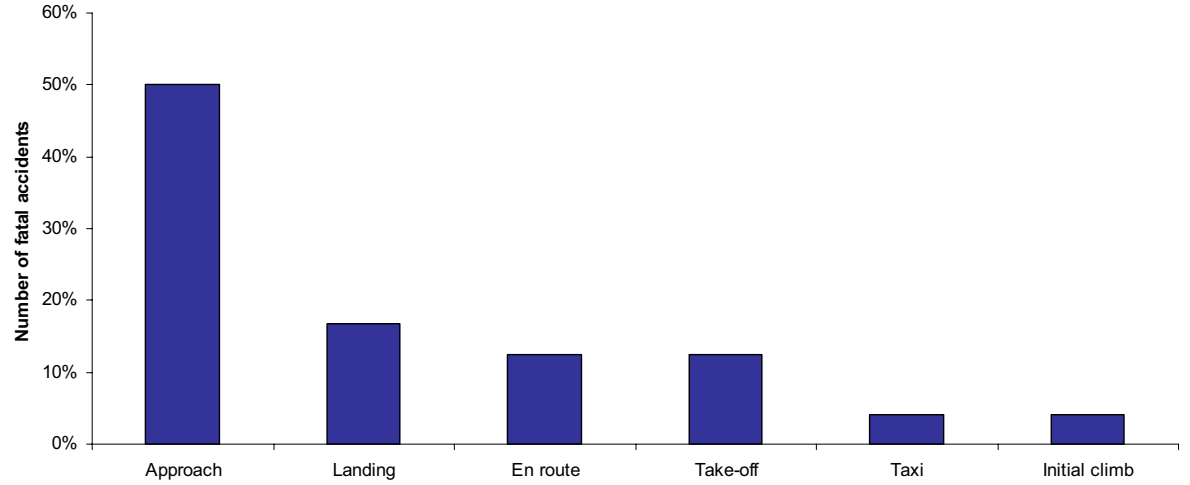

Figure 16 Fatal accidents by phase of flight

4 Type of Fatal Accident

4.1 Causal Factors and Primary Causal Factors

4.1.1 23 of the 24 fatal accidents had causal factors assigned by AAG. As many causal factors as are appropriate may be assigned to each accident, since there are often a number of different events that directly lead to an accident.

4.1.2 The six most common causal factors are shown in Table 9. It should be noted that a causal factor does not imply fault or blame. Hence, although the table shows a high proportion of flight crew–related causal factors, it is widely acknowledged that organisational issues and other factors affecting crew performance such as commercial pressure, usability of equipment, training and support, may precipitate these factors. At least one of these six factors was present in 75% of the accidents examined.

Table 9 Six most common causal factors

Rank	Causal factor	Percent of accidents with factor
1	Crew – Omission of action/inappropriate action	63%
2	Crew – Failure in CRM (cross check/co-ordinate)	29%
3	Crew – Lack of positional awareness – in air	25%
4	Crew – Flight handling	25%
5	Crew – Poor professional judgement/airmanship	21%
5	Infrastructure – Incorrect, inadequate or misleading information to crew	21%

4.1.3 The causal factors assigned by AAG to the 24 fatal accidents contain a high level of detail, however they can be consolidated into broader groups. Table 10 shows the distribution of the fatal accidents into these broader causal factor groups. At least one of the five groups was present in 92% of the accidents examined.

Table 10 Five most common causal factor groups

Rank	Causal factor group	Percent of accidents with group
1	Flight Crew	75%
2	Engine	21%
3	Infrastructure	21%
4	Aircraft Design	17%
5	Aircraft Performance/Control	17%

4.1.4 Where there is sufficient information, a primary causal factor is assigned by AAG and only one primary causal factor is assigned per accident. In the case of the 24 fatal accidents examined in this chapter, 23 had a primary causal factor assigned. Figure 17 shows the relative proportion of primary causal factor groups assigned to the 24 fatal accidents.

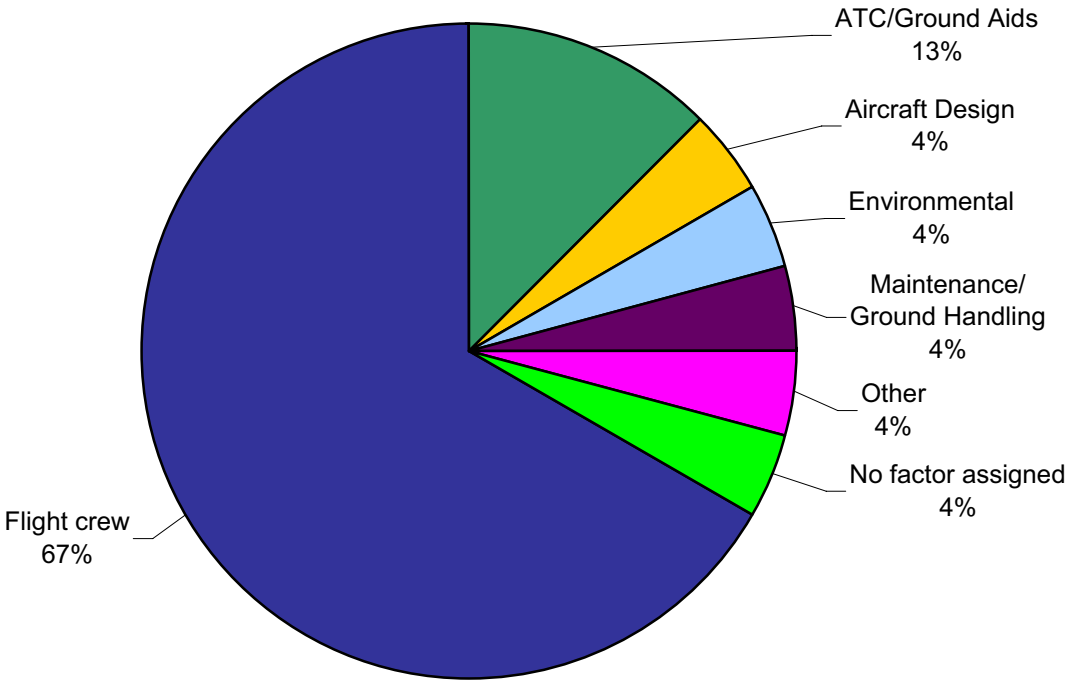

Figure 17 Primary causal factor groups

4.2 Circumstantial factors

4.2.1 Circumstantial factors refer to those factors that are not directly part of the chain of events resulting in an accident, however they may have influenced the outcome.

4.2.2 At least one circumstantial factor was applied by AAG to 21 of the 24 fatal accidents. Table 11 shows the five most common circumstantial factors applied to the 24 fatal accidents. At least one of these five factors was present in 75% of the accidents examined.

Table 11 Five most common circumstantial factors

Rank	Circumstantial factor	Percent of accidents with factor
1	Non-fitment of presently available safety equipment	33%
2	Poor visibility or lack of external visual reference	29%
3	Weather	25%
3	Failure in CRM (cross-check/co-ordinate)	25%
3	Company management failure	25%

4.3 Consequences

4.3.1 Table 12 shows the six most common consequences of fatal accidents involving European Union passenger and cargo operators. These consequences were assigned by AAG and are not mutually exclusive, since an accident can have more than one direct consequence. At least one of these six factors was present in 83% of the accidents examined.

Table 12 Six most common consequences

Rank	Consequence	Percent of accidents with consequence
1	Post crash fire	42%
2	Controlled flight into terrain	29%
3	Loss of control in flight (non-technical)	21%
4	Emergency evacuation difficulties	13%
5	Ground collision with object/obstacle	13%
5	Runway excursion	13%

5 Injury Data

5.1 The 24 fatal accidents that occurred between 1998 and 2007 resulted in 520 fatalities on board the aircraft, compared to a total of 1,164 people on board the aircraft at the time of the accident. In 15 of the 24 fatal accidents, there were no survivors.

6 Utilisation Data

6.1 The number of hours and flights completed by European operators is shown in Table 13. A total of 54.4 million flights and 103.9 million hours were completed by European operators in the period 1998-2007.

Table 13 Hours and flights completed by European operators

Year	Hours (million)	Flights (million)
1998	8.5	4.5
1999	9.2	4.8
2000	9.9	5.0
2001	9.7	5.1
2002	9.4	5.1
2003	9.7	5.2
2004	11.0	5.9
2005	11.6	6.0
2006	12.1	6.3
2007	13.0	6.4

7 Fatal Accident Rate

7.1 The fatal accident rate between 1998 and 2007 has been calculated using the utilisation data quoted in Table 9. A three-year moving average has also been calculated and this has reduced from 0.5 per million hours in the period 1998-2000 to 0.1 per million hours in the period 2005-2007.

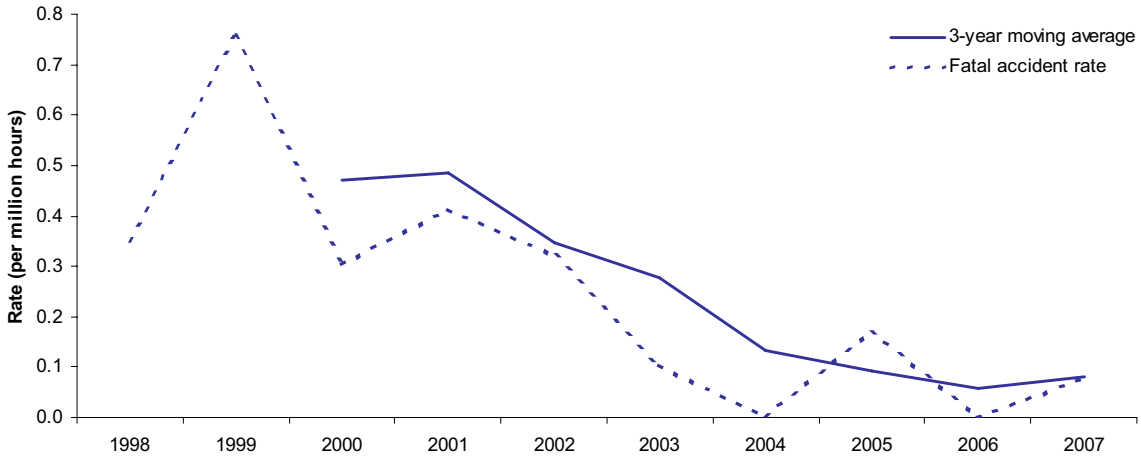

Figure 18 European operators fatal accident rate

8 Event Details

8.1 Details of each of the fatal accidents are shown in Table 14.

Table 14 European Union member state operator accident details

Date	Aircraft Type	Operator Country	Phase of flight	Nature of flight	Description	Location	POB	On-board fatalities
Jul 1998	Fairchild (Swearingen) Metro	Spain	Approach	Cargo	Loss of control during final approach whilst simulating a single-engine approach.	Barcelona International Airport, Barcelona, Spain	2	2
Jul 1998	Raytheon 1900	France	En route	Passenger	Lost control after mid-air collision with Cessna 177.	Baie de Quiberon, (near) Vannes, France	14	14
Sep 1998	BAE SYSTEMS (HS) 146	Spain	Approach	Passenger	Aircraft flew into hillside during approach.	Cabo de Tres Forcas area, (near) Melilla, Spain	38	38
Jan 1999	Fokker F.27	United Kingdom	Approach	Cargo	Aircraft stalled and crashed during approach due to CG out of limits.	La Villiaze Airport, St. Peter Port, Guernsey	2	2
Feb 1999	Fairchild/ Dornier 328	Italy	Landing	Passenger	Aircraft overran the runway and fell into the waters off the Golfo di Genova.	Cristoforo Colombo Airport, Genoa, Italy	31	4
Sep 1999	Boeing 757	United Kingdom	Landing	Passenger	Aircraft landed hard during rain storm and ran off the side of the runway.	Costa Brava Airport, Gerona, Spain	245	1
Oct 1999	Bombardier (Learjet) Learjet 35	Italy	Approach	Passenger	Aircraft was destroyed when it crashed into the sea while on approach to Genoa.	In sea, 7 miles S. of Camogli, Italy	3	3
Nov 1999	ATR ATR 42	Italy	Approach	Passenger	Aircraft was destroyed when it flew into the top of a ridge whilst on approach to Pristina.	(near) Pristina, Kosovo	24	24
Dec 1999	BAE SYSTEMS (HS) ATP	Portugal	En route	Passenger	Aircraft was destroyed when it apparently flew into the side of Pico da Esperanza whilst en route from Ponta Delgada to Horta.	Pico da Esperanza, Sao Jorge Island, Azores, Portugal	35	35
Dec 1999	Boeing (McDonnell-Douglas) DC-10	France	Landing	Passenger	Aircraft overran runway and fell down a steep slope and came to rest amongst houses.	La Aurora Airport, Guatemala City, Guatemala	314	16
May 2000	Bombardier (Learjet) Learjet 35	United Kingdom	Landing	Passenger	Aircraft wing struck ground just prior to touch-down. Aircraft had diverted following an engine problem.	Satolas Airport, Lyon, France	5	2
May 2000	Bombardier (Shorts) 330	United Kingdom	Taxi	Cargo	Aircraft entered runway and was struck by an MD-83 which was in the process of taking off.	Charles de Gaulle Airport, Paris, France	2	1

Table 14 European Union member state operator accident details (Continued)

Date	Aircraft Type	Operator Country	Phase of flight	Nature of flight	Description	Location	POB	On-board fatalities
Jul 2000	Aerospatiale Concorde	France	Take-off	Passenger	Control was lost shortly after take-off and following the loss of at least one engine.	Gonesse, (near) Paris, France	109	109
Feb 2001	Bombardier (Shorts) 360	United Kingdom	Initial climb	Cargo	Aircraft crashed during forced landing following flame-out of both engines.	Firth of Forth, (near) Granton Harbour, United Kingdom	2	2
Aug 2001	Dassault Aviation Falcon 20/200	Germany	Approach	Cargo	Aircraft was destroyed when it apparently flew into high ground during the final stage of an NDB/DME approach.	(near) Narsarsuaq, Greenland	3	3
Aug 2001	CASA CN-235	Spain	Approach	Passenger	Aircraft undershot runway after developing an engine problem.	Pablo Ruiz Picasso Airport, Malaga, Spain	47	4
Oct 2001	Boeing (McDonnell-Douglas) MD-80	Sweden	Take-off	Passenger	Aircraft was destroyed by impact and post impact fire when it struck another aircraft at a late stage in its take off run.	Linate Airport, Milan, Italy	110	110
Jan 2002	Embraer EMB-120 Brasilia	Spain	Approach	Cargo	Crashed into mountain during an ILS approach to Bilbao.	Mt. Santa Maria la Vieja, (near) Zaldibar, Spain	3	3
Apr 2002	Fairchild (Swearingen) Metro	Spain	Approach	Cargo	Crashed during a nighttime landing at Palma de Mallorca.	Palma de Mallorca Airport, Palma de Mallorca, Spain	2	2
Nov 2002	Fokker 50	Luxembourg	Approach	Passenger	Crashed following loss of control during approach.	Niederanven, Luxembourg	22	20
Jun 2003	Bombardier (Canadair) CRJ Regional Jet	France	Approach	Passenger	Aircraft undershot runway on approach and was destroyed by post impact fire.	(near) Guipavas Airport, Brest, France	24	1
Jan 2005	Let L-410 Turbolet	Hungary	Approach	Cargo	Aircraft crashed during non-precision approach in poor visibility.	(near) Iasi, Romania	2	2
Aug 2005	Boeing 737 (CFMI)	Cyprus	En route	Passenger	Aircraft crashed following incapacitation of both pilots.	(near) Grammatikos, Greece	121	121
Dec 2007	Bombardier (Canadair) Challenger	Germany	Take-off	Passenger	Aircraft lost control during take-off and was destroyed by impact and post-impact fire.	Alma Ata International Airport, Almaty, Kazakhstan	4	1

Chapter 4 Safety of UK Public Transport Worldwide

1 Introduction

1.1 This Chapter discusses the safety of UK-registered or operated aircraft engaged in public transport flights, both in the UK and overseas.

1.2 Public transport operations are those involving ambulance, cargo, passenger, police support, or search and rescue (SAR). A more detailed explanation of public transport is available in Appendix 1.

1.3 The Chapter is divided into the following sections: large aeroplanes, small aeroplanes, helicopters and balloons. Large aeroplanes may be defined as those exceeding 5,700 kg MTWA; conversely small aeroplanes are those up to 5,700 kg MTWA.

1.4 The source of the occurrence data used in this Chapter is the UK MOR scheme. Further information regarding the scheme and the types of occurrences used in this Chapter may be found in Chapter 8 and Appendix 3. Utilisation data is sourced from the CAA's Air Transport Statistics Department.

2 Large Aeroplanes

2.1 This section contains information relating to UK-registered or UK-operated aeroplanes exceeding 5,700kg MTWA, on public transport flights.

2.2 It should be noted that there are some aeroplanes where the weight of the original type did not exceed 5,700kg MTWA, but where subsequent variants have exceeded this weight. An example is the Embraer EMB110 Bandeirante. For consistency across the dataset, all variants are categorised using the weight limit of the original type. A list of public transport aircraft types is available in Appendix 5, showing the weight groups and classes of aircraft that have been used.

2.3 Reportable Accidents by Class of Aeroplane

2.3.1 In the period 1998-2007, there were 132 reportable accidents involving large public transport aeroplanes. Figure 19 shows the number of UK reportable accidents per year, the accidents have been divided by class of aeroplane into: jets, business jets, turbo-props and piston aeroplanes. There were no reportable accidents involving piston aeroplanes in the period 1998-2007, therefore these are not shown in Figure 19.

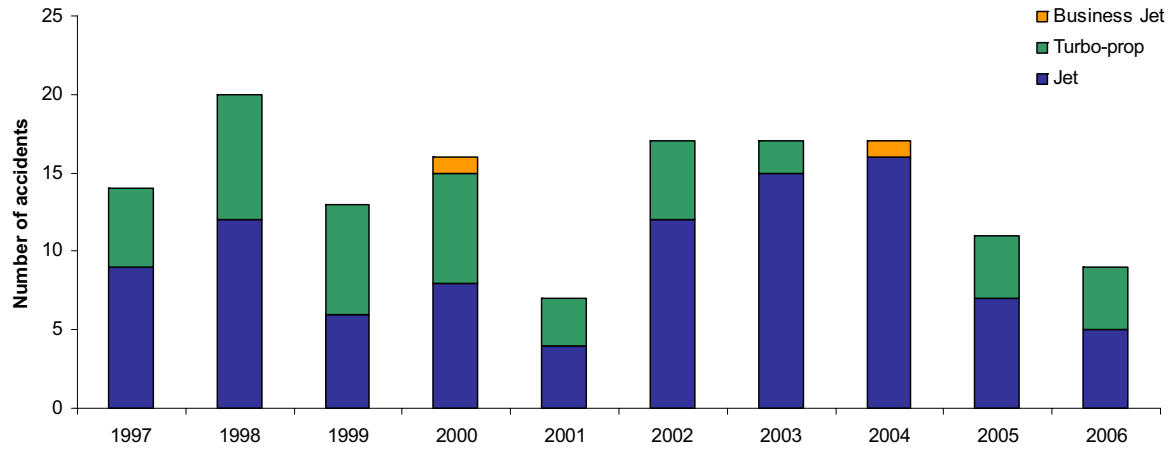

Figure 19 Number of UK reportable accidents per year involving large public transport aeroplanes

2.4 Types of Reportable Accident

2.4.1 Figure 20 shows a categorisation of the types of reportable accident involving UK large public transport aeroplanes that occurred in the period 1998-2007.

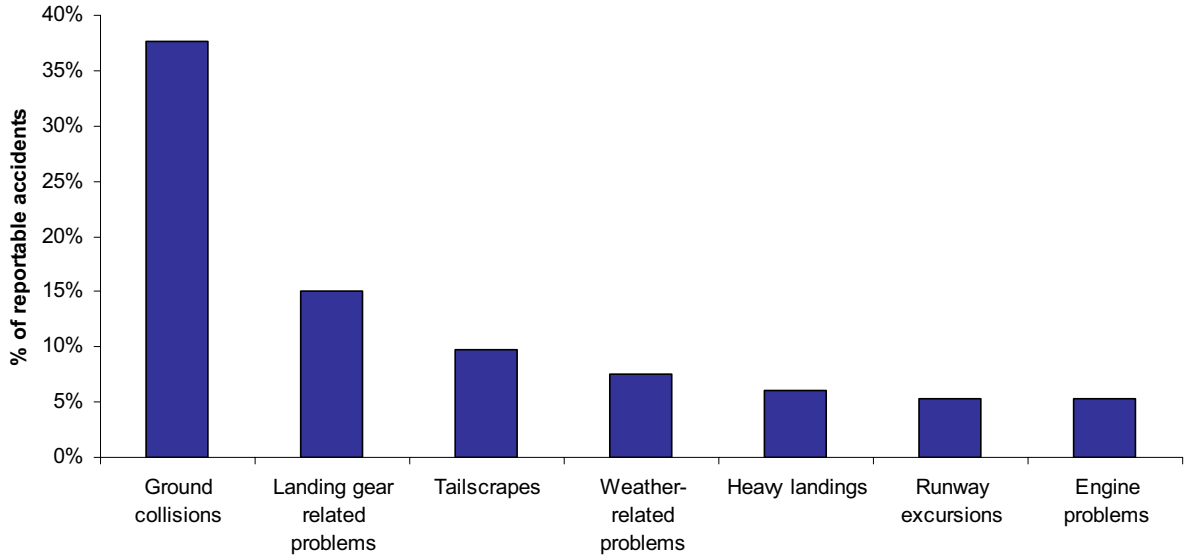

Figure 20 Types of reportable accident involving large public transport aeroplanes

2.5 Fatal Accidents

2.5.1 Between 1998 and 2007, there were five fatal accidents involving large aeroplanes engaged in public transport operations. These accidents resulted in a total of eight fatalities to those on board the aeroplane. Details of each of these fatal accidents is shown in Table 11.

Table 11 Details of fatal accidents involving large UK public transport aeroplanes

Date	Aircraft type	Phase Of Flight	Type of Operation	Location Of Occurrence	Description	POB	Fatalities
12-Jan-1999	Fokker F27 Friendship	Approach	Cargo	Guernsey	Aircraft stalled on approach and struck houses. Stall caused by aircraft operation outside of weight and balance limitations.	2	2
14-Sep-1999	B757	Landing	Passenger	Gerona	Aircraft departed runway following heavy landing in severe rainstorm. Fuselage broke into three pieces.	245	1
2-May-2000	Learjet	Approach	Passenger	Lyon	Aircraft caught fire on landing, following diversion due to engine problems en route.	5	2
25-May-2000	SD330	Taxi	Cargo	Paris CDG	MD83 collided with SD330 during take off run, striking the SD330's flight deck.	2	1
27-Feb-2001	SD360	Climb	Cargo	Firth of Forth	Aircraft ditched in the Firth of Forth following a double engine flameout.	2	2

2.5.2 In addition to the five fatal accidents to persons on board the aircraft, there was one accident involving a third party fatality in the period 1998-2007.

Date	Aircraft Type	Phase Of Flight	Type of Operation	Location Of Occurrence	Description	Fatalities
5-Sep-2001	B777	Parked	Passenger	Denver	Fire during aircraft refuelling, fatally injuring refuelling operative.	1

2.6 Utilisation

2.6.1 Between 1998 and 2007, UK operators (airline and air taxi) have completed over 11.2 million flights and flown for over 25.5 million hours. The annual breakdown of these figures is shown in Table 12.

Table 12 Hours and flights flown by UK airline and air taxi operators

Year	Hours (x1000)	Flights (x1000)
1998	2,140	978
1999	2,289	1,032
2000	2,442	1,088
2001	2,505	1,136
2002	2,408	1,083
2003	2,473	1,078
2004	2,626	1,137
2005	2,736	1,175
2006	2,908	1,211
2007	2,996	1,238

2.6.2 Over 91% of the hours completed in the period involved jet aeroplanes, whereas turboprop aeroplanes operated 8% of the hours, business jets operated 0.47% of the hours and piston aeroplanes 0.01%.

2.6.3 For UK airlines, information is available regarding the number of passengers carried. In the period 1998-2007, nearly 1.1 billion passengers were flown by UK airlines. The annual breakdown for these figures is shown in Table 13. The figure is restricted to airlines as air taxi operators are not required by the CAA to report the number of passengers that they carry.

Table 13 Passengers carried by UK airlines (large aeroplanes)

Year	Airline passengers carried (millions)
1998	87
1999	93
2000	100
2001	100
2002	101
2003	104
2004	115
2005	120
2006	125
2007	128

2.6.4 Information regarding the number of passenger and cargo flights and hours performed by UK airlines is shown in Table 14. The data are not available for air taxi operators, as they are not required to report to this level of detail.

Table 14 UK airline utilisation by type of operation

Year	Passenger		Cargo	
	Hours (x1000)	Flights (x1000)	Hours (x1000)	Flights (x1000)
1998	2,080	911	42	38
1999	2,230	967	43	38
2000	2,381	1,023	42	35
2001	2,444	1,069	38	32
2002	2,347	1,015	40	35
2003	2,409	1,019	55	40
2004	2,574	1,082	59	41
2005	2,679	1,124	56	35
2006	2,845	1,156	52	33
2007	2,901	1,165	76	41

2.7 Reportable and fatal accident rates

2.7.1 The overall reportable and fatal accident rates for large public transport aeroplanes are shown in Figure 21. Three-year moving averages (3 yr ma) have also been calculated. The reportable accident rate between 1998 and 2007 was 4.8 per million hours and the corresponding fatal accident rate was 0.2 per million hours.

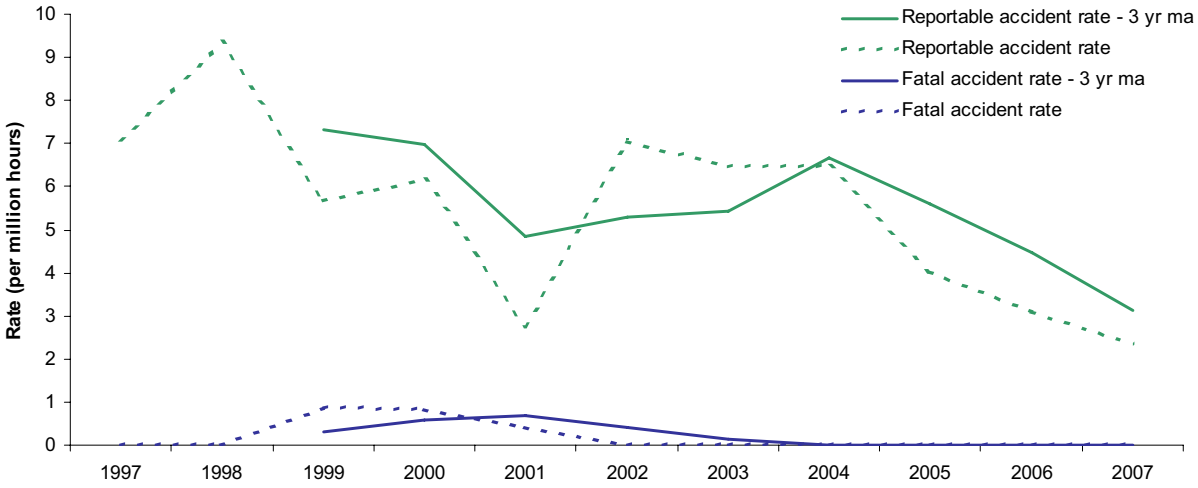

Figure 21 Reportable and fatal accident rates for large public transport aeroplanes

2.7.2 The reportable accident rate, shown as a three year moving average and broken down by class of aircraft is shown in Figure 22.

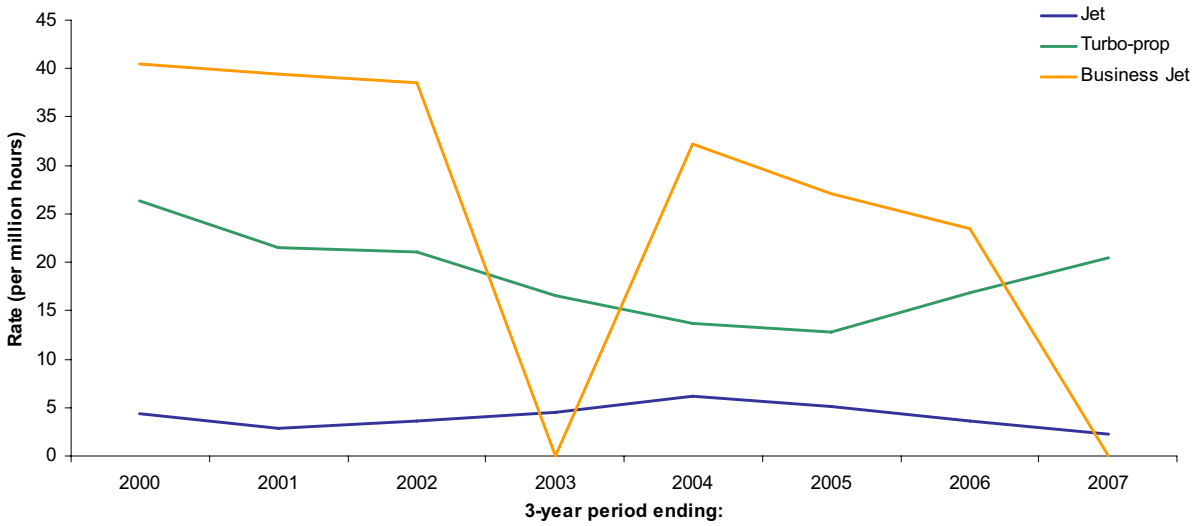

Figure 22 Reportable accident rate by class of aircraft

2.7.3 The reportable and fatal accident rates for each class of aircraft are compared over the period 1998-2007 in Table 15.

Table 15 Relative reportable and fatal accident rates for categories of large public transport aeroplanes

Class of aircraft	Reportable accident rate (per million hours)	Fatal accident rate (per million hours)
Business Jet	16.8	8.4
Jet	3.9	0.04
Piston	0.0	0.0
Turbo-prop	20.2	1.4
All classes of aircraft	4.8	0.2

2.7.4 It may be seen that although the number of accidents involving business jets shown in Figure 19 is smaller than for turboprops or jets, the reportable accident rate is higher. This is because of the low proportion of flights generated by business jets compared to jets and turboprops. Conversely, although jets were involved in the majority of accidents, their accident rate is low because they generate a high number of hours.

2.8 Injury Tables

2.8.1 The number of injuries sustained by aircraft occupants in the reportable accidents analysed in this section is shown in Table 16. The injuries are divided into fatal, serious and minor injuries. Definitions for these injuries are available in Appendix 1.

2.8.2 In total, there were 8 fatal injuries, 14 serious injuries and 89 minor injuries in the period 1998-2007. The 40 minor injuries in 1999 were all sustained in the Boeing 757 fatal accident in Gerona, Spain.

Table 16 Injuries sustained in reportable accidents involving large public transport aeroplanes

Year	Crew				Passengers			
	Fatal	Serious	Minor	Total	Fatal	Serious	Minor	Total
1998	0	0	1	1	0	1	19	20
1999	2	0	1	3	1	2	40	43
2000	3	1	4	8	0	1	13	14
2001	2	0	0	2	0	0	0	0
2002	0	3	0	3	0	0	1	1
2003	0	1	5	6	0	1	0	1
2004	0	1	0	1	0	1	0	1
2005	0	1	0	1	0	0	0	0
2006	0	1	3	4	0	0	2	2
2007	0	0	0	0	0	0	0	0
Total	7	8	14	29	1	6	75	82

2.9 Serious Incidents

2.9.1 There were 155 serious incidents involving large public transport aeroplanes in the period, as classified by the AAIB. Figure 23 shows the annual number of serious incidents broken down by class of aircraft.

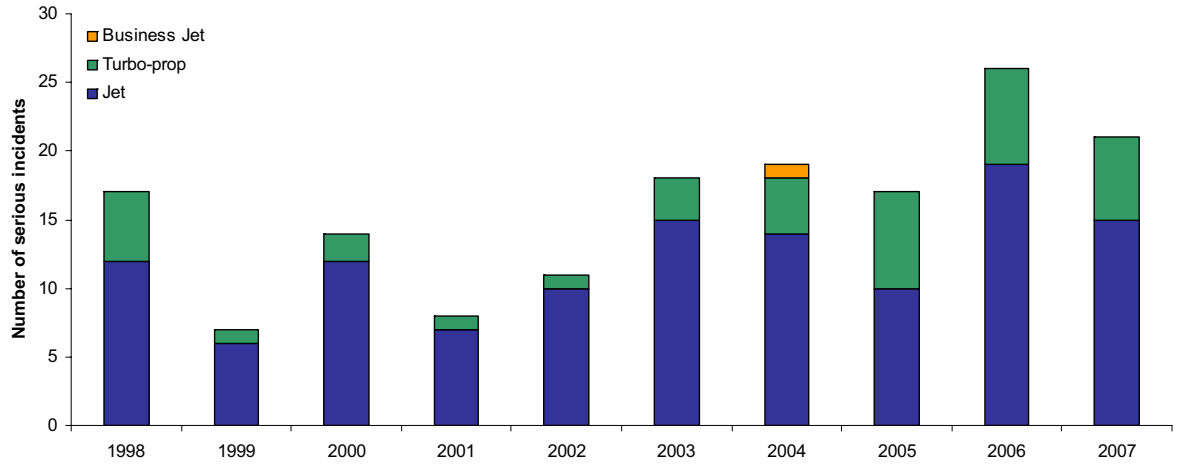

Figure 23 Number of serious incidents per year involving large public transport aeroplanes

2.10 Types of Serious Incident

2.10.1 Figure 24 shows a categorisation of the types of serious incident that have occurred involving UK large public transport aeroplanes in the period 1998-2007. 76% of serious incidents could be grouped into these categories.

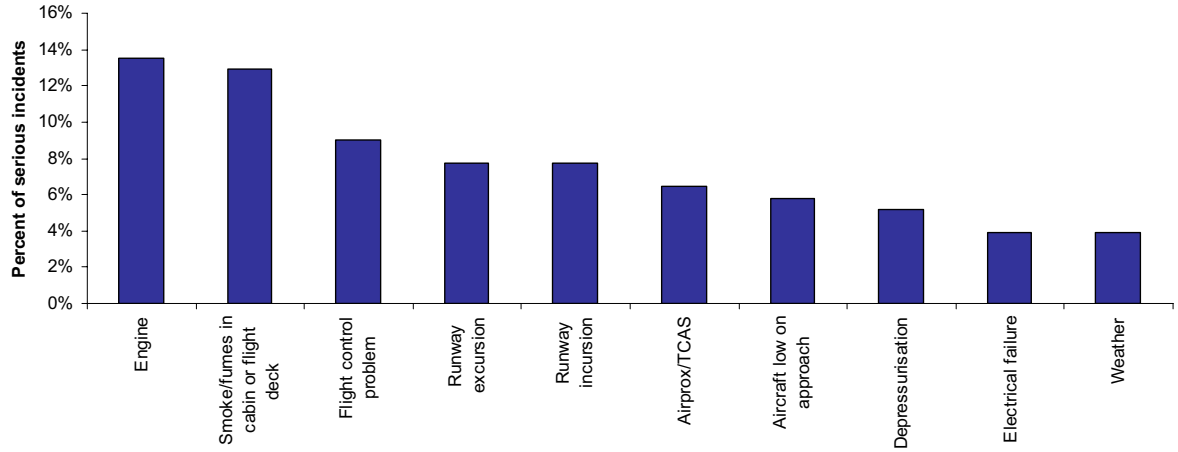

Figure 24 Types of serious incident involving large public transport aeroplanes

2.11 Serious Incident Rate

2.11.1 The three-year moving average serious incident rate of is shown by class of aircraft in Figure 25.

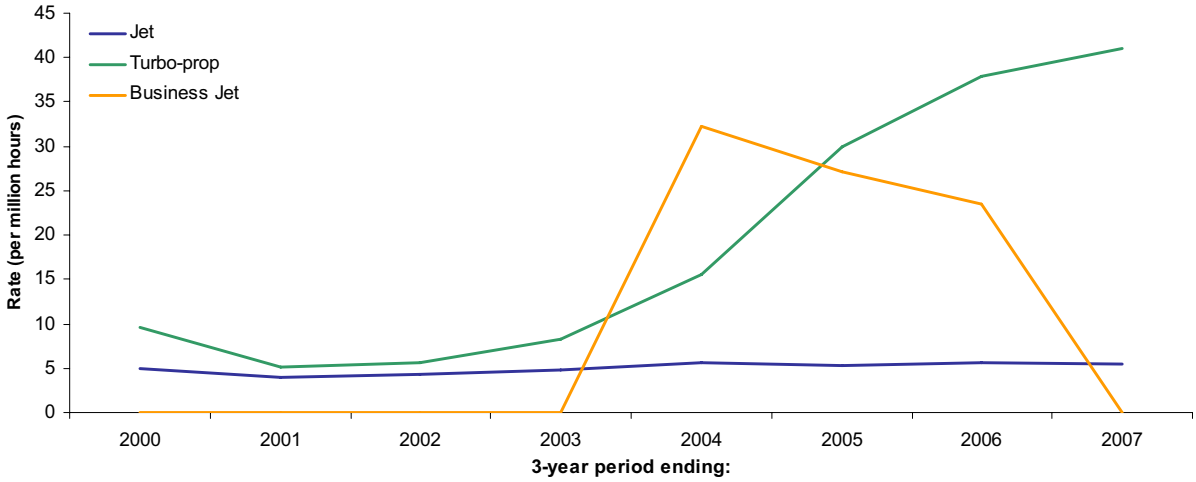

Figure 25 Large public transport aeroplane serious incident rate

2.11.2 The overall rate of serious incidents by class of aircraft is shown in Table 17. It can be seen that although jet aircraft contribute the greatest number of serious incidents, they have a consistently lower rate.

Table 17 Serious incident rate for large public transport aeroplanes, by type of aircraft

Class of aircraft	Serious Incident Rate
Business Jet	8.4
Jet	5.1
Turbo-prop	17.8
All classes of aircraft	**6.1**

2.12 Occurrences

2.12.1 Over 42,000 occurrences involving large public transport aeroplanes were reported between 1998 and 2007. This figure includes both accidents and serious incidents, which together form less than 1% of the total. The three-year moving average occurrence rate has increased 30%, from 1,400 per million hours in the period 1997-2000 to 1,800 per million hours in the period 2005-2007.

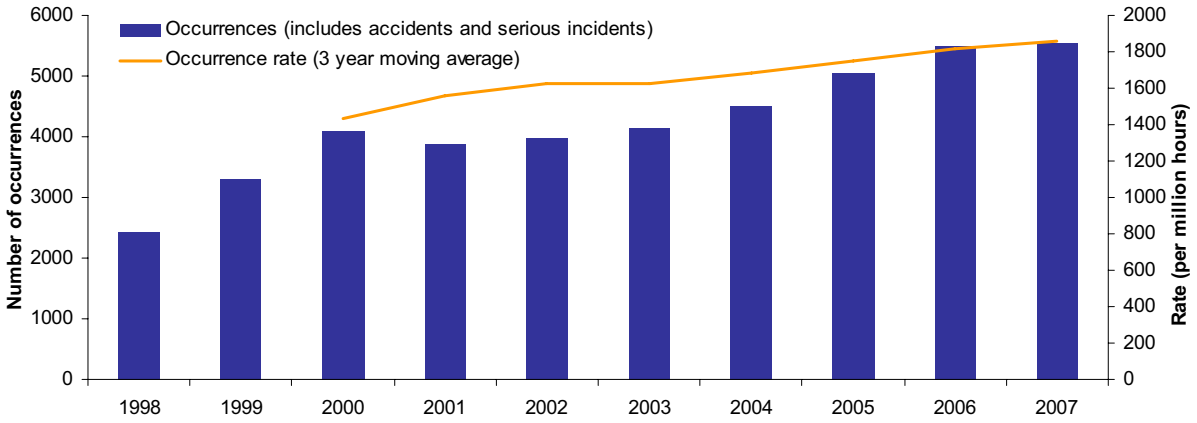

Figure 26 Number and rate of occurrences involving large public transport aeroplanes

2.12.2 In 1998, the CAA established a risk grading system in order to provide better analysis of occurrences. Figure 27 shows the rate of high-severity occurrences involving large public transport aeroplanes between 1998 and 2007. In the ten-year period, 0.8% of occurrences involving large public transport aeroplanes have been considered to be high-severity. Appendix 4 describes the risk grading system in more detail. The three-year moving average high-severity occurrence rate has decreased 70%, from 24.7 per million hours in the period 1997-2000 to 7.4 per million hours in the period 2005-2007.

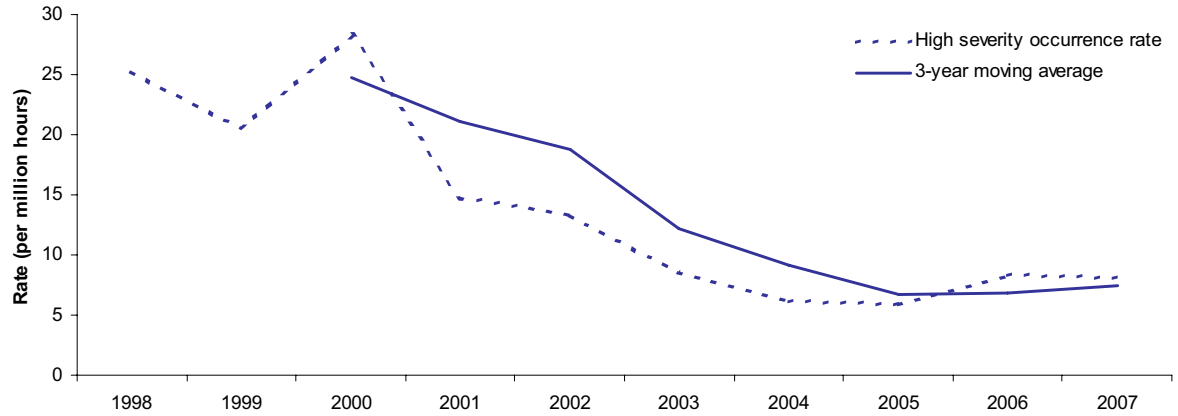

Figure 27 High-severity occurrence rate for large public transport aeroplanes

3 Small Aeroplanes

3.1 This section contains information relating to UK-registered or operated aeroplanes not exceeding 5,700kg MTWA, on public transport flights.

3.2 It should be noted that there are some aeroplanes where the weight of the original type was below 5,700kg MTWA, but where subsequent series of aircraft have exceeded this weight. An example is the Embraer EMB110 Bandeirante. For consistency across the dataset, all series of the types have been included under the original weight limit. A list of public transport aircraft types is available in Appendix 5, showing the weight groups and classes of aircraft that have been used.

3.3 Public transport using small aeroplanes includes the emergency services. This type of operation is very different to small aeroplane cargo and passenger services, therefore the data has been categorised by type of operation wherever possible. Emergency services helicopter operations are not discussed in this section, but may be found later in the Chapter.

3.4 Reportable Accidents

3.4.1 There were 22 reportable accidents involving small public transport aeroplanes between 1998 and 2007. Figure 28 shows the number of reportable accidents per year by class of aircraft. The classes of aircraft that form this category are business jets, turboprops and piston aeroplanes, it may be seen from Figure 28 that there were no small public transport business jet accidents in the period examined.

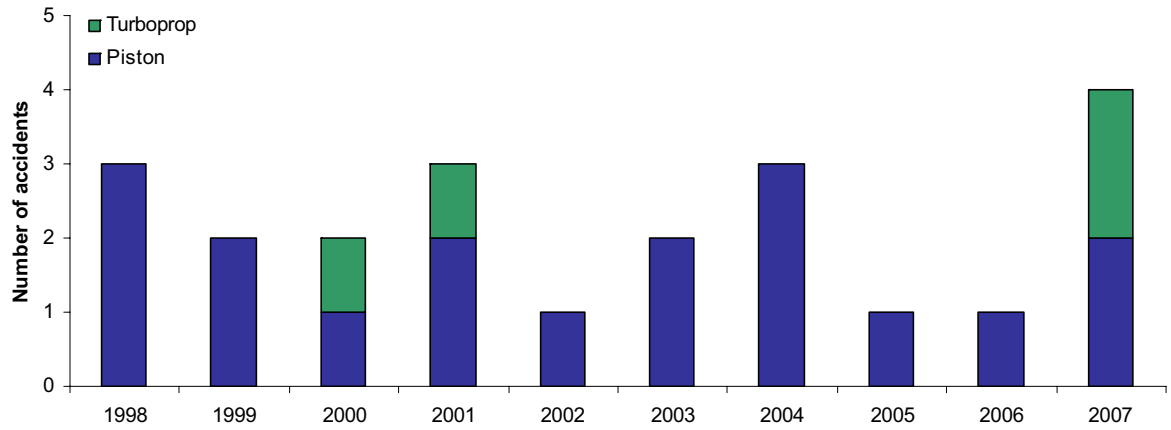

Figure 28 Number of reportable accidents involving small public transport aeroplanes, by class of aircraft

3.4.2 The annual breakdown of reportable accidents by type of operation is shown in Figure 29.

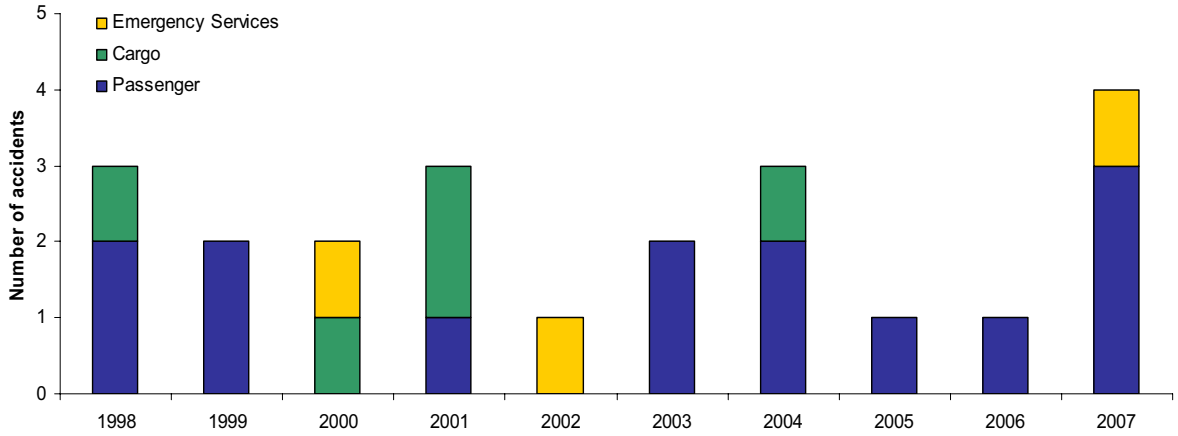

Figure 29 Number of reportable accidents involving small public transport aeroplanes, by type of operation

3.5 Fatal Accidents

3.5.1 There were two fatal accidents involving small public transport aeroplanes in the period 1998-2007, resulting in 13 fatalities. Details of the two accidents are shown in Table 18 below:

Table 18 Fatal accidents involving small public transport aeroplanes

Date	Aircraft Type	Phase of Flight	Nature of Flight	Location	Fatalities	Serious Injuries	POB	Description
3-Sep 1999	Cessna 404 Titan	Initial Climb	Passenger	Glasgow	8	3	11	Left-hand engine failed shortly after take off. Aircraft crashed and was destroyed by fire.
14-Jun 2000	Piper PA31	Approach	Ambulance	Mersey	5	0	5	Aircraft crashed into River Mersey following a loss of control on approach.

3.5.2 In 2005, a BN2 Islander crashed while on approach to Campbeltown. This accident has appeared in some CAA publications as a public transport flight, however it has since been reclassified as a positioning flight. Therefore the accident is now included in the data presented in Chapter 5 – Safety of UK Non-public Transport Aircraft Worldwide.

3.6 Utilisation Data

3.6.1 Between 1998 and 2007, UK airline and air taxi operators completed over 657,000 flights and flew for 415,000 hours on revenue operations. The annual breakdown of these flights and hours is shown in Table 19.

Table 19 Hours and flights flown by UK small public transport airline and air taxi operators

Year	Hours (x1000)	Flights (x1000)
1998	45	73
1999	40	67
2000	39	63
2001	36	61
2002	38	66
2003	38	60
2004	44	67
2005	44	67
2006	43	65
2007	49	69

3.6.2 In the ten-year period, 5% of the total hours were flown by business jets, 65% by piston aeroplanes and 30% by turboprop aeroplanes.

3.6.3 Although air taxi operators do not report the number of passengers carried, the information is reported by airlines. Table 20 shows the number of passengers carried by airlines using small aeroplanes in the period 1998-2007.

Table 20 Passengers carried by UK airlines (small aeroplanes)

Year	Airline passengers carried (x1000)
1998	294
1999	280
2000	270
2001	275
2002	269
2003	225
2004	229
2005	237
2006	219
2007	244

3.7 Reportable and Fatal Accident Rates

3.7.1 The reportable and fatal accident rates for small public transport aeroplanes have been calculated, along with three-year moving average rates. It has not been possible to separate emergency services utilisation from the rest of public transport; therefore the rates cover small public transport aeroplanes as a whole.

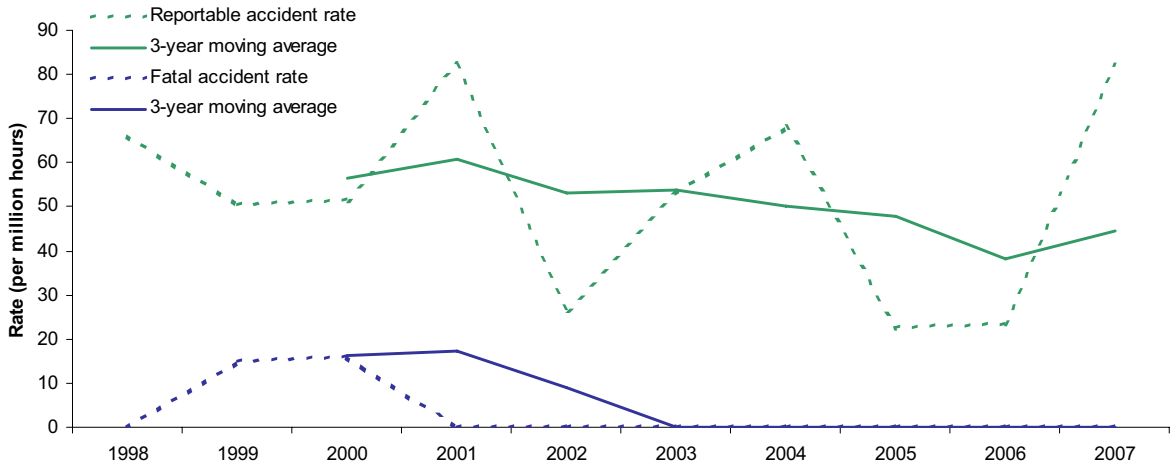

Figure 30 Reportable and fatal accident rate for small public transport aeroplanes

3.7.2 Table 21 shows the reportable and fatal accident rates by class of aircraft for small public transport aeroplanes.

Table 21 Reportable and fatal accident rate for small public transport by class of aircraft

Class of aircraft	Reportable accident rate (per million hours)	Fatal accident rate (per million hours)
Business jet	0.0	0.0
Piston	66.8	7.4
Turboprop	31.7	0.0
All	53.0	4.8

3.8 Injury Tables

3.8.1 The number of injuries sustained by aircraft occupants in the reportable accidents analysed in this section is shown in Table 22. The injuries are divided into fatal, serious and minor injuries. Definitions for these injuries are available in Appendix 1.

3.8.2 In total, there were 13 fatal injuries, 6 serious injuries and 3 minor injuries in the period 1998-2007.

Table 22 Injuries sustained in reportable accidents involving small public transport aeroplanes

Year	Crew				Passengers			
	Fatal	Serious	Minor	Total	Fatal	Serious	Minor	Total
1998	0	0	0	0	0	0	0	0
1999	2	0	0	2	6	3	0	9
2000	1	0	0	1	4	0	0	4
2001	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	1	1	2
2005	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0
2007	0	1	1	2	0	1	1	2
Total	3	1	1	5	10	5	2	17

3.9 Serious Incidents

3.9.1 There were 10 serious incidents involving small public transport aeroplanes in the period 1998-2007, as classified by the AAIB. Figure 31 shows the annual number of serious incidents, broken down by class of aircraft.

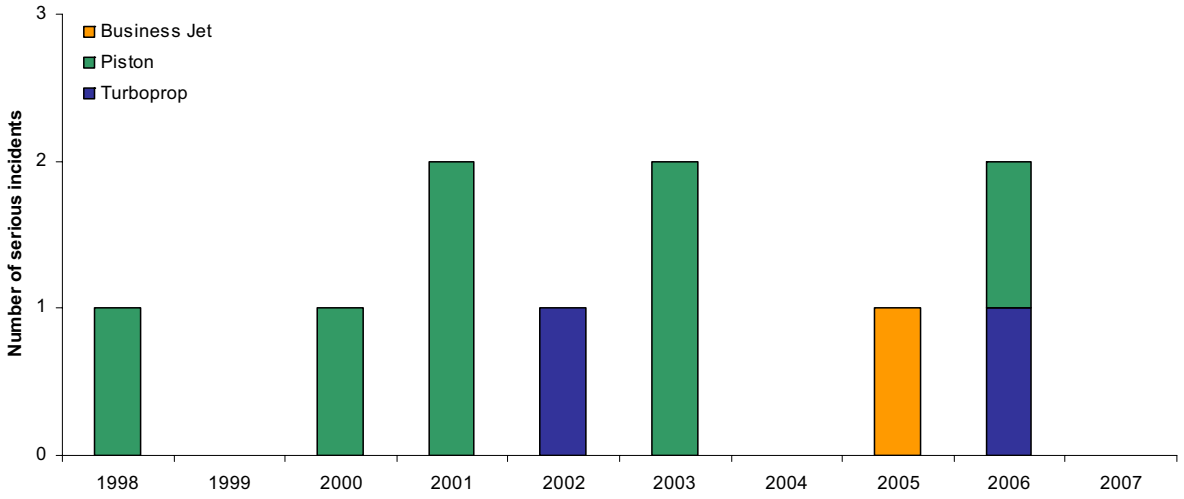

Figure 31 Serious incidents involving small public transport aeroplanes, by class of aircraft

3.9.2 Figure 32 shows the number of serious incidents per year, broken down by type of operation.

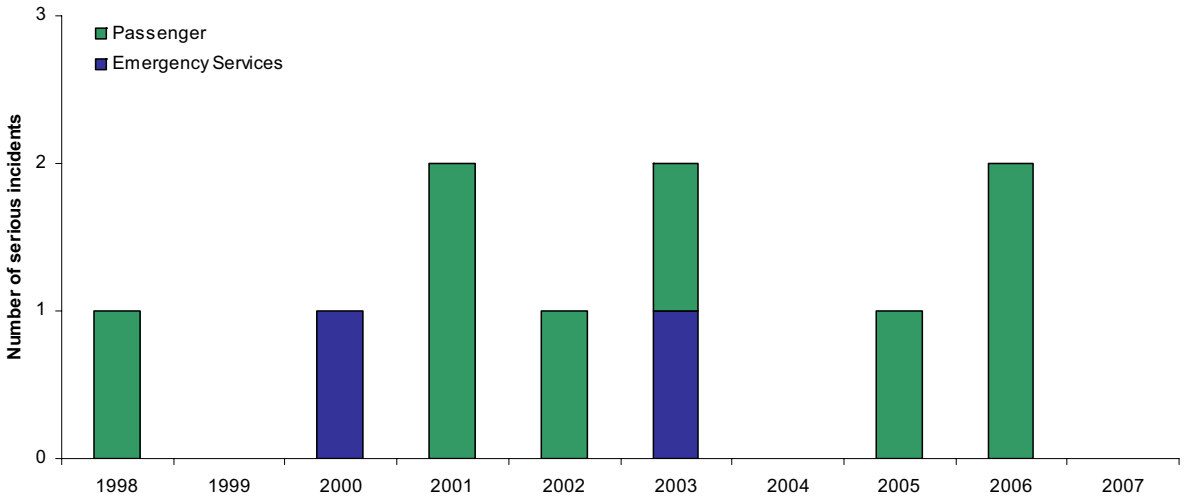

Figure 32 Serious incidents involving small public transport aeroplanes, by type of operation

3.10 Occurrences

3.10.1 Approximately 650 occurrences involving small public transport aeroplanes were reported to the MOR scheme in the period 1998-2007. This figure includes accidents and serious incidents, which form 4.9% of the total number of occurrences.

3.10.2 Figure 33 shows the number of occurrences per year, divided into their risk categories. In 1998, a risk grading scheme was introduced into the MOR scheme, to better classify occurrences. In the decade since the introduction of the scheme, 1.5% of small public transport aeroplane occurrences have been considered to be high-severity (grades A or B). Further details regarding risk grading are available in Appendix 4. The three-year moving average occurrence rate increased by 84%, from 1,100 per million hours in the period 1998-2000 to 2,000 per million hours in the period 2005-2007.

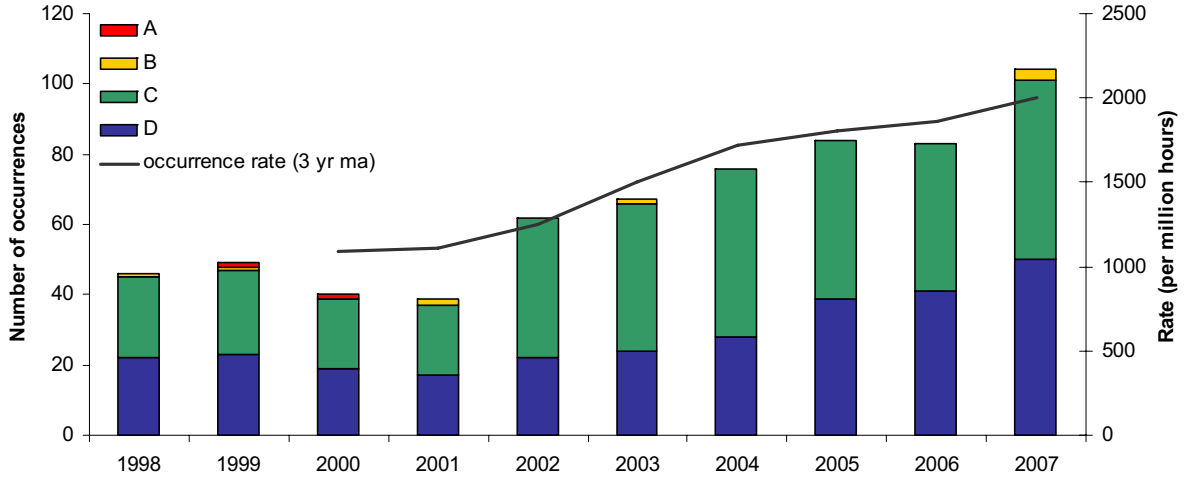

Figure 33 Number and rate of occurrences involving small public transport aeroplanes

3.10.3 The rate of high severity occurrences is shown in Figure 34, along with a three-year moving average rate. The three-year moving average high-severity occurrence rate decreased by 31%, from 32 per million hours in the period 1998-2000 to 22 per million hours in the period 2005-2007.

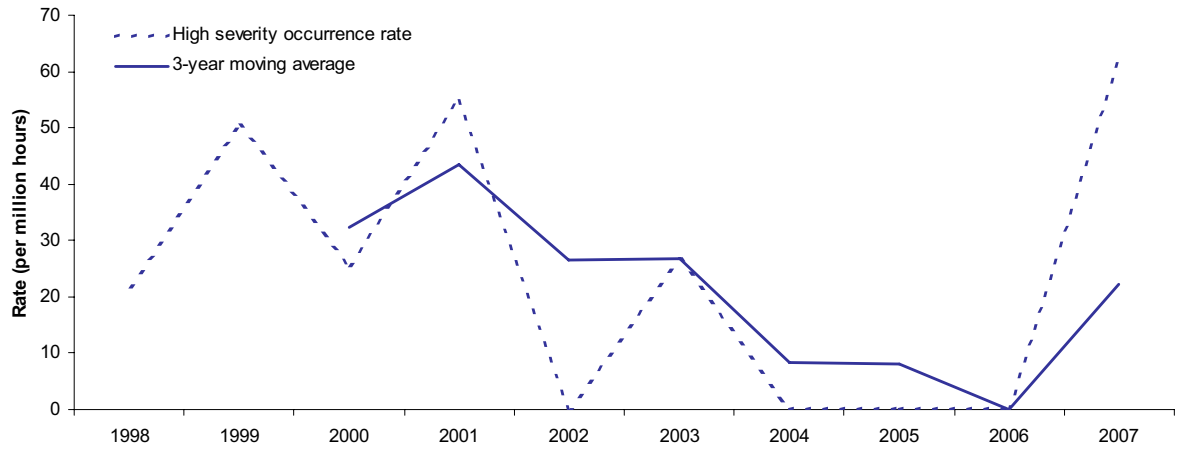

Figure 34 High severity occurrence rate for small public transport aeroplanes

4 Helicopters

4.1 This section contains information relating to all UK registered or operated helicopters, engaged in public transport operations.

4.2 Helicopter public transport may be divided into three main areas of industry: emergency services, off-shore helicopters and 'other', where the 'other' category is largely dominated by passenger flights.

4.3 Emergency services operations may be defined as aircraft being used for the purpose of police support, air ambulance or search and rescue (SAR). Emergency services operations involving aeroplanes have been discussed in section 2 of this Chapter.

4.4 Off-shore operations refer to an aircraft being used for the purpose of carrying passengers or cargo, either to oil and gas platforms or to drilling and support platforms, commonly located in the North Sea and Irish Sea.

4.5 It is not always possible to differentiate between the various types of operation involving helicopters. This is particularly the case for off-shore operations, which are identified through the departure and arrival locations. Therefore, although every attempt has been made to provide as accurate a view as possible, some caution should be attached to the data in this section.

4.6 Reportable Accidents

4.6.1 There were 25 reportable accidents in the period 1998-2007 involving public transport helicopters. Figure 35 shows the number of accidents per year, divided by type of operation.

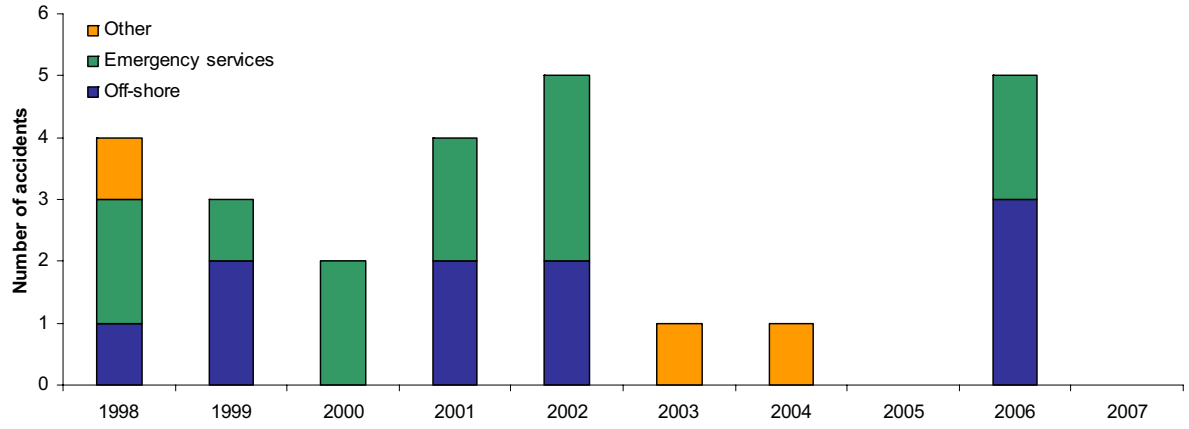

Figure 35 Reportable accidents involving helicopters by type of operation

4.6.2 Figure 36 shows the number of reportable accidents per year divided by the type of helicopter. The available categories were: single piston, single turbine, twin turbine. It can be seen that there were no single piston public transport helicopter accidents in the period analysed.

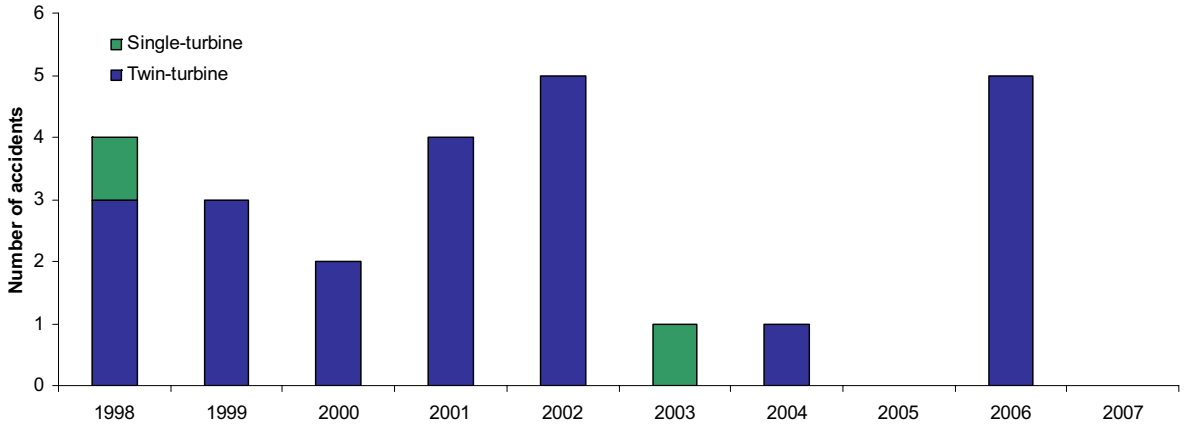

Figure 36 Reportable accidents involving public transport helicopters by class of aircraft

4.6.3 The most common types of reportable accident involving public transport helicopters were technical failures, followed by tail and main rotor strikes, lightning strikes and loss of control in poor weather.

4.7 Fatal accidents

4.7.1 There were four fatal accidents between 1998 and 2007 involving public transport helicopters, resulting in a total of 22 fatalities. Of these four accidents, two were during emergency services flights and two were during off-shore operations. There were no accidents involving third party fatalities during the period analysed.

4.7.2 Table 23 gives details of the four fatal accidents.

Table 23 Details of fatal accidents involving public transport helicopters

Date	Aircraft Type	Phase of Flight	Nature of Flight	Location	Fatalities	Serious Injuries	POB	Description
26 Jul 1998	SA355 Ecureuil Twin	Cruise	Ambulance	Rochester	3	0	3	Aircraft struck overhead power cables and crashed into a field.
09 Oct 1998	SA355 Ecureuil Twin	Initial Climb	Police Support	Welford	1	2	3	A/c crashed into woodland shortly after take off.
16 Jul 2002	Sikorsky S76	Approach	Off-shore	North Sea	11	0	11	The aircraft crashed into the sea and was destroyed following the failure of a main rotor blade.
27 Dec 2006	SA365 Dauphin	Initial Climb	Off-shore	Morecambe Bay	7	0	7	Helicopter seen to descend into sea close to offshore platform.

4.8 Utilisation

4.8.1 In the period 1998-2007, UK airline and air taxi operators have completed 2.6 million flights and flown 1.3 million hours on revenue operations involving helicopters. The annual breakdown of these figures is in Table 24.

Table 24 Total hours and flights completed by public transport helicopters

Year	Hours (x1000)	Flights (x1000)
1998	127	254
1999	117	250
2000	118	254
2001	128	250
2002	136	261
2003	132	263
2004	128	259
2005	136	277
2006	143	274
2007	145	279

4.8.2 91% of the hours flown by public transport helicopters in the period analysed are attributable to twin turbine helicopters. 8% are attributable to single turbine helicopters and 1% to single piston helicopters.

4.8.3 Although it is not possible to separate the hours flown by off-shore or emergency services helicopters from the total, utilisation for the helicopters typically used by these types of operator are available. An estimate per year for each type of operation has been calculated and is presented below:

Table 25 Hours and flights completed by offshore and emergency service helicopters

Year	Off-shore		Emergency Services	
	Hours (x1000)	Flights (x1000)	Hours (x1000)	Flights (x1000)
1998	85	171	29	67
1999	72	163	32	70
2000	69	166	35	72
2001	75	152	38	83
2002	82	161	39	82
2003	74	153	42	90
2004	70	151	42	89
2005	78	168	43	91
2006	82	166	46	90
2007	84	165	44	88

4.9 Reportable and Fatal Accident Rates

4.9.1 Reportable and fatal accident rates for the different types of operation have been calculated, covering the period 1998-2007. Overall, the rate of reportable accidents involving public transport helicopters was 19.1 per million hours and the fatal accident rate was 3.1 per million hours.

4.9.2 Figure 37 shows the reportable and fatal accident rate for the offshore category between 1998 and 2007.

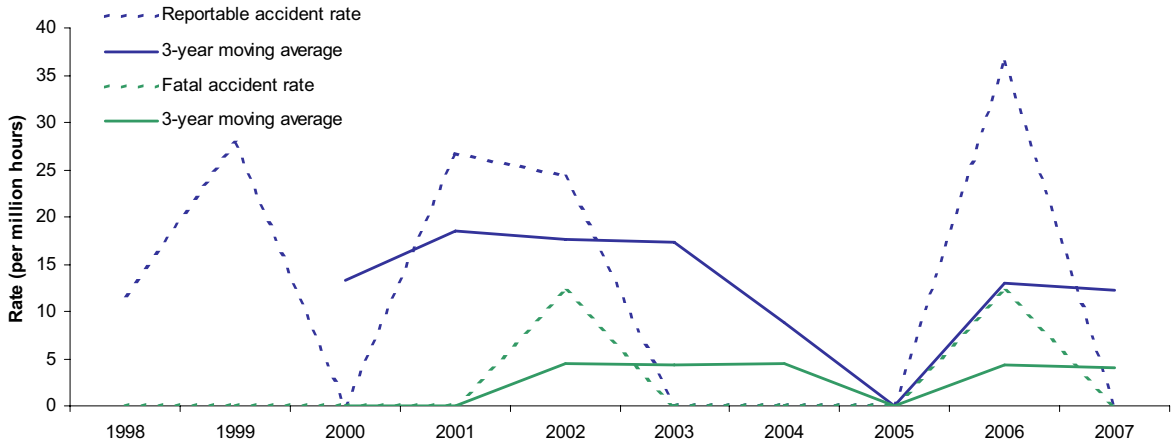

Figure 37 Reportable and fatal accident rates for off-shore helicopter operations

4.9.3 Figure 38 shows the reportable and fatal accident rate for the emergency services category between 1998 and 2007.

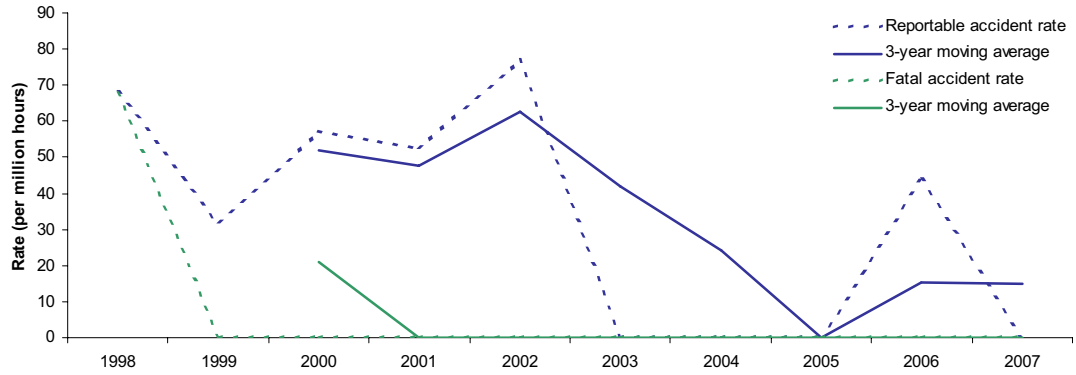

Figure 38 Reportable and fatal accident rates for emergency services helicopter operations

4.9.4 Figure 39 shows the reportable accident rate for the 'other' category between 1998 and 2007. There were no fatal accidents involving helicopters in the 'other' category in the period analysed.

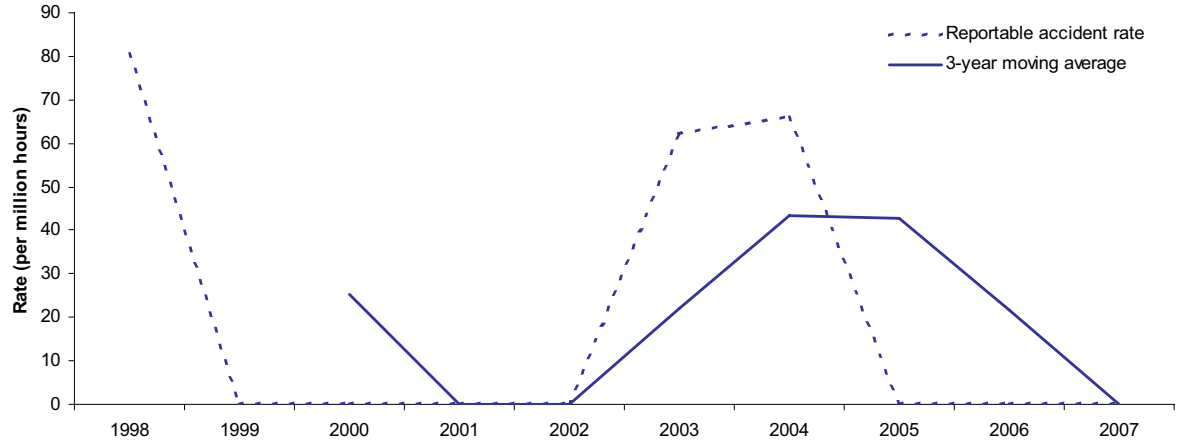

Figure 39 Reportable and fatal accident rates for 'other' helicopter operations

4.10 Injury Tables

4.10.1 The number of injuries sustained by aircraft occupants in reportable accidents involving public transport helicopters is shown in Table 26. The injuries are divided into fatal, serious and minor injuries. Definitions for these injuries are available in Appendix 1.

4.10.2 In total, there were 22 fatal injuries, 3 serious injuries and 15 minor injuries in the period 1998-2007.

Table 26 Injuries sustained in reportable accidents involving public transport helicopters

Year	Crew				Passengers			
	Fatal	Serious	Minor	Total	Fatal	Serious	Minor	Total
1998	1	1	1	3	3	1	1	5
1999	0	0	0	0	0	0	0	0
2000	0	0	1	1	0	0	2	2
2001	0	0	2	2	0	0	3	3
2002	2	0	1	3	9	1	1	11
2003	0	0	3	3	0	0	0	0
2004	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0
2006	2	0	0	2	5	0	0	5
2007	0	0	0	0	0	0	0	0
Total	5	1	8	14	17	2	7	26

4.10.3 Table 27 is a subset of Table 26 and shows the number of injuries sustained in reportable accidents involving off-shore helicopter public transport.

Table 27 Injuries sustained in reportable accidents involving off-shore helicopters

Year	Crew				Passengers			
	Fatal	Serious	Minor	Total	Fatal	Serious	Minor	Total
1998	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0
2002	2	0	0	2	9	0	0	9
2003	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0
2006	2	0	0	2	5	0	0	5
2007	0	0	0	0	0	0	0	0
Total	4	0	0	4	14	0	0	14

4.10.4 Table 28 is also a subset of Table 26 and shows the number of injuries sustained in reportable accidents involving emergency service helicopter public transport.

Table 28 Injuries sustained in reportable accidents involving emergency service helicopters

Year	Crew				Passengers			
	Fatal	Serious	Minor	Total	Fatal	Serious	Minor	Total
1998	1	1	0	2	3	1	0	4
1999	0	0	0	0	0	0	0	0
2000	0	0	1	1	0	0	2	2
2001	0	0	2	2	0	0	3	3
2002	0	0	1	1	0	1	1	2
2003	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0
Total	1	1	4	6	3	2	6	11

4.10.5 Table 29 is also a subset of Table 26 and shows the number of injuries sustained in reportable accidents involving 'other' helicopter public transport.

Table 29 Injuries sustained in reportable accidents involving 'other' helicopters

Year	Crew				Passengers			
	Fatal	Serious	Minor	Total	Fatal	Serious	Minor	Total
1998	0	0	1	1	0	0	1	1
1999	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0
2003	0	0	3	3	0	0	0	0
2004	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0
Total	0	0	4	4	0	0	1	1

4.11 Serious Incidents

4.11.1 There were 11 serious incidents involving public transport helicopters in the period 1998-2007, as classified by the AAIB. Figure 39 shows the annual number of serious incidents, categorised by type of operation. All of the helicopters involved in these serious incidents were twin-turbine.

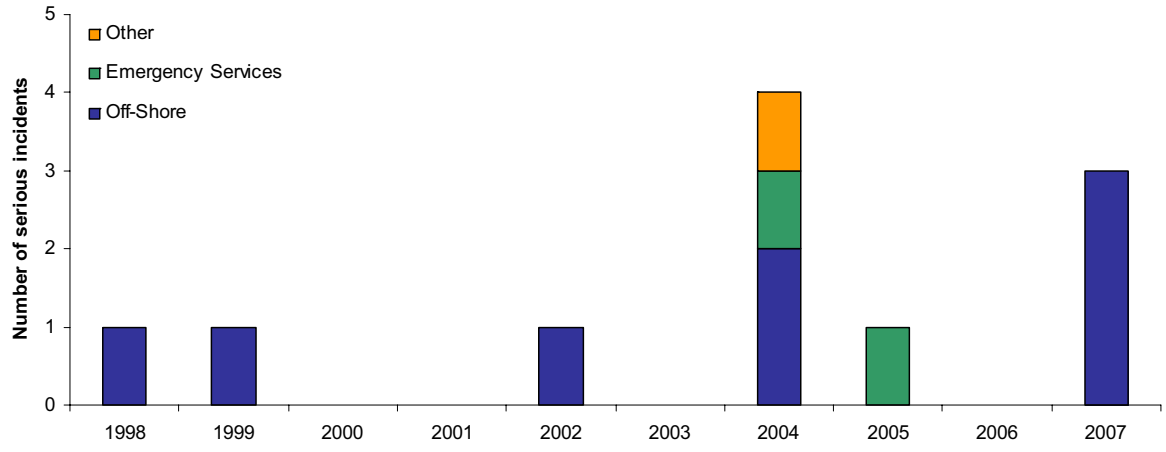

Figure 40 Number of serious incidents per year involving public transport helicopters

4.12 Occurrences

4.12.1 There were over 2,400 occurrences involving public transport helicopters in the period 1998-2007. This figure includes accidents and serious incidents, which form 1.5% of the total number of occurrences.

4.12.2 Figure 41 below shows the number of occurrences per year, divided into their risk categories. In 1998, a risk-grading scheme was introduced into the MOR scheme, to better classify occurrences. In the decade since the introduction of the scheme, 1.9% of public transport helicopter occurrences have been considered to be high-severity (grades A or B). Further details regarding risk grading are available in Appendix 4.

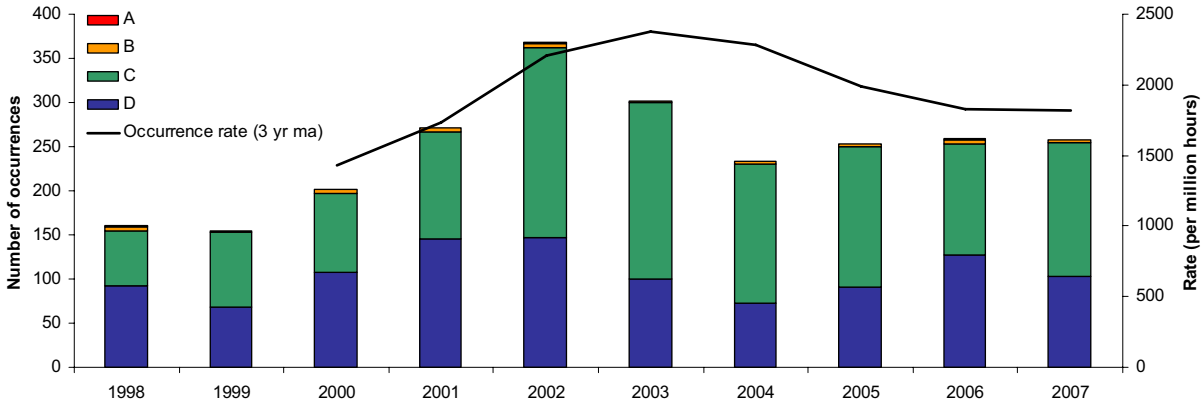

Figure 41 Number and rate of occurrences involving public transport helicopters

4.12.3 The rate of high severity occurrences is shown in Figure 42.

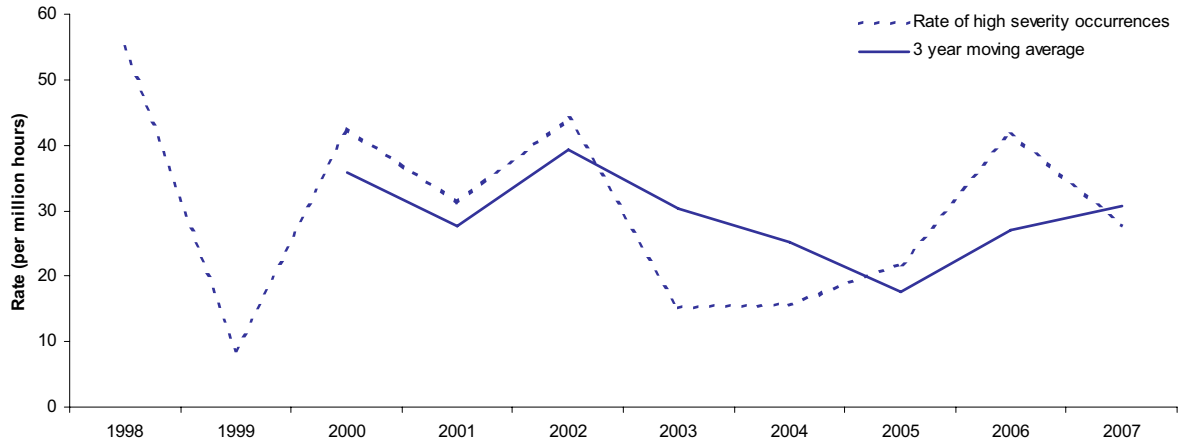

Figure 42 Rate of high severity occurrences involving public transport helicopters

5 Balloons

5.1 This section contains information regarding balloons engaged in public transport operations.

5.2 Reportable Accidents

5.2.1 There were 27 reportable accidents involving public transport balloons in the period 1998-2007. Figure 43 shows number of reportable accidents per year.

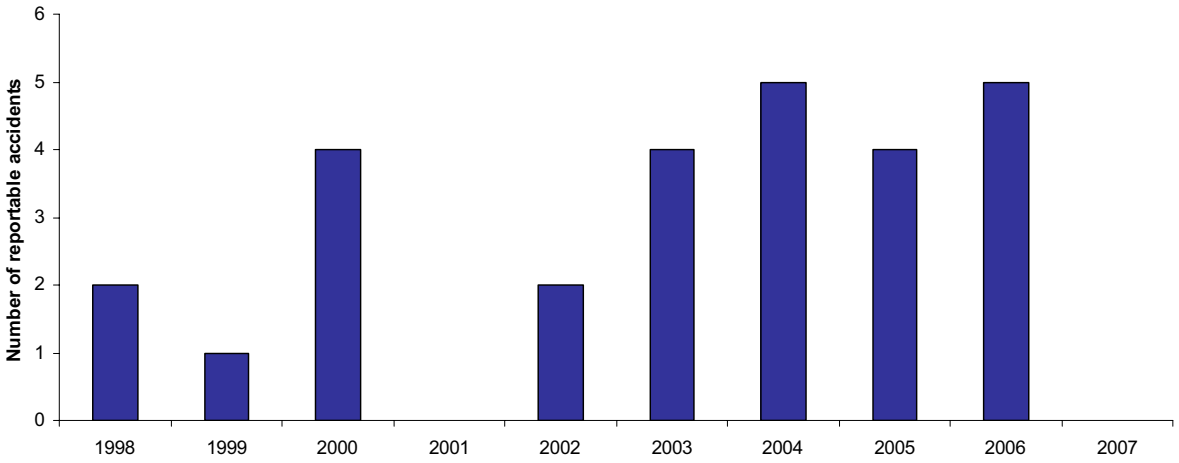

Figure 43 Number of public transport balloon accidents per year

5.2.2 There were no fatal accidents in the period analysed.

5.3 Utilisation Data and Reportable Accident Rates

5.3.1 No utilisation data is available for public transport balloon operations, therefore it is not possible to calculate the rate of accidents over the period analysed.

5.4 Injury Tables

5.4.1 The injuries sustained in reportable accidents involving public transport balloon operations are shown in Table 30. There were no fatalities in the period analysed, 10 serious injuries and 41 minor injuries.

Table 30 Injuries sustained in accidents involving public transport balloons

Year	Crew				Passenger			
	Fatal	Serious	Minor	Total	Fatal	Serious	Minor	Total
1998	0	0	0	0	0	0	2	2
1999	0	0	0	0	0	0	4	4
2000	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	2	0	2
2005	0	2	1	3	0	4	20	24
2006	0	1	0	1	0	1	14	15
2007	0	0	0	0	0	0	0	0
Total	0	3	1	4	0	7	40	47

5.5 Serious Incidents

5.5.1 There were no serious incidents involving public transport balloons between 1998 and 2007.

5.6 Occurrences

5.6.1 There were 100 occurrences involving public transport balloon operations in the period analysed. This figure includes reportable accidents and serious incidents, which form 27% of the total.

5.6.2 Figure 44 shows the number of occurrences per year, divided into their risk categories. In 1998, a risk-grading scheme was introduced into the MOR scheme, to better classify occurrences. In the decade since the introduction of the scheme, 2% of public transport balloon occurrences have been considered to be high-severity (grades A or B). Further details regarding risk grading are available in Appendix 4.

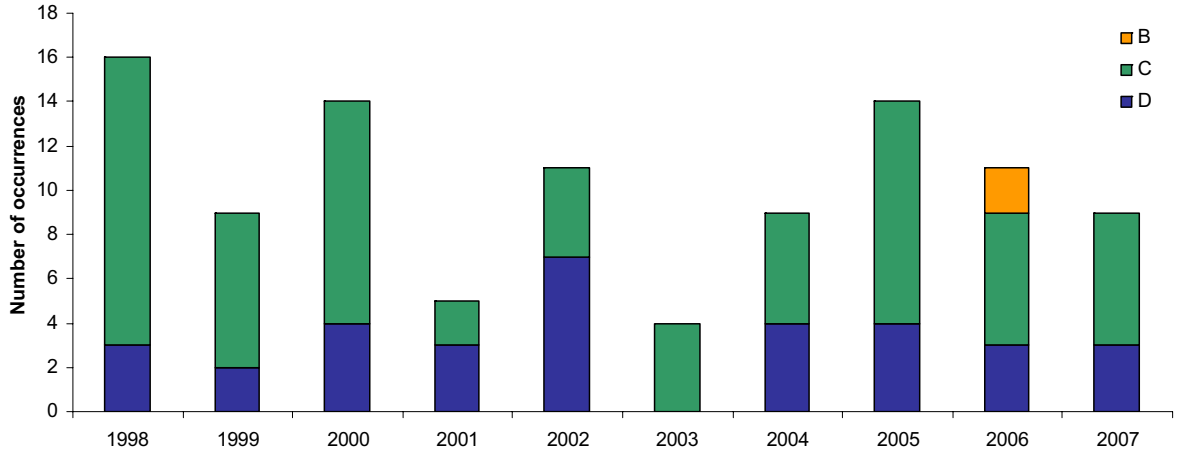

Figure 44 Number of occurrences per year involving public transport balloons

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Chapter 5 Safety of UK Non-public Transport Worldwide

1 Introduction

1.1 This Chapter discusses the safety of UK-registered or operated aircraft, engaged in non-public transport flights.

1.2 The definition of a non-public transport flight is available in Appendix 1. Broadly speaking, non-public transport is defined as a flight that was not engaged in ambulance, cargo, passenger, police support or search and rescue operations. In cases where the nature of flight has been stated to be 'unknown' or 'not applicable', the flight is assumed to be non-public transport.

1.3 The source of the data used in this Chapter is the UK MOR scheme and in the case of gliders the BGA. Further information regarding the MOR scheme and the types of occurrences used in this Chapter may be found in Appendix 3. Utilisation data is sourced from the CAA aircraft register and from the BGA.

2 Large Aeroplanes

2.1 This section contains information relating to UK-registered or UK-operated aeroplanes with a maximum take-off weight authorised exceeding 5,700kg, on non-public transport flights.

2.2 It should be noted that there are some aeroplanes where the weight of the original type did not exceed 5,700kg MTWA, but where subsequent variants have exceeded this weight. An example is the Embraer EMB110 Bandeirante. For consistency across the dataset, all variants are categorised using the weight limit of the original type. A list of public transport aircraft types is available in Appendix 5, which although limited to public transport aircraft types, is a useful reference for this section.

2.3 Utilisation data are not available for this section, so occurrence rates cannot be calculated.

2.4 Reportable Accidents

2.4.1 In the period 1998-2007, there were 21 reportable accidents involving large non-public transport aeroplanes. Figure 45 shows the number of UK reportable accidents per year, divided by class of aeroplane into: jets, business jets, turbo-props and piston aeroplanes. There were no piston aeroplane reportable accidents in this category during the period analysed.

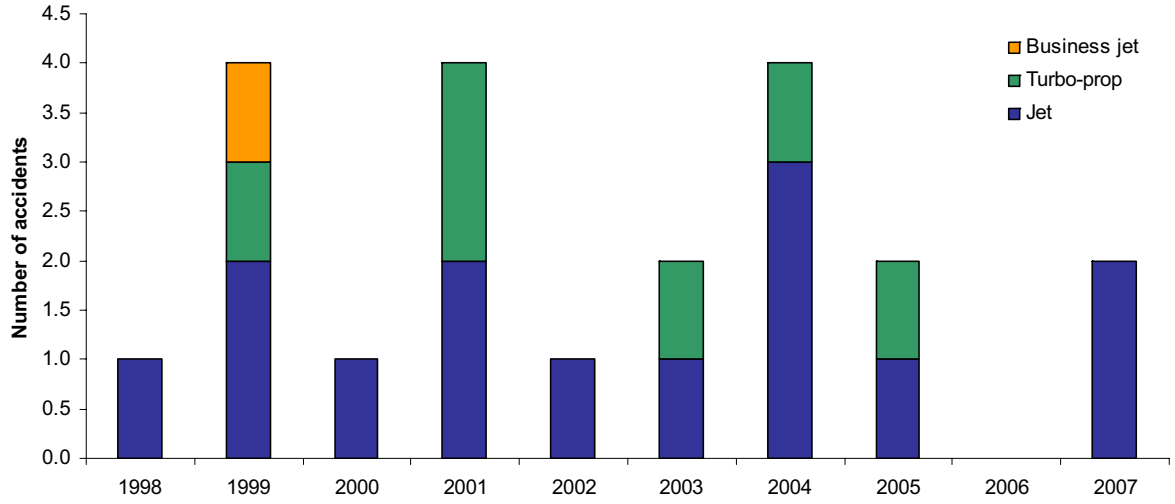

Figure 45 Number of reportable accidents per year involving large non-public transport aeroplanes

2.5 Types of Reportable Accident

2.5.1 Figure 46 shows a categorisation of the types of reportable accident that have occurred involving UK large non-public transport aeroplanes in the period 1998-2007.

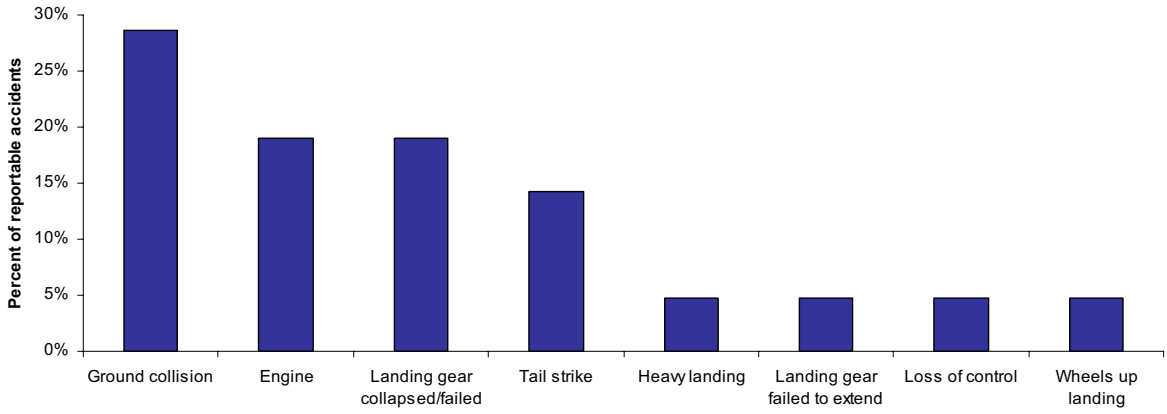

Figure 46 Types of reportable accident involving large non-public transport aeroplanes

2.6 Fatal Accidents

2.6.1 There were two fatal accidents involving large non-public transport aeroplanes in the period analysed. These accidents resulted in a total of 3 fatalities to those on board the aeroplanes. Details of each of these fatal accidents is shown in Table 31.

Table 31 Details of fatal accidents involving large non-public transport aeroplanes

Date	Aircraft type	Phase of Flight	Type of Operation	Location of Occurrence	Description	POB	Fatalities
5-Jun 1998	Hunter	Circuit	Display practice	Dunsfold, Surrey	Crashed during an attempt to land after engine failure and in-flight fire.	1	1
2-Jun-2001	Vampire	Flight	Air display	Biggin Hill	Crashed after suffering loss of control during flying display.	2	2

2.7 Injury Tables

2.7.1 The number of injuries sustained by aircraft occupants in the reportable accidents analysed in this section is shown in Table 32. The injuries are divided into fatal, serious and minor injuries. Definitions for these injuries are available in Appendix 1.

2.7.2 In total, there were 3 fatal injuries, 1 serious injury and no minor injuries in the period analysed. None of the injuries involved passengers.

Table 32 Injuries sustained in reportable accidents involving large non-public transport aeroplanes

Year	Crew			
	Fatal	Serious	Minor	Total
1998	1	0	0	**1**
1999	0	0	0	**0**
2000	0	0	0	**0**
2001	2	0	0	**2**
2002	0	0	0	**0**
2003	0	1	0	**1**
2004	0	0	0	**0**
2005	0	0	0	**0**
2006	0	0	0	**0**
2007	0	0	0	**0**
Total	**3**	**1**	**0**	**4**

2.8 Serious Incidents

2.8.1 There were 12 serious incidents involving large non-public transport aeroplanes in the period analysed, as classified by the AAIB. Figure 47 shows the annual number of serious incidents divided by class of aeroplane into: jets, business jets, turbo-props and piston aeroplanes. There were no piston aeroplane or business jet serious incidents in this category during the period analysed.

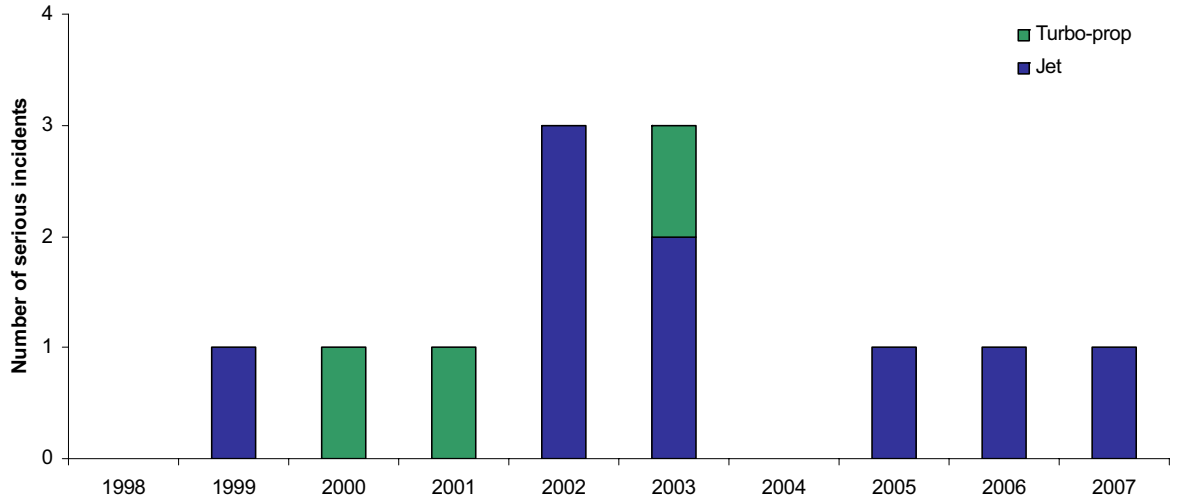

Figure 47 Number of serious incidents per year involving large non-public transport aeroplanes

2.9 Occurrences

2.9.1 Approximately 6,700 occurrences involving large non-public transport aeroplanes were reported in the period analysed. This figure includes both accidents and serious incidents, which together form 0.5% of the total.

2.9.2 Figure 48 below shows the number of occurrences per year, divided into their risk categories. In 1998, a risk-grading scheme was introduced into the MOR scheme, to better classify occurrences. In the decade since the introduction of the scheme, 0.5% of large non-public transport aeroplane occurrences have been considered to be high-severity (grades A or B). Further details regarding risk grading are available in Appendix 4.

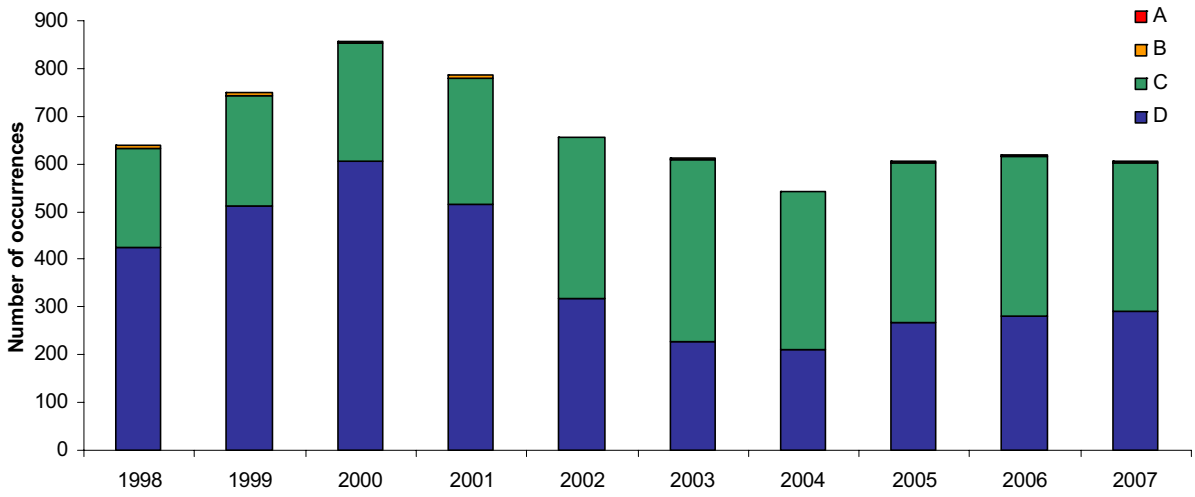

Figure 48 Number of occurrences per year involving large non-public transport aeroplanes

3 Small Conventional Aeroplanes

3.1 This section contains information regarding UK registered or operated non-public transport conventional aeroplanes, with a maximum take-off weight not exceeding 5,700kg.

3.2 Conventional aeroplanes may be defined as: landplanes, seaplanes and self-launching motorgliders. Data relating to other types of glider and to microlights may be found in section 5 of this Chapter.

3.3 It should be noted that there are some aeroplanes where the weight of the original type did not exceed 5,700kg MTWA, but where subsequent variants have exceeded this weight. An example is the Embraer EMB110 Bandeirante. For consistency across the dataset, all variants are categorised using the weight limit of the original type. A list of public transport aircraft types is available in Appendix 5, which although limited to public transport aircraft types, is a useful reference for this section.

3.4 A large proportion of the aircraft that fall into the category of small conventional aeroplanes are not legally required to report incidents to the MOR scheme (although they are encouraged to). As a result, although reportable accidents and serious incidents are discussed in this section, there is no section discussing occurrences as a whole (reportable accidents, serious incidents and incidents).

3.5 Reportable Accidents

3.5.1 In the period 1998-2007, there were approximately 1,500 reportable accidents involving small conventional aeroplanes. Figure 49 shows the number of reportable accidents per year in the period analysed. Single piston aeroplanes were involved in 89% of the reportable accidents, while single turboprop aeroplanes were involved in 8% of the reportable accidents.

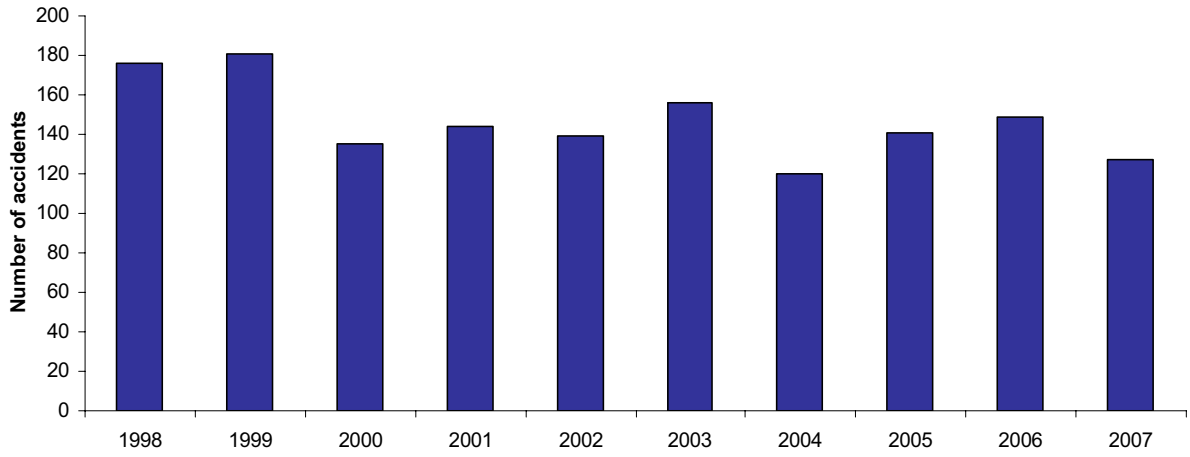

Figure 49 Number of reportable accidents per year involving small conventional aeroplane non-public transport

3.6 Fatal Accidents

3.6.1 There were 96 fatal accidents involving small conventional aeroplanes between 1998-2007. Figure 50 shows the number of fatal accidents per year.

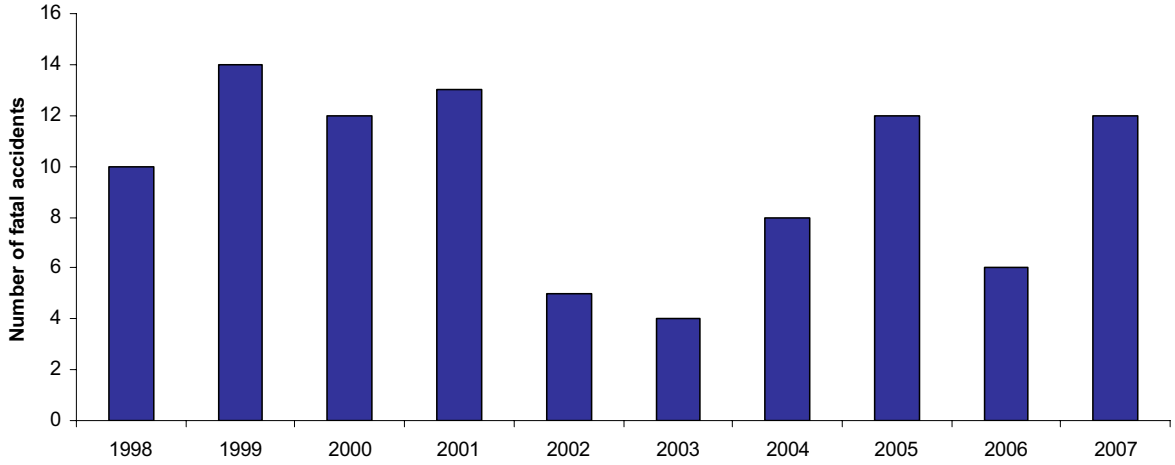

Figure 50 Number of fatal accidents per year involving small conventional aeroplane non-public transport

3.6.2 Details of fatal accidents are shown in Table 33. It should be noted that there are a small number of mid-air collisions in the table; these are counted as one accident and the figures showing the number of people on board and number of fatal injuries apply to the sum of both aircraft involved. In cases where a mid-air collision occurred with an aircraft that was not a small conventional aeroplane (non-public transport), the incident is only included if a fatality occurred on board the aeroplane. Otherwise, an incident such as this is detailed under the relevant section for the other aircraft.

Table 33 Details of fatal accidents involving small conventional aeroplane non-public transport

Date	Aircraft Type	Location of accident	Type of operation	Description	POB	Fatal injuries
19-Apr 1998	DH Tigermoth	English Channel	Private	Missing with one POB, believed to have ditched	1	1
17-May 1998	Taylor Mono	Andrewsfield, Essex	Private	Crashed shortly after take-off	1	1
23-May 1998	Cessna 152	Snowdonia	Private	Crashed on mountainside	2	2
29-May 1998	Rockwell 114	nr. Dijon, France	Private	Overran runway, struck a wall and overturned	4	2
26-Jul 1998	Jodel D112	Bentworth, Hants.	Private	Ran out of fuel, stalled and spun into field	2	2
9-Aug 1998	Druine D31 Turbulent	Swanton Morley, Norfolk	Display	Crashed during air display, aircraft destroyed	1	1
15-Aug 1998	Fairchild M62	Woburn Abbey, Beds.	Private	Crashed after engine failure shortly after take-off	2	1

Table 33 Details of fatal accidents involving small conventional aeroplane non-public transport (Continued)

Date	Aircraft Type	Location of accident	Type of operation	Description	POB	Fatal injuries
28-Aug 1998	Cessna 150	nr. Ardglass, County Down	Private	Crashed during local VFR flight	1	1
20-Oct 1998	Slingsby 67	Mow Cop, Staffs.	Training	Crashed on rising ground for unknown reasons	2	2
24-Dec 1998	Jet Provost	North Sea	Private	Entered flat spin from steep climb and crashed into sea off West Mersea, Essex	1	1
21-Jan 1999	Cessna 152	Mattersey, Notts.	Photography	Mid-air collision during aerial photography	4	4
4-Feb 1999	Cessna 150	Turweston, Bucks.	Training	During simulated engine failure after take-off, spun and crashed	2	1
12-Feb 1999	Cessna 172	Berwyn Mount, Powys	Private	Crashed in mountainous area	3	3
29-Apr 1999	Mooney 20	Selby, W York.	Private	Stalled and spun after engine power loss	4	4
9-May 1999	Jodel DR1050	Black Isle, Highlands	Private	Crashed on rising ground in poor weather	2	2
6-Jun 1999	Cuby II	Giants Causeway, Antrim	Private	Wings folded during turbulence	2	2
3-Jul 1999	CST Racer	Bembridge, Isle of Wight	Racing	Engine stopped during a low level roll. Dived into ground	1	1
15-Jul 1999	Piper PA31	nr. Rome, Italy	Positioning	Crashed in mountainous region	2	2
26-Jul 1999	Beech 58	nr. Kulusuk, Greenland	Ferry	Crashed in low cloud during ferry flight	2	2
1-Aug 1999	Jet Provost	Woolaston, Glos.	Private	Struck ground during steep low level turn	2	2
2-Aug 1999	Piper PA23	nr. Beddgelert, Gwynedd	Private	Crashed on mountainside	1	1
18-Sep 1999	Grumman AA5	Luton, Beds.	Private	Loss of control on landing, struck parked SD330	3	3
25-Sep 1999	ME 109	Sabadell, Spain	Private	Crashed on landing and caught fire	1	1
18-Dec 1999	Piper PA28	Bournemouth, Dorset	Private	Stalled and spun at 500ft during turn after take-off	3	3

Table 33 Details of fatal accidents involving small conventional aeroplane non-public transport (Continued)

Date	Aircraft Type	Location of accident	Type of operation	Description	POB	Fatal injuries
4-Mar 2000	DH Chipmunk	Cosford, Shrops.	Towing	Pilot incapacitated during take-off, struck telegraph pole and inverted	1	1
24-Mar 2000	Europa	Upwood, Cambs.	Test	Lost control after unintentional take-off during taxi test run	1	1
8-Apr 2000	Spitfire	Goodwood, W. Susx.	Training	Lost control during turn onto final approach, left wing struck ground & detached	2	2
19-Apr 2000	Cessna 150	North Weald, Essex	Private	Mid-air collision with Russian registered Yak 50	3	3
27-May 2000	Mooney 20	Moniseny Mtns, Spain	Private	Crashed in mountainous region	1	1
1-Jun 2000	Piper PA34	Newmarket, Cambs.	Private	Lost control and crashed after propeller struck ground on take-off	3	1
16-Jul 2000	Nipper	Cumberworth, Lincs.	Private	Engine failure after take-off. Forced landing.	1	1
18-Aug 2000	Aero L29 Delfin	Eastbourne, E.Susx	Display	Crashed into sea during air display	1	1
11-Sep 2000	Jodel D112	Swansea, Dyfed	Private	Crashed in mountainous region, possible power loss	1	1
3-Dec 2000	Piper PA28	Lambourn Downs, Berks.	Private	In-flight structural failure of left wing	4	4
9-Dec 2000	Jet Provost	Welton le Wold, Lincs.	Test	Entered uncontrollable spin. Both crew ejected at low level	2	1
13-Dec 2000	Cessna 152	Torridon, Highlands	Private	Crashed in mountainous region. Wreckage found 2 months later	2	2
24-Feb 2001	Rockwell 114	Sharpthorne, W.Susx	Private	Right wing overload, detached during steep turn and descent	4	4
27-Mar 2001	Piper PA28	Verdun, France	Private	Crashed shortly after take-off	1	1

Table 33 Details of fatal accidents involving small conventional aeroplane non-public transport (Continued)

Date	Aircraft Type	Location of accident	Type of operation	Description	POB	Fatal injuries
27-Apr 2001	Socata TB10	Sherburn, W York.	Private	Lost control during return due open baggage compartment door	1	1
12-May 2001	Sea Fury	Sywell, Northants.	Private	Lost control on landing, entered area of soft ground and turned over	1	1
12-May 2001	Piper PA24	Osea Island, Essex	Private	Spun into ground	2	2
12-May 2001	Cessna 182	Leicester, Leics.	Private	Stalled and crashed shortly after take-off	2	2
3-Jun 2001	Bell King Cobra	Biggin Hill, Kent	Display	Lost control and crashed during air display	1	1
3-Jun 2001	Spitfire	Rouen, France	Display	Engine malfunctioned after take-off. Crashed during attempted return	1	1
4-Jun 2001	Robin DR250	Monte Tobbio, Italy	Private	Crashed in mountainous region	2	2
23-Jun 2001	Cessna 182	St Mawgan, Cornwall	Private	Departed runway on landing, struck light, overturned and caught fire	4	1
15-Aug 2001	Piper PA28	Halesworth, Suffolk	Private	Engine failure. Crashed during forced landing	1	1
14-Sep 2001	Piper PA25	Aston Down, Glos.	Private	Mid-air collision with glider	2	2
28-Dec 2001	Robin 2160	Goodwood, W.Susx.	Private	Failed to pull out of roll during aerobatics	1	1
7-Feb 2002	Cessna 150	Hannington, Hants.	Private	Struck power cables in poor weather	1	1
1-Apr 2002	Piper PA38	Cwmbran, Glamorgan	Private	Struck an electricity pylon on high ground in poor visibility	2	2
2-Jun 2002	Aero L39 Albatros	Duxford, Cambs.	Training	Overran on landing and came to rest on M11 motorway	2	1
3-Jul 2002	Piper PA32	Sintra Mountains, Portugal	Private	Crashed into mountain in poor weather conditions	4	4

Table 33 Details of fatal accidents involving small conventional aeroplane non-public transport (Continued)

Date	Aircraft Type	Location of accident	Type of operation	Description	POB	Fatal injuries
3-Nov 2002	Slingsby 67	Banbury, Oxon.	Training	Failed to recover from a spinning exercise and crashed	2	2
5-Jan 2003	YAK 52	Towcester, Northants.	Private	Dived vertically into the ground during aerobatics	2	2
15-Feb 2003	Scheibe SF25 Falke	Chipping, Lancs.	Private	On take off the tailwheel became entangled with a launch cable	2	2
29-Mar 2003	Cessna 421	Humberside, N Lincs.	Training	Crashed following touch and go landing	3	1
18-May 2003	Piper PA31	Barbados	Private	Ditched after failure of one engine and loss of fuel	2	2
1-Feb 2004	Piper PA25	Crowland, Lincs.	Towing	Tug aircraft failed to pull out of dive from approx 300ft following glider release.	1	1
29-Feb 2004	Piper PA25	West Chiltington, W.Susx	Towing	Crashed after pilot became incapacitated.	1	1
13-Mar 2004	Cessna 310	Hotham, E York.	Training	Crashed in a field	2	2
27-Jun 2004	Cessna 206	Beacon, Devon	Parachuting	Nosed over and hit the ground hard due to inflight engine failure.	6	4
4-Jul 2004	Piper PA28	Liverpool Bay, Wirral	Private	Ditched off Wallasey following engine problem	2	2
28-Aug 2004	Socata TB10	Bournemouth, Dorset	Private	During attempt to return to airfield, aircraft struck fence and crashed.	3	1
16-Oct 2004	Mooney 20	Jersey, Channel Islands	Private	Stalled and nose dived after engine problems	1	1
22-Oct 2004	Cessna 406	Inverness, Highlands	Positioning	Crashed in bad weather	1	1
8-Feb 2005	Piper PA28	Horsmonden, Kent	Private	Crashed into muddy field in dense fog	1	1
15-Mar 2005	BN2 Islander	Campbeltown, Strathclyde	Positioning	Descended into sea during instrument approach	2	2

Table 33 Details of fatal accidents involving small conventional aeroplane non-public transport (Continued)

Date	Aircraft Type	Location of accident	Type of operation	Description	POB	Fatal injuries
30-Apr 2005	ARV	Clapton in Gordano, Somerset	Private	Struck trees and power cables after take off.	1	1
25-May 2005	Slingsby 67	Potterspury, Northamptonshire	Training	Spun into ground and was destroyed	2	2
8-Jul 2005	CAP 222 (Modified)	White Waltham, Berkshire	Private	During aerobatic practise the aircraft entered an inverted spin and spiralled into the ground	1	1
7-Aug 2005	Cessna 172	Bracklesham Bay, West Sussex	Aerial work	Shortly after take off the aircraft entered a banked left turn, stalled and crashed into a field	1	1
18-Aug 2005	DH Tigermoth	Henley on Thames, Oxon.	Private	Entered spin and crashed into field	2	2
4-Sep 2005	Piper PA28	Irish Sea	Private	Unknown - Wreckage of aircraft subsequently recovered from sea	2	2
2-Oct 2005	Homebuilt	Lymington, Hants.	Private	Nosedived into ground and was destroyed	2	2
22-Oct 2005	Piper PA38 Tomahawk	Biggin Hill, Kent	Training	Engine failed during initial climb.During an attempted turn back the aircraft stalled, crashed and was destroyed	2	2
17-Nov 2005	Grumman AA1	Northampton, Northants.	Private	Spun into field from 5,000ft	2	2
18-Dec 2005	Cessna 152 Microlight	Moreton-in-Marsh, Glos.	Training	Mid-air collision between C152 and EV-97 microlight	3	1
29-Jun 2006	Piper PA23	Thirkleby, N.Yorks.	Private	Suspected loss of engine power on take-off	1	1
16-Jul 2006	Slingsby 67	Hoxne, Suffolk	Private	Entered spin during aerobatics, crashed and was destroyed	1	1
19-Jul 2006	Cessna 150	Eastwood Park, Essex	Training	During go-around, aircraft stalled and crashed in a park.	1	1
22-Jul 2006	YAK 52	Bournemouth, Dorset	Private	Crashed from apparent aerobatic manoeuvre	2	2

Table 33 Details of fatal accidents involving small conventional aeroplane non-public transport (Continued)

Date	Aircraft Type	Location of accident	Type of operation	Description	POB	Fatal injuries
10-Sep 2006	Tailwind	Schramberg, Germany	Private	Emergency landing following smoke in the cockpit	1	1
11-Sep 2006	Cessna 152	Bethesda, Gwynedd	Private	Flew into terrain	2	1
3-Feb 2007	Piper PA28	Blackpool, Lancs.	Private	During approach to Blackpool in poor visibility, the aircraft descended into the sea and sank	2	2
9-Apr 2007	Piper PA28	Bragleenmore Farm, Strathclyde	Private	Crashed into farmland/high ground	3	3
17-Apr 2007	Pulsar	Aston Juxta Mondrum, Cheshire	Private	Crashed following loss of engine power shortly after take-off.	1	1
13-May 2007	Homebuilt	Koprubasi, Turkey	Private	Crashed in deteriorating weather conditions	2	2
1-Jun 2007	Europa	Magor, Gwent	Private	Suffered in-flight structural failure	2	2
8-Jul 2007	Cessna 150	Clutton Hill, Avon	Private	Entered vertical dive, crashed and caught fire	2	2
5-Aug 2007	Piper PA28	Sandown, Isle of Wight	Private	Crashed on take-off.	4	4
15-Sep 2007	Hurricane	Shoreham, W.Susx	Display	Crashed during airshow	1	1
16-Sep 2007	Piper PA32	Shotteswell, Oxon	Unknown	Experienced problems after take-off and crashed into field	1	1
17-Oct 2007	BN2 Islander	Guadalcanal, Spain	Unknown	Overran runway on landing	2	1
16-Dec 2007	Luscombe PAC 750	Rudgeley, Staffs.	Private	Mid-air collision between Luscombe 8 & PAC 750	5	2
30-Dec 2007	Zenair	Selkirk, Borders	Unknown	Aircraft overdue. Wreckage later located	1	1

3.7 Utilisation Data

3.7.1 In the period 1998-2007, small conventional aeroplanes flew an estimated 8.2 million hours. The annual breakdown of these figures is in Table 34.

3.7.2 The utilisation in Table 34 is derived from certificate of airworthiness and permit to fly renewals. Hence there is an estimate for the most recent years, where certificates of airworthiness are not renewed annually. In addition, these hours include all types of operation: public and non-public transport. However, small conventional aeroplanes predominantly fly non-public transport operations, therefore it is reasonable to consider the data to be representative of this category of aircraft.

Table 34 Hours flown by UK registered small conventional aeroplanes

Year	Estimated hours (x1000)
1998	854
1999	839
2000	808
2001	802
2002	795
2003	798
2004	775
2005	828
2006	843
2007	857

3.8 Reportable and Fatal Accident Rates

3.8.1 Figure 51 shows the reportable and fatal accident rates for small conventional aeroplanes engaged in non-public transport operations. These rates have been produced using the utilisation data from Table 34 and are therefore subject to the caveats described in 3.7.2.

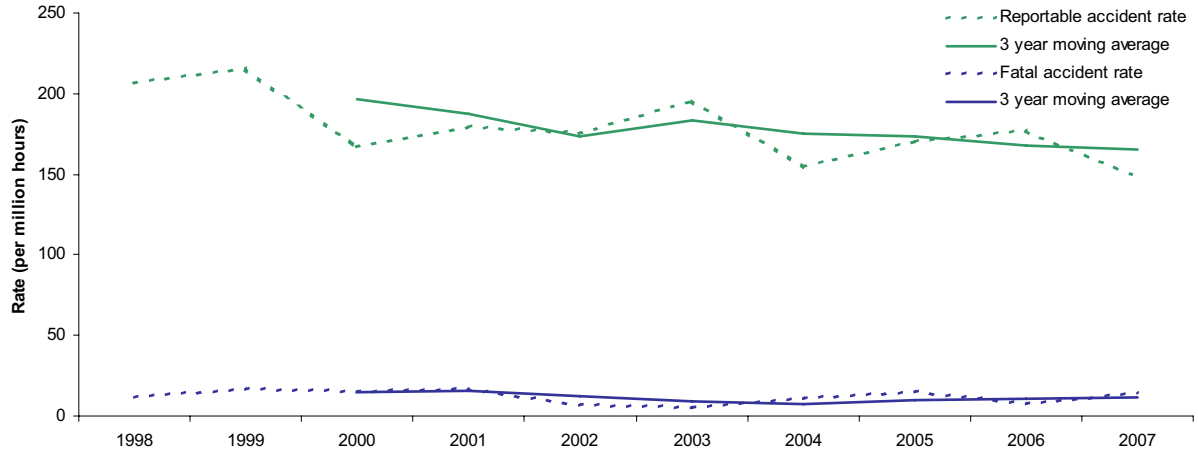

Figure 51 Reportable and fatal accident rate for small non-public transport conventional aeroplanes

3.8.2 The overall reportable accident rate for the period analysed is 179.0 per million hours and the fatal accident rate is 11.7 per million hours.

3.9 Injury Tables

3.9.1 The injuries sustained in reportable accidents involving small conventional aeroplanes are shown in Table 35. In total, there were 165 fatal, 105 serious and 241 minor injuries in the period analysed[1]. It should be noted that if more than one aircraft was involved in the accident, then the total number of injuries sustained in the accident is shown.

Table 35 Injuries sustained in reportable accidents involving small conventional aeroplanes

Year	Crew				Passenger			
	Fatal	Serious	Minor	Total	Fatal	Serious	Minor	Total
1998	11	8	11	30	3	3	15	21
1999	19	9	24	52	12	5	14	31
2000	14	8	7	29	5	5	3	13
2001	17	10	21	48	4	2	6	12
2002	6	5	20	31	4	1	8	13
2003	4	5	20	29	3	1	10	14
2004	8	10	8	26	5	3	3	11
2005	14	7	21	42	5	2	4	11
2006	7	5	17	29	0	7	13	20
2007	13	5	10	28	9	4	6	19
Total	113	72	159	344	50	33	82	165

3.9.2 The rate of fatalities (as opposed to fatal accidents) is shown in Figure 52. In the period analysed the rate of fatalities was 19.9 per million hours.

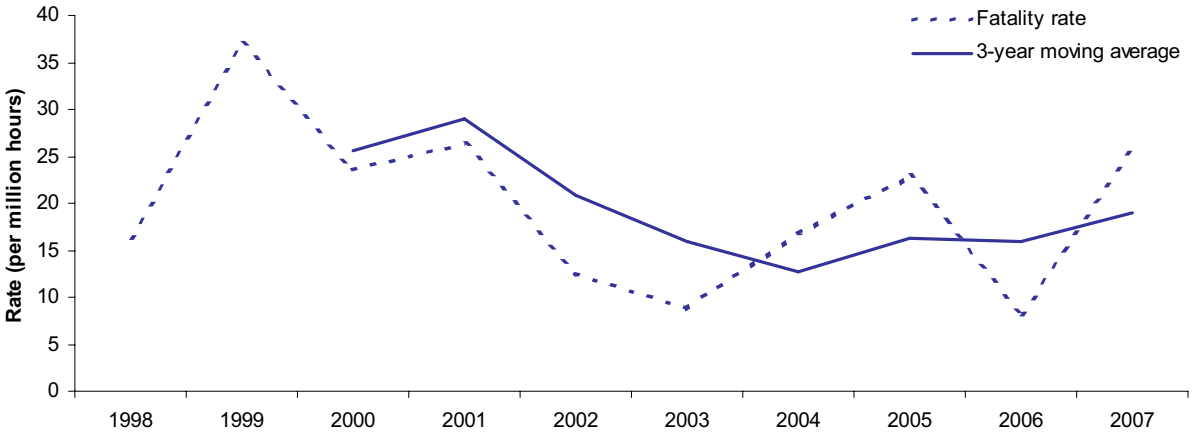

Figure 52 Fatality rate involving small conventional aeroplane non-public transport

1. This figure includes one fatality on board a glider involved in a mid-air collision with a tug-glider aerotow combination. There were no fatalities on board the conventional aeroplane, therefore the accident is not listed in this section, however the fatal injury to the glider pilot is included in the injury table.

3.10 Serious Incidents

3.10.1 There were 28 serious incidents in the period analysed, as classified by the AAIB. Figure 53 shows the annual number of serious incidents between 1998 and 2007. 71% of the serious incidents involved single piston aeroplanes, while 18% involved twin piston aeroplanes.

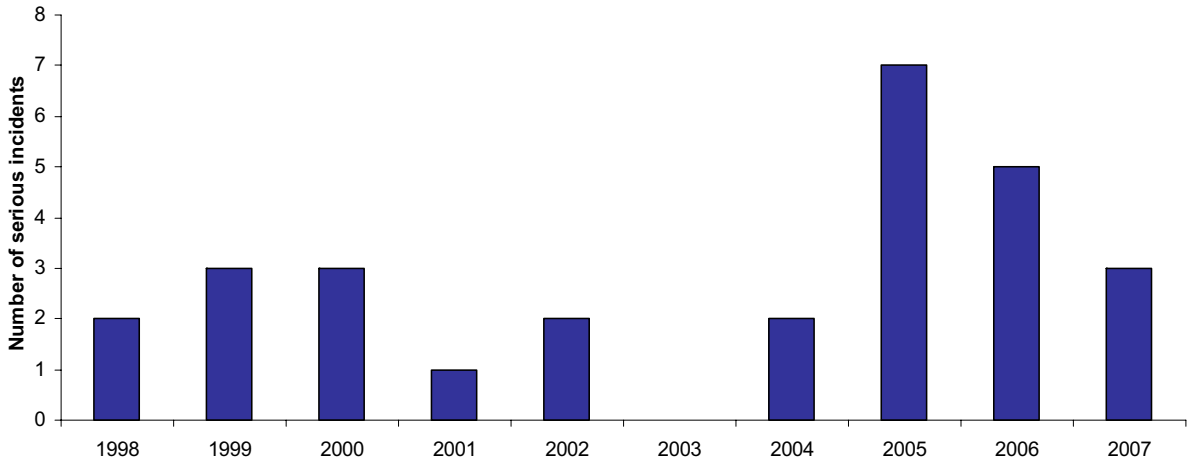

Figure 53 Number of serious incidents per year involving small conventional aeroplane non-public transport

4 Small Helicopters

4.1 This section contains information regarding UK registered or operated helicopters with a maximum take-off weight not exceeding 2,730kg, engaged in non-public transport operations.

4.2 A large proportion of the aircraft that fall into the category of small helicopters are not legally required to report incidents to the MOR scheme (although they are encouraged to). As a result, although reportable accidents and serious incidents are discussed in this section, there is no section discussing occurrences as a whole (reportable accidents, serious incidents and incidents).

4.3 Reportable Accidents

4.3.1 There were 213 reportable accidents involving small helicopters in the period 1998-2007. Figure 54 shows the annual distribution of these accidents over the period analysed.

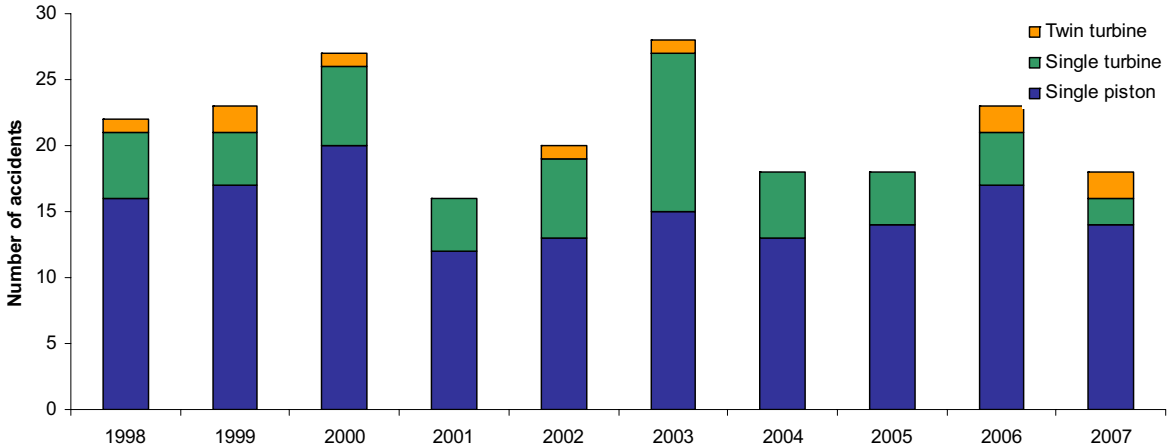

Figure 54 Number of reportable accidents per year involving small helicopter non-public transport

4.3.2 71% of reportable accidents in this category involved single piston helicopters, 25% involved single turbine helicopters and 5% involved twin turbine helicopters.

4.4 Fatal Accidents

4.4.1 In the period 1998-2007, there were 24 fatal accidents involving small helicopters, resulting in 56 fatalities to occupants of the helicopters. Fatal mid-air collisions have been discounted if the fatality occurred on board another class of aircraft. The distribution of fatal accidents per year is shown in Figure 55.

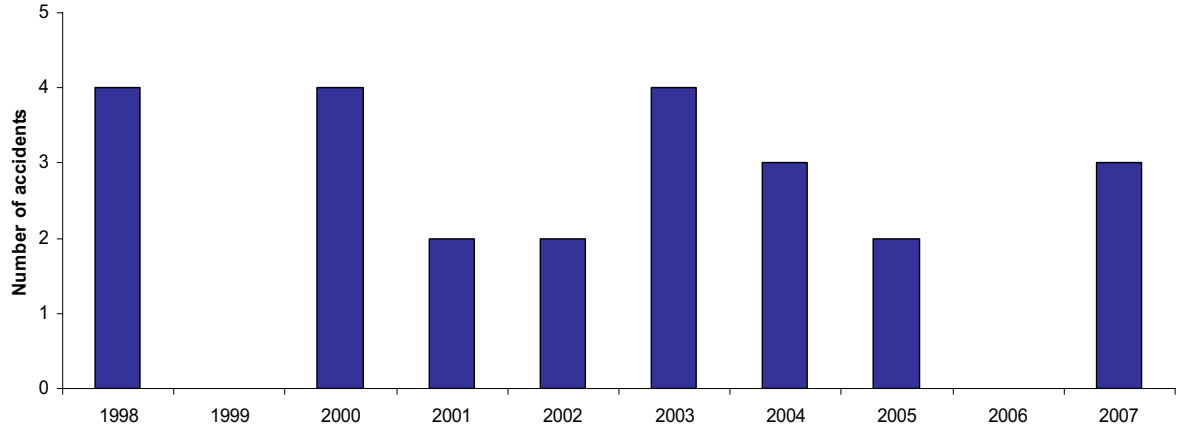

Figure 55 Fatal accidents involving small helicopter non-public transport

4.4.2 Details of the fatal accidents are shown in Table 36.

Table 36 Details of fatal accidents involving small helicopter non-public transport

Date	Aircraft Type	Location	Type of operation	Description	POB	Fatal injuries
28-Jan 1998	SA355 Ecureuil Twin	Nr Bicester, Oxon	Private	Crashed on rising ground & caught fire.	1	1
9-Mar 1998	Robinson R22	Amport, Hants.	Private	Engine stopped, crashed. Main rotor drive sprag clutch failed.	1	1
19-Apr 1998	Robinson R44	Gumley, Leics.	Private	crashed in copse in poor weather - fire after impact.	4	4
1-Aug 1998	Rotorway Executive	nr. Cambridge, Cambs.	Test	Crashed in a field during a test flight.	2	2
1-Feb 2000	Robinson R44	Chorley, Lancs.	Private	Lost control after inadvertently entering cloud.	3	3
8-Mar 2000	Hughes 269	Hare Hatch, Berks.	Private	Crashed following in-flight break up.	3	3
5-Aug 2000	Robinson R44	Alps, France	Private	Collided with power cable in poor weather.	2	2

Table 36 Details of fatal accidents involving small helicopter non-public transport (Continued)

Date	Aircraft Type	Location	Type of operation	Description	POB	Fatal injuries
2-Dec 2000	Robinson R22	Sherburn in Elmet, W York.	Private	Main rotor blades struck canopy following apparent loss of engine power.	2	2
21-Jan 2001	SA350 Ecureuil	Enniskilen, Fermanagh	Private	Lost control after inadvertently entering cloud.	5	3
5-May 2001	Robinson R22	Beaune, France	Private	Crashed in bad weather.	2	2
24-May 2002	Bolkow 105	Brough of Birsay, Orkney Isles	Commercial	Underslung load became unstable and struck the tail rotor. The aircraft crashed into the sea.	1	1
13-Jul 2002	Robinson R22	Warwick, Warks.	Private	Broke up in-flight and crashed in a field.	2	2
17-Jan 2003	Bell 206 Jet Ranger	Cudham, Kent	Private	Crashed shortly after take off and was destroyed in post impact fire.	2	2
19-Jul 2003	Hughes 369 / 500	Knockholt, Kent	Private	Entered a descending left turn from which it did not recover before striking the ground.	3	3
30-Jul 2003	Robinson R44	Teviothead, Borders	Private	After encountering low cloud, the aircraft entered a rapid descent and the main rotor struck the tailboom.	1	1
2-Dec 2003	SA355 Ecureuil Twin	Hurstbourne Tarrant, Hants.	Test	Crashed during air test.	3	3
19-Sep 2004	Robinson R44	Kentallen, Highlands	Private	Aircraft struck hillside and was destroyed by post-crash fire.	2	1
24 Oct 2004	Enstrom 280	nr Asane, Norway	Private	Ditched in sea following loss of engine power.	3	1
11-Nov 2004	Robinson R22	Stratford upon Avon, Warks.	Training	Helicopter crashed in deteriorating weather.	1	1
22-Jan 2005	Bell 206 Jet Ranger	Taunton	Private	Helicopter crashed in poor weather and was destroyed.	4	4
21-Dec 2005	Bell 206 Jet Ranger	Coupar Angus	Survey	Vertical stabiliser detached in flight, causing tail rotor and associated gearbox to separate.	2	2

Table 36 Details of fatal accidents involving small helicopter non-public transport (Continued)

Date	Aircraft Type	Location	Type of operation	Description	POB	Fatal injuries
1-May 2007	SA355 Ecureuil Twin	Peterborough	Private	Disappeared from radar screens after making a sharp turn. Wreckage found on following day.	4	4
3-Aug 2007	Robinson R44	Kendal	Private	Reported overdue by ARCC Kinloss. Wreckage found on following day.	4	4
15-Sep 2007	SA350 Ecureuil	Lanark	Private	Crashed and was destroyed by fire.	4	4

4.5 Utilisation Data

4.5.1 In the period 1998-2007, UK-registered small helicopters flew an estimated 1.7 million hours. The annual breakdown of these hours is shown in table a.

4.5.2 The utilisation in Table 37 is derived from certificate of airworthiness and permit to fly renewals. Hence there is an estimate for the most recent years, where certificates of airworthiness are not renewed annually. In addition, these hours include all types of operation: public and non-public transport. However, small helicopters predominantly fly non-public transport operations, therefore it is reasonable to consider the data to be representative of this category of aircraft.

Table 37 Hours flown by UK-registered small helicopters

Year	Estimated hours (x1000)
1998	151
1999	152
2000	153
2001	149
2002	159
2003	162
2004	169
2005	183
2006	190
2007	203

4.6 Reportable and Fatal Accident Rates

4.6.1 Figure 56 shows the reportable and fatal accident rates for small helicopters in the period analysed. These rates have been produced using the data outlined in Table 37 and are subject to the caveats discussed in 4.5.2. The overall reportable accident rate between 1998 and 2007 was 127.4 per million hours. The corresponding fatal accident rate was 14.4 per million hours.

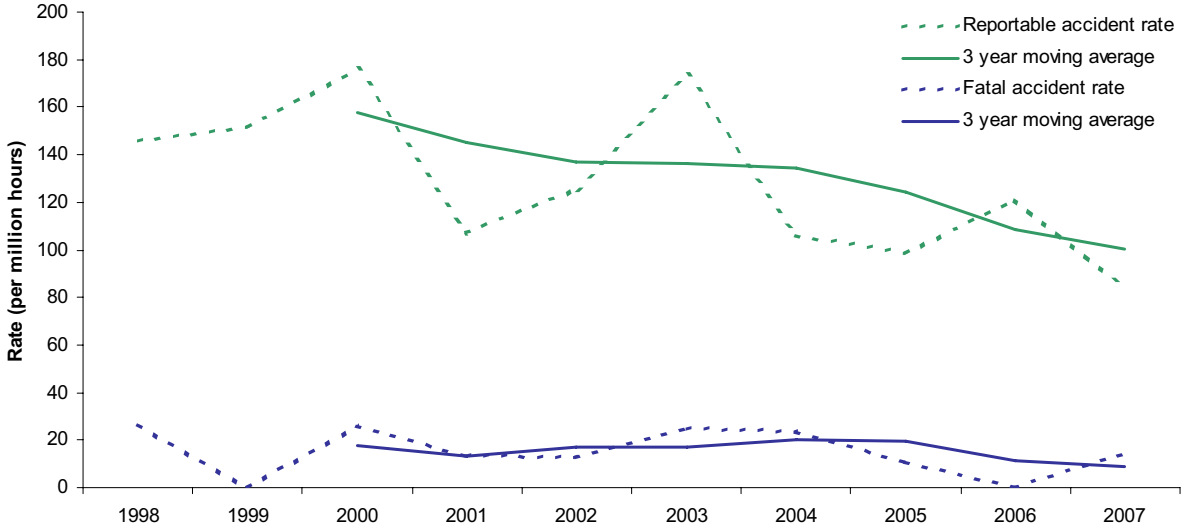

Figure 56 Rate of reportable and fatal accidents involving small helicopter non-public transport

4.7 Injury Tables

4.7.1 The injuries sustained in the reportable accidents involving small helicopters are shown in Table 38. There have been 58 fatalities[1], 17 serious injuries and 80 minor injuries.

Table 38 Injuries sustained in reportable accidents involving small helicopter non-public transport

Year	Crew				Passenger			
	Fatal	Serious	Minor	Total	Fatal	Serious	Minor	Total
1998	4	0	3	7	4	2	0	6
1999	0	0	9	9	0	0	3	3
2000	7	1	4	12	3	2	4	9
2001	2	0	4	6	3	2	1	6
2002	2	2	5	9	1	0	2	3
2003	4	0	10	14	5	0	3	8
2004	2	5	6	13	3	0	3	6
2005	3	1	4	8	3	0	3	6
2006	0	0	7	7	0	0	0	0
2007	3	1	8	12	9	1	1	11
Total	27	10	60	97	31	7	20	58

1. This figure includes two fatalities on a microlight that collided with a helicopter. This accident is not listed as a fatal accident in section 4.4 as there were not any fatalities on-board the helicopter involved. The accident is listed as a microlight fatal accident.

4.7.2 The rate of fatalities (as opposed to fatal accidents) is shown in Figure 57. In the period analysed the rate of fatalities was 33.5 per million hours.

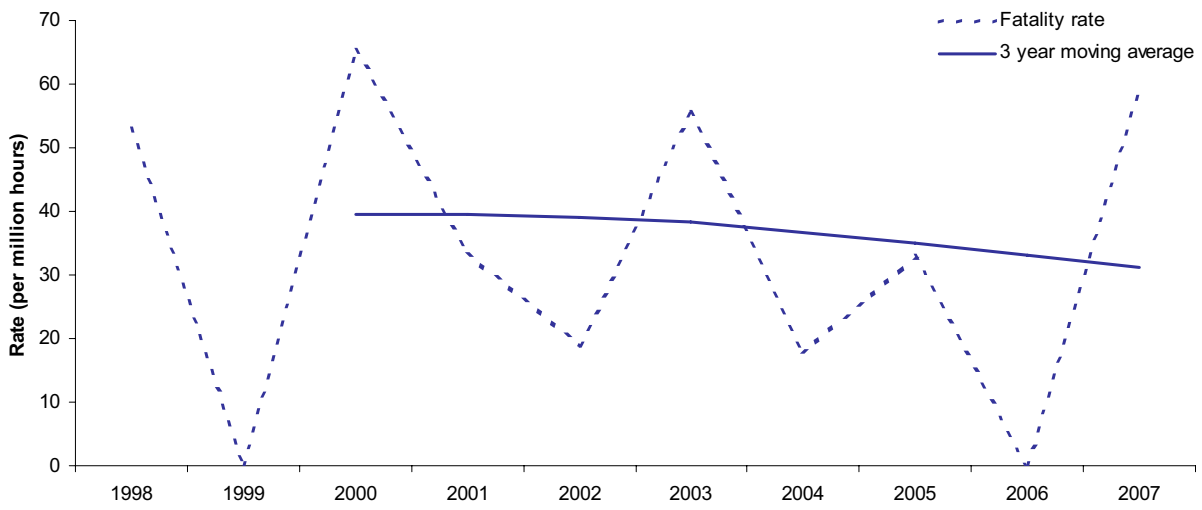

Figure 57 Fatality rate involving small helicopter non-public transport

4.8 Serious Incidents

4.8.1 There were nine serious incidents, as classified by the AAIB, involving small helicopters in the period analysed. Figure 58 shows the annual number of serious incidents between 1998-2007.

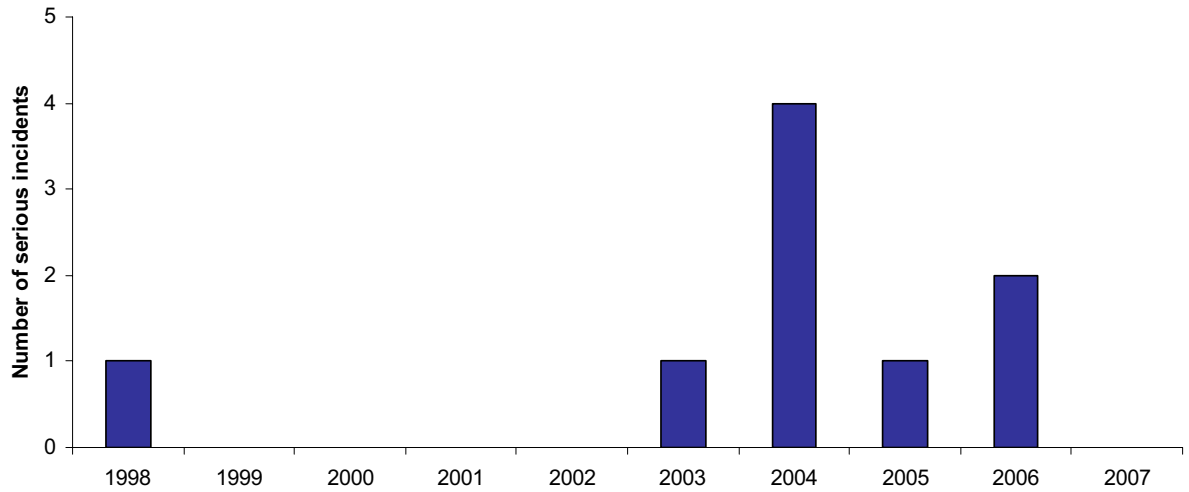

Figure 58 Number of serious incidents per year involving small helicopter non-public transport

5 Small 'Other' Aircraft

5.1 This section contains information regarding UK registered or operated airships, balloons, gliders, gyroplanes and microlights engaged in non-public transport flights.

5.2 Responsibility for the safety of these aircraft types has been delegated by the CAA to their representative bodies. For airships and balloons this is the British Balloon and Airship Club (BBAC), for gliders the British Gliding Association (BGA) and for microlights the British Microlight Aircraft Association (BMAA).

5.3 Information in this section is limited to accident data and, where available utilisation data (and therefore accident rates).

5.4 Airships

5.4.1 Between 1998 and 2007, there has been only one reportable accident involving a UK registered airship. This accident, in 2003, was a mid-air collision between two airships and did not result in any injuries. Table 39 summarises safety data for airships.

Table 39 Safety data for UK airships

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Aircraft Registered in UK	40	42	33	28	31	30	29	27	24	24	308
Estimated hours flown	227	317	305	1,040	985	846	298	206	197	197	4,618
Fatal Accidents	0	0	0	0	0	0	0	0	0	0	0
Reportable Accidents	0	0	0	0	0	1	0	0	0	0	1
Injuries (all)	0	0	0	0	0	0	0	0	0	0	0

5.5 Balloons (non-public transport)

5.5.1 In the period 1998-2007, there have been 21 reportable accidents involving UK non-public transport balloons. None of these accidents resulted in a fatal injury, however there were 10 serious injuries in the period analysed. Table 40 summarises safety data for this type of aircraft.

5.5.2 It should be noted that Table 40 shows data for non-public transport operations only, information related to UK public transport balloon flights can be found in Chapter 4. It is not possible to separate utilisation statistics for public and non-public transport balloons, therefore this information has been excluded from the table.

Table 40 Safety data for UK non-public transport balloons

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Fatal Accidents	0	0	0	0	0	0	0	0	0	0	0
Reportable Accidents	4	4	1	0	1	2	1	1	6	1	21
Fatal Injuries	0	0	0	0	0	0	0	0	0	0	0
Serious Injuries	2	1	1	0	1	1	0	0	4	0	10
Minor Injuries	1	2	0	0	0	1	0	0	5	1	10

5.6 Gliders

5.6.1 The information in this section has been provided by the British Gliding Association (BGA). The BGA statistical analysis year is 1st October – 30th September. It should be noted that paragliders and hang gliders are not included within these data.

5.6.2 Between 1st October 1997 and 30th September 2007, there were 436 reportable accidents involving UK gliders, 36 of which resulted in fatalities. Table 41 summarises safety and utilisation data for UK gliders.

Table 41 Safety data for UK gliders

BGA YEAR	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	Total
Number of aircraft	2,419	2,502	2,667	2,621	2,614	2,594	2,641	2,537	2,511	2,550	25,656
Movements (x1000)	794	774	728	651	708	688	632	629	591	578	6,773
Number of hours flown (x1000)	148	156	144	129	145	137	149	139	139	134	1,420
Fatal accidents	6	1	3	7	1	3	7	1	4	3	36
Reportable accidents	44	43	57	38	41	42	40	37	46	48	436
Fatal injuries	7	3	2	8	2	3	9	1	3	5	43
Serious injuries	4	6	6	6	5	15	5	3	8	10	68
Minor/No injuries	47	45	71	34	45	36	37	40	41	50	446

5.6.3 Details of the 36 fatal accidents between 1st October 1997 and 30th September 2007 are shown in Table 42. There are a number of mid-air collisions in the table, these are listed as a single accident and the figures for the number of people on board and number of fatalities refer to the sum of both aircraft.

Table 42 Details of fatal accidents involving UK gliders

Date	Aircraft Type	Location of accident	Description of accident	People on board	Fatal injuries
2-May-1998	LS3A & KA8	Seighford, Staffs	Mid-air collision between two gliders	2	2
9-Jul-1998	ASK13	nr. Dunstable, Beds.	Crashed on hillside	2	1
10-Jul-1998	2x Ventus 2	Mildenhall, Suffolk	Mid-air collision between two gliders	2	1
27-Jul-1998	2x Kestral 19	Bidford, Warks.	Mid-air collision between two gliders	2	1
5-Aug-1998	KA6	Aston Down, Glos.	Entered spin and crashed into corn field	1	1
19-Aug-1998	Pegasus 101	Great Saxham, Suffolk	Crashed on farmland, circumstances unknown	1	1
31-May-1999	ASW20 & Grob Twin Akro	Great Hucklow, Derbys.	Mid-air collision between two gliders	3	3
18-Jun-2000	Slingsby Swallow	Riggewell, Suffolk	Crashed on take-off	1	1
31-Jul-2000	Nimbus 4DT	Arcania, Spain	Spiral dive following loss of control. Wing separated	2	1
4-Aug-2000	ASW 22	Segovia mountains, Spain	Crashed in mountainous region	1	1

Table 42 Details of fatal accidents involving UK gliders (Continued)

Date	Aircraft Type	Location of accident	Description of accident	People on board	Fatal injuries
3-Feb-2001	Ventus 2CT	Benalla, Australia	Pitched nose down and spiralled into ground	1	1
1-Apr-2001	SZD Junior	Long Stratton, Norfolk	Spiralled into ground on downwind leg to airfield	1	1
23-Jun-2001	D5 Kestrel	Husbands Bosworth, Leics.	Wingtip struck ground during low level turn	1	1
15-Jul-2001	ASW15	Bidford, Warks.	Mid-air collision between glider and PA18 tug/glider tow	3	1
15-Jul-2001	Cirrus Standard	Usk,Wales	Stalled and spun in shortly after winch launch	1	1
26-Aug-2001	LS8	Syerston, Notts.	Spun into ground after loss of control during winch launch	1	1
14-Sep-2001	Cirrus	Aston Down, Glos.	Mid-air collision between glider and PA25 tug.	2	2
1-Jun-2002	KA8	Hinton in the Hedges, Northants.	Mid-air collision between glider and freefall parachutist	2	2
21-Feb-2003	SZD-50-3 Puchacz	Great Hucklow, Derbys.	Spiralled into ground after impacting launch cable of another glider	2	1
11-Jun-2003	ASW19	Camphill, Derbys.	During launch, left wing hit ground and aircraft tipped onto nose	1	1
29-Jun-2003	Discus 'B'	High Ellington, N Yorks.	Lost control and impacted ground in steep nose down attitude	1	1
18-Jan-2004	Puchacz	Husbands Bosworth, Leics	Entered spin at 1500ft and crashed nose-down into a field	2	2
26-Apr-2004	Skylark IV/ Ventus CT	Lasham, Hants.	Mid-air collision between two gliders	2	1
16-May 2004	ASK18	Halesland, Somerset	Crashed on take-off following winch cable failure	1	1
26-May 2004	KA7	Strubby, Lincs.	Crashed after reported wing separation	2	2
9-Jul 2004	ASW20L	La Motte Du Caire, France	Ground collision shortly after take off by hoist system	1	1
7-Aug-2004	LS7	Dunstable, Beds.	Climbed too steeply during winch launch, stalled and nose dived to ground	1	1

Table 42 Details of fatal accidents involving UK gliders (Continued)

Date	Aircraft Type	Location of accident	Description of accident	People on board	Fatal injuries
7-Aug-2004	Std. Cirrus	Nympsfield, Glos.	Collided with tree following early release from winch launch	1	1
18-Sep-2005	Glaser Dirks DG600	Sudbury, Suffolk	Entered steep climb, stalled and spun into ground	1	1
12-Jun-2006	Schleicher ASW 27	Les Pads, France	Crashed in mountainous terrain	1	1
30-Aug-2006	Slingsby T.51 Dart 15	Sutton Bank, North Yorkshire	Spun in during low-level ridge soaring	1	1
23-Sep-2006	Schleicher ASW 20L	Raf Keevil, Wiltshire	Wing tip struck ground during winch launch	1	1
2-Oct-2006	Scheibe SF27, Schleicher ASW 19	Sutton Bank, North Yorkshire	Mid-air collision between two gliders	2	1
15-Nov-2006	Stemme S10-V	Mount Pleasant, New Zealand	Went missing during cross-country competition	2	2
2-Sep-2007	Ash 25	Tomintoul, Grampian	Crashed into field whilst attempting to land	2	1
6-Sep-2007	Centrair 101A Pegase	Heusca, Spain	Impacted mountainous terrain	1	1

5.6.4 Third party only fatal accidents are not included in the fatal accident statistics discussed in this paper. However, details of the third party fatalities involving UK gliders are shown in Table 43.

Table 43 Details of third party only fatal accidents involving UK gliders

Date	Aircraft type	Location of accident	Description	Fatal injuries
3-Jul-1998	ASK21	Long Mynd, Shropshire	On landing, glider's left wing struck & killed a person walking along a track adjacent to landing strip	1
9-Aug-2005	LS1F	Husbands Bosworth, Leicestershire	Hit spectator during competition finish	1

5.7 Gyroplanes

5.7.1 In the period 1998-2007, there were 25 reportable accidents, of which eight were fatal. Table 44 summarises safety data for UK-registered gyroplanes. Gyrogliders are not included in these data.

Table 44 Safety data for UK-registered gyroplanes

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Aircraft Registered in the UK	265	244	233	242	244	247	251	249	260	278	2,513
Estimated hours flown	1,432	1,445	1,266	1,596	2,535	2,315	1,872	1,960	2,046	2,188	18,654
Fatal Accidents	1	0	1	1	2	1	1	0	1	0	8
Reportable Accidents	3	2	2	2	2	6	4	0	3	1	25
Fatal Injuries	1	0	1	1	3	1	1	0	1	0	9
Serious Injuries	0	0	0	0	0	1	0	0	0	0	1
Minor Injuries	0	0	0	0	0	3	0	0	0	0	3

5.7.2 Details of the eight fatal accidents involving UK-registered gyroplanes are shown in Table 45.

Table 45 Details of fatal accidents involving UK-registered gyroplanes

Date	Aircraft type	Location of accident	Description	POB	Fatal Injuries
13-Jun-1998	Bensen	Coll, Isle of Lewis	Entered steep climb, stalled and crashed inverted	1	1
16-Apr-2000	Bensen	Carlisle, Cumbria	Crashed during attempt to land in field next to runway end	1	1
1-Jun-2001	Cricket	Henstridge, Somerset	Crashed on approach	1	1
23-Mar-2002	Bensen	Kirkbride, Cumbria	Shortly after take-off entered rolling manoeuvres and crashed	1	1
17-May-2002	RAF 2000 Autogyro	Braintree, Essex	Lost control, started to break up and fell vertically to the ground	2	2
29-Jun-2003	Bensen	Shipdham, Norfolk	Control lost after rotor blades struck rudder in flight	1	1
15-Dec-2004	Ken Brock KB-2	Sutton Bank, N Yorks.	Crashed into trees after failing to gain height following take-off	1	1
1-Jun-2006	RAF 2000 Autogyro	Bodmin Moor, Cornwall	Main rotor struck vertical stabiliser, propeller and rudder in flight	1	1

5.8 Microlights

5.8.1 In the period 1998-2007, there have been 320 reportable accidents involving UK-registered microlights, 23 of which resulted in fatalities. Table 46 summarises safety and utilisation data for UK-registered microlights in the period analysed.

Table 46 Safety data for UK-registered microlights

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Aircraft Registered in the UK	3,450	3,548	3,478	3,531	3,617	3,827	4,069	4,117	4,253	4,393	38,283
Estimated hours flown (x1000)	75	85	80	90	102	120	125	115	119	123	1,033[1]
Fatal Accidents	1	3	0	3	1	2	4	2	3	4	23
Reportable Accidents	22	23	19	26	29	38	32	32	44	55	320
Fatal Injuries	2	3	0	4	1	2	7	3	4	5	31
Serious Injuries	2	7	4	3	11	5	9	7	10	8	66
Minor Injuries	9	7	8	3	5	9	4	11	14	18	88

1. Total differs from the sum of column entries due to rounding to the nearest 1000.

5.8.2 Details of the 23 fatal accidents between 1998 and 2007 are shown in Table 47. There are two mid-air collisions in the table; in each case, these are listed as a single accident and the figures for the number of people on board and number of fatalities refer to the sum of both aircraft.

Table 47 Details of fatal accidents involving UK-registered microlights

Date	Aircraft type	Location of accident	Description	POB	Fatal Injuries
26-Jul-1998	Kolb Twinstar Mk3	Louth, Lincs.	Crashed in cornfield	2	2
28-Mar-1999	MW6S (Mod)	Newnham, Herts.	Loss of control during go around	1	1
21-Aug-1999	Pegasus XLQ	Radwell, Herts.	Loss of control in flight	2	1
6-Oct-1999	Rans S6-ESD	Monewden, Suffolk	Crashed into field following engine failure shortly after take-off	1	1
13-Jan-2001	Mainair Blade	Enson, Staffs.	Engine stopped due fuel starvation. Overturned on landing	2	1
14-Feb-2001	Rans S4	Davidstow Moor, Cornwall	Loss of control during climb out, entered spin and crashed	1	1
23-Jun-2001	Aviasud Mistral	Nash, Shrops.	Stalled and spun into ground from low level after engine failure	2	2

Table 47 Details of fatal accidents involving UK-registered microlights (Continued)

Date	Aircraft type	Location of accident	Description	POB	Fatal Injuries
2-Jan-2002	Mainair Blade	Alby, Norfolk	Failed to climb due to ice accretion. Wing tip struck ground and aircraft overturned.	2	1
13-Apr-2003	Chaser S	Clitheroe, Lancs.	Crashed following an apparent loss of control in flight	1	1
7-May-2003	Pegasus XLQ	Stock, Essex	Crashed into a tree during go-around	1	1
27-Jan-2004	Sirocco 377GB	Ashby de la Zouch, Leics.	Crashed following an in-flight structural failure of the tailplane.	1	1
6-Jul-2004	Hybred 44XLR	Welham Green, Herts.	Mid-air collision with Robinson R22	4	2
21-Aug-2004	Pegasus Quik	Eastchurch, Kent	Crashed in a field following possible in-flight break-up	2	2
3-Sep-2004	Ikarus C42 FB UK	Pyrenees, Spain	Crashed in the Pyrenees Mountains	2	2
15-Jun-2005	Aerotechnik EV-97 Eurostar	Wotton-under-Edge, Gloucestershire	Stalled at low level	2	2
18-Dec-2005	Cessna 152	Moreton-in-Marsh, Gloucestershire	Mid-air collision between C152 and EV-97 microlight	3	1
9-Jun-2006	Raven X	Cliffe, Nr, Kent	Went missing during duration flight	1	1
6-Aug-2006	LETOV LK-2M SLUKA	North Coates, Lincolnshire	Pilot reported control problems. Aircraft lined up for runway but dived into ground	1	1
25-Aug-2006	Zenair	Rotherham, South Yorkshire	Crashed and exploded on impact	2	2
28-Mar-2007	Airborne Edge/Streak	St Albans, Hertfordshire	Clipped a tree on approach and crashed	2	1
6-Apr-2007	Pegasus Quasar	Shifnal, Shropshire	Clipped a hedge on approach and crashed	1	1
30-Apr-2007	PEGASUS QUANTUM 15-912	Benicolet,	Entered rapid descent/left turn and struck ground short of threshold	1	1
26-Aug-2007	Pegasus Quantum 15	Knotting, Northamptonshire	Crashed in field	2	2

5.9 Comparison of Fatal Accident Rates

5.9.1 Figure 59 shows the fatal accident rates for all types of aircraft listed in the "non-public transport – other" section. There were no airship or balloon fatal accidents, therefore these do not appear. The rates have been calculated as a three-year moving average rate (per million hours) for the ten-year period 1998-2007.

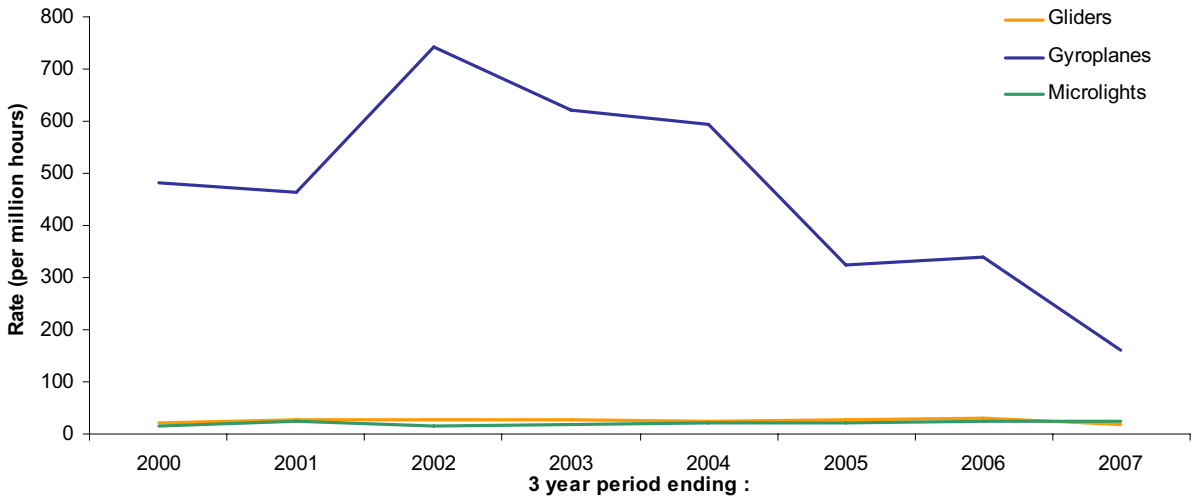

Figure 59 Comparison of non-public transport 'other' fatal accident rates

5.9.2 Figure 59 has been recreated using a logarithmic scale and is shown below as Figure 60. The logarithmic scale has the benefit of more clearly showing the trend of the fatal accident rates for microlights and gliders, which were previously obscured by the disparity between the fatal accident rates for these aircraft compared to gyroplanes.

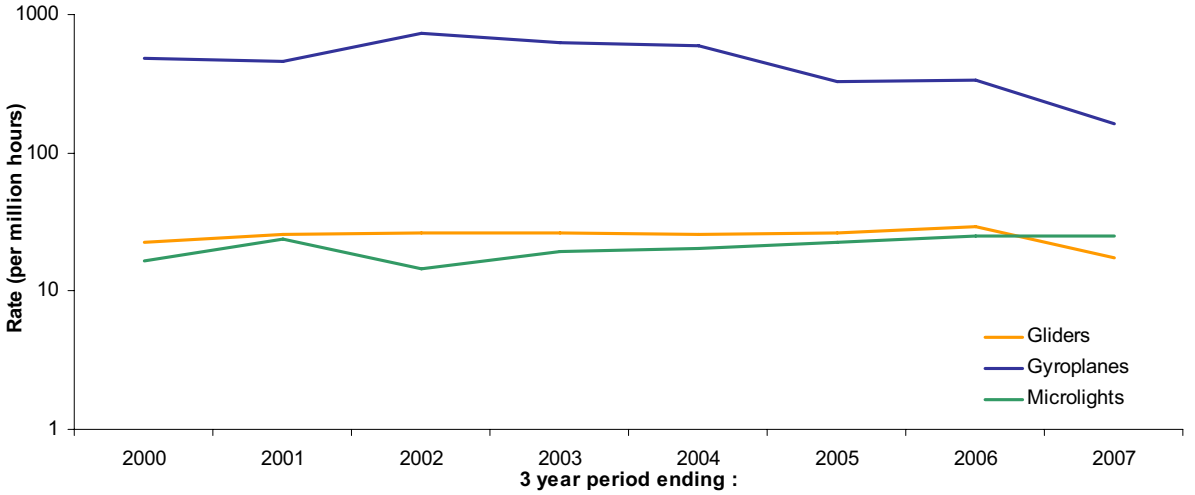

Figure 60 Logarithmic comparison of non-public transport 'other' fatal accident rates

Chapter 6 Safety of UK Airspace and Aerodromes

1 Introduction

1.1 This Chapter contains information regarding the safety of UK airspace and aerodromes. The data relates to any aircraft using UK airspace or aerodromes, regardless of the country of registration.

1.2 The source data for occurrences is the Mandatory Occurrence Reporting Scheme, while utilisation has been sourced from the CAA's Air Transport Statistics Department. In addition, statistics regarding Airprox have been sourced from the UK Airprox Board (UKAB) publication "Analysis of Airprox in UK Airspace – July – December 2007".

2 Foreign-Registered Aircraft in UK Airspace

2.1 This section contains information regarding foreign-registered or operated aircraft in UK airspace. In some cases, the registration or operator of the aircraft is not listed; therefore the statistics in this section may be underestimated.

2.2 Various categories of aircraft are referred to in this section. Large and small aircraft refer to aircraft exceeding or not exceeding 5,700kg MTWA respectively. Public transport refers to aircraft that can be established to have been engaged in ambulance, cargo, passenger, police support or search and rescue operations. By contrast, non-public transport is assigned where it could not be established that the aircraft was engaged in one of these types of operation.

2.3 Reportable Accidents

2.3.1 Between 1998 and 2007, there were 203 reportable accidents involving foreign registered or operated aircraft. The number of accidents per year is shown in Figure 61, divided into public transport aircraft and non-public transport aircraft.

2.3.2 76% of the 203 reportable accidents involved non-public transport aircraft and 24% involved public transport aircraft. It should be noted that some of the accidents also involved a UK-registered or operated aircraft, for example where a collision between two aircraft occurred.

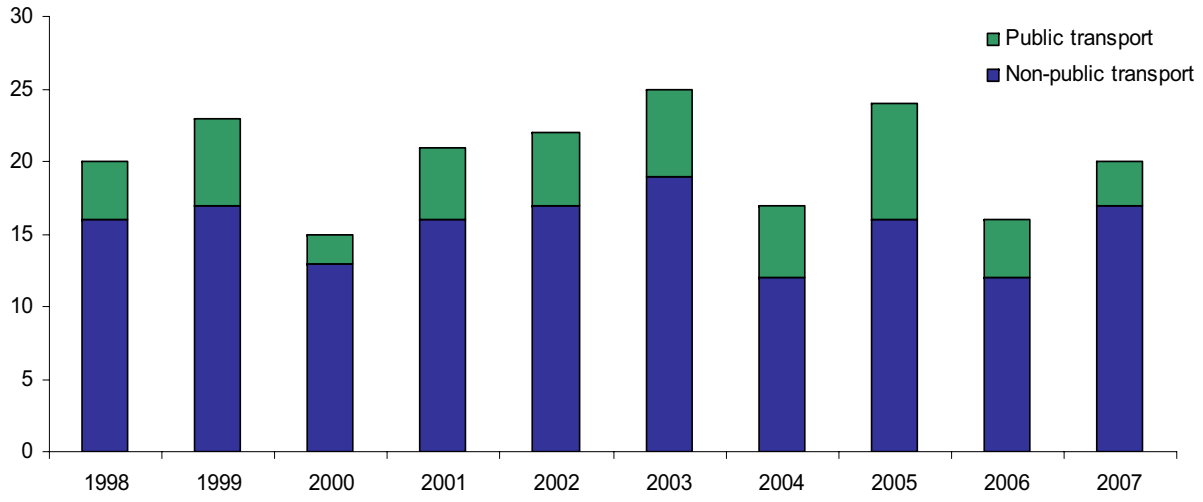

Figure 61 Number of reportable accidents per year involving foreign registered aircraft in UK airspace

2.3.3 Figure 62 shows the proportion of reportable accidents attributable to the various different types of aircraft.

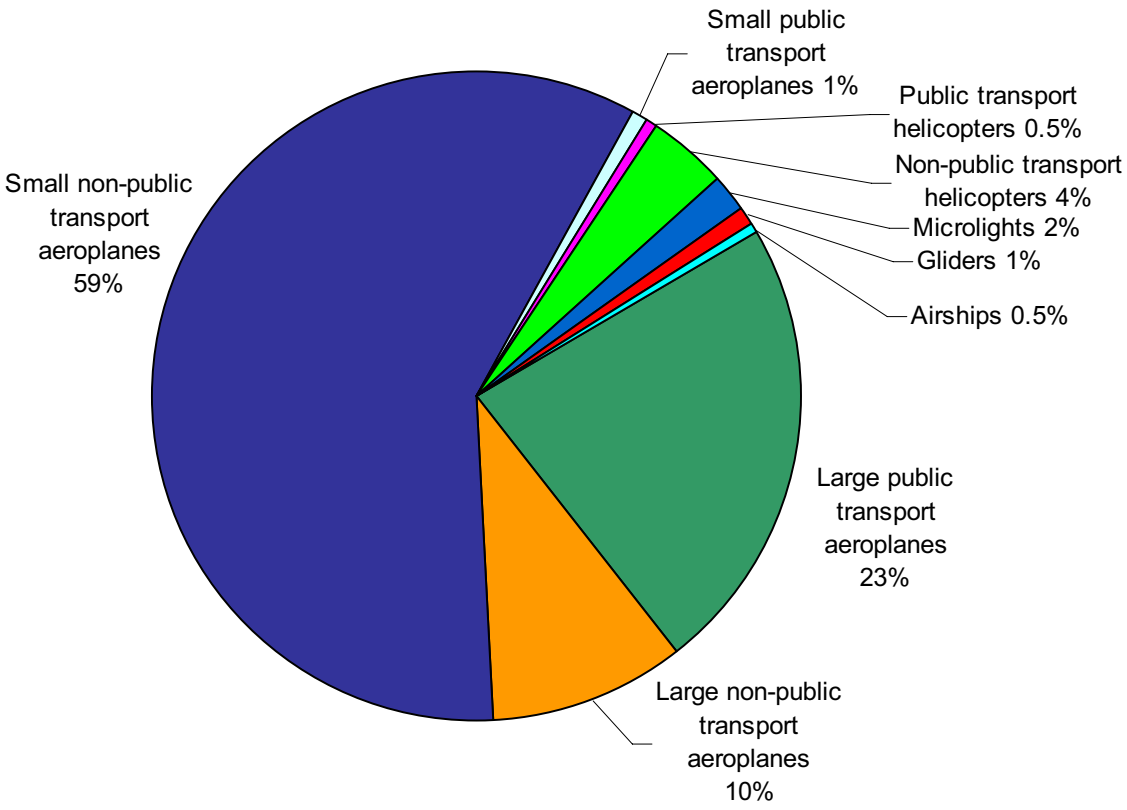

Figure 62 Class of foreign-registered aircraft involved in reportable accidents in UK airspace

2.4 Fatal Accidents

2.4.1 There were 20 fatal accidents involving foreign-registered aircraft in UK airspace in the period 1998-2007, resulting in 40 fatalities. Details of these accidents are shown in the tables below, which have been divided by class of aircraft.

2.4.2 There was one fatal accident in the category of large public transport aeroplanes in the period 1998-2007. This accident resulted in four fatalities. Details are shown in Table 48.

Table 48 Details of fatal accidents – large public transport aeroplanes

Date	Aircraft Type	Location of accident	Nature of flight	Description	People on board	Fatal injuries
22 Dec 1999	B747	Stansted, Essex	Cargo	Aircraft crashed on take off from Stansted and was destroyed by impact/fire.	4	4

2.4.3 There were three fatal accidents in the category of large non-public transport aeroplanes in the period 1998-2007. These accidents resulted in nine fatalities. Details are shown in Table 49.

Table 49 Details of fatal accidents – large non-public transport aeroplanes

Date	Aircraft Type	Location of accident	Nature of Flight	Description	People on board	Fatal injuries
27 Jul 1998	Catalina	Southampton, Hants.	Private	Struck boat wake during water landing, water flooded into fuselage and aircraft sank.	18	2
28 Nov 1998	DHC7	Ashburton, Devon	Other	Stalled and entered spin before crashing to the ground.	2	2
04 Jan 2002	CL600 Challenger	Birmingham, West Mids.	Private	Shortly after becoming airborne, aircraft rolled left and wingtip clipped ground. Aircraft cartwheeled and caught fire.	5	5

2.4.4 There were 16 fatal accidents in the category of small non-public transport aeroplanes in the period 1998-2007. These accidents resulted in 27 fatalities. Details are shown in Table 50.

Table 50 Details of fatal accidents – small non-public transport aeroplanes

Date	Aircraft Type	Location of accident	Nature of Flight	Description	People on board	Fatal injuries
19 Apr 2000	Yak 50	North Weald, Essex	Private	Mid-air collision with Cessna 150[1]. 1 fatality on board the Yak 50, 2 fatalities on board the C150.	3	3
30 Nov 2000	Aerostar	Fortingall, Perthshire	Private	Aircraft lost control during climb and crashed, following reported icing problems.	1	1
23 Dec 2000	BE200 Super King Air	Blackbushe, Hants.	Private	Aircraft crashed into a factory after taking off in fog with a thrust asymmetry.	5	5
06 Jun 2001	BE58 Baron	Isle of Man	Private	Aircraft crashed into the sea following a reported compass problem.	1	1
19 Jun 2001	Rockwell 114	Southampton, Hants.	Private	Aircraft failed to climb after take-off and crashed during attempted return.	2	2
22 Jul 2001	Wassmer WA40	Litchfield, Hants.	Private	Left wing and tailplane detached in flight. Aircraft descended vertically from 4000ft.	1	1
11 Aug 2001	YAK 52	Compton Abbas, Dorset	Private	Aircraft stalled and spun into ground during practice aerobatic manoeuvre.	1	1
07 Apr 2003	Cessna 310	Sandtoft, N Lincs.	Private	Loss of control after the aircraft door opened during take-off.	1	1
31 May 2003	Ryan M1/M2 NYP	Coventry, West Mids.	Air Display	Structural failure of right wing shortly after take-off.	1	1

1. The Cessna 150 was a UK registered aircraft, therefore this accident also appears in Chapter 5 of this document.

Table 50 Details of fatal accidents – small non-public transport aeroplanes (Continued)

Date	Aircraft Type	Location of accident	Nature of Flight	Description	People on board	Fatal injuries
01 Aug 2003	Cessna 182 Skylane	Marlow, Bucks.	Private	Aircraft entered a spiral dive and crashed.	1	1
06 Dec 2003	Socata TBM700	Oxford, Oxon.	Private	On final approach the aircraft entered an uncontrolled roll to the left and crashed beside the runway threshold.	3	3
30 Mar 2004	Cessna 310	Trawden, Lancs.	Private	Aircraft crashed following a fire in the nose baggage compartment.	1	1
25 Mar 2005	Europa	Kemble, Gloucester-shire	Private	Aircraft entered a spin from 400ft after take off, impacted the ground and caught fire. Aircraft destroyed. 2 POB fatal. AAIB Field investigation.	2	2
11 Mar 2007	DHC2 Beaver	Headcorn / Lashenden, Kent	Parachuting	Aircraft failed to get airborne and overran the runway, striking a parked aircraft.	9	1
27 Aug 2007	Bolkow 207	Navestock, Essex	Private	Aircraft crashed shortly after take-off and was destroyed by fire.	3	2
30 Sep 2007	Dyn'Aero MCR-01	Bethersden, Kent	Private	Pilot reported returning due to engine problems. Aircraft subsequently crashed in field.	2	1

2.5 Injury Tables

2.5.1 The injuries sustained in UK-reportable accidents involving foreign-registered aircraft in the period 1998-2007 are shown in Table 51. In total, there were 41 fatalities, 17 serious injuries and 78 minor injuries. The injury tables have been broken down by class of aircraft/operation.

Table 51 Injuries sustained in reportable accidents involving foreign-registered/ operated aircraft in UK airspace

Class/ operation	Injury		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Large public transport aeroplanes	Crew	Fatal	0	4	0	0	0	0	0	0	0	0	4
		Serious	0	1	0	0	0	0	0	1	0	0	2
		Minor	0	0	0	0	0	0	0	0	0	0	0
		Total	0	5	0	0	0	0	0	1	0	0	6
	Passenger	Fatal	0	0	0	0	0	0	0	0	0	0	0
		Serious	0	0	0	0	0	0	0	0	0	0	0
		Minor	1	1	0	0	0	0	0	24	0	0	26
		Total	1	1	0	0	0	0	0	24	0	0	26

Table 51 Injuries sustained in reportable accidents involving foreign-registered/ operated aircraft in UK airspace (Continued)

Class/ operation	Injury		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Large non-public transport aeroplanes	Crew	Fatal	2	0	0	0	2	0	0	0	0	0	4
		Serious	0	0	0	0	0	0	0	0	1	0	1
		Minor	4	0	0	0	2	0	0	0	0	0	6
		Total	6	0	0	0	4	0	0	0	1	0	11
	Passenger	Fatal	2	0	0	0	3	0	0	0	0	0	5
		Serious	0	0	0	0	0	0	0	0	0	0	0
		Minor	4	0	0	0	0	0	0	0	0	0	4
		Total	6	0	0	0	3	0	0	0	0	0	9
Small public transport aeroplanes	Crew	Fatal	0	0	0	0	0	0	0	0	0	0	0
		Serious	0	0	0	0	0	0	0	0	0	0	0
		Minor	0	0	0	0	0	0	0	0	1	0	1
		Total	0	0	0	0	0	0	0	0	1	0	1
	Passenger	Fatal	0	0	0	0	0	0	0	0	0	0	0
		Serious	0	0	0	0	0	0	0	0	0	0	0
		Minor	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0
Small non-public transport aeroplanes	Crew	Fatal	0	0	3	5	0	4	1	1	0	4	18
		Serious	0	1	0	1	1	0	0	0	0	1	4
		Minor	2	1	2	3	1	1	2	3	1	1	17
		Total	2	2	5	9	2	5	3	4	1	6	39
	Passenger	Fatal	0	0	5	0	0	2	0	1	0	2	10
		Serious	0	0	0	3	0	0	0	0	0	1	4
		Minor	0	0	2	1	3	3	1	3	1	1	15
		Total	0	0	7	4	3	5	1	4	1	4	29
Non-public transport helicopters	Crew	Fatal	0	0	0	0	0	0	0	0	0	0	0
		Serious	0	0	0	0	0	0	0	1	0	0	1
		Minor	1	0	0	0	0	0	1	0	0	0	2
		Total	1	0	0	0	0	0	1	1	0	0	3
	Passenger	Fatal	0	0	0	0	0	0	0	0	0	0	0
		Serious	0	0	0	0	0	0	0	1	0	0	1
		Minor	3	1	0	0	0	0	1	0	0	0	5
		Total	3	1	0	0	0	0	1	1	0	0	6

Table 51 Injuries sustained in reportable accidents involving foreign-registered/ operated aircraft in UK airspace (Continued)

Class/ operation	Injury		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Microlights	Crew	Fatal	0	0	0	0	0	0	0	0	0	0	0
		Serious	1	1	0	0	0	0	0	0	0	0	2
		Minor	0	0	0	0	0	0	0	1	0	0	1
		Total	1	1	0	0	0	0	0	1	0	0	3
	Passenger	Fatal	0	0	0	0	0	0	0	0	0	0	0
		Serious	1	0	0	0	0	0	0	0	0	0	1
		Minor	0	0	0	0	0	0	0	1	0	0	1
		Total	1	0	0	0	0	0	0	1	0	0	2
Gliders	Crew	Fatal	0	0	0	0	0	0	0	0	0	0	0
		Serious	0	0	0	0	0	0	0	0	0	1	1
		Minor	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	1	1
	Passenger	Fatal	0	0	0	0	0	0	0	0	0	0	0
		Serious	0	0	0	0	0	0	0	0	0	0	0
		Minor	0	0	0	0	0	0	0	0	0	0	0
		Total	0	0	0	0	0	0	0	0	0	0	0

2.6 Serious Incidents

2.6.1 There were 65 serious incidents in the period 1998-2007 involving foreign-registered aircraft in UK airspace, as classified by the AAIB. 83% of these involved public transport aircraft and 17% involved non-public transport aircraft. Figure 63 shows the annual number of serious incidents, divided by type of operation.

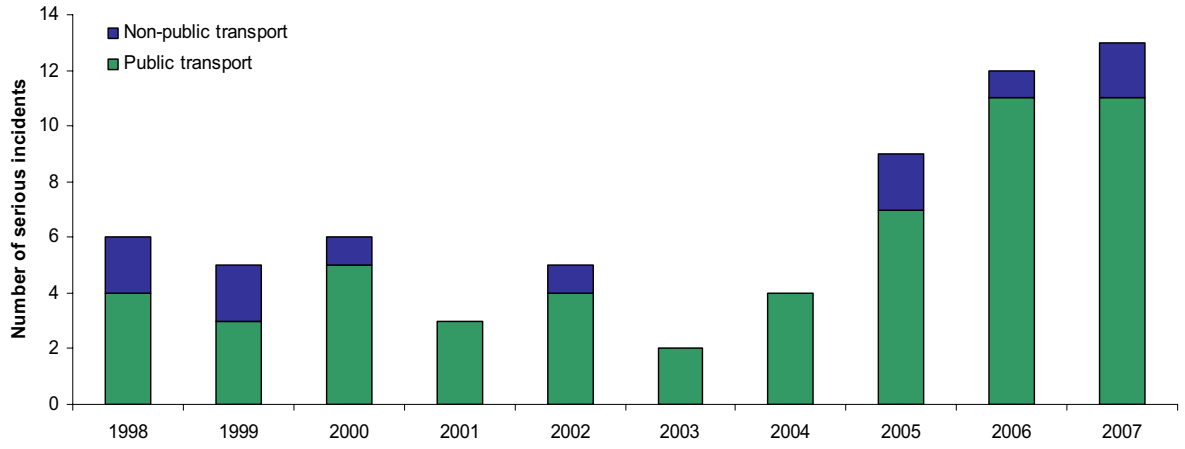

Figure 63 Number of serious incidents per year involving foreign-registered aircraft in UK airspace

2.7 Occurrences

2.7.1 There were nearly 11,000 occurrences involving foreign-registered aircraft in UK-airspace in the period 1998-2007. This figure includes the UK reportable accidents and serious incidents previously discussed, which form 2.5% of the total number of occurrences.

2.7.2 Figure 64 below shows the number of occurrences per year, divided into their risk categories. In 1998, a risk-grading scheme was introduced into the MOR scheme, to better classify occurrences. In the decade since the introduction of the scheme, 1.1% of occurrences involving foreign-registered aircraft in UK airspace have been considered to be high-severity (risk grades A or B). Further details regarding risk grading are available in Appendix 4.

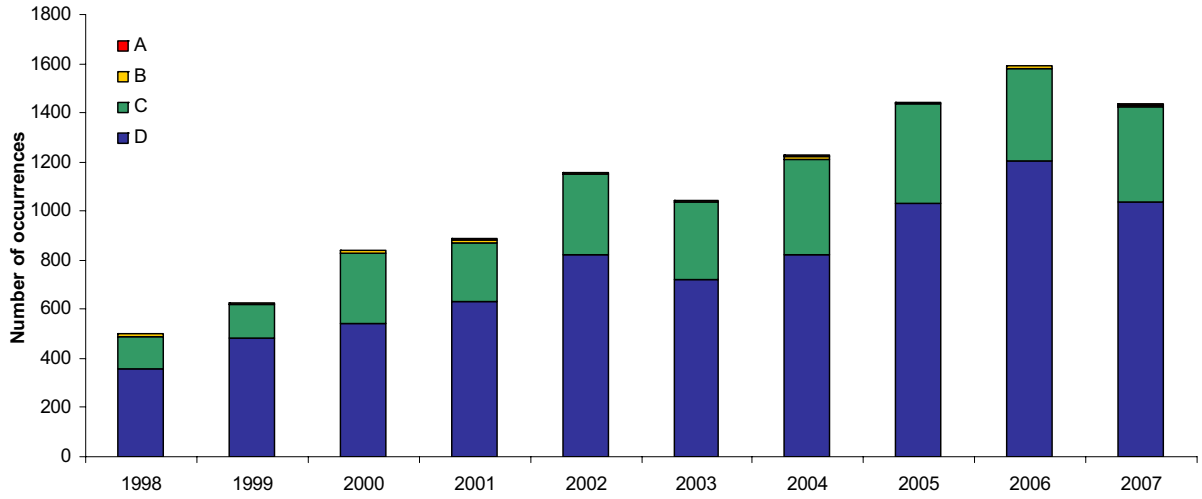

Figure 64 Number of occurrences per year involving foreign-registered aircraft in UK airspace

3 ATC Occurrences in UK Airspace

3.1 This section examines occurrences with an Air Traffic Control (ATC) involvement that occurred within UK airspace. The data excludes Airprox, which are reviewed separately by the UK Airprox Board (UKAB) and are covered in brief in section 4.

3.2 The involvement of ATC in an occurrence does not imply that ATC were at fault or even the cause of the occurrence. The types of occurrence examined in this section include: runway incursions, level busts, losses of separation, airspace infringements, ATC engineering problems and difficulties with communication.

3.3 The description "ATC occurrence" is broad and there is no strict definition of the term, therefore it is difficult to ensure that all relevant occurrences have been included. As a result, the statistics produced in this section should be considered indicators rather than absolute figures.

3.4 Utilisation

3.4.1 It is not possible to derive a measure of utilisation that can be compared to all ATC occurrences. However to put the occurrences into context, the utilisation of UK airspace in terms of Instrument Flight Rules (IFR) flights is shown in Table 52. The data are recorded by Eurocontrol and are publicly available[1]. In total, there were 7.1 million departures and 7.1 million arrivals to the UK in the period 1998-2007. In

1. Data from Eurocontrol (see www.eurocontrol.int/statfor/public/standard_page/daio.html)

addition, there were 4.9 million internal flights and 2.7 million overflights. In the ten year period analysed, the total number of flights in UK airspace has increased by 35%.

Table 52 UK departures, arrivals, internal flights and overflights, as recorded by Eurocontrol

Year	Departures from the UK (x1000)	Arrivals to the UK (x1000)	Internal flights within the UK (x1000)	Overflights of the UK (x1000)	Total
1998	593	589	467	219	1,867
1999	634	633	473	242	1,982
2000	673	672	477	261	2,083
2001	676	675	489	260	2,100
2002	674	675	481	241	2,072
2003	698	699	484	261	2,142
2004	733	733	500	276	2,242
2005	773	774	520	295	2,362
2006	798	799	523	319	2,439
2007	830	831	517	346	2,523

3.5 All ATC Occurrences

3.5.1 In the period 1998 to 2007, there were over 21,000 ATC occurrences in UK airspace (excluding Airprox) involving at least one civil aircraft. The figures below show the number of ATC occurrences per year, categorised according to the type of airspace (Figure 65), the country of registry (Figure 66) and the type of operation (Figure 67).

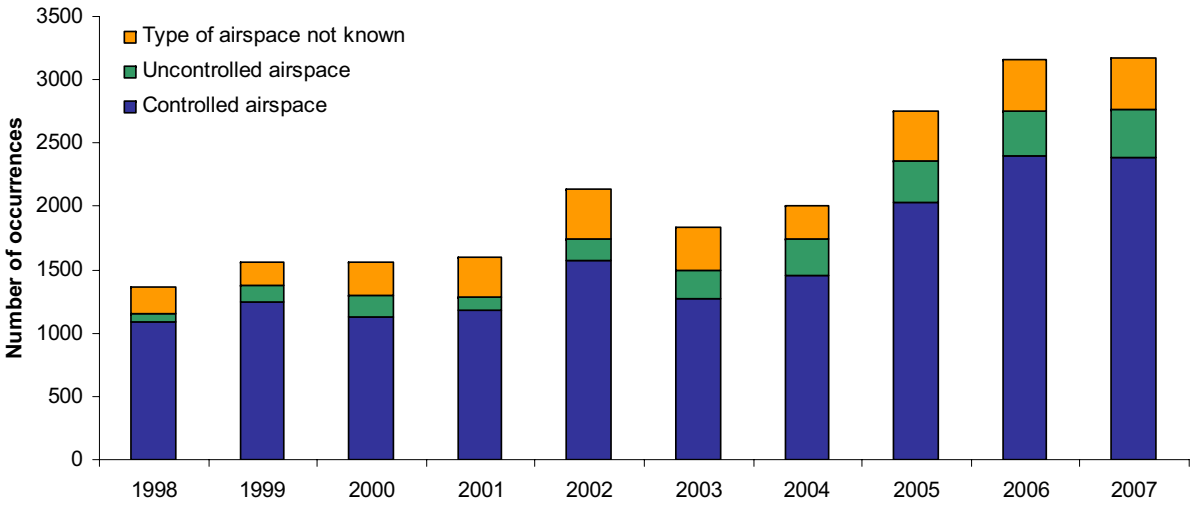

Figure 65 ATC occurrences in UK airspace, by type of airspace

3.5.2 75% of ATC occurrences were in controlled airspace, 10% were in uncontrolled airspace and 15% of occurrences did not state the type of airspace.

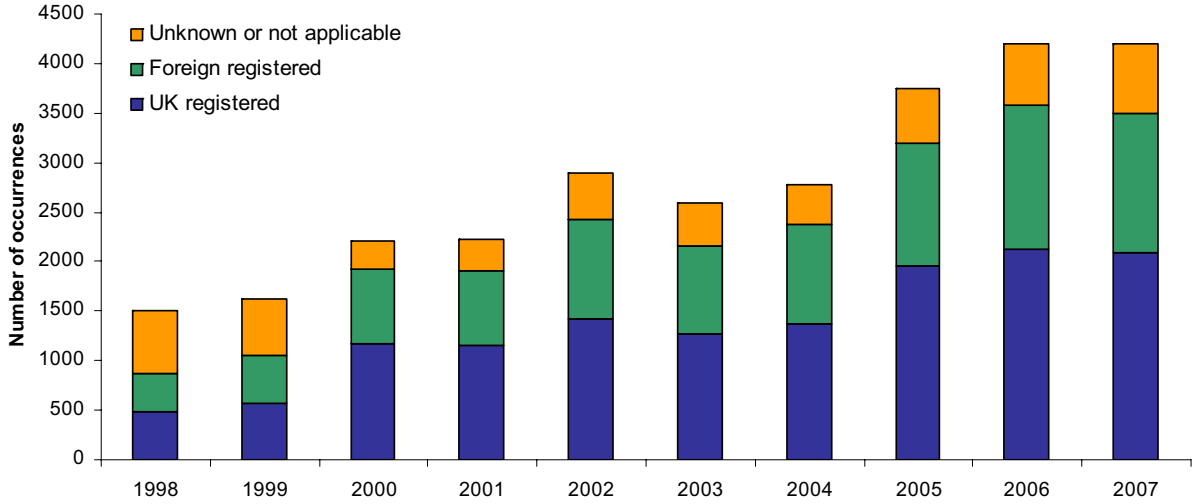

Figure 66 ATC occurrences in UK airspace, by country of registration

3.5.3 49% of ATC occurrences involved UK registered aircraft, 33% involved foreign registered aircraft and 18% involved aircraft where the registration was unknown or not applicable. It should be noted that an ATC occurrence frequently involves more than one aircraft, therefore the total number of occurrences per year (Figure 65) is less than the total number of aircraft involved in an ATC occurrence per year (Figure 66).

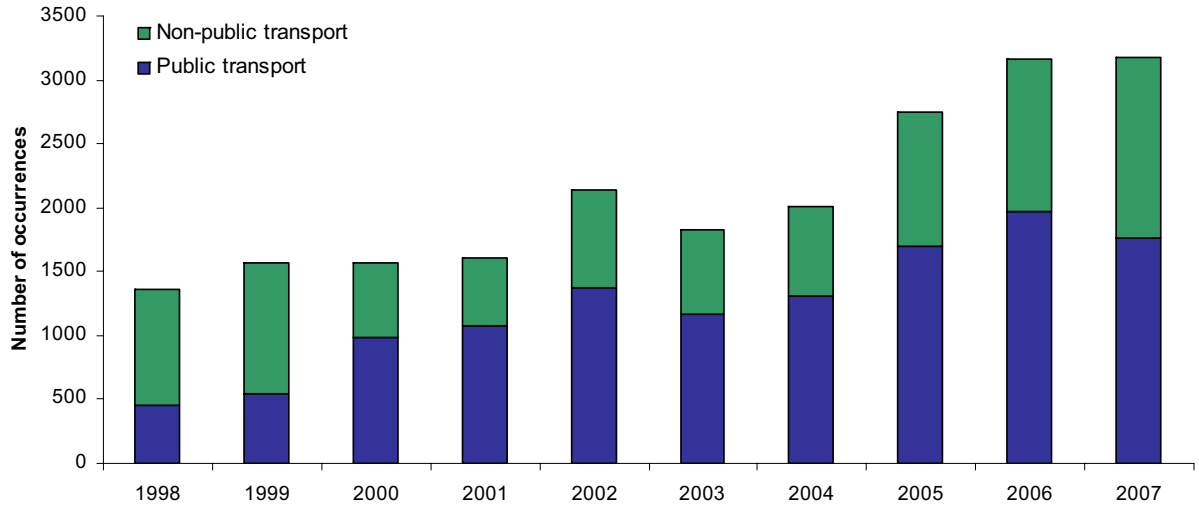

Figure 67 ATC occurrences in UK airspace, by type of operation

3.5.4 58% of ATC occurrences involved public transport operations, whereas 42% involved non-public transport.

3.6 High Severity ATC Occurrences

3.6.1 In 1998, a risk-grading scheme was introduced into the MOR scheme, to better classify occurrences. In the decade since the introduction of the scheme, 68 ATC occurrences have been considered to be high-severity (grades A or B); this corresponds to 0.3% of all ATC occurrences. Further details regarding risk grading are available in Appendix 4.

3.6.2 The figures below show the number of high-severity ATC occurrences per year, categorised according to the type of airspace (Figure 68), the country of registry (Figure 69) and the type of operation (Figure 70).

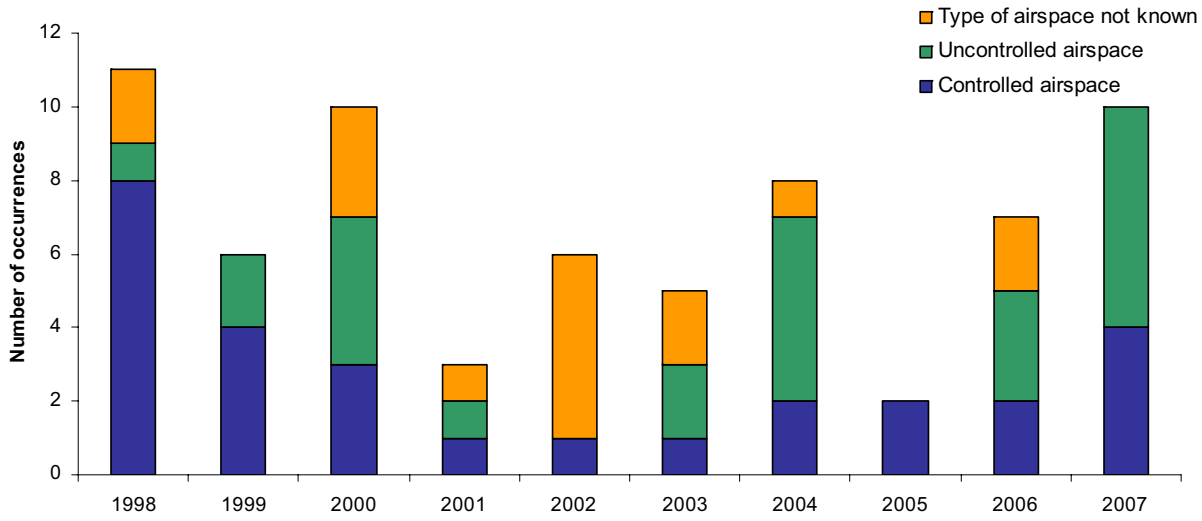

Figure 68 High-severity ATC occurrences per year, by type of airspace

3.6.3 41% of high-severity ATC occurrences were in controlled airspace, 35% were in uncontrolled airspace and 24% of occurrences did not state the type of airspace.

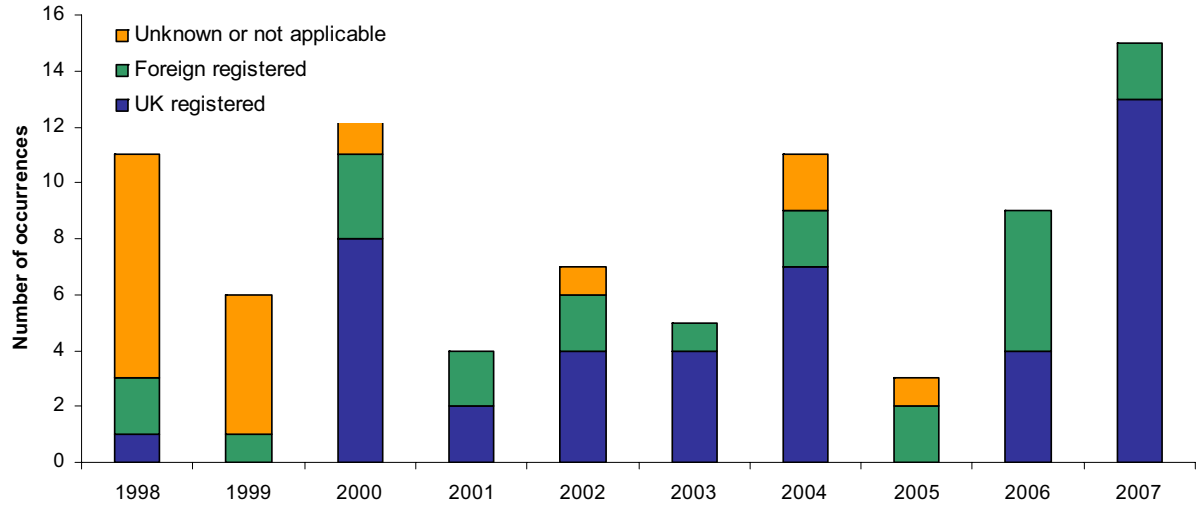

Figure 69 High-severity ATC occurrences in UK airspace, by country of registration

3.6.4 50% of high-severity ATC occurrences involved UK registered aircraft, 26% involved foreign registered aircraft and 24% involved aircraft where the registration was unknown or not applicable. It should be noted that an ATC occurrence frequently involves more than one aircraft, therefore the total number of high-severity occurrences per year (Figure 68) is less than the total number of aircraft involved in a high-severity ATC occurrence per year (Figure 69).

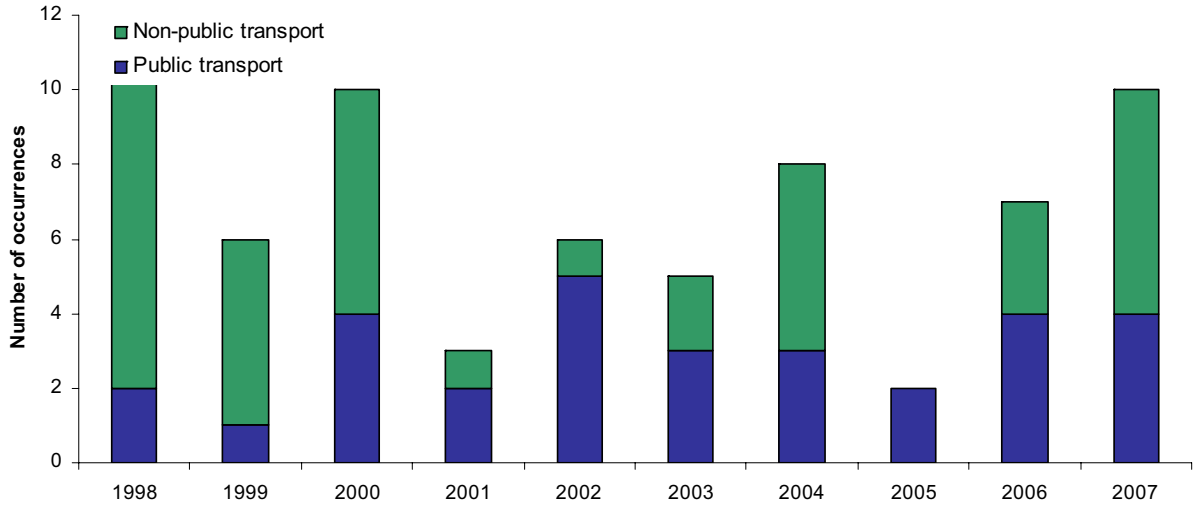

Figure 70 High-severity ATC occurrences in UK airspace, by type of operation

3.6.5 44% of ATC occurrences involved public transport operations, whereas 56% involved non-public transport.

3.7 Runway Incursions

3.7.1 Runway incursions are one of the specific types of ATC occurrence that the CAA examines in detail.

3.7.2 A runway incursion was previously defined by the CAA as an unauthorised or unplanned presence of an aircraft, vehicle or person on the protected area of a surface designated for aircraft landings and departures.

3.7.3 In January 2007, the definition of a runway incursion used by the CAA was changed to "any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft." The implication of this change in definition is that a greater number of incidents are now considered to be runway incursions.

3.7.4 The annual number of runway incursions in the period 1998-2007 is shown in Figure 71. Severity categories have been assigned to all runway incursions, using a severity matrix developed by the US Federal Aviation Administration (FAA). 4.8% of runway incursions were considered to be high-severity (grades A or B) in the ten-year period analysed. It should be noted that the figure for 2007 uses the new definition of a runway incursion; 24% of the 2007 runway incursions were solely included under the new definition.

3.7.5 In total, there were 956 runway incursions in the period 1998-2007. Had the definition not been changed in January 2007, this figure would be 902.

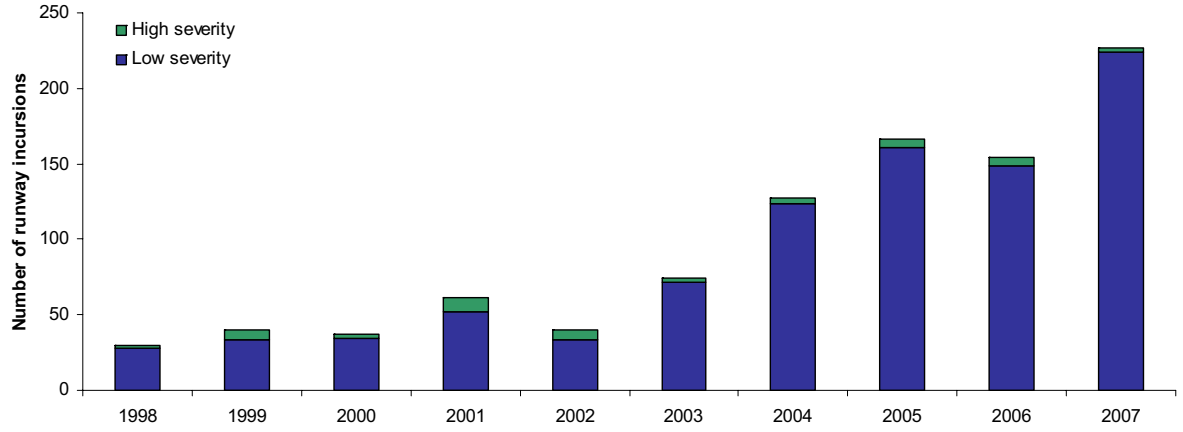

Figure 71 Number of runway incursions per year

3.8 Level Busts

3.8.1 An altitude deviation, or "level bust" is defined as when an aircraft deviates from its ATC-assigned flight level by 300 feet or more. In doing so, an aircraft can subsequently experience further problems, such as a loss of separation from another aircraft or even a mid-air collision. Hence, this is another area that the CAA has analysed in detail in recent years.

3.8.2 There were approximately of 4,500 level busts in the period 1998-2007, of which 572 resulted in a loss of separation (this corresponds to 12.7% of the total). The number of level busts per year is shown in Figure 72, which has been divided into level busts that do and do not involve a loss of separation.

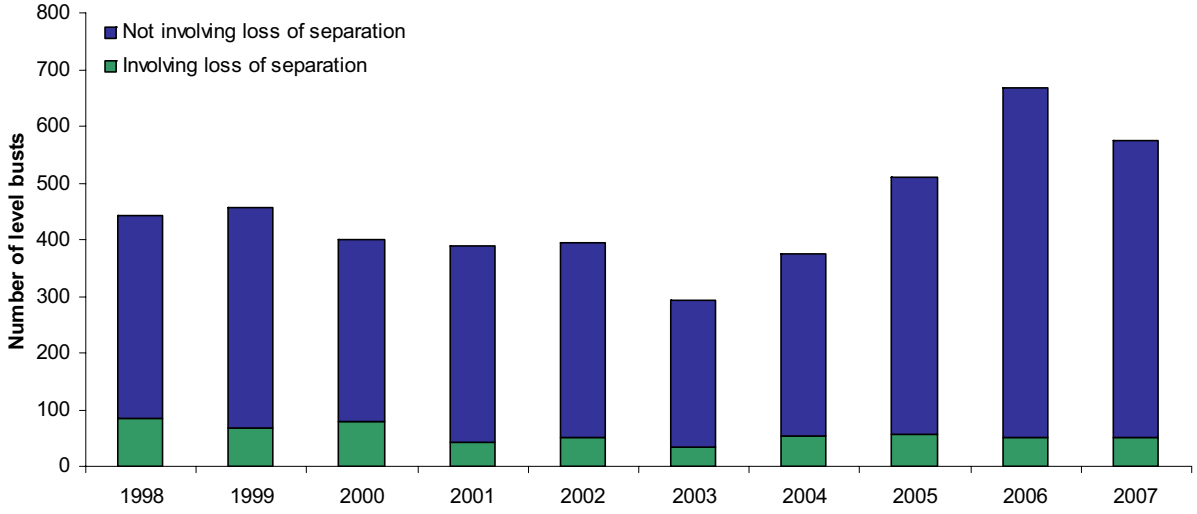

Figure 72 Number of level busts per year in UK airspace

3.8.3 The most common phase of flight in which a level bust occurred was climb, accounting for 52% of level busts. 32% of level busts occurred during descent, 10% during cruise, 3% during a holding pattern, and 2% during approach. The remainder were unknown or occurred during less common manoeuvres.

3.8.4 Figure 73 shows the proportion of level busts attributable to UK or foreign registered aircraft.

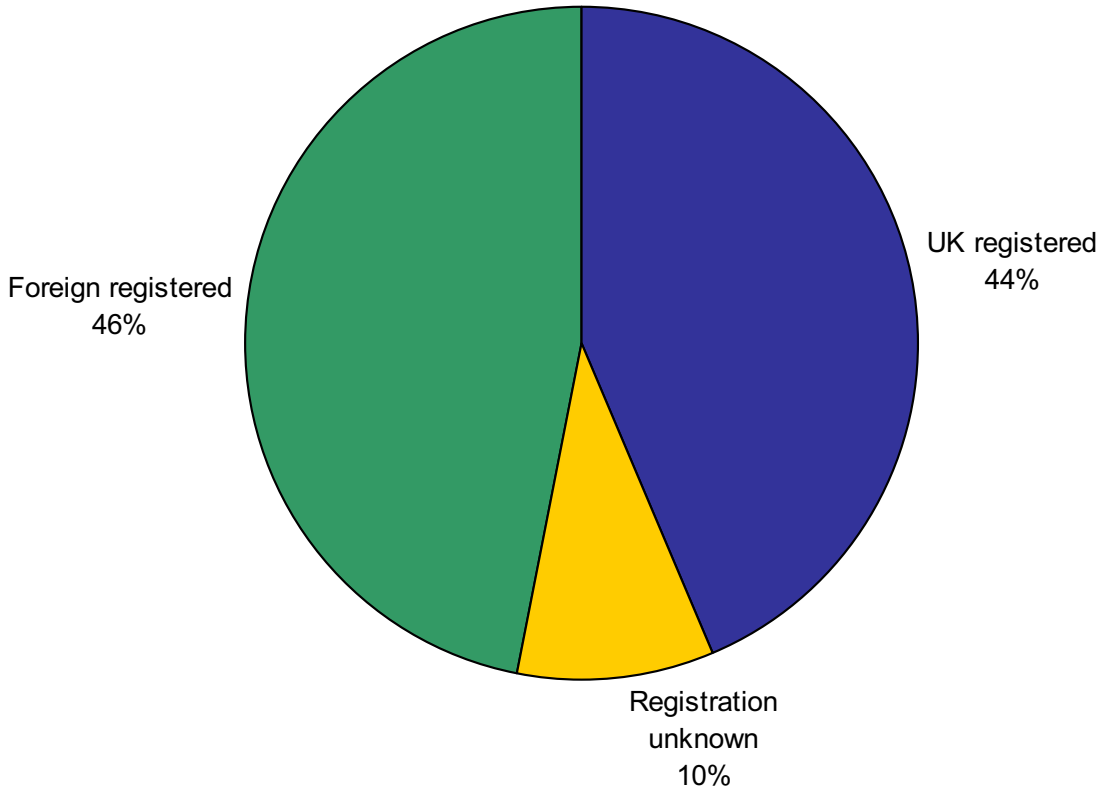

Figure 73 Proportion of level busts attributable to UK or foreign aircraft

3.9 Other types of ATC Occurrence

3.9.1 Table 53 shows a number of different types of ATC occurrence. Runway incursions and level busts have been included for comparison purposes. It should be noted that the different ATC occurrence types are not mutually exclusive, for example a runway incursion may be caused by callsign confusion. The figures for airspace infringements have changed since the previous edition of the aviation safety review, in that they now include instances of military aircraft infringing civil airspace.

Table 53 Other types of ATC occurrence

Year	Runway incursions	Level busts	Airspace infringements	ATS engineering/ equipment	Callsign confusion	Loss of separation
1998	30	442	315	432	147	252
1999	40	457	413	529	105	247
2000	37	401	343	592	96	265
2001	61	389	313	555	83	206
2002	40	394	387	826	108	214
2003	74	293	459	587	137	194
2004	127	376	442	560	106	237
2005	166	511	646	752	121	299
2006	154	669	745	728	91	318
2007	227	575	878	672	94	299
Total	956	4,507	4,941	6,233	1,088	2,531

4 Airprox in UK Airspace

4.1 An Airprox is defined as a situation in which, in the opinion of a pilot or controller, the distance between aircraft as well as their relative positions and speed was such that the safety of the aircraft involved was or may have been compromised.

4.2 Airprox reported as occurring within UK airspace are investigated and assessed by the UK Airprox Board (UKAB), an independent organisation jointly sponsored by the CAA and the MOD. Detailed reports are published by UKAB and are available at http://www.airproxboard.org.uk/. In publishing these reports, UKAB's aim is to promote air safety awareness and improve the understanding of Airprox, not to apportion blame or liability.

4.3 Each Airprox is assigned one of four internationally-agreed risk categories by UKAB, based on the events that took place. The categories and their definitions are shown in Table 54.

Table 54 Airprox Risk Categories

Risk Category	Name	Definition
A	Risk of collision	An actual risk of collision existed
B	Safety not assured	The safety of the aircraft was compromised
C	No risk of collision	No risk of collision existed
D	Risk not determined	Insufficient information was available to determine the risk involved, or inconclusive or conflicting evidence precluded such determination

4.4 The statistics presented below are taken with kind permission from "Analysis of Airprox in UK Airspace – Report No.19 – July 2007-December 2007" and cover the period 1998-2007. Further information can be obtained from the UKAB internet site http://www.airproxboard.org.uk/ which is regularly updated.

4.5 Airprox Involving at least one Civil Aircraft

4.5.1 The number of Airprox per year from 1998 to 2007 involving at least one civil aircraft is shown in Table 55. The first column shows the number of Airprox involving only civil aircraft whereas the second column shows the number of Airprox between civil and military aircraft.

Table 55 Number of Airprox per year involving at least one civil aircraft

Year	Civil-Civil	Civil-Military
1998	129	53
1999	113	81
2000	100	78
2001	97	73
2002	109	77
2003	87	67
2004	109	69
2005	99	74
2006	95	46
2007	93	38
Total	1,031	656

4.6 UK Airprox Involving Commercial Air Transport Aircraft

4.6.1 Commercial air transport (CAT) may be defined as scheduled or non-scheduled passenger flights in airliners and helicopters, or cargo flights. The number of UK Airprox per year in the period 1998 to 2007 involving at least one commercial air transport aircraft is shown in Table 56, subdivided by risk category (Table 54).

Table 56 Number of Airprox per year involving at least one CAT aircraft, by Risk

Year	A	B	C	D	Total
1998	1	14	82	1	98
1999	4	12	83	0	99
2000	6	8	85	1	100
2001	0	14	65	4	83
2002	1	7	70	4	82
2003	0	12	54	0	66
2004	1	7	67	4	79
2005	1	7	78	1	87
2006	0	6	68	0	74
2007	0	5	60	0	65
Total	14	92	712	15	833

4.7 Rate of UK Airprox Involving Commercial Air Transport Aircraft

4.7.1 The rate per 100,000 hours of UK Airprox involving at least one CAT aircraft is shown in Figure 74 for the period 1998 to 2007. The figure shows the rate for all risk categories of Airprox and also for risk categories A and B combined, the so-called 'risk bearing' rate.

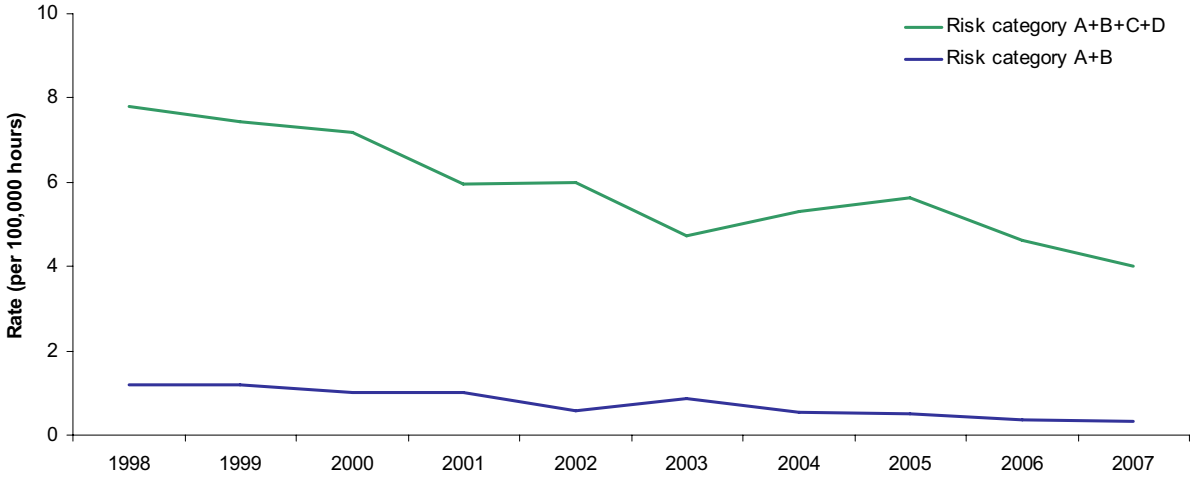

Figure 74 Rate of UK Airprox involving at least one Commercial Air Transport aircraft

4.8 UK Airprox Involving General Aviation

4.8.1 The annual number of Airprox between 1998 and 2007 involving at least one General Aviation aircraft is shown in Table 57. The table shows the number of Airprox in each risk category, as described in Table 54, as well as the total number of Airprox involving at least one General Aviation aircraft. In essence, UKAB considers all civil aircraft operations that are not commercial air transport to be General Aviation.

Table 57 Number of Airprox per year involving at least one General Aviation aircraft

Year	A	B	C	D	Total
1998	18	30	66	2	116
1999	17	41	74	2	134
2000	19	33	54	2	108
2001	24	27	60	1	112
2002	9	58	57	3	127
2003	10	38	70	0	118
2004	13	42	71	4	130
2005	16	41	75	1	133
2006	10	36	57	0	103
2007	8	30	65	0	103
Total	144	376	649	15	1,184

4.9 Rate of UK Airprox Involving General Aviation Aircraft

4.9.1 The rate per 100,000 hours of UK Airprox involving at least one General Aviation aircraft is shown in Figure 75 for the period 1998 to 2007. The figure shows the rate for all risk categories of Airprox and also for risk categories A and B combined.

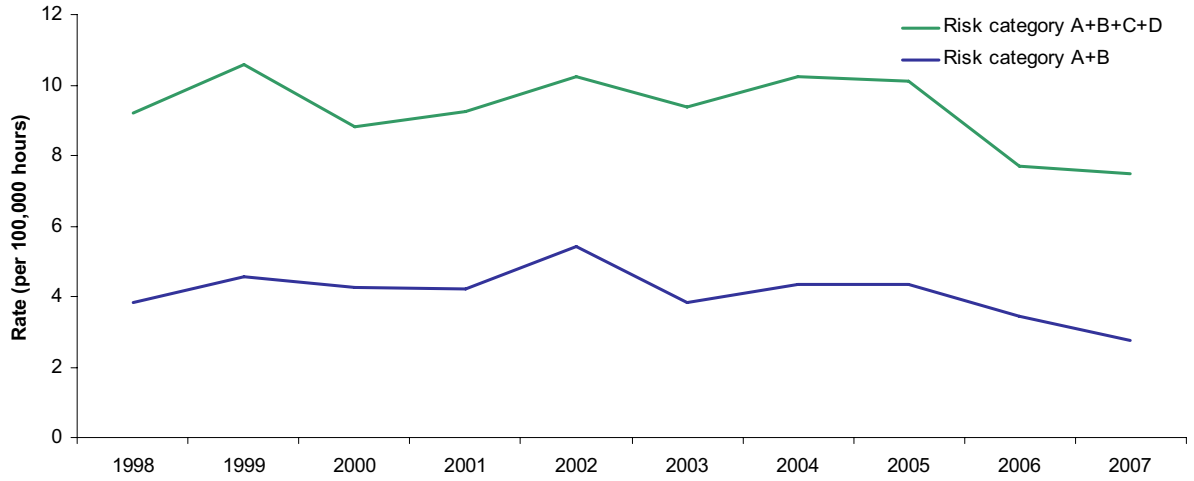

Figure 75 Rate of UK Airprox involving at least one General Aviation aircraft

4.10 UK Airprox Involving Military Aviation

4.10.1 The Aviation Safety Review does not cover military-only aviation occurrences. The reader is referred to the UKAB website and/or its publications for information concerning military Airprox in UK airspace.

5 UK Aerodromes

5.1 This Chapter examines aerodrome–related occurrences at UK licensed aerodromes, involving civil aircraft. A list of aerodromes that are licensed by the CAA is provided in the UK Aeronautical Information Publication[1] (AIP). The current list of aerodromes has been used as a definitive list to cover the whole ten-year period analysed, from 1998 to 2007.

5.2 There is no precise definition of an aerodrome occurrence, therefore some caution should be applied to the data presented in this section. Runway incursions, which can be aerodrome-related, have been covered in section 3 of this Chapter, as they are more commonly related to ATC. Damage consistent with a ground collision has been assigned according to the recorded location of the occurrence, however it is not always possible to ascertain precisely when or where the damage occurred.

5.3 Aerodrome occurrences are considered to be those that are associated with an aerodrome's personnel or infrastructure. Therefore events such as technical malfunctions on an aircraft that occur at an aerodrome are only included if there are factors directly related to the aerodrome that influence the outcome of the occurrence. Security events are not covered by the Aviation Safety Review, therefore events such as bomb threats, prohibited items on aircraft and stowaways have been excluded. By contrast, occurrences involving people or non-airport vehicles entering an airfield unescorted have been included, since they present a safety hazard.

5.4 Utilisation

5.4.1 Between 1998 and 2007, there were approximately 36.5 million aircraft movements at UK airports. Table 58 shows the annual number of aircraft movements and the proportion of these that were commercial aircraft movements[2].

Table 58 Aircraft movements at UK reporting airports

Year	Total aircraft movements (x1000)	Percent that are commercial movements
1998	3,535	61%
1999	3,539	63%
2000	3,542	65%
2001	3,603	65%
2002	3,456	67%
2003	3,604	66%
2004	3,670	68%
2005	3,795	69%
2006	3,951	68%
2007	3,798	72%

1. This information is provided by NATS at the following website: http://www.nats-uk.ead-it.com/public/index.php.html
2. Using UK reporting airports, as published by the CAA at www.caa.co.uk/airportstatistics

5.5 All Aerodrome Occurrences

5.5.1 There were over 5,400 aerodrome occurrences at UK licensed aerodromes in the period 1998-2007. Figure 76 shows the annual number of aerodrome occurrences.

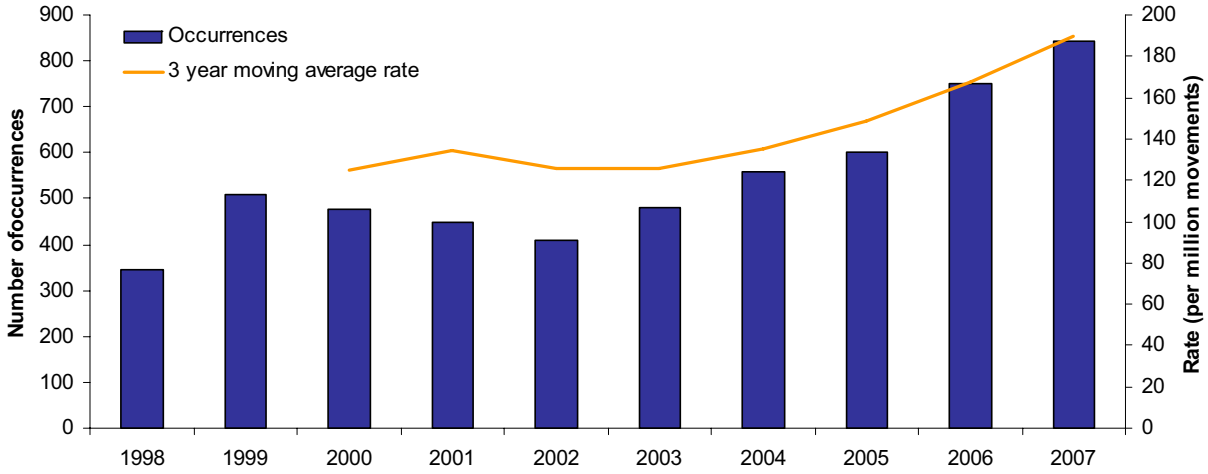

Figure 76 Number of aerodrome occurrences per year at UK licensed aerodromes

5.5.2 Common types of aerodrome occurrence include: the state of the ramp, taxiway or runway; jet or rotor blast; ramp services errors (such as loading, marshalling or deicing); collisions involving aircraft whilst manoeuvring around the airfield.

5.5.3 It should be noted that aerodrome occurrences reported to the CAA relate to aircraft only. Events such as collisions not involving aircraft (that is, between two vehicles) are reported to the HSE rather than the CAA.

5.6 High-severity Aerodrome Occurrences

5.6.1 There were 46 high-severity aerodrome occurrences at UK licensed aerodromes in the period 1998-2007. Figure 77 shows the number of these occurrences per year.

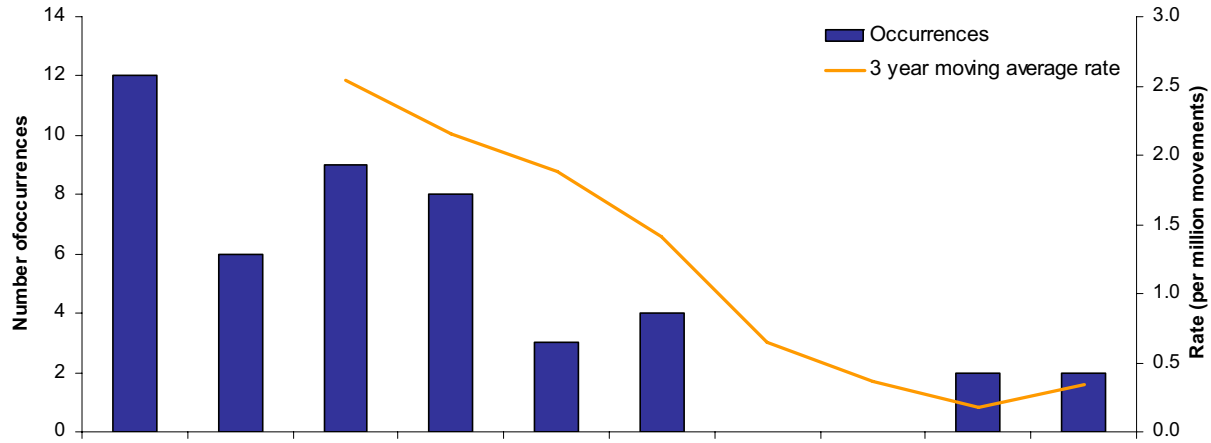

Figure 77 Number of high-severity aerodrome occurrences per year at UK licensed aerodromes

5.7 Ground Collisions and Other Damage

5.7.1 There were approximately 750 aerodrome occurrences involving an aircraft collision or damage in the period 1998-2007. Figure 78 shows the number of these occurrences per year, divided into four categories of collision or damage.

5.7.2 The four categories of ground collision/damage are as follows:

- Aircraft – Aircraft collisions, for example wingtip collisions during parking or pushback.
- Aircraft – Vehicle collisions/damage, for example vehicles denting or scraping the aircraft during the turnaround.
- Aircraft – Aerodrome equipment/infrastructure, for example a collision with an airbridge.
- Aircraft – Other/Unknown, for example foreign object damage or cases of unreported damage.

5.7.3 It should be noted that these collisions exclude events that have occurred on the runway during take-off or landing.

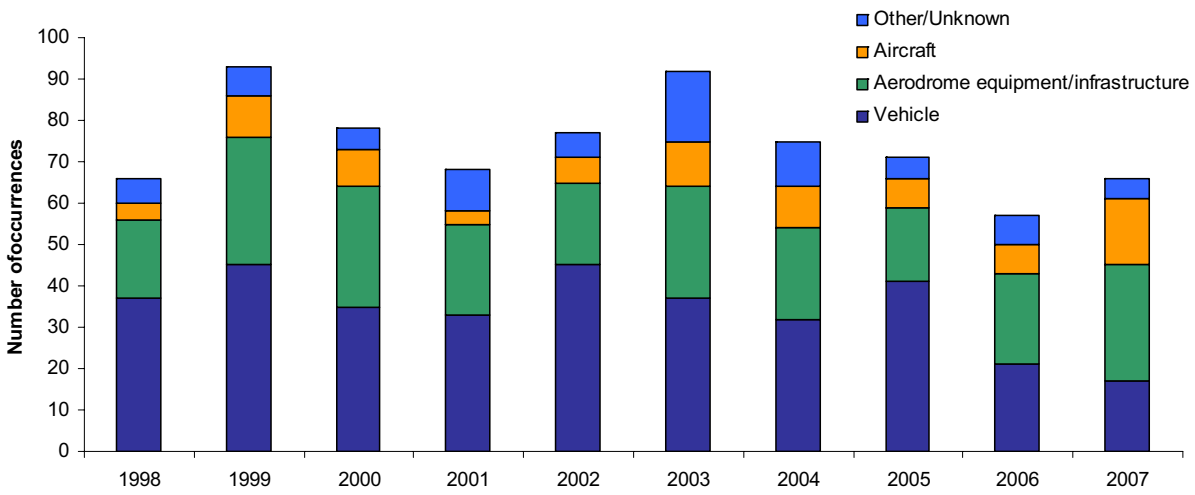

Figure 78 Number of aircraft collision/damage occurrences per year at UK licensed aerodromes

5.8 Loading Errors

5.8.1 In the period 1998-2007, there were approximately 800 loading errors at UK licensed aerodromes involving UK-registered or operated aircraft. Figure 79 shows the rate and number of loading errors per year in this category.

5.8.2 It should be noted that the definition of a loading error has been revised since CAP 763, to remove errors made by the cargo shipper and damage caused during loading. Therefore a loading error may be more closely defined as a weight and balance related error that occurred during the loading process.

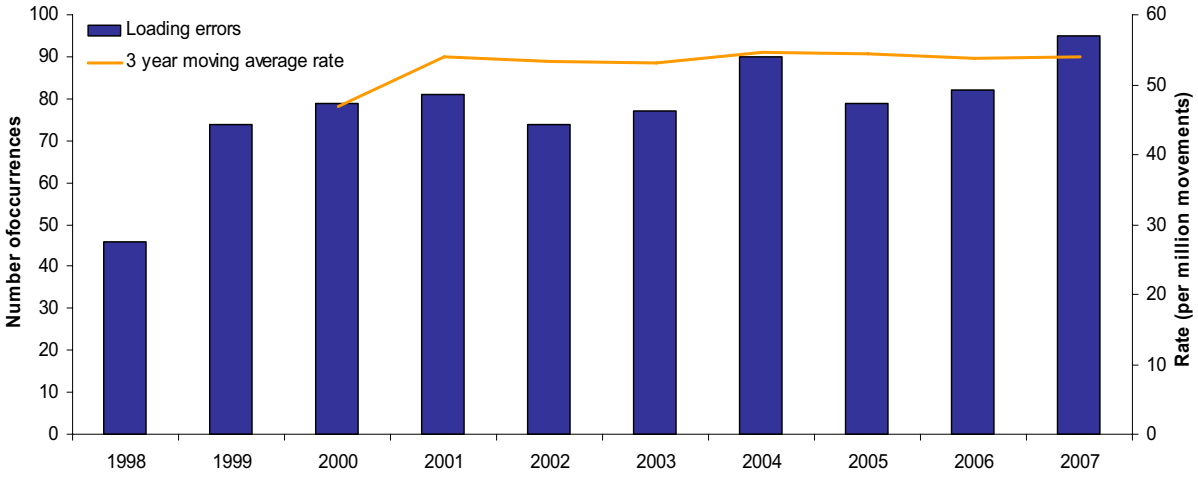

Figure 79 Number and rate of loading errors per year at UK aerodromes, involving UK operators

5.9 Other Ground Occurrences

5.9.1 In addition to loading errors and ground damage/collisions involving aircraft, other ground occurrences have been analysed. These occurrences may be described as follows:

- Airside driving: can refer to hazards or damage resulting from airside driving errors.
- Dangerous goods: can refer to leakage of such goods, inappropriate carriage or incorrect documentation.
- Deicing: can refer to errors associated with the deicing or anti-icing of aircraft, for example inadequate or incomplete deicing, or contamination of other aircraft systems.
- Jet blast, propeller wash or rotor wash: can refer to hazards, damage or injury resulting from this phenomenon.
- Aircraft marshalling: can refer to hazards or errors that occur during marshalling of aircraft.
- Aircraft parking system: can refer to errors with, or inoperative, stand entry guidance.
- Ramp equipment serviceability: can refer to ramp equipment, such as GPUs or airstairs that are in a poor condition.
- Refuelling: can refer to errors in refuelling, such as an incorrect fuel load.
- Ramp obstructed: can refer to obstructions such as incorrectly parked vehicles or abandoned equipment on the ramp.

It should be noted that these categories are not necessarily mutually exclusive.

Table 59 Number of other ground occurrences per year at UK licensed aerodromes

Year	Airside driving	Dangerous goods	Deicing	Jet blast, propellor wash or rotor wash	Aircraft marsh-alling	Aircraft parking system	Ramp equipment service-ability	Re-fuelling	Ramp obstructed
1998	65	23	5	6	10	8	13	15	6
1999	82	29	5	10	12	2	24	21	17
2000	74	27	3	5	14	3	15	16	12
2001	78	21	15	6	7	2	9	32	11
2002	75	19	9	7	10	1	10	21	16
2003	84	22	16	15	15	7	15	29	22
2004	117	35	14	10	5	7	15	54	20
2005	111	31	24	10	16	4	26	50	23
2006	124	39	22	7	15	3	16	27	30
2007	152	36	3	16	18	13	22	45	30
Total	962	262	119	91	122	50	165	310	187

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Chapter 7 High Severity Events

1 Introduction

1.1 Occurrences received through the UK MOR scheme are subject to a risk grading system. This system assesses the severity of the event (using criteria such as aircraft damage or injury to occupants) and the likelihood of the event recurring. A full description of the risk grading criteria is given in Appendix 4.

1.2 This Chapter provides a narrative for high-severity events that have a UK interest. A high-severity event is one graded with a severity of A or B. The likelihood of recurrence component is not considered in this Chapter, hence these occurrences are considered to be 'high severity' instead of 'high risk'. A UK interest may be: events occurring in UK airspace; involving UK licensed pilots; or the state of registry, design, manufacture or operation. Some of these events have already been described in other Chapters, for example fatal accidents involving UK public transport aircraft.

1.3 The previous edition of the Aviation Safety Review provided high-severity events up to the end of 2004. This edition therefore provides narratives of high-severity events from 1st January 2005 to 31st December 2007.

1.4 Occurrences in this Chapter are divided into separate categories. These categories are:

- UK air traffic services – controlled airspace and aerodromes;
- UK air traffic services – uncontrolled airspace and aerodromes;
- UK registered/AOC aircraft – foreign air traffic services and aerodromes;
- UK public transport aeroplanes;
- UK public transport helicopters;
- UK non-public transport small conventional aeroplanes;
- UK non-public transport helicopters;
- UK non-public transport other;
- Foreign registered aircraft in UK airspace;
- Foreign registered aircraft overseas.

1.5 Some high-severity events may qualify for more than one of these categories, however in order that events are not repeated (and therefore counted twice), they are only assigned to one category. Where an overlap exists, the categories are prioritised in the following order: UK air traffic services, UK public transport, UK non-public transport, and foreign-registered aircraft.

1.6 It should be noted that the list of foreign-registered aircraft is not exhaustive; it includes only those incidents that were reported to the UK MOR scheme and have a UK interest.

1.7 The number of fatal and serious injuries is supplied to the right of the narratives in the tables. The definition of these injuries is available in Appendix 1. Minor injuries are not included in the tables.

1.8 UK Airprox are often considered to be high-severity events, nevertheless they are not included in the tables below. This is because it is the responsibility of the UKAB to investigate these occurrences and detailed descriptions and analysis of each UK Airprox may be found in UKAB publications[1]. Statistical analysis of Airprox may be found in Chapter 6.

1. http://www.airproxboard.org.uk/default.aspx?catid=423&pagetype=90&pageid=5638

2 High Severity Events in 2005

2.1 UK Air Traffic Services (Controlled Airspace and Aerodromes)

Table 60 UK air traffic services, high severity events 2005

Aircraft type	Narrative	Location	Injuries	Date
EMB 145 Balloon Met	Conflict between an EMB145 and a met balloon near Woodley, Berkshire at FL300	Woodley, Berkshire	-	Aug-05
MD11	Low on approach to Nottingham East Midlands Airport. Incorrect altimeter pressure setting.	Nottingham East Midlands	-	Dec-05

2.2 UK Registered/AOC Aircraft – Foreign Air Traffic Services and Aerodromes

Table 61 Foreign air traffic services and UK-registered/AOC aircraft, high severity events 2005

Aircraft type	Narrative	Location	Injuries	Date
Bell 212 ATR 42	Foreign Airprox involving Bell 212 (UK registered) on finals to Nouakchott, Mauritania and ATR42 (Senegalese registered) who was calibrating ILS. ATC talking to ATR42 in local language.	Nouakchott, Mauritania	-	Jan-05
A321 Katana Dv20	Foreign Airprox involving A321 and Katana DV20 at 800-900ft following A321 departure from Malaga, Spain	Malaga	-	May-05
B747 Unknown	Foreign Airprox in the Kolkata FIR between B747 and airliner at approximately 2330N and 9300E. Both a/c appear to have been cleared at FL360.	Kolkata, India	-	Jun-05
B737 A340	During taxi UK operated B737 had to brake to avoid a Spanish operated A340 that allegedly failed to follow ATC taxi instructions at Barcelona.	Barcelona, Spain	-	Sep-05
A320 A320	Foreign Airprox involving UK operated A320 and Turkish operated A320 over HANKO, Turkey at FL320. Both received and reacted to TCAS Ras	HANKO, Turkey	-	Oct-05
B767 Unknown	Foreign Airprox involving UK operated B767 and light twin aircraft at 9000ft at Sanford.	Sanford, USA	-	Oct-05
DHC8	During take-off run at Limoges, UK operated DHC8 heard two transmissions in local language and then saw a car and two people vacating runway. As DHC8 took off, car and people were 5m from runway edge and aircraft cleared them by 100ft.	Limoges, France	-	Nov-05

2.3 UK Public Transport Aircraft

Table 62 UK public transport aircraft, high severity events 2005

Aircraft type	Narrative	Location	Injuries	Date
A340	Numbers 1 and 4 engines ran down in flight. Nr 4 engine restarted following fuel crossfeed. Crew declared Mayday and diverted to Amsterdam.	Amsterdam, Netherlands	-	Feb-05
BAE146	High vibration on all four engines due to severe icing during domestic UK flight.	-	-	Feb-05
DO 328	Shortly after touchdown, aircraft veered right and departed the runway. No damage and no injury to 29 POB.	London City	-	Feb-05
A321	Descent below MDA during approach in poor visibility. EGPWS 'Terrain Ahead, Pull Up' warning triggered. A/c diverted to Port Sudan after two go-arounds.	Khartoum, Sudan	-	Mar-05
B757	Tailscrape on rotation, aircraft returned for an overweight landing.	Manchester	-	May-05
ATR 72	Reduced braking efficiency during landing roll at Guernsey, Channel Islands due to maintenance error.	Guernsey	-	Sep-05
DHC8	Tailscrape on landing following a practice CAT II ILS approach. Minor damage to tail 'touch indicator'.	Leeds Bradford	-	Oct-05
A319	A319 suffered a major electrical failure causing temporary (90 second) multiple system, display and lighting losses. PAN declared.	-	-	Oct-05

2.4 UK Non-Public Transport Conventional Aeroplanes

Table 63 UK non-public transport conventional aeroplanes, high severity events 2005

Aircraft type	Narrative	Location	Injuries	Date
Piper PA28	Piper PA28 crashed into field in dense fog during VFR flight.	Horsmonden, Kent	1 Fatal	Feb-05
Piper PA34 Seneca	Cracks found in main wing spar during maintenance.		-	Mar-05
BN2 Islander	Inadvertent descent into sea during instrument approach to R/W11 at Campbeltown. A/c destroyed.	Campbeltown	2 Fatal	Mar-05
BE76 Duchess	Lost engine power and veered to the left shortly after take off. The aircraft clipped trees and crashed into a football field.	Belfast City	-	Apr-05

Table 63 UK non-public transport conventional aeroplanes, high severity events 2005 (Continued)

Aircraft type	Narrative	Location	Injuries	Date
ARV	Struck trees and power cables shortly after take-off.	Clapton in Gordano, Somerset	1 Fatal	Apr-05
Grumman AA5	Overran runway on landing and struck a gate. Aircraft destroyed.	Farley Farm	-	May-05
Miles M38	Mayday declared after engine seized at 1000ft. Wing and landing gear detached during forced landing	North Beveland	-	May-05
Slingsby 67	Aircraft spiralled towards the ground and crashed in a field.	Potterspury, Northants.	2 Fatal	May-05
Piper PA28	Landed heavily and bounced, then departed runway and struck tree. Aircraft destroyed	Full Sutton, Yorkshire.	-	Jun-05
A340	PAN declared after indications of an engine problem accompanied by airframe vibration and acrid fumes at rear of cabin.	Bovingdon, Hertfordshire.	-	Jul-05
CAP222	During aerobatic practise the CAP222 entered an inverted spin and spiralled into the ground. Aircraft destroyed.	White Waltham, Berkshire.	1 Fatal	Jul-05
Cessna 172	Shortly after take-off, aircraft entered a banked left turn, stalled and crashed into a field.	Bracklesham Bay, West Sussex	1 Fatal	Aug-05
DH Tigermoth	Tigermoth entered a spin and crashed into a field.	Henley on Thames	2 Fatal	Aug-05
Ventus 2CM	Heavy landing in a field.	Stretton	1 Serious	Aug-05
Piper PA28	Unknown. Wreckage of the aircraft subsequently recovered from sea.	Irish Sea	2 Fatal	Sep-05
MCR-01	Aircraft pitched up momentarily and then descended steeply into the ground and was destroyed.	Lymington, Hampshire.	2 Fatal	Oct-05
Piper J3	During a forced landing on a road under construction, aircraft collided with a car.	Kanazawa City, Japan	-	Oct-05
Piper PA38 Tomahawk	Engine failure during initial climb. Following partial power recovery, pilot attempted to turn back but the aircraft stalled, crashed and was destroyed.	Biggin Hill	2 Fatal	Oct-05
PZL Koliber 160A	Pilot became disorientated in deteriorating weather and aircraft struck ground.	Clayton, West Sussex	1 Serious	Oct-05
Sipa 903	Engine started unexpectedly during hand swung start. Aircraft ran forward into hangar and struck a person who was seriously injured.	Sandown, Isle of Wight	1 Serious	Nov-05

Table 63 UK non-public transport conventional aeroplanes, high severity events 2005 (Continued)

Aircraft type	Narrative	Location	Injuries	Date
Grumman AA1	Aircraft entered spin. Mayday declared but aircraft spun into field from 5000ft	Northampton	2 Fatal	Nov-05
Maule MX 7	Landed beside runway and struck parked aircraft. Pilot dazzled by setting sun. Substantial damage to both aircraft.	Cambridge	-	Nov-05
Piper PA32	Veered off runway on landing in gusty conditions, then struck an embankment and three fence posts. A/c destroyed.	Eshott, Northumberland	1 Serious	Dec-05
Cessna 152 Microlight	Mid-air collision between C152 and EV-97 microlight. C152 crashed & was destroyed with 1 fatality. EV-97 substantially damaged but landed safely with no injuries to 2 POB.	Moreton-in-Marsh, Gloucestershire.	1 Fatal	Dec-05

2.5 UK Non-public Transport Helicopters

Table 64 UK non-public transport helicopters, high severity events 2005

Aircraft type	Narrative	Location	Injuries	Date
Bell 206 Jet Ranger	Collided with high terrain in poor weather and was destroyed.	Taunton, Somerset	4 Fatal	Jan-05
Robinson R44	During a landing on sloping ground, the helicopter tipped backwards, causing the rotor blades to contact the ground. Aircraft turned through 180 degrees but remained upright and caught fire.	Haydon Bridge, Newcastle.	-	Mar-05
Robinson R44	Entered uncontrollable right yaw during hover taxi at slow speed with a tail wind. Aicraft struck the ground and came to rest on its side.	Swansea	-	May-05
Robinson R44	Helicopter observed to strike ground in a nose-down attitude. Aircraft destroyed.	Amersham	1 Serious	Sep-05
Robinson R44	Helicopter yawed and rolled left on lift off. Main rotor struck ground, causing aircraft to roll over. Aircraft destroyed.	Northampton - Sywell	-	Dec-05
Bell 206 Jet Ranger	Vertical stabiliser detached in flight, causing tail rotor and associated gearbox to separate.	Coupar Angus	2 Fatal	Dec-05

2.6 UK Non-public Transport Other

Table 65 UK non-public transport other, high severity events 2005[1]

Aircraft type	Narrative	Location	Injuries	Date
EV97 microlight	Low level stall while attempting to avoid worsening weather and effect a forced landing.	Wotton-under-Edge	2 Fatal	Jun-05
LS1F glider	Collision with spectator during competition finish.	Husbands Bosworth, Leicestershire	1 Fatal - spectator	Aug-05
Ikarus C42 microlight	Stall during go-around. Substantial damage to aircraft.	Middlewich	1 Serious	Aug-05
Pegasus XL-Q microlight	Microlight aborted takeoff but went through fence.	Long Framlington, Northumberland	1 Serious	Aug-05
DG600 glider	Glider entered a steep climb to 350 ft during launch then stalled and spun into the ground.	Sudbury, Suffolk	1 Fatal	Sep-05
Puchacz glider	Glider flew into trees following failed winch launch.	Nympsfield, Gloucestershire	-	Nov-05
Glider	Glider crashed in a field, aircraft destroyed.	Bakewell, Derbyshire	2 Serious	Nov-05

1. Please note that there was also a mid air collision between microlight and Cessna 152 but this is listed under UK Non-Public Transport Conventional Aeroplanes.

2.7 Foreign Registered Aircraft in the UK

Table 66 Foreign registered aircraft in the UK, high severity events 2005

Aircraft type	Narrative	Location	Injuries	Date
Europa	US registered Europa entered spin from 400ft after take-off. Aircraft impacted ground and caught fire.	Kemble	2 Fatal	Mar-05
Cessna 150	Aircraft crashed into side of mountain after entering cloud.	Dundee	-	May-05

2.8 Foreign Registered Aircraft Overseas

Table 67 Foreign registered aircraft overseas, high severity events 2005

Aircraft type	Narrative	Location	Injuries	Date
A340	A340 (French registered) overran runway on landing at Toronto. Aircraft destroyed by post-crash fire.	Toronto, Canada	-	Aug-05
B737	B737 (Cypriot registered) failed to pressurise and crew became incapacitated by hypoxia. Aircraft crashed at Grammatikos, after both engines flamed out due to fuel exhaustion.	Grammatikos, Greece.	121 Fatal	Aug-05
A320	A320 (US registered) diverted and landed with nose landing gear cocked 90 degrees at Los Angeles.	Los Angeles, USA	-	Sep-05
Cessna 150	Cessna 150 (Italian registered) wreckage found in Italian Alps (1 Fatal)	Italian Alps	1 Fatal	Sep-05
Cessna 206 Super Sky	Cessna 206 (Tanzanian registered) impacted terrain above Mahale.	Mahale, Tanzania	5 Fatal	Oct-05
BN2 Islander	BN2 Islander (Belizean registered) crashed in poor weather in mountainous terrain at Mountain Pine Ridge.	Mountain Pine Ridge, Belize	3 Fatal	Nov-05
Piper PA23	Piper PA23 (US registered) crashed into sea shortly after take-off from South Caicos.	South Caicos	4 Fatal	Dec-05

3 High Severity Events in 2006

3.1 UK Air Traffic Services (Controlled Airspace and Aerodromes)

Table 68 UK air traffic services controlled airspace and aerodromes, high severity events 2006

Aircraft Type	Narrative	Location	Injuries	Date
Paraglider Jetstream 41	Airprox involving a JS41 and a paraglider, 6nm NNE of Southampton at 3000ft.	Southampton, Hampshire	-	Apr-06
BE36 Bonanza Rockwell Turbo	Infringement of the LTMA (Class A) by a BE36 at 4200ft, which lead to a loss of separation with an RTC690 descending to 3000ft.	TANET	-	Jun-06
A310	Aircraft descended below cleared altitude of 2500ft, to approximately 1500ft in potential conflict with TV mast before climbing back to 2000ft.	Birmingham, West Midlands	-	Nov-06

3.2 UK Air Traffic Services (Uncontrolled Airspace and Aerodromes)

Table 69 UK air traffic services uncontrolled airspace and aerodromes, high severity events 2006

Aircraft Type	Narrative	Location	Injuries	Date
AS355 Ecureuil Twin AS355 Ecureuil Twin	Near collision on ground. AS355 requested start clearance for an engineering ground run. After running for 5mins an AS355 20ft in front was also cleared to start and lifted into conflict.	Elstree, Hertfordshire	-	Jun-06

3.3 UK Registered/AOC Aircraft – Foreign Air Traffic Services and Aerodromes

Table 70 Foreign air traffic services and UK-registered/AOC aircraft, high severity events 2006

Aircraft Type	Narrative	Location	Injuries	Date
B767 B757	Foreign Airprox involving a UK registered B767 and a foreign registered B757. Both aircraft received and responded to TCAS RA.	Italy	-	Jan-06
A340 B747	Foreign Airprox involving a UK registered A340 and a foreign registered B747-400 at FL360. TCAS RA received and actioned.	Russia	-	Feb-06
B757 A320	A UK registered B757 was cleared for take-off and, whilst still on its take-off roll, an inbound A320 touched down on the runway.	Tenerife, Spain	-	Feb-06
B757	Visual contact with runway lost after passing VDP. During subsequent go-around crew did not follow correct missed approach procedure. A/c diverted to Malaga.	Gibraltar	-	Mar-06
A319 MD 80 Srs	During taxi to runway 36L via R5, UK registered A319 had to brake suddenly to avoid conflict with a foreign registered MD80 taxiing from R6. Spanish was used on frequency between ATC and MD80, which reduced A319 crew's awareness.	Madrid, Spain	-	Apr-06
B767 Military	Foreign Airprox involving a UK registered B767 on the ground and a military crop duster type aircraft which passed over the B767.	Kefallinia, Greece	-	Jun-06
EMB 145	EMB145 experienced severe wake turbulence whilst descending to FL50. Aircraft banked 50deg left then 45deg right with the airspeed decreasing rapidly. Aircraft climbed to FL60 until clear of wake turbulence.	Paris, France	-	Aug-06
Unknown A319	UK registered A319 on approach received a TCAS RA descent against a VFR aircraft that had been instructed to turn downwind. However, the aircraft turned base. A319 continued on approach and landed uneventfully.	Dortmund, Germany	-	Sep-06

3.4 UK Public Transport Aeroplanes

Table 71 UK public transport aeroplanes, high severity events 2006

Aircraft Type	Narrative	Location	Injuries	Date
BAE146	Jet pipe fire during engine start (with APU unserviceable). Emergency evacuation initiated by cabin crew.	Edinburgh	-	Jan-06
BAE146	First Officer became incapacitated during climb. Oxygen administered. Aircraft returned.	Belfast City	-	Feb-06
B767	B767 paperwork indicated 7.9 tonnes of cargo loaded. On take-off, general handling of B767 was not as expected. On arrival, 11.9 tonnes of cargo was found loaded.	Goa	-	Feb-06
BAE146	Aileron control restriction/jam. PAN declared and aircraft returned. Ailerons contaminated with anti-icing fluid residue.	Southampton, Hampshire	-	Feb-06
HS748	Aircraft overran runway after touchdown at Guernsey.	Guernsey, Channel Islands	-	Mar-06
DO 228	Alleged poor quality inter-island crew transport. Crew of B747 noticed that the Do228 was being loaded in excess of hold limitations and no safety demonstrations were carried out.	Barbados	-	Apr-06
DHC8	Cabin attendant sustained a broken ankle during a severe turbulence encounter in descent.	Exeter, Devon	1 Serious	Jun-06
B747	Whilst B747 taxied onto stand D22, the chock handling person slipped and became trapped under the main gear and was seriously injured.	Johannesburg, South Africa	1 Serious	Jun-06
Jetstream 32	Wheels up landing. Aircraft took off again. PAN declared and aircraft returned to Aberdeen	Wick, Highland	-	Oct-06
B777 BE90 King Air	Four cabin attendants injured when a/c entered sudden descent in response to TCAS RA	Jacksonville	-	Oct-06
A340	Section of cascade vane detached from LH side of nr3 engine thrust reverser on landing, damaging two MLG tyres.	London-Heathrow	-	Oct-06
BAE146	Total loss of electrical power to flight deck instruments. MAYDAY declared.	Inverness, Highland	-	Nov-06

Table 71 UK public transport aeroplanes, high severity events 2006 (Continued)

Aircraft Type	Narrative	Location	Injuries	Date
A320	Hard landing. Check failed to notice RH MLG damaged. PAN declared next flight and diversion to Manchester due to gear indication fault.	Bristol, Avon	-	Nov-06
B747	MAYDAY declared due to instrument problems. Fuel jettisoned and aircraft returned.	Bovingdon, Hertfordshire	-	Dec-06
DHC8	PAN declared due to loss of instrument readings in severe icing. Aircraft descended to FL80 and systems recovered.	Turnberry, Ayreshire	-	Dec-06

3.5 UK Public Transport Helicopters

Table 72 UK public transport helicopters, high severity events 2006

Aircraft Type	Narrative	Location	Injuries	Date
MD 900	As the helicopter landed on a garage forecourt, a metal sign detached from the wall and was blown into the main rotor disc.	Southwark, London	-	Jun-06
SA332 Super Puma	Take off rejected due to severe vibration following loud bang. Main rotor head spindle fractured.	Aberdeen, Aberdeenshire	-	Oct-06
SA332 Super Puma	Abnormal engine indications followed by increasingly restricted cyclic movement. Aircraft ditched in sea. No injuries to 17 POB.	North Sea	-	Nov-06
SA365 Dauphin	Helicopter seen to descend into sea close to offshore platform.	Morecambe Bay, Lancashire/ Cumbria	7 Fatal	Dec-06

3.6 UK Non-Public Transport Conventional Aeroplanes

Table 73 UK non-public transport conventional aeroplanes, high severity events 2006

Aircraft Type	Narrative	Location	Injuries	Date
Cessna 152	Aircraft struck wire during practice forced landing. Top of fin and rudder sheared off	Nairn, Highland	-	Jan-06
BAE146	Loud bang on short finals followed by loss of yellow hydraulic system/contents. Hydraulic accumulator exploded, piercing pressure hull.	Birmingham, West Midlands	-	Feb-06

Table 73 UK non-public transport conventional aeroplanes, high severity events 2006 (Continued)

Aircraft Type	Narrative	Location	Injuries	Date
Diamond Katana DA20	Nose landing gear leg failed during touch and go landing. Aircraft destroyed.	Redhill, Surrey	-	Jun-06
Piper PA23	Suspected loss of engine power on take-off. Aircraft returned but bounced on landing. Go-around initiated during which a/c stalled, crashed and caught fire.	Thirkleby, North Yorkshire	1 Fatal	Jun-06
Slingsby 67	MAYDAY declared during aerobatic manoeuvres. Aircraft entered spin, crashed and was destroyed.	Hoxne, Suffolk	1 Fatal	Jul-06
Europa	Aircraft struck hedge during emergency landing after cockpit filled with smoke.	Portbury, Avon	-	Jul-06
Denney Kitfox	Aircraft crashed on an industrial estate road after losing engine power. Substantial damage. Minor injuries to two POB. AAIB AARF investigation.	Pontypridd, Rhondda Cynon Taf	-	Jul-06
Cessna 150	During go-around, aircraft stalled and crashed in a park.	Eastwood Park, Essex	1 Fatal	Jul-06
YAK 52	During climb out from low level pass, a/c crashed from apparent aerobatic manoeuvre.	Bournemouth, Dorset	2 Fatal	Jul-06
Cessna 303 Crusader	Both engines lost power on approach due to fuel starvation. Aircraft crashed into woodland.	Denham Green, Buckinghamshire	6 Serious	Aug-06
Denney Kitfox	Engine failed in flight. Aircraft crashed in crop field during attempted forced landing.	Wheaton Ashton, Staffordshire	2 Serious	Aug-06
Cessna 150	Engine power appeared to reduce after take off. Pilot lowered nose but right wing dropped and aircraft struck ground.	Netherthorpe, East Midlands	-	Aug-06
Lockheed T-33	Aircraft stalled and crashed in a field outside airfield boundary after taking off from runway 24. Aircraft destroyed by fire.	Duxford, Cambridgeshire	1 Serious	Sep-06
Tailwind	Pilot reported smoke/fire in cockpit. Emergency landing attempted but aircraft stalled & crashed in field.	Schramberg, Germany	1 Fatal	Sep-06

Table 73 UK non-public transport conventional aeroplanes, high severity events 2006 (Continued)

Aircraft Type	Narrative	Location	Injuries	Date
Cessna 152	Aircraft collided with mountainside.	Bethesda, Gwynedd	1 Fatal, 1 Serious	Sep-06
B747	Engine failure during high level cruise in adverse weather conditions, with significant loss of control/performance.	En Route Dubai to Singapore	-	Sep-06
Socata TB10	MAYDAY declared due to engine power loss. Aircraft crashed into trees, caught fire and was destroyed.	Delamere, Cheshire	1 Serious	Sep-06
Cessna 182 Skylane	A/c moved forward and collided with parked van during engine start in preparation to position a/c for later demonstration flight.	Oxford	-	Sep-06
B757	Lightning strike at 2500ft, during climb out, followed by speed reduction below V2.	Exeter, Devon	-	Oct-06
Cessna 182 Skylane	Aircraft crashed on short final.	Liverpool	2 Serious	Oct-06
Slingsby 67	Temporary rudder control jam during aerobatic manoeuvres due to restricted rudder pedal movement. Significant hazard due to delayed spin recovery.	Cambridgeshire	-	Nov-06
Cessna 404 Titan	Temporary incapacitation of pilot due to oxygen starvation.	North Atlantic	-	Dec-06

3.7 UK Non-public Transport Helicopters

Table 74 UK non-public transport helicopters, high severity events 2006

Aircraft Type	Narrative	Location	Injuries	Date
Hughes 269 / 300	Skids dug in on landing and helicopter rolled onto side.	Sheffield, South Yorkshire	-	Feb-06
Agusta Bell 206	Helicopter began to yaw during descent and both skids broke off on touchdown. Helicopter then rolled onto its side.	Southend, Essex	-	Apr-06
Robinson R44	Helicopter landed heavily and rolled onto right side.	Llan-y-pwll, Wrexham	-	Apr-06
Robinson R44	Helicopter rolled over during engine start-up / shutdown procedure.	Carnforth, Lancashire	-	May-06
Hughes 369 / 500	Engine power began to fluctuate erratically during approach. Pilot entered autorotation but helicopter landed heavily and rolled over.	Lane End, Buckinghamshire	-	May-06
Rotorway Executive	Smoke in cockpit during climb. A/c entered autorotation, landed heavily and was destroyed by fire.	Northiam, West Sussex	-	May-06
Agusta A109	Engine exhaust duct separated and struck tail rotor, causing gearbox to separate followed by part of upper vertical stabiliser. Forced landing made without further damage.	Warlingham, Surrey	-	Oct-06

3.8 UK Non-public Transport Other

Table 75 UK non-public transport other, high severity events 2006

Aircraft Type	Narrative	Location	Injuries	Date
Pegasus Quantum 15-912 microlight	Aircraft collided with a barn during approach.	Clench Common	2 Serious	Apr-06
Schleicher Ask 21 glider	Glider crashed on extended downwind leg during training flight.	Long Mynd	1 Serious	Apr-06
Balloon	Balloon envelope contacted power lines during landing. Burn damage to envelope.	Bordon, Hampshire	-	Apr-06
Autogyro	Aircraft rolled over on landing.	Coventry, West Midlands	-	Apr-06
Quik GT450	Aircraft struck ground during practice forced landing.	Halsall, Lancashire	1 Serious	May-06
Balloon	Balloon landed heavily. All 15 occupants thrown out of basket.	Pontypool, Torfaen	2 Serious	May-06

Table 75 UK non-public transport other, high severity events 2006 (Continued)

Aircraft Type	Narrative	Location	Injuries	Date
RAF 2000 Autogyro	Main rotor struck vertical stabiliser, propeller and rudder in flight.	Bodmin Moor, Cornwall	1 Fatal	Jun-06
EON Olympia glider	Aircraft struck trees on final approach.	Challock, Kent	-	Jun-06
Raven X microlight	Raven X microlight went missing during duration flight. Wreckage located after co-ordinated search.	Cliffe, Kent	1 Fatal	Jun-06
Schleicher-ASW 27glider	Aircraft crashed in mountainous terrain.	Les Pads, France	1 Fatal	Jun-06
Schleicher K13 glider	Glider developed sink and was unable to reach airfield. Landed in field and ground looped.	Long Mynd, Shropshire	-	Jun-06
Ventus 2CT glider	Glider crashed in unknown circumstances.	Braemar, Aberdeenshire	1 Serious	Jul-06
ASW glider	On final approach, glider began to sink heavily, overshot field and passed through a hedge.	Bicester, Oxfordshire	-	Jul-06
Glider	Ground loop on landing.	Bicester, Oxfordshire	-	Jul-06
Letov LK-2M Sluka microlight	Pilot encountered elevator control problems. Aircraft lined up for runway but descended into the ground from approx 150ft.	North Coates, Lincolnshire	1 Fatal	Aug-06
DG101 glider	Aircraft stalled on approach.	Mursley, Buckinghamshire	1 Serious	Aug-06
Zenair microlight	Aircraft crashed and exploded on impact.	Rotherham, South Yorkshire	2 Fatal	Aug-06
Slingsby Dart 15 glider	Aircraft entered spin during low-level ridge soaring.	Sutton Bank, North Yorkshire	1 Fatal	Aug-06
Schleicher ASW 20L glider	Wing tip struck ground during winch launch	RAF Keevil, Wiltshire	1 Fatal	Sep-06
Schleicher ASW19B Scheibe SF27	Mid-air collision between two gliders.	Sutton Bank, North Yorkshire	1 Fatal	Oct-06
Pegasus Quantum 15	Passenger's helmet came off and hit propeller, breaking off a blade. Forced landing in field.	Blakeney, Gloucestershire	-	Nov-06
Stemme S10-V	Aircraft went missing during cross-country competition.	Mount Pleasant, New Zealand	2 Fatal	Nov-06

3.9 Foreign Registered Aircraft in UK Airspace

Table 76 Foreign registered aircraft in UK airspace, high severity events 2006

Aircraft Type	Narrative	Location	Injuries	Date
B747	During autopilot coupled ILS approach, aircraft descended to 1,200ft at about 8nm from runway threshold. Manual return to glidepath effected and normal landing completed.	London-Heathrow	-	Jan-06
A310	During Loc/DME approach to runway 33 at Birmingham, aircraft commenced early descent reaching 660ft (164ft agl) at 6nm. Instructed to climb and go-around.	Birmingham, West Midlands	-	Feb-06
Learjet	Inadvertent power application caused a/c to move forward and swing left, striking vehicle and ramp agent. P1 fell from open doorway and was also struck and seriously injured.	London-Gatwick	1 Serious	Mar-06
DO 328	Captain failed to respond to GPWS warnings on approach and flew in close proximity to ground.	Sumburgh (SUM)	-	Jun-06
B737	Following weather related diversion to Nottingham East Midlands, aircraft landed heavily and right-hand main landing gear failed. MAYDAY declared and aircraft continued to Birmingham	Nottingham East Midlands, Leicestershire		Jun-06
DO 328	Pilot unable to release power lever latches on landing. Aircraft overran runway, coming to rest 350m into rough grass.	Aberdeen	-	Jun-06
Piper PA28	Aircraft landed heavily in a field adjacent to airstrip in gusty conditions. Left-hand main landing gear collapsed.	Churt, Surrey	-	Aug-06
Cessna 303 Crusader	Both engines stopped due to fuel starvation. MAYDAY declared. Aircraft ditched in sea and was destroyed.	North Sea	-	Sep-06
B737	After take-off, a/c adopted steep nose-down attitude to 500ft. Flew at low level for 5-6 miles before climbing.	Stansted Airport, Essex	-	Oct-06

3.10 Foreign Registered Aircraft Overseas

Table 77 Foreign registered aircraft overseas, high severity events 2006

Aircraft Type	Narrative	Location	Injuries	Date
HS125	Aircraft crashed during approach.	Kharkov, Ukraine	3 Fatal	Jan-06
Cessna 206 Super Sky*	Aircraft crashed into dam at Willow Bank shortly after take off.	Amberley, Australia	5 Fatal, 2 Serious	Jan-06
BAE146	Flames/smoke on flight deck with external power connected, APU running and engines shut down.	Zurich, Switzerland	-	Jan-06
SD360 SD360	Mid-air collision between two SD360 aircraft flying in formation over Milwaukee.	Milwaukee, USA	3 Fatal	Feb-06
Jetstream 31	Aircraft overran runway on landing.	Bocas de Toro, Panama	2 Serious	Jun-06
Fokker F27 Friendship	Reported engine problems shortly after take off. Aircraft struck power line and crashed into field.	Multan, Pakistan	45 Fatal	Jul-06
Hunter	Aircraft crashed near airshow, possibly due to loss of power.	Hillsboro, USA	1 Fatal	Jul-06
Jet Provost	Aircraft crashed into a forest.	Bathurst, Australia	2 Fatal	Oct-06
Jetstream 41	Engine flamed out during climb, leaving aircraft unable to maintain height. Engine restarted below 1000ft. Aircraft returned to airport.	Durban, South Africa	-	Oct-06
BAE146	Aircraft crashed on landing and caught fire.	Stord, Norway	4 Fatal	Oct-06
BE200 Super King Air	Hard landing following stall on short finals.	Courchevel, France	-	Oct-06
Cirrus SR22	Aircraft crashed after reporting icing.	Meadview, USA	4 Fatal	Oct-06
BN2 Islander	Left main landing gear hit runway hard, causing wing to strike ground.	West Point Island, Falkland Islands	-	Nov-06
Bell 47	Hard landing during autorotation training.	Rendsburg-Schachtholm, Germany.	-	Nov-06

4 High Severity Events in 2007

4.1 UK Air Traffic Services (Controlled Airspace and Aerodromes)

Table 78 UK air traffic services controlled airspace and aerodromes, high severity events 2007

Aircraft Type	Narrative	Location	Injuries	Date
B747 HS125	HS125 following a B747, with 5 nm separation, encountered wake turbulence. HS125 rolled to the right through 90 degrees and lost height by 300-400ft.	London-Heathrow	-	Apr-07
B737	While climbing through FL215, a free-fall parachutist passed the aircraft.	Henton	-	May-07
Robinson R22	R22 targeted by a high intensity green laser whilst on a training flight. Laser entered the cockpit causing momentary blindness and disorientation of the instructor. Student able to continue flight.	Westhill	-	Oct-07
B757	Deviation from ILS glide path on approach. After being challenged by ATC, aircraft went around but deviated further from ATC instructions, climbing above its assigned level before landing safely.	Birmingham, West Midlands	-	Dec-07

4.2 UK Air Traffic Services (Uncontrolled Airspace and Aerodromes)

Table 79 UK air traffic services uncontrolled airspace and aerodromes, high severity events 2007

Aircraft Type	Narrative	Location	Injuries	Date
Piper PA28 Mainair Blade microlight	When a microlight with a student pilot and instructor was on initial climb at approximately 600ft, a student pilot on a solo circuit training in a PA28 flew beneath the microlight and overtook it.	Sandtoft, Lincolnshire	-	Jan-07
Gemini Flash microlight Military	Microlight on a cross country navigation exam took a wrong heading and infringed the RAF Scampton ATZ.	Scampton, Lincolnshire	-	Feb-07
Diamond Star DA40-TDI Mainair Blade microlight	DA40, following a Mainair Blade, initiated a go-around at 50 ft, as the microlight was lifting off during its tough and go. DA40 took avoiding turn to dead side and climbed, then turned back and flew under the microlight.	Sandtoft, Lincolnshire	-	Feb-07
DHC8 Cessna 152	DHC8 cleared to line-up R/W13 and wait due C152 landing R/W24. DHC8 took off without clearance whilst C152 on short finals. C152 continued approach and landed safely.	Plymouth, Devon	-	Aug-07

4.3 UK Registered/AOC Aircraft – Foreign Air Traffic Services and Aerodromes

Table 80 Foreign air traffic services and UK-registered/AOC aircraft, high severity events 2007

Aircraft Type	Narrative	Location	Injuries	Date
B767 Unknown	Foreign Airprox involving a B767 and an unknown aircraft.	Sanford, USA	-	May-07
B767 Unknown	B767 crew observed another a/c on TCAS below and indicating climbing. A/c continued to close until B767 received TCAS RA to climb. B767 followed TCAS instruction.	Sanford, USA	-	Jul-07
A319 BE33	Foreign Airprox involving an A319 (UK registered) and BE33 at 1,000 ft on departure.	Alicante, Spain	-	Aug-07

4.4 UK Public Transport Aeroplanes

Table 81 UK public transport aeroplanes, high severity events 2007

Aircraft Type	Narrative	Location	Injuries	Date
Jetstream 41	Nr2 engine ran down during descent. MAYDAY declared. Engine subsequently restarted without crew intervention.	Popham, Hampshire	-	Jan-07
Jetstream 41	Pitch control problem due to interference between elevator trim and engine condition lever.	Durham Tees Valley	-	Jan-07
DHC8	First Officer passed out during descent, remaining unconscious for approx 30 seconds. PAN declared. Aircraft landed safely and was met by an ambulance.	Dusseldorf, Germany	-	Jan-07
A321	Nr2 generator failure, followed by multiple equipment failures, leading to prolonged loss of communications (PLOC).		-	Feb-07
A319	MAYDAY declared due double engine ECAM warn/checklist requiring both engines be shut down when apparently normal. Diversion to Stansted.	Midhurst, West Sussex	-	Feb-07
Lockheed L188 Electra	PAN declared due to erratic engine indications. Number 2 engine shutdown and numbers 1 and 3 engines flamed out during return.	Stansted Airport, Essex	-	Mar-07
B747	Pod scrape on nrs 3 and 4 engines on landing. Both engine pods damaged.	London-Gatwick	-	Mar-07
BE200 Super King Air	Only two greens obtained on landing gear extension. Aircraft diverted to Southend. Nose landing gear collapsed on landing run.	Southend, Essex	-	Mar-07

Table 81 UK public transport aeroplanes, high severity events 2007 (Continued)

Aircraft Type	Narrative	Location	Injuries	Date
A319	Uncommanded 20 degree right yaw on rotation (quick access recorder showed full right rudder).	Amsterdam, Netherlands	-	Apr-07
EMB 145	Smoke/fumes in cockpit accompanied by loss of Captain's navigation displays/instruments.	Aberdeen, Aberdeenshire	-	May-07
A319	Mobile steps partially collapsed during disembarkation, trapping one passenger's foot. The passenger suffered severe injuries to the ankle/lower leg and was hospitalised.	Nottingham East Midlands Airport	1 Serious	Jun-07
A330	Hard landing in excess of main landing gear limits.	Sanford, USA	-	Jun-07
A320	Heavy landing - 3.15 vertical 'g' recorded.	Kos, Greece	-	Jul-07
MD 80 Srs	Go-around due to unstable approach to R/W 34. Aircraft subsequently landed on R/W 16.	Dublin, Ireland	-	Aug-07
B737	Go-around carried out due to unstable approach. Subsequent FDM review showed passing 2,400ft, a/c appeared to stall at pitch angle 44 degrees and IAS 82kt.	Bournemouth, Dorset	-	Sep-07
B777	Loading vehicle struck aircraft near rear baggage hold. Driver's legs trapped against aircraft, causing serious injury.	London-Heathrow	1 Serious	Oct-07
BAE146	MAYDAY declared due to suspected fire in toilet. Crew donned oxygen masks. Aircraft diverted to Cardiff and landed safely	Cardiff, South Glamorgan	-	Oct-07
B757	Loud bang heard and jolt felt during climb. LH EGT rose into red segment. Engine shutdown, PAN declared and a/c returned.	Alicante, Spain	-	Oct-07
B737	Stall warning during climb out with difficulty re-engaging autopilot and configuration warning.	Phuket, Thailand	-	Nov-07
A340	During taxi, nr1 engine struck airbridge. Engine damaged.	Chicago O'Hare Airport, USA	-	Dec-07

4.5 UK Public Transport Helicopters

Table 82 UK public transport helicopters, high severity events 2007

Aircraft Type	Narrative	Location	Injuries	Date
Eurocopter EC155	As aircraft was being refuelled on ramp with rotors running, small fire occurred at connector for electric hoist. Power supply shorted to connector due moisture ingress via seal.	Norwich, Norfolk	-	Mar-07
Sikorsky S92A	PAN declared due to high vibration. Precautionary descent and diversion carried out. Tail rotor damaged due to blade stop failure.	North Sea	-	Apr-07
SA332 Super Puma	Nosewheel lock inadvertently engaged instead of parking brake. Taxi commenced with nosewheel lock engaged.	Aberdeen, Aberdeenshire	-	Dec-07

4.6 UK Non-Public Transport Conventional Aeroplanes

Table 83 UK non-public transport conventional aeroplanes, high severity events 2007

Aircraft Type	Narrative	Location	Injuries	Date
Grumman GA7 Cougar	Aircraft struck power cable during approach. Top of tail fin removed.Aircraft landed safely.	Stapleford, Essex	-	Jan-07
Falcon 900	MAYDAY declared due to nr3 engine fire. Aircraft diverted to Gatwick and landed safely	London-Gatwick	-	Jan-07
Piper PA28	During approach to Blackpool in poor visibility, the aircraft descended into the sea and sank.	Blackpool, Lancashire	2 Fatal	Feb-07
BE55 Baron	MAYDAY declared due to double engine failure. One engine subsequently restarted. Aircraft diverted to Carlisle and landed safely.	Dean Cross	-	Mar-07
Piper PA28	Aircraft crashed into farmland/high ground.	Bragleenmore Farm, Strathclyde	3 Fatal	Apr-07
Pulsar	Aircraft crashed following engine failure after take-off.	Aston Juxta Mondrum, Cheshire	1 Fatal	Apr-07
Sky Arrow	Aircraft crashed in deteriorating weather conditions.	Koprubasi, Turkey	2 Fatal	May-07
Europa	In-flight structural failure, resulting in separation of both wings and tailplane.	Magor, Monmouthshire	2 Fatal	Jun-07
Cessna 150	Aircraft entered vertical dive, crashed and caught fire.	Clutton Hill, Somerset	2 Fatal	Jul-07

Table 83 UK non-public transport conventional aeroplanes, high severity events 2007 (Continued)

Aircraft Type	Narrative	Location	Injuries	Date
Piper PA28	Aircraft crashed on take-off.	Sandown, Isle of Wight	4 Fatal	Aug-07
Diamond Star DA40-TDI	During visual circuit, door separated from aircraft and struck horizontal stabiliser. Aircraft landed safely.	Goodwood, West Sussex	-	Aug-07
Piper PA24 Comanche	Engine lost power following touch and go. Pilot attempted return but aircraft crashed in field and caught fire.	Leicester, Leicestershire	1 Serious	Aug-07
Hurricane	Aircraft crashed during airshow.	Shoreham, West Sussex	1 Fatal	Sep-07
BAE146	Fumes on flight deck. Oxygen masks donned. PAN declared and aircraft returned to departure airport.	Belfast City Airport	-	Sep-07
Cessna 406 Caravan 2	MAYDAY declared due to flight control restriction during engine out training flight.	Coventry, West Midlands	-	Sep-07
Cessna 152	After experiencing problems with altimeter, C152 returned to airfield but bounced on landing and inverted.	Redhill, Surrey	-	Sep-07
Piper PA32	Aircraft appeared to experience problems after take-off and crashed into field.	Shotteswell, Oxfordshire	1 Fatal	Sep-07
Cessna 208 Caravan 1	Go-around initiated before touch down because landing gear not lowered. Subsequent inspection indicated that aircraft momentarily touched down.	Glasgow	-	Oct-07
Piper L21	While overflying airstrip, aircraft contacted power cables, spun round and struck ground.	Anwick, Lincolnshire	2 Serious	Oct-07
BN2 Islander	Overran runway on landing.	Spain	1 Fatal, 1 Serious	Oct-07
Luscombe PAC 750	Mid-air collision between Luscombe 8 & PAC 750. PAC declared MAYDAY & landed safely. Luscombe crashed & destroyed by fire.	Rudgeley	2 Fatal	Dec-07
Piper PA34 Seneca	A/c reported finals but crashed in woods close to the airport.	Oxford, Oxfordshire	1 Serious	Dec-07
Zenair	Aircraft overdue. Wreckage later found, aircraft destroyed.	Selkirk, Scottish Borders	1 Fatal	Dec-07

4.7 UK Non-Public Transport Helicopters

Table 84 UK non-public transport helicopters, high severity events 2007

Aircraft Type	Narrative	Location	Injuries	Date
Robinson R22	Left skid contacted ground during hover turn and a/c rolled onto left side.	Wolverhampton, West Midlands	-	Jan-07
Robinson R22	During a hover turn in a strong wind, the helicopter began to descend, struck a fence and rolled onto its side.	Stockport, Greater Manchester	-	Jan-07
Robinson R44	During landing manoeuvre helicopter began to vibrate and turn of its own accord. Immediate landing carried out. Damage consistent with tail rotor strike.	Clay Cross, Derbyshire	-	Mar-07
SA355 Ecureuil Twin	Helicopter disappeared from radar screens after making a sharp turn. Wreckage found on following day.	Peterborough, Cambridgeshire	4 Fatal	May-07
Rotorway Executive	Rotor RPM dropped during recovery from practice autorotation. Aircraft landed in crop field, pitched forward and rolled onto side.	Willingdale Airfield, Essex	-	Jun-07
Robinson R44	Helicopter reported overdue by ARCC Kinloss. Wreckage found on following day.	Kendal, Cumbria	4 Fatal	Aug-07
SA350 Ecureuil	Aircraft crashed and was destroyed by fire.	Lanark, Lanarkshire	4 Fatal	Sep-07
Eurocopter EC135	Aircraft crashed following loss of power at about 1000ft.	North Weald	-	Sep-07
SA350 Ecureuil	During maintenance interrogation of a/c VEMD it was discovered that the a/c had suffered an overtorque of 107% for one second.	-	-	Dec-07

4.8 UK Non-Public Transport Other

Table 85 UK non-public transport other, high severity events 2007

Aircraft Type	Narrative	Location	Injuries	Date
Mainair Blade microlight	Mainair Blade 912 microlight collided with dry stone wall.	Leek, Staffordshire	1 Serious	Jan-07
XT912 microlight	Aircraft clipped tree on approach and crashed.	St Albans, Hertfordshire	1 Fatal, 1 Serious	Mar-07
Pegasus Quasar microlight	Pegasus Quasar microlight clipped a hedge on approach and crashed.	Shifnal, Shropshire	1 Fatal	Apr-07
Mainair Blade microlight	Mainair Blade microlight stalled during forced landing and collided with hedge.	Mellor	2 Serious	Apr-07

Table 85 UK non-public transport other, high severity events 2007 (Continued)

Aircraft Type	Narrative	Location	Injuries	Date
DG505 glider	Glider entered steep dive on approach and collided with ground.	Broadhembury, Devon	1 Serious	Apr-07
Pegasus Quantum microlight	On approach at about 30m, aircraft entered rapid descending left turn and struck ground short of threshold.	Benicolet, Spain	1 Fatal	Apr-07
Easy Raider microlight	In-flight engine failure. During landing in cornfield, a/c pitched forward and overturned.	Seaton Delavel, Northumberland	-	Jun-07
Nimbus 3DT glider	Glider crashed on airfield.	Lasham, Hampshire	1 Serious	Aug-07
Pegasus Quantum microlight	Pegasus Quantum 15 crashed in field.	Knotting, Bedfordshire	2 Fatal	Aug-07
Ash25 Glider	Ash 25 glider crashed into field whilst attempting to land.	Tomintoul	1 Fatal, 1 Serious	Sep-07
Pegasus XL-Q microlight	Pegasus microlight damaged on landing - nosewheel separated and wings folded.	Carnew, Cornwall	-	Sep-07
Mainair Blade microlight	Mainair Blade microlight believed to have crashed on take-off.	Aghadoe, Ireland	1 Serious	Sep-07
MCR-01 microlight	Microlight MCR-01 ULC engine cut out and aircraft spun out of control.	Felton	2 Serious	Dec-07

4.9 Foreign Registered Aircraft in UK Airspace

Table 86 Foreign registered aircraft in UK airspace, high severity events 2007

Aircraft Type	Narrative	Location	Injuries	Date
BAE146	Spoilers failed to deploy on landing, emergency braking used. All four MLG tyres burst due no anti-skid and the aircraft came to rest in undershoot area.	London City Airport	-	Feb-07
DHC2 Beaver	Aircraft failed to get airborne and overran runway, striking a parked a/c.	Headcorn / Lashenden, Kent	1 Fatal	Mar-07
BAE146	Tailstrike during heavy landing.	London City Airport	-	Aug-07
Bolkow 207	Aircraft crashed shortly after take-off and was destroyed by fire.	Navestock, Essex	2 Fatal, 1 Serious	Aug-07
MCR-01	Aircraft attempted to return to airfield due to engine problems, but crashed in afield.	Bethersden, Kent	1 Fatal, 1 Serious	Sep-07

4.10 Foreign Registered Aircraft Overseas

Table 87 Foreign registered aircraft overseas, high severity events 2007

Aircraft Type	Narrative	Location	Injuries	Date
SA332 Super Puma	Aircraft ditched in the sea following a loss of hydraulic fluid.	Miri, Malaysia	1 Fatal	Jan-07
BE200 Super King Air	Aircraft failed to gain height after take-off and crashed into sea.	North Caicos	1 Fatal, 3 Serious	Feb-07
Bulldog	Aircraft crashed in snow covered mountainous terrain. Cause unknown.	South Lake Tahoe, USA	1 Fatal, 1 Serious	Apr-07
BN2 Islander	Aircraft impacted with mountain 3nm south of destination.	Kopingang Mountain	3 Fatal	Apr-07
Centrair 101A Pegase glider	Centrair 101A Pegase glider impacted mountainous terrain.	Nr Heusca, Spain	1 Fatal	Sep-07

Chapter 8 CAA MOR Scheme

1 Introduction

1.1 The majority of the occurrence data used in this review are sourced from the CAA's Mandatory Occurrence Reporting Scheme (MORS). The scheme was created in January 1976, with the aim of preventing accidents and incidents by ensuring that relevant safety information is reported, collected, stored, protected and disseminated throughout industry. The scheme requires UK aviation professionals and approved and licensed organisations to report to the CAA all incidents which endangered or, if not corrected, would have endangered an aircraft, its occupants or any other person.

1.2 In 2006, the CAA's Mandatory Occurrence Reporting Scheme celebrated its 30th birthday. In the time since its creation, the scheme expanded from receiving 5,500 reports in 1976 to 11,800 reports in 2006.

1.3 Further details regarding the MOR scheme are available in CAP 382 – The Mandatory Occurrence Reporting Scheme[1].

1.4 The aim of this Chapter is to examine reporting trends during the period 1998-2007. A risk grading mechanism was introduced into MORS in 1998, hence for the first time the Aviation Safety Review can analyse a full decade of occurrences according to their risk grading.

1.5 Total Mandatory Occurrence Reports

1.5.1 Over 95,500 MORs were received during the period 1998-2007, and the annual number of reports has more than doubled, from approximately 6,000 in 1998 to nearly 13,000 in 2007. Figure 80 shows the annual number of reports received from 1998-2007.

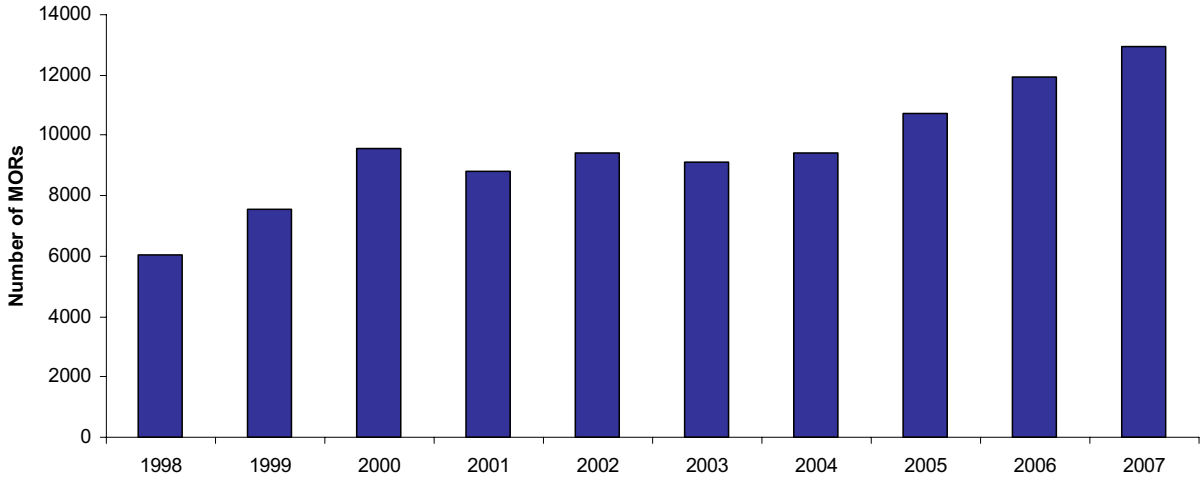

Figure 80 Total number of MORs received per year

1. http://www.caa.co.uk/CAP382

1.6 UK Mandatory Occurrence Reports

1.6.1 This section considers occurrences that involved UK-registered or operated aircraft, or that occurred in UK airspace. Occurrences that only involved military aircraft have been excluded.

1.6.2 There were approximately 78,000 grade A-D UK occurrences reported to the MOR scheme in the period 1998-2007. Figure 81 shows the number of reports received per year, divided by the severity grading. A rate of occurrence has been calculated using NATS "General Air Traffic" movements, as a three-year moving average.

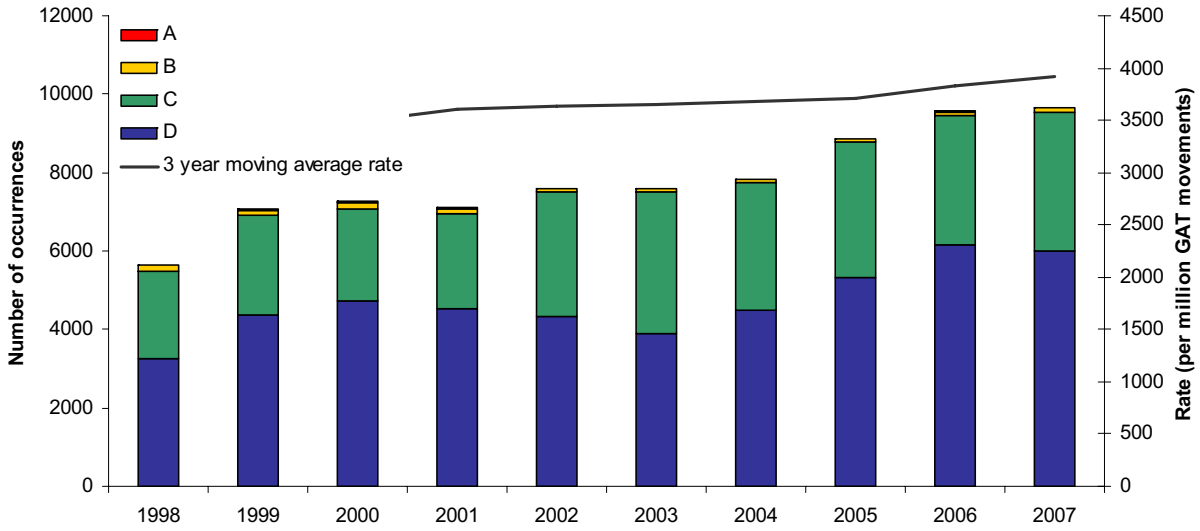

Figure 81 Number and rate of UK MORs per year

1.6.3 Approximately 1,200 UK occurrences were considered to be high-severity, corresponding to 1.6%. The scale of Figure 81 obscures the trend in high-severity (grade A or B) occurrences, therefore Figure 82 shows the number of high-severity occurrences without the more numerous grade C and D occurrences.

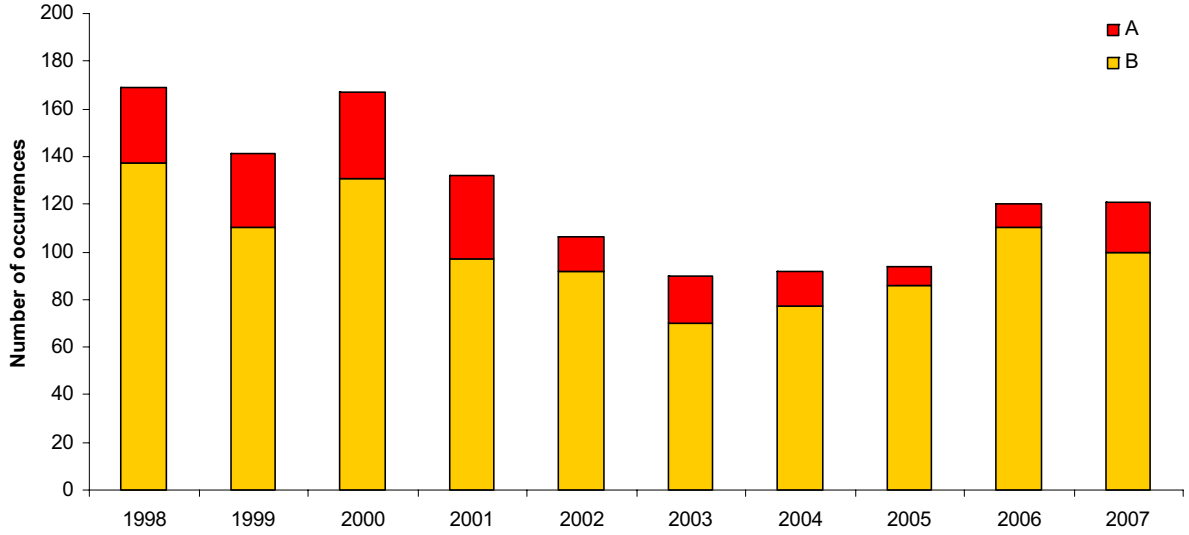

Figure 82 Number of high-severity occurrences per year

1.6.4 Figure 83 shows the rate of high-severity occurrences, along with a three-year moving average.

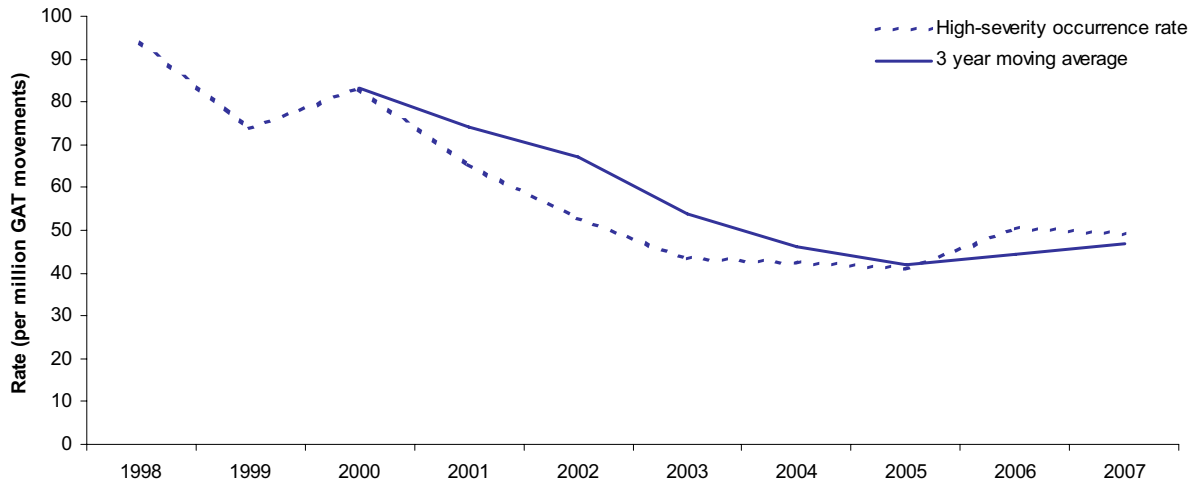

Figure 83 Rate of high-severity occurrences per million GAT movements

1.7 UK Reportable Accidents and Serious Incidents

1.7.1 Reportable accidents and serious incidents are classified as such by the UK Air Accidents Investigation Branch (AAIB), independently of the CAA or UK government. Definitions of a reportable accident and serious incident are available in Appendix 1. The reportable accidents analysed in this section only include occurrences that involved a UK-registered or operated aircraft or which occurred in UK airspace.

1.7.2 In the period 1998-2007, there were approximately 2,600 reportable accidents and 300 serious incidents. Figure 84 shows the annual number of reportable accidents and serious incidents in the period analysed.

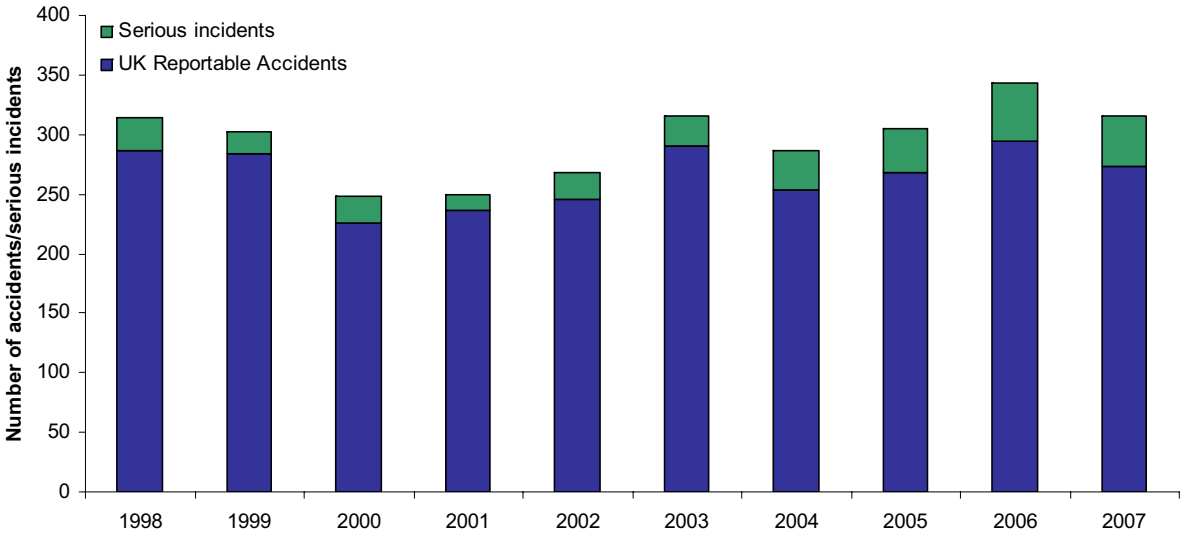

Figure 84 Number of reportable accidents and serious incidents per year

1.7.3 Figure 85 shows the rate of reportable accidents and serious incidents, along with a three-year moving average.

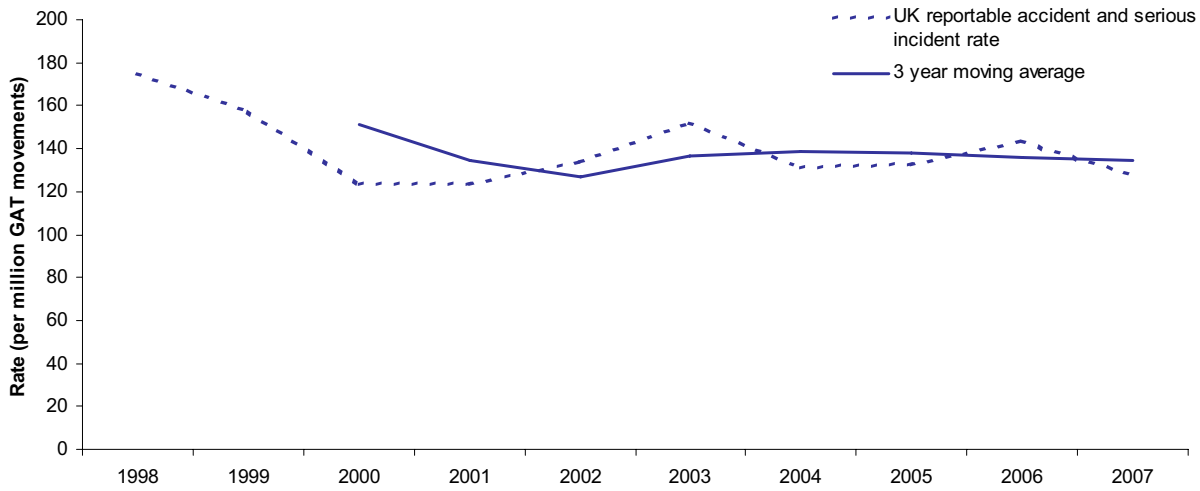

Figure 85 Rate of UK reportable accidents and serious incidents

Conclusions and Summary

1 Conclusions

1.1 This Aviation Safety Review provides an update to the statistics provided in previous versions of the review, primarily CAP 763. In doing so there have been two objectives: to provide a simple statistical overview of UK civil aviation safety; and to closely mirror the statistics provided in previous reviews, in order that current data remain comparable with historical data.

1.2 The CAA has intentionally avoided drawing conclusions from the statistics, but invites readers to make their own inferences.

1.3 Further statistical analysis of global fatal accidents is available in the Global Fatal Accident Review (CAP 776). The main safety concerns of the CAA and the safety planning process are discussed in the Safety Plan, which is published on the CAA website[1] and updated annually.

2 Summary

2.1 Worldwide Aviation Safety

2.1.1 Reportable accidents in worldwide aviation have been analysed using ICAO's Safety Indicator Study Group (SISG) data. Table 88 provides summary statistics for worldwide reportable accidents, as recorded by SISG.

Table 88 Worldwide reportable accident summary statistics

Total number of reportable accidents	1,420
Average number of reportable accidents per year	142
Most common phase of flight in reportable accidents	Landing (32%)
Most common reportable accident category	Runway excursion (19%)

2.1.2 Fatal accidents in worldwide aviation have been analysed using the CAA's Accident Analysis Group (AAG). Table 89 provides summary statistics for worldwide fatal accidents, as recorded by AAG.

Table 89 Worldwide fatal accident summary statistics

	Total	**Annual average**
Number of fatal accidents	247	24.7
Number of fatalities	8,110	811.0
Jet and turboprop fatal accident rate	0.5 per million hours	
Jet and turboprop fatality rate	15.9 per million hours	
Most common causal factor group	Flight crew (74%)	
Most common circumstantial factor	Poor visibility or lack of external visual reference (30%)	
Most common consequence	Post-crash fire (42%)	

1. See www.caa.co.uk/safetyplan

2.2 Aviation Safety in the European Union

2.2.1 Fatal accidents involving fixed-wing and passenger aircraft operated by European union based airlines were analysed using data from the AAG fatal accident database. Table 90 shows summary statistics for aviation safety in the European union.

Table 90 European union fatal accident summary statistics

	Total	Annual average
Number of fatal accidents	24	2.4
Number of fatalities	520	52
Fatal accident rate	0.2 per million hours	
Fatality rate	5.0 per million hours	
Most common causal factor group	Flight crew (75%)	
Most common circumstantial factor	Non-fitment of presently available safety equipment (33%)	
Most common consequence	Post-crash fire (42%)	

2.3 Safety of UK Public Transport Worldwide

2.3.1 The following tables show summary statistics for the safety of UK public transport aircraft worldwide. The source data is the mandatory occurrence reporting scheme (MORS) and the utilisation used for the rates are sourced from the CAA's air transport statistics department. Utilisation for public transport balloon operations is not available; therefore it has not been possible to calculate accident rates for this class of aircraft.

Table 91 Large UK public transport aeroplane statistics 1998-2007

Large aeroplanes	1998-2007
Number of occurrences	42,400
Number of reportable accidents	132
Number of fatal accidents	5

Table 92 Accident rates for large public transport aeroplanes

Large aeroplanes	1998-2007	2005-2007
Reportable accident rate per million hours	4.8	3.1
Fatal accident rate per million hours	0.2	0.0

Table 93 Small UK public transport aeroplane statistics 1998-2007

Small aeroplanes	1998-2007
Number of occurrences	650
Number of reportable accidents	22
Number of fatal accidents	2

Table 94 Accident rates for small public transport aeroplanes

Small aeroplanes	1998-2007	2005-2007
Reportable accident rate per million hours	53.0	44.3
Fatal accident rate per million hours	4.8	0.0

Table 95 UK public transport helicopter statistics 1998-2007

Helicopters	1998-2007
Number of occurrences	2,400
Number of reportable accidents	25
Number of fatal accidents	4

Table 96 Accident rates for public transport helicopters

Helicopters	1998-2007	2005-2007
Reportable accident rate per million hours	19.1	11.8
Fatal accident rate per million hours	3.1	2.4

Table 97 UK public transport balloon statistics 1998-2007

Balloons	1998-2007
Number of occurrences	100
Number of reportable accidents	27
Number of fatal accidents	0

2.4 Safety of UK Non-public Transport Worldwide

2.4.1 The safety of UK non-public transport was analysed using data from MORS. Where possible rates have been calculated using utilisation from the CAA aircraft register. The British Gliding Association (BGA) has provided glider statistics, therefore CAA data is not used for this class of aircraft.

Table 98 Large non-public transport aeroplane summary statistics

Large aeroplanes	1998-2007
Number of occurrences	6,700
Number of reportable accidents	21
Number of fatal accidents	2

Table 99 Small conventional aeroplane non-public transport summary statistics

Small conventional aeroplanes	1998-2007
Number of reportable accidents	1,500
Number of fatal accidents	96

Table 100 Small conventional aeroplane non-public transport accident rates

Small conventional aeroplanes	1998-2007	2005-2007
Reportable accident rate per million hours	179.0	164.9
Fatal accident rate per million hours	11.7	11.9

Table 101 Small helicopter non-public transport summary statistics

Small helicopters	1998-2007
Number of reportable accidents	213
Number of fatal accidents	24

Table 102 Small helicopter non-public transport accident rates

Small helicopters	1998-2007	2005-2007
Reportable accident rate per million hours	127.4	102.4
Fatal accident rate per million hours	14.4	8.7

Table 103 Airship summary statistics

Airships	1998-2007
Number of reportable accidents	1
Number of fatal accidents	0

Table 104 Balloon summary statistics

Balloons	1998-2007
Number of reportable accidents	21
Number of fatal accidents	0

Table 105 Glider summary statistics

Gliders	1998-2007
Number of reportable accidents	436
Number of fatal accidents	36

Table 106 Glider accident rates

Gliders	1998-2007	2005-2007
Reportable accident rate	306.3	318.0
Fatal accident rate	24.6	19.4

Table 107 Gyroplane summary statistics

Gyroplanes	1998-2007
Number of reportable accidents	25
Number of fatal accidents	8

Table 108 Gyroplane accident rates

Gyroplanes	1998-2007	2005-2007
Reportable accident rate per million hours	1340.2	645.8
Fatal accident rate per million hours	428.9	161.5

Table 109 Microlight summary statistics

Microlights	1998-2007
Number of reportable accidents	320
Number of fatal accidents	23

Table 110 Microlight accident rates

Microlights	1998-2007	2005-2007
Reportable accident rate per million hours	309.8	368.1
Fatal accident rate per million hours	22.3	25.3

2.5 Safety of UK Airspace and Aerodromes

2.5.1 The safety of UK airspace was analysed using data from MORS. Although there is no measure of the utilisation of all UK airspace (controlled and uncontrolled), data published by Eurocontrol shows that IFR traffic has increased by 35% between 1998 and 2007.

2.5.2 The number of occurrences and accidents involving foreign-registered aircraft in UK airspace is shown in Table 111.

Table 111 Foreign registered aircraft in UK airspace summary statistics

Foreign-registered aircraft in UK airspace	1998-2007
Number of occurrences	11,000
Number of reportable accidents	203
Number of fatal accidents	20

2.5.3 The number of ATC occurrences in UK airspace is shown in Table 112.

Table 112 UK ATC occurrences summary statistics

ATC occurrences in UK airspace	1998-2007
All ATC occurrences (excluding Airprox)	21,000
Runway incursions	956
Level busts	4,500

2.5.4 The number of aerodrome-related occurrences at UK licensed aerodromes is shown in Table 113.

Table 113 UK aerodrome summary statistics

UK aerodrome occurrences	1998-2007
All UK aerodrome occurrences	5,400
Ground damage	750
Loading errors	800

3 Comparison with Previous Edition

3.1 The following tables compare statistics presented in the summary of the previous edition of the Aviation Safety Review (CAP 763) with those presented in this review. The content of the Chapter "Aviation Safety in the European Union" has changed substantially between CAP 763 and CAP 780, therefore it is not possible to compare data from the two versions. Where the definition of an occurrence type or reporting requirement has changed slightly, the data is not directly comparable; differences of this type have been highlighted in the tables. In many cases, rates have been re-calculated since the publication of CAP 763 as new utilisation data have become available. As a result, some of the rates for the period 1995-2004 differ between this document and CAP 763.

3.2 Worldwide Aviation Safety

Table 114 Comparison of worldwide aviation safety 1995-2004 and 1998-2007

		1995-2004	1998-2007
Average number of reportable accidents per year		170	142
Average number of fatal accidents per year	Jets	11	10
	Turboprops	14	13
	Business jets	2	2
Average number of fatalities per year	Jets	744	653
	Turboprops	216	151
	Business jets	10	7

3.3 Safety of UK Public Transport Aircraft Worldwide

Table 115 Comparison of large public transport aeroplane safety, CAP 763 and CAP 780

		1995-2004	1998-2007
Large aeroplanes	Number of occurrences	32,000	42,400
	Number of reportable accidents	162	132
	Number of fatal accidents	5	5
		2002-2004	**2005-2007**
	Three-year moving average reportable accident rate (per million hours)	6.7	3.1
	Three-year moving average fatal accident rate (per million hours)	0	0

Table 116 Comparison of small public transport aeroplane safety, CAP 763 and CAP 780

		1995-2004	1998-2007
Small aeroplanes	Number of occurrences	500	650
	Number of reportable accidents	22	22
	Number of fatal accidents	5	2
		2002-2004	**2005-2007**
	Three-year moving average reportable accident rate (per million hours)	50.3	44.3
	Three-year moving average fatal accident rate (per million hours)	0	0

Table 117 Comparison of public transport helicopter safety, CAP 763 and CAP 780

		1995-2004	1998-2007
Helicopters	Number of occurrences	2,200	2,400
	Number of reportable accidents	31	25
	Number of fatal accidents	4	4
		2002-2004	**2005-2007**
	Three-year moving average reportable accident rate (per million hours)	17.7	11.8
	Three-year moving average fatal accident rate (per million hours)	2.5	2.4

Table 118 Comparison of public transport balloon safety, CAP 763 and CAP 780

		1995-2004	1998-2007
Balloons	Number of occurrences	100	100
	Number of reportable accidents	26	27
	Number of fatal accidents	1	0

3.4 Safety of UK Non-public Transport Aircraft Worldwide

Table 119 Comparison of non-public transport large aeroplane safety, CAP 763 and CAP 780

		1995-2004	1998-2007
Large aeroplanes	Number of occurrences	6,700	6,700
	Number of reportable accidents	19	21
	Number of fatal accidents	3	2

Table 120 Comparison of non-public transport small conventional aeroplane safety, CAP 763 and CAP 780

		1995-2004	1998-2007
Small conventional aeroplanes	Number of reportable accidents	1,600	1,500
	Number of fatal accidents	102	96
		2002-2004	**2005-2007**
	Three-year moving average reportable accident rate (per million hours)	175.3	164.9
	Three-year moving average fatal accident rate (per million hours)	7.2	11.9

Table 121 Comparison of non-public transport small helicopter safety, CAP 763 and CAP 780

		1995-2004	1998-2007
Small helicopters	Number of reportable accidents	214	213
	Number of fatal accidents	27	24
		2002-2004	**2005-2007**
	Three-year moving average reportable accident rate (per million hours)	134.7	102.4
	Three-year moving average fatal accident rate (per million hours)	20.4	8.7

Table 122 Comparison of non-public transport airship safety, CAP 763 and CAP 780

		1995-2004	1998-2007
Airships	Number of reportable accidents	1	1
	Number of fatal accidents	0	0

Table 123 Comparison of non-public transport balloon safety, CAP 763 and CAP 780

		1995-2004	1998-2007
Balloons	Number of reportable accidents	23	21
	Number of fatal accidents	0	0

Table 124 Comparison of non-public transport glider safety, CAP 763 and CAP 780

		1995-2004	1998-2007
Gliders	Number of reportable accidents	430	436
	Number of fatal accidents	38	36
		2002-2004	**2005-2007**
	Three-year moving average reportable accident rate (per million hours)	285.4	318.0
	Three-year moving average fatal accident rate (per million hours)	25.5	19.4

Table 125 Comparison of non-public transport gyroplane safety, CAP 763 and CAP 780

		1995-2004	1998-2007
Gyroplanes	Number of reportable accidents	31	25
	Number of fatal accidents	8	8
		2002-2004	**2005-2007**
	Three-year moving average reportable accident rate (per million hours)	1,785.2	645.8
	Three-year moving average fatal accident rate (per million hours)	595.1	161.5

Table 126 Comparison of non-public transport microlight safety, CAP 763 and CAP 780

		1995-2004	1998-2007
Microlights	Number of reportable accidents	251	320
	Number of fatal accidents	23	23
		2002-2004	**2005-2007**
	Three-year moving average reportable accident rate (per million hours)	285.5	368.1
	Three-year moving average fatal accident rate (per million hours)	20.2	25.3

3.5 Safety of UK Airspace and Aerodromes

Table 127 Comparison of the safety of foreign-registered aircraft in UK airspace, CAP 763 and CAP 780

		1995-2004	1998-2007
Foreign registered aircraft in UK airspace	Number of occurrences	4,700	11,000
	Number of reportable accidents	198	203
	Number of fatal accidents	19	20

Table 128 Comparison of ATC occurrences, CAP 763 and CAP 780

		1995-2004	1998-2007
ATC Occurrences in UK airspace	Number of occurrences (excluding Airprox)	16,500	21,000
	Runway incursions	504	902*
	Level busts	3,300	4,500

*The definition of a runway incursion was changed in 2007, this figure represents the number of runway incursions had the definition remained the same. The total number of runway incursions under the new definition is 956.

Table 129 Comparison of aerodrome occurrences, CAP 763 and CAP 780

		1995-2004	1998-2007
UK aerodromes	Number of occurrences	4,300	5,400
	Ground damage	775	750
	Loading errors	621	800

Appendix 1 Definitions

Accident

See reportable accident.

Africa

Algeria
Angola
Benin
Botswana
British Indian Ocean Territory
Burkina Faso
Burundi
Cameroon
Cape Verde Islands
Central African Republic
Chad
Comoros
Congo
Congo (Democratic Republic)
Djibouti
Egypt
Equatorial Guinea
Eritrea
Ethiopia
Gabon
Gambia
Ghana
Guinea
Guinea-Bissau
Ivory Coast
Kenya
Lesotho
Liberia
Libya
Madagascar
Malawi
Mali
Mauritania
Mauritius
Morocco
Mozambique
Namibia
Niger
Nigeria
Reunion
Rwanda
Saint Helena
Sao Tome and Principe
Senegal
Seychelles
Sierra Leone
Somalia
South Africa
Sudan
Swaziland
Tanzania
Togo
Tunisia
Uganda
Western Sahara
Zambia
Zimbabwe

(Source – ICAO Safety Indicators Study Group)

Airline

Commercial air carrier carrying revenue paying passengers and cargo.

(Source – CAA)

Air taxi

Small airlines, none of whose aircraft capacities exceed 20 seats, or sole use charter flights utilising aircraft of less than 15 tonnes MTWA, i.e. small scale scheduled, charter and air taxi operations.

(Source – CAA)

Air Transport Movement (ATM)

A landing or a take-off of aircraft engaged on the transport of passengers, cargo or mail on commercial terms. All scheduled movements, including those operated empty, loaded charter and air taxi movements are included.

(Source – CAA)

Airprox

A situation in which, in the opinion of a pilot or a controller, the distance between aircraft as well as their relative positions and speed have been such that the safety of the aircraft involved was or may have been compromised.

(Source – UK Airprox Board)

Asia

Afghanistan
Bangladesh
Bhutan
Brunei
Cambodia
China
East Timor
Hong Kong
India
Indonesia
Japan
Kazakhstan
Kyrgyzstan
Laos
Macau
Malaysia
Maldives
Mongolia
Myanmar
Nepal
North Korea
Pakistan
Philippines
Singapore
South Korea
Sri Lanka
Taiwan
Tajikistan
Thailand
Turkmenistan
Uzbekistan
Vietnam

(Source – ICAO Safety Indicators Study Group)

Causal factor

An event or item that was directly instrumental in the causal chain of events leading to the accident.

(Source – CAA)

Central and South America and Caribbean

Anguilla
Antigua and Barbuda
Argentina
Aruba
Bahamas
Barbados
Belize
Bermuda
Bolivia
Brazil
Cayman Islands
Chile
Colombia
Costa Rica
Cuba
Dominica
Dominican Republic
Ecuador
El Salvador
Falkland Islands
French Antilles
French Guiana
Grenada
Guadeloupe
Guatemala
Guyana
Haiti
Honduras
Jamaica
Martinique
Mexico
Montserrat
Netherlands Antilles
Nicaragua
Panama
Paraguay
Peru
Puerto Rico
Saint Barthelemy
Saint Kitts and Nevis
Saint Lucia
Saint Martin
Saint Vincent and the Grenadines
Suriname
Trinidad and Tobago
Turks and Caicos Islands
Uruguay
Venezuela
Virgin Islands (British)
Virgin Islands (US)

(Source – Combined ICAO Safety Indicators Study Group regions "Central America and Caribbean" and "South America")

Circumstantial factor

An event or item that was not directly in the causal chain of events but could have contributed to the accident.

(Source – CAA)

Consequence

Outcome of the accident.

(Source – CAA)

Emergency services

An aircraft being used for the purpose of police support, ambulance or search and rescue (SAR).

(Source – CAA)

Europe (as applicable to Chapter 2)

Albania
Andorra
Armenia
Austria
Azerbaijan
Azores
Belarus
Belgium
Bosnia-Herzegovina
Bulgaria
Canary Islands
Croatia
Cyprus
Czech Republic
Denmark
Estonia
Faroe Islands
Federation of Serbia and Montenegro
Finland
France
Georgia
Germany
Gibraltar
Greece
Greenland
Hungary
Iceland
Ireland
Italy
Latvia
Liechtenstein
Lithuania
Luxembourg
Macedonia
Madeira
Malta
Moldova
Monaco
Montenegro
Netherlands
Norway
Poland
Portugal
Romania
Russia
San Marino
Serbia
Slovak Republic
Slovenia
Spain
Sweden
Switzerland
Turkey
Ukraine
United Kingdom

(Source – ICAO Safety Indicators Study Group)

Fatal accident

A reportable accident which results in fatal injury to any person in or upon the aircraft or by direct contact with any part of the aircraft, as defined in 'reportable accident'.

(Source – CAA)

Fatal injury

An injury which is sustained by a person in an accident and which results in his death within 30 days of the date of the accident.

(Source – ICAO)

Incident

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

(Source – ICAO)

Middle East

Bahrain	Kuwait	Republic of Yemen
Iran	Lebanon	Saudi Arabia
Iraq	Oman	Syria
Israel	Palestine	United Arab Emirates
Jordan	Qatar	Yemen

(Source – ICAO Safety Indicators Study Group)

Minor injury

An injury, other than fatal or serious, which is sustained by a person in a reportable accident.

(Source – CAA)

Non-public transport

All operations by UK operators other than public transport (as defined) including aerial applications, aerial survey, construction work, line inspections, club and group, business and executive, commercial operations, test, training, positioning and private flying.

(Source – CAA)

North America

Canada	Saint Pierre and Miquelon	USA

(Source – ICAO Safety Indicators Study Group)

Oceania

American Samoa	Marshall Islands	Pitcairn Island
Australia	Micronesia	Solomon Islands
Cook Islands	Midway	Tonga
Easter Island	Nauru	Tuvalu
Fiji	New Caledonia	Vanuatu
French Polynesia	New Zealand	Wake Island
Guam	Niue	Wallis and Futuna Islands
Johnston Island	Northern Marianas Islands	Western Samoa
Kiribati	Palau	
Line Islands	Papua New Guinea	

(Source – ICAO Safety Indicators Study Group)

Offshore

An aircraft being used for the purpose of carrying passengers or cargo to oil or gas platforms primarily in the North Sea or Irish Sea, or to drilling or support ships.

(Source – CAA)

Occurrence

Accidents, serious incidents and other incidents.

(Source – CAA)

Primary causal factor

The dominant causal factor of the accident as judged by the AAG.

(Source – CAA)

Public transport

Operations involving transport of passengers and/or cargo, or other revenue services including police, ambulance and search and rescue flights.

(Source – CAA)

Reportable 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 suffers a fatal or serious injury as a result of:

- being in or upon the aircraft;
- 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, tyres, brakes, fairings, small dents or puncture holes in the aircraft skin; or

c) the aircraft is missing or completely inaccessible.

(Source – ICAO)

Serious incident

An incident involving circumstances indicating that an accident nearly occurred.

(Source – ICAO)

Serious injury

An injury which is sustained by a person in an accident and which -

a) requires hospitalisation for more than 48 hours, commencing within seven days from the date the injury was received;

b) results in a fracture of any bone (except simple fractures of fingers, toes or nose);

c) involves lacerations which cause severe haemorrhage, nerve, muscle or tendon damage;

d) involves injury to any internal organ;

e) involves second or third degree burns, or any burns affecting more than 5 per cent of the body surface; or

f) involves verified exposure to infectious substances or harmful radiation.

(Source – ICAO)

State of registry

The State on whose register the aircraft is entered.

(Source – ICAO)

State of the operator

The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

(Source – ICAO)

Third party accident

An accident that involves injury to third parties only such as people on the ground, in another aircraft or vehicle.

(Source – CAA)

Appendix 2 Glossary

AAG	CAA Accident Analysis Group
AAIB	UK Air Accidents Investigation Branch
AIP	Aeronautical Information Publication
ALAR	Approach and Landing Accident Reduction task force
AOC	Air Operator's Certificate
ATA	Air Transport Association
ATC	Air Traffic Control
ATM	Air Transport Movement Air Transport Management
BBAC	British Balloon and Airship Club
BGA	British Gliding Association
BMAA	British Microlight Aircraft Association
CAA	UK Civil Aviation Authority
CAST	Commercial Aviation Safety Team
CFIT	Controlled Flight Into Terrain
CG	Centre of Gravity
CICTT	CAST/ICAO Common Taxonomy Team
EASA	European Aviation Safety Agency
EU	European Union
FAA	US Federal Aviation Administration
F-Post	Post-crash fire
FSF	Flight Safety Foundation
GNSS	Global Navigation Satellite System
HSE	UK Health and Safety Executive
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
LOC-I	Loss of control in-flight
MOR	Mandatory Occurrence Report
MORS	Mandatory Occurrence Reporting Scheme
MTWA	Maximum Take-off Weight Authorised
NTSB	US National Transportation Safety Board

SAR	Search And Rescue
SCF	System Component Failures
SCF-NP	System/component failure or malfunction - non powerplant
SISG	Safety Indicators Study Group
TAWS	Terrain Awareness and Warning System
UK	United Kingdom

Appendix 3 Terminology

1 Introduction

1.1 There are various terminologies used in the Aviation Safety Review with respect to accidents and incidents. Although a definitions list is provided in Appendix 1, this Appendix discusses the terms in more detail.

2 Background

2.1 In the 1930s H.W. Heinrich suggested that for every major injury accident there were approximately 30 minor injury accidents and 300 non-injury accidents. This information was presented as a pyramid, known as a Heinrich pyramid, with major injury accidents as the pinnacle and non-injury accidents at the base. Heinrich proposed that if the events at the bottom of the pyramid are identified and, where possible, corrected then the consequent effect would be the prevention of an event at the top of the pyramid. This concept is still used today and may be extended to include incidents and even unreported events as shown in figure A.3.1.

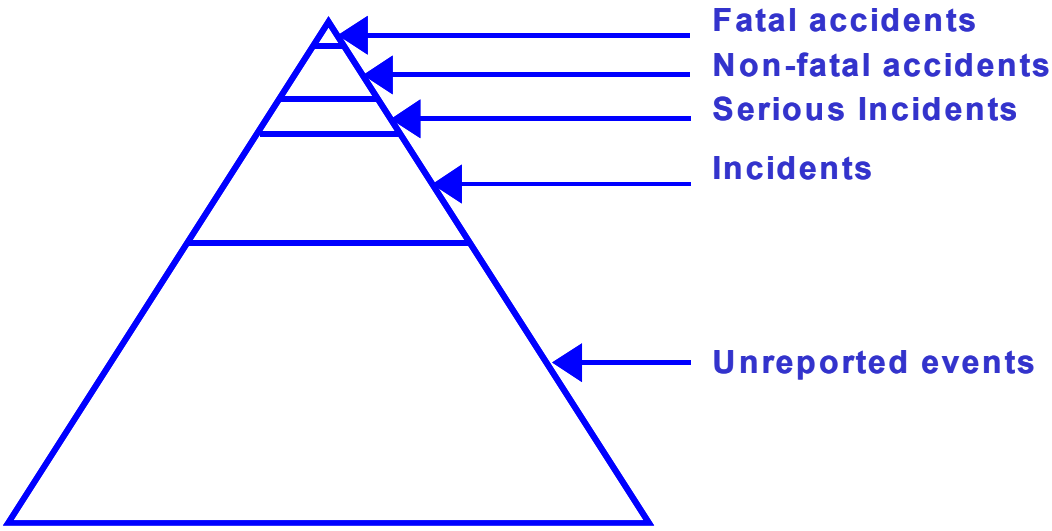

Figure A3.1

2.2 Within the UK, fatal accidents, non-fatal accidents, serious incidents and incidents are reported to the CAA through the Mandatory Occurrence Reporting (MOR) scheme. The Heinrich pyramid also suggests that there are a large number of events that remain unreported.

3 Data Types and Limitations

3.1 Occurrence

3.1.1 An occurrence is an umbrella term that covers both accidents and incidents. In the Aviation Safety Review an occurrence can be a fatal accident, a non-fatal accident, a serious incident or an incident. All of these occurrences are reported through the CAA's MOR scheme.

3.1.2 The MOR scheme was established in 1976 with the objectives of ensuring that the CAA is advised of hazardous or potentially hazardous occurrences, to disseminate knowledge of these occurrences so that lessons can be learnt and to allow an assessment of the safety implications of each occurrence so that necessary action can be taken. The emphasis of the scheme is that the information reported to CAA should be used to improve flight safety and not to attribute blame.

3.1.3 In the UK, criteria for reportable occurrences has been established in law since 1976. The European Union (EU), recognising the value of such a scheme in helping improve safety, produced a European Directive[1] that, with some modifications, mandates the MOR scheme for all EU Member States. The Directive was transposed into Article 142 of the Air Navigation Order (ANO) 2005.

3.1.4 The revised definition of a reportable occurrence from Article 142 of the ANO is as follows:

'occurrences which endanger or which, if not corrected, would endanger an aircraft, its occupants or any other person'

The types of persons required to report these occurrences are also outlined in Article 142. The amendments created by transposing the Directive into Article 142 of the ANO resulted in an expansion of the persons required to report to the MOR scheme. Personnel and companies performing ground-handling activities, such as re-fuelling or loading of the aircraft are now required by law to report occurrences to the CAA.

3.1.5 The definition of occurrence is necessarily subjective, given the complexity of the aviation industry. To assist industry, a list of examples is included in CAP 382[2] but the MOR database can never be a complete account of all incidents. However, the CAA believe that the reporting culture in the UK is good and improving, hence the data can be used to assist industry and CAA to address safety issues. The subjectivity in the scheme also means that each dataset must be viewed in context. For example, an increase in the number of reports, either in general or related to a specific issue, may at first glance appear to be a sign of decreasing safety levels. However, it must be borne in mind that an increase may be as a result of an improved reporting culture or increased awareness of an issue, often due to a CAA and industry campaign.

3.1.6 As with the previous MOR scheme, the Directive also encourages voluntary reporting outside the mandatory requirements.

3.1.7 The Civil Aviation (Investigation or Accidents and Incidents) Regulations require that accidents and serious incidents be reported to the Air Accidents Investigation Branch (AAIB). The AAIB can also elect to investigate an incident if it is felt to be appropriate. All occurrences reported to AAIB are forwarded to CAA for inclusion in the MOR database.

3.2 Incident

3.2.1 An incident is defined as an occurrence, other than an accident, that affects or could potentially affect aviation safety.

3.2.2 Serious incidents (see next section), as classified by AAIB, are a subset of incidents.

1. Directive 2003/42/EC of the European Parliament and of the Council on occurrence reporting in civil aviation.
2. CAP 382 The Mandatory Occurrence Reporting Scheme – Information and Guidance (can be viewed at www.caa.co.uk/CAP382)

3.3 Serious incident

3.3.1 A serious incident is defined as an incident that nearly resulted in an accident.

3.3.2 In the UK, the AAIB determine whether an incident should be classified as a serious incident.

3.3.3 The definition of a serious incident is subjective and this means that it is difficult to compare between countries or categories of operation. However, serious incidents can also be a useful measure of safety, as long as they are not used comparatively. Although serious incidents are classed as near-accidents, they tend to be potential severe accidents. An example of a serious incident could be a near collision with high ground, whereas a near collision with a vehicle on an aerodrome whilst taxiing would not be considered a serious incident.

3.4 Reportable accident

3.4.1 The full definition of a reportable accident from the UK Civil Aviation – Investigation of Air Accidents and Incidents – Regulations 1996 is as follows:

'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 suffers a fatal or serious injury as a result of:

- *being in or upon the aircraft;*
- *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, tyres, brakes, fairings, small dents or puncture holes in the aircraft skin; or

c) the aircraft is missing or completely inaccessible.'

3.4.2 An aircraft occurrence is typically designated by the AAIB as being a reportable accident if, as a result, a person has been fatally or seriously injured and/or the aircraft has sustained significant damage. An additional case that is defined as an accident is an aircraft that is missing or completely inaccessible. In all cases, the aircraft must be in flight or in the process of being prepared for a flight at the time of the accident.

3.4.3 The scale of severity of an accident can range from a complete loss of the aircraft and all of those persons on board, to a more minor event, for example a ground collision between an aircraft and an aerodrome vehicle that results in damage to the aircraft but not any injuries. This wide range of severity means that reportable accidents are not necessarily a good measure of safety, for example when comparisons are made between countries. Two countries may have equal rates of accidents but one country's accidents may all be catastrophic accidents, perhaps resulting in loss of life, whereas the other country's accidents may all be ground collisions with no loss of life.

3.4.4 This Review excludes accidents that result from violent causes, e.g. sabotage, war, hijack etc. from its statistics.

3.5 Fatal accident

3.5.1 Fatal accidents are a subset of reportable accidents.

3.5.2 The definition of a fatal accident derived from the definition of a reportable accident in the UK Civil Aviation – Investigation of Air Accidents and Incidents – Regulations 1996 is as follows:

A reportable accident which results in fatal injury to any person in or upon the aircraft or by direct contact with any part of the aircraft, as defined in 'reportable accident'.

3.5.3 The exceptions to the definition are when the fatal injury results from natural causes, is self inflicted or when the injury involves a stowaway hiding outside the areas normally available to passengers and crew.

3.5.4 A fatal injury is defined as an injury that results in death within thirty days of the accident. Fatal injuries are further sub-divided into onboard fatalities and third party fatalities. If the fatality occurs to persons outside the aircraft then these are treated as third party fatalities. Accidents involving only UK third party fatalities are excluded from the Review.

3.5.5 Fatal accidents are a good measure of safety in that they are tightly defined, which means that useful comparisons between different groups of accidents can be made. However, it can be difficult to identify trends within fatal accident data as they are relatively rare so the resulting dataset can be small.

3.6 Serious Injury

3.6.1 In addition to fatal injuries, serious injuries have their own specific definition.

3.6.2 For an injury to be 'serious', a person must have been hospitalised for more than 48 hours (within 7 days of the accident), fractured major bones, suffered significant lacerations, suffered internal organ damage, received serious burns or been subject to exposure to infectious substances or significant radiation.

3.7 95% confidence levels

3.7.1 The majority of the statistics covered in the Review are actual numbers, or rates, of occurrences that have been recorded over time. However, within Chapter 2, a statistical method is used where a level of confidence has been applied to the data.

3.7.2 Where the aircraft population is relatively small and the associated fatal accident rate is very low, the fatal accident rate may be misleading because of the small sample size of the population used. Such a fatal accident rate would be considered to have a low level of statistical confidence.

3.7.3 To overcome this problem, and establish a consistent level of confidence for fatal accident rates of different populations, an accepted approach is to employ the Poisson distribution. This is used to determine the fatal accident rate that, to a given level of confidence, is unlikely to be exceeded.

3.7.4 A level of confidence commonly employed in statistical comparisons is 95%. Lowering the confidence level employed (for example to 90%) results in the calculated fatal accident rate being closer to its historical value but does mean that there is a greater chance of the fatal accident rate being exceeded.

3.7.5 With small samples, the 95% confidence fatal accident rate can be large relative to the historical value but, as the sample increases, the gap between the historical value and the 95% confidence fatal accident rate decreases, i.e. there is a greater confidence in the fatal accident rate as a whole.

3.7.6 The concept of 95% confidence levels can be better explained with an example:

Between 1995 and 2004 the fleet in country A has accumulated a total of one million flying hours and has been involved in one fatal accident. Over the same time period, the fleet in country B has accumulated a total of ten million flying hours and has been involved in ten fatal accidents.

The historical fatal accident rate for country A is calculated to be 1 per million hours. The historical fatal accident rate for country B is also calculated to be 1 per million hours. These fatal accident rates are shown in Figure A3.2.

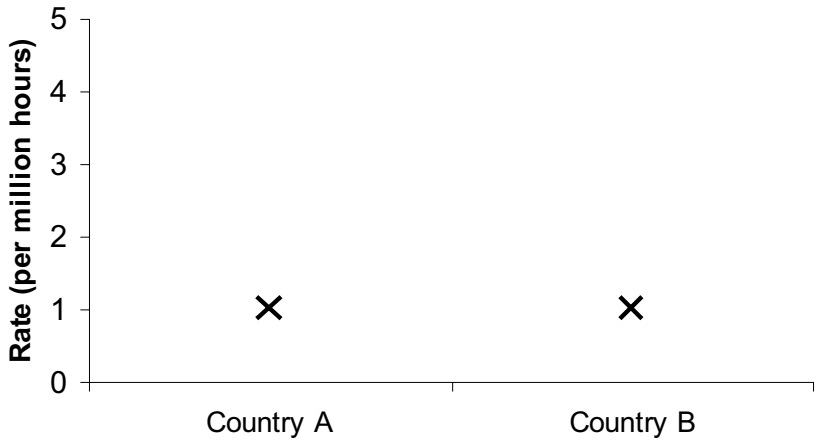

Figure A3.2 Historical fatal accident rates

Although the historical fatal accident rates are identical, is it really true that the safety level in both countries is identical? The fleet in country A has only accumulated one million flying hours and although has been involved in one fatal accident, it may be that they can generate another five million hours before being involved in another fatal accident. Because the amount of utilisation generated is relatively low, the uncertainty in the true level of safety for country A is high. The fleet in country B has accumulated a greater amount of utilisation and has also been involved in more accidents. As there is more data available for country B, there can be more certainty in the level of safety achieved. To establish a consistent level of confidence for both countries, the Poisson distribution is used to generate 95% confidence fatal accident rates.

The 95% confidence fatal accident rate for country A is calculated to be 4.7 per million hours (i.e. there is a 95% confidence that the fatal accident rate for country A will fall below 4.7 per million hours). The 95% confidence fatal accident rate for country B is calculated to be 1.7 per million hours (i.e. there is a 95% confidence that the fatal accident rate for country A will fall below 1.7 per million hours). These fatal accident rates are shown in figure A3.3 along with the historical fatal accident rates from figure A3.2.

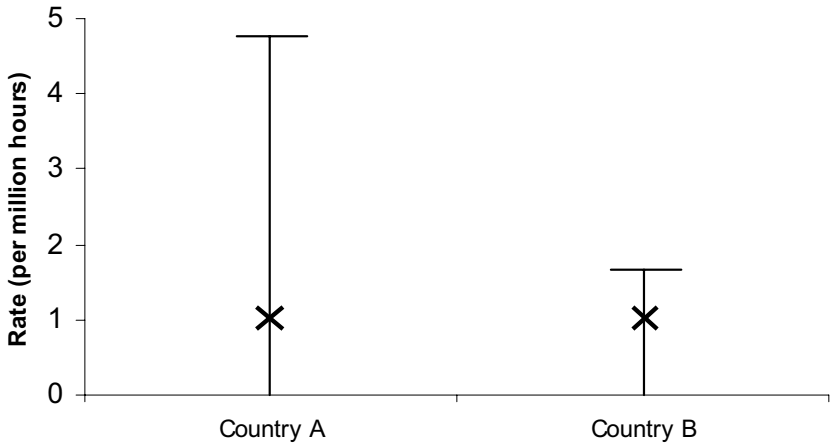

Figure A3.3 95% confidence fatal accident rates

It can be seen that the fatal accident rates for the countries have changed from identical point values to differing ranges of values. The uncertainty in the safety level in country A is illustrated by the 95% confidence fatal accident rate starting at 4.7 per million hours. The greater certainty in the safety level in country B is illustrated by the 95% confidence fatal accident rate starting closer to the original historical rate.

Appendix 4 Occurrence Grading

1 Introduction

1.1 In 1998, the CAA established a system of grading the occurrences according to risk. As has been discussed in Appendix 3 - Types of Occurrence, a reportable accident is not necessarily an indication of the risks associated with the accident. Therefore a risk grading system was developed in order to provide better analysis of occurrences, allowing better management information within the CAA.

2 Occurrence Grading Criteria

2.1 The occurrence grading criteria are based on the severity of the occurrence and the likelihood of recurrence, creating an overall assessment of risk.

2.2 **Severity**

2.2.1 The severity of the occurrence is graded as described in Table 130:

Table 130 Occurrence grading severity categories

Severity	A (Severe)
	B (High)
	C (Medium)
	D (Low)
	E (Non-significant)

2.2.2 Occurrences are assessed for their severity when they first arrive with the MOR scheme. This initial assessment may be re-evaluated on receipt of supplementary information or following further investigation.

2.2.3 When assessing the severity of an occurrence, the criteria used depends on whether the occurrence is Air Traffic Management (ATM) related.

2.2.4 Non-ATM related occurrences are assessed in terms of the numbers of injuries that resulted, the ability to continue safe flight and landing and/or the effect on flight crew workload, aircraft strength/integrity, and/or aircraft performance/handling. For example, a severe (A) Non-ATM occurrence would be one where there was a catastrophic, or potentially catastrophic, event or an inability to continue safe flight and landing. All fatal accidents are considered to be severe and are graded as such.

2.2.5 ATM occurrences are assessed in terms of the proximity of the aircraft involved, the ability of the pilot/controller to correct the situation, the workload of the controllers and/or ATC system failures. For example, a severe (A) ATM occurrence would be one where there were aircraft in very close proximity or a mid-air collision.

2.2.6 Occurrences are assigned an occurrence grade 'E' if they are not considered reportable in accordance with the European Directive 2003/42 on occurrence reporting in civil aviation (copied in CAP 382) or if they are required to be reported for statistical purposes only e.g. PAN call made for an expeditious approach due to a passenger medical emergency on board, with no associated flight safety hazard.

2.2.7 For analysis purposes, occurrences are considered to be high severity events if they have been assigned an A or B grade.

2.3 Likelihood of Recurrence

2.3.1 The likelihood, or probability, of an event is assessed using the three categories shown in Table 131:

Table 131 Occurrence grading probability categories

Probability	1 (High)
	2 (Medium)
	3 (Low)

2.3.2 When the severity has been assigned, the probability is then added, using the following criteria:

1 HIGH A significant number of similar incidents already on record.
Has occurred several times to aircraft of the type or a significant number of times at the same location or involving the particular ground based system.

2 MEDIUM Several similar incidents on record, has occurred more than once to aircraft of the type or similar, or more than once at the same location, or more than once to similar ground based systems.

3 LOW Only very few similar incidents on record when considering a large fleet, or no records on a small fleet.
No similar incidents on record when considering a particular location or ground based system.

2.4 Risk Grading

2.4.1 The severity and likelihood of recurrence are combined to create the following occurrence grading user matrix:

Table 132 Occurrence grading user matrix

SEVERITY	SEVERE A	**A1**	**A2**	**A3**
	HIGH B	**B1**	**B2**	**B3**
	MEDIUM C	**C1**	**C2**	**C3**
	LOW D	**D1**	**D2**	**D3**
		1 HIGH	2 MEDIUM	3 LOW
		PROBABILITY		

Appendix 5 Aircraft Types

1 Introduction

1.1 Within the Review a distinction is made between small aeroplanes and large aeroplanes. Small aeroplanes are defined to have a maximum take-off weight authorised (MTWA) not exceeding 5,700kg whereas large aeroplanes are defined as having an MTWA exceeding 5,700kg.

1.2 There are some aeroplanes where the weight of the original type did not exceed 5,700kg MTWA, but where subsequent variants have exceeded this weight, e.g. Embraer EMB110 Bandeirante. For purposes of consistency, all variants are categorised using the weight limit of the original type.

1.3 It is not practical to list all the aircraft types that are included within the Review broken down as to whether they are considered 'large' or 'small' because the lists would be too large. However, it is possible to show those types typically used for public transport.

1.4 Table A5.1 shows public transport aircraft types that have been considered 'large' for analysis purposes, by class of aircraft.

Table A5.1 Large public transport aircraft types

Jets		
Airbus A300	BAe 146	Embraer RJ135
Airbus A310	Boeing 707	Embraer RJ145
Airbus A319	Boeing 727	Fokker 70
Airbus A320	Boeing 737	Fokker 100
Airbus A321	Boeing 747	Lockheed L1011 Tristar
Airbus A330	Boeing 757	McDonnell-Douglas DC8
Airbus A340	Boeing 767	McDonnell-Douglas DC9
Avroliner RJ	Boeing 777	McDonnell-Douglas DC10
BAC/Aerospatiale Concorde	Bombardier Regional Jet RJ700	McDonnell-Douglas MD-80
BAe (BAC) 111	Canadair Regional Jet	
Turboprops		
ATR 42	DHC-8 Dash 8	Lockheed L-188 Electra
ATR 72	Dornier 228	Saab Fairchild 340
BAe (H.P) Jetstream 31/32	Dornier 328	Shorts Belfast
BAe (HS) 748	Fairchild Hillier FH227B	Shorts SD330
BAe ATP	Fairchild SA-227 Metro III	Shorts SD360
BAe Jetstream 41	Fokker 50	V953C Merchantman
Beech 1900	Fokker F27	Viscount 800
DHC-7 Dash 7	Handley Page Herald	

Table A5.1 Large public transport aircraft types (Continued)

Pistons		
Douglas DC3	Douglas DC6	Scottish Aviation Twin Pioneer
Business Jets		
Airbus A319 CJ	Cessna 550	Dassault Mystere-Falcon 90
BAe (HS) 125	Cessna 560	Dassault Mystere-Falcon 2000
Beech 400 Beechjet	Cessna 650	Gulf American Gulfstream IV
Boeing BBJ	Cessna 750	Learjet
Canadair Challenger	Dassault Mystere-Falcon 20	
Canadair Global Express	Dassault Mystere-Falcon 50	

1.5 Table A5.2 shows public transport aircraft types that have been considered 'small' for analysis purposes.

Table A5.2 Small public transport aircraft types

Business jets		
Cessna 500	Cessna 525	Raytheon Premier 1
Turboprops		
Beech King Air	DHC-6 Twin Otter	Rockwell Turbo Commander
Beech Super King Air	Embraer EMB110 Bandeirante	
Cessna 441	Reims-Cessna 406	
Pistons		
Beech Baron 55/58	Cessna 337	Partenavia P68
Cessna 150	Cessna 340	Pilatus BN Islander
Cessna 152	Cessna 401	Pilatus BN Trislander
Cessna 172	Cessna 402	Piper PA-23
Cessna 180	Cessna 404	Piper PA-28
Cessna 182	Cessna 411	Piper PA-31
Cessna 206	Cessna 414	Piper PA-32
Cessna 210	Cessna 421	Piper PA-34
Cessna 310	DH 104 Dove	Tiger Moth
Cessna 320	DHC-2 Beaver	
Cessna 336	Dragon Rapide	