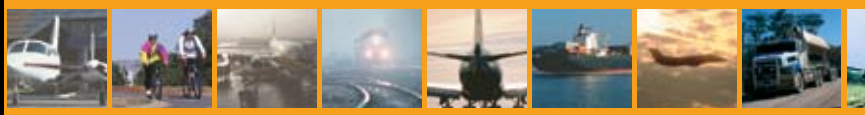
Australian Government
Australian Transport Safety Bureau

# The Australian



## Executive Director's Message

### Progress on ATSB Aviation Safety Research

To complement the independent investigation of transport accidents and incidents, the ATSB has a small aviation safety research program. Its aim is to provide data and analysis of current aviation safety issues to the aviation industry and members of the general public. Over the past 12 months, the ATSB has published 10 aviation safety research and analysis reports as well as eight reports funded by ATSB grants.

I think the study released in early 2006 that examined the trends in fatal accidents and fatalities involving Australian civil aviation aircraft between 1990 and 2005 injected some much-needed factual material into the public debate. It found that the number of reported fatal accidents and fatalities declined significantly during the reporting period for both commercial and non-commercial operations. However, the 2005 fatal accident at Lockhart River is a salient reminder that we cannot afford to become complacent.

Another research report examined accidents and incidents over a 30 year period that involved the use of either drugs or alcohol. The study found that the proven prevalence of drug and alcohol-related accidents and incidents in Australian civil aviation is very low. However, where drugs and alcohol have been involved in an accident, the results are very serious, with two thirds of these accidents resulting in fatalities. Moreover, pilots need to be mindful that taking over-the-counter medications can have serious and unintended consequences, such as impairing a pilot's ability or judgement. The paper provides a useful baseline analysis on the eve of new legislation that will introduce mandatory drug and alcohol testing into the Australian civil aviation industry.

The Bureau also released eight other aviation research reports. Three human factors reports included a 'layman's guide to human factors', the effects of depressurisation, and accidents and incidents involving pilot distraction. Two operations-related reports were on destination weather forecasts and on wire-strike accidents in GA. Investigation technique reports included Conversation analysis tools for interpreting voice recordings and Interpreting Measured Alcohol Levels, while procedures were dealt with in a report on Compliance in Mandatory Broadcast Zones.

The ATSB also released eight Aviation Safety Grant Reports. Please see feature article and ATSB website for details.

*Kym Bills, Executive Director*

## A comparison of Australian civil aviation fatality rates with international data

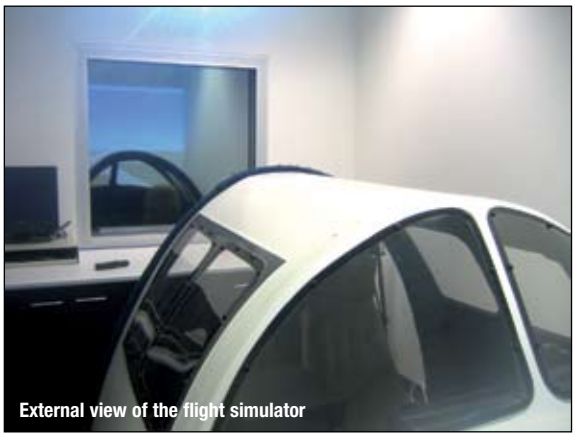
How does Australia's aviation safety record compare with that of other Western countries? To answer this, fatal accident and fatality rates for Australia were compared with similar rates for the United States, Canada, the United Kingdom, and New Zealand, between 1995 and 2004 (the latest year for which comparable data was available). The ATSB aviation accident and incident database was searched to identify all fatal accidents involving Australian civil registered aircraft during this period. The dataset was then matched with comparable datasets for the overseas countries, taking into consideration the variation in operational definitions between the countries. In the period studied, Australia had no high capacity regular public transport fatal accidents and one low capacity regular public transport fatal accident.

The key findings indicated that the fatal accident rate for Australian air carrier operations, which includes all regular public transport and commercial charter operations, was slightly higher than the rate for the United States for all years, except for 2002 when it was marginally lower, and for 2004, when the rate was zero. The fatal accident rates for the non-general aviation sector for both countries are largely influenced by the commercial charter (Australia) and on-demand (United States) operational categories, which each have a much higher fatal accident rate than scheduled airline services. In Australia, commercial charter operations account for 32 per cent of the total air carrier activity. This has a greater impact on the overall air carrier fatal accident rate compared with the United States, where on-demand operations account for only 15 per cent of the total air carrier activity. If Australia's activity profile mirrored that of the United States, Australia's overall fatal accident rate would fall below that of the United States. Both Australia and the United States recorded a significant downward trend for the general aviation fatal accident rate. For most years, the rate of fatal accidents for all operations in Australia was slightly lower than that for Canada. Australia also recorded a significant decline in the rate of non-public transport fatal accidents during this period compared with the United Kingdom. Australia recorded one low capacity regular public transport fatal accident, which resulted in eight fatalities, and New Zealand recorded two fatal accidents, which resulted in 10 fatalities. The general aviation fatal accident rate for Australia was lower than the rate recorded for New Zealand, and showed a downward trend. Overall, the findings showed that Australia's fatal accident and fatality rates were mostly similar to the corresponding rates of the other countries examined. Using North America and the United Kingdom to represent world's best practice and as a benchmark of aviation safety, the findings demonstrate that Australia has a good safety record. ▪

# An assessment of pilot performance during simulated flight

The primary aim of this study was the development of a set of normative data that captured the performance of a sample of general aviation pilots during a simulated flight from Wagga Wagga to Bankstown via Canberra, Goulburn and Mittagong. A secondary aim was to consider the impact of pilot qualification on the performance of pilots during the five legs of the flight.

Pilots were issued a completed flight plan and all the relevant documents necessary to complete the flight, including weather information, maps, and an aircraft checklist. A total of 34 pilots were recruited to undertake the flight and the exercise was conducted as it would be expected to occur within the operational environment. The experimenter acted as the Flightwatch operator and air traffic controller where necessary, and recorded the details of the flight.



External view of the flight simulator

Data pertaining to in-flight performance were recorded at a number of different levels of analysis, the first of which was pilots' own self-reports of their performance. Pilots' performance was also rated by an observer, and assessments were made on a number of different dimensions including the accuracy with which the aircraft was controlled, the accuracy of the track flown, the accuracy in maintaining the prescribed altitude, the level of fatigue management, and the appropriateness of the communication. The final level of analysis involved objective data that were recorded each second that the simulator was in operation. For each of the five legs of the flight, a set of geographic boundaries were identified and representative data that occurred with these boundaries were summarised using measures of central tendency.

In relation to the self-report data, pilots considered their performance in the flight simulator poorer than their performance in general. This may be explained by the difficulties that some pilots perceived in exercising control over the simulated aircraft. Indeed, of the eight dimensions assessed, aircraft control was associated with the lowest rating during the simulation. However, it should also be noted that relatively lower ratings were recorded for other variables including fuel management, fatigue management, scanning, and decision-making.

The observations of pilot performance revealed differences between perceived behaviour during the five legs of the flight. Specifically, performance during leg 5, the last leg, tended to be rated at a level consistently lower than performance during the preceding legs. Comparative analyses using pilot qualification as a between-groups factor failed to explain the basis for this difference in perceived performance.

The differences between the perceived performance of pilots in leg 5 and perceived performance during the preceding legs of the flight were further examined using the data recorded by the flight simulator. While differences were anticipated for variables such as altitude, it appeared that performance deteriorated on a range of variables, including the mean range of the heading and the mean range of the pitch angle of the aircraft. The variability in performance during the final leg of the flight could not be explained on the basis of pilot qualification, and suggests that other factors may be impacting on performance. It was considered that these factors might include the impact of fatigue and/or the impact of the demands in conducting a stepped descent to avoid violations of controlled airspace during the approach to Bankstown airport.

Overall, the data acquired in the present study represent a useful normative dataset against which the performance of pilots can be assessed in the future. As expected, there is a significant level of variability in the performance of pilots who conducted the simulated approach. This variability was most evident during the final stage of the flight when the demands on pilots were most acute and when the impact of fatigue was most likely to occur. This represents an avenue for future research and development. ■

*By Dr Mark Wiggins, MARCS Auditory Laboratories, University of Western Sydney*

This report arose from work funded through a grant under the Australian Transport Safety Bureau's Aviation Safety Research Grants Program which funds a number of one-off research projects on a competitive basis. The work reported and the views expressed herein are those of the author(s) and do not necessarily represent those of the Australian Government or the ATSB. However, the ATSB publishes and disseminates the grant reports in the interests of information exchange and as part of the overall safety aim of the grants program.

# Safety briefs

## Collision with ground

Occurrence 200501788

At about 0945 Eastern Standard Time on Saturday 23 April 2005, a Cessna Aircraft Company A150L Aerobat aircraft, registered VH-UPS, departed Coldstream Airfield, Vic, for a private flight in the Coldstream General Flying Training Area, with the pilot as the only occupant.

The aircraft was tracked by the Air Traffic Services radar after its departure from Coldstream Airfield. The radar track showed that the aircraft performed some aerial manoeuvres to the east of the airfield before a descending orbit into the Yarra Valley when radar contact was lost. At about that time a passenger in a vehicle travelling along the Healesville – Koo Wee Rup Road observed the aircraft flying at low level. Shortly after, the aircraft was seen in a steep dive before they lost sight of it. The occupants of the vehicle located the wreckage of the aircraft in an open field about 1 km west of the Healesville – Koo Wee Rup Road. The aircraft was destroyed by impact forces and the pilot was fatally injured.

The aircraft had impacted the ground in a left wing-low and nose-down attitude. The fuselage lay on its roof with the left wing wrapped over the cabin and the right wing in a near vertical position. The rear fuselage was bent downward and to the left. The tailplane had separated from the fuselage and the fin had broken away from its mounting brackets. There were no indications of a pre-existing defect in the structure.

The investigation found that it was likely that the pilot was performing a practice forced landing and had descended below the safe altitude when the accident occurred. The airspeed was reduced to a point that the aircraft stalled and the altitude was not sufficient to affect a recovery before impact with the ground. It is possible that carburettor ice was present during the descent. ■

## Collision between two aircraft

Occurrence 200600524

On 2 February 2006 at approximately 1308 Eastern Daylight-saving Time, a US registered Boeing Company 747-422 (747) aircraft was taxiing for departure at Melbourne Airport, Vic. At the same time, a Boeing Company 767-338ER (767) aircraft was stationary on taxiway Echo and waiting in line to depart from runway 16. The tail section of the 767 was protruding into taxiway Alpha while it was stationary on taxiway Echo awaiting a clearance to enter the runway.

The pilots of the 747 received a clearance to taxi, which included a taxi route from the international apron to the holding point on taxiway Bravo, for a departure from runway 16, via taxiways Uniform then Alpha. The pilot in command of the 747 deviated from the taxi clearance issued by the surface movement controller and turned the 747 right into taxiway Echo, to pass behind the 767. The left wing tip of the 747 collided with the right horizontal stabiliser of the 767 as the 747 crew attempted to manoeuvre behind the 767.

The taxiway dimensions and markings at Melbourne Airport complied with international standards and were suitable for use by the aircraft types involved in the occurrence.

The 747 crew was aware of the 767, and chose to pass behind it rather than wait on taxiway Alpha until the 767 was no longer obstructing the taxiway. The decision by the pilot in command of the 747 to deviate off the centreline of taxiway Alpha and taxi behind the 767 did not comply with the taxi clearance issued by the SMC. It was based on his assessment that it was safe to do so. The pilot in command of the 747 misjudged the distance between the wingtip of the 747 and the right horizontal stabiliser of the 767, which resulted in the collision. ■

## Loss of control in flight

Occurrence 200404589

On 21 November 2004, the crew of a Fairchild Industries SA227-AC Metro III aircraft, registered VH-TAG, was conducting an endorsement training flight near Lake George, 33 km north-east of Canberra Airport. The flight included a planned in-flight engine shutdown and restart, conducted at an altitude below 4,500 ft (about 2,200 ft above ground level (AGL)). During the engine restart preparation, the instructor departed from the published procedure by moving the power lever for the left engine into the beta range and directing the pilot to select the unfeather test switch. These actions were appropriate to prepare an engine for start on the ground with a feathered propeller, but not during an airstart. As a result, the propeller on the left engine became fixed in the start-locks position. The crew lost control of the aircraft and it descended 1,000 ft, to about 450 ft AGL, before they regained control. The crew could not diagnose the source of the loss of control and proceeded to start the left engine while the propeller was fixed on the start-locks. As a result, the crew lost control of the aircraft for a second time and it descended 1,300 ft, to about 300 ft AGL, before they regained control. The SA226 / SA227 aircraft contain no lockout system to prevent pilots from intentionally moving the power lever into the beta range during flight. It was the first time the instructor had given a Metro endorsement and he was subject to time pressure to complete the endorsement. His ongoing difficulties in adapting to his employment tasks were not successfully dealt with by the operator. He had a limited understanding of the aircraft's engine and propeller systems, and had not practiced an airstart for eight years as the CASA check and training approval did not include an assessment of all flight critical exercises. ■

## Collision with terrain

Occurrence 200504847

On the morning of 24 September 2005, a Raytheon Aircraft Company Beechcraft A-36 Bonanza, registered VH-BKM, was being flown by the owner pilot on a private flight from Murwillumbah, NSW, to Coonabarabran, NSW, with one passenger. The pilot had not submitted a flight plan or nominated a SARTIME and there was no requirement to do so.

The aircraft was reported to be missing on 28 September 2005 and a search was then commenced. The wreckage of the aircraft was located on 29 September 2005. The aircraft had impacted a heavily timbered hill on a private property 'Millera', located approximately 35 km east of Tenterfield. The aircraft had been destroyed by impact forces and a post-impact fire and both occupants were fatally injured. Witnesses reported clear weather in the vicinity of the accident site.

The recorded radar data indicated that the aircraft was maintaining a stable heading and altitude which was consistent with the autopilot having been engaged. The aircraft then descended from a cruising altitude of 6,500 ft above mean sea level (AMSL) to a final recorded altitude of 3,800 ft AMSL, at a rate of approximately 5000 ft/min.

The pilot was 71 years old and held both commercial and private pilot licenses for aeroplanes with a valid Class 2 medical. The maintenance records indicated that the aircraft had a valid maintenance release which was issued on 27 January 2005.

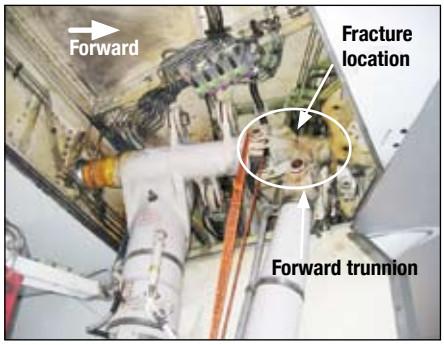
Weight and balance calculations showed that the aircraft was within centre of gravity limits for the final flight. Discolouration of tree foliage at the accident site and the extent of the post-impact fire indicated that fuel was present when the accident occurred.

The accident is consistent with the pilot becoming incapacitated, the aircraft departing controlled flight and subsequently impacting terrain. The possible reasons for any incapacitation could not be determined. ■

## Fatigue cracking of trunnion fork

Occurrence 200502400

At about 1200 Eastern Standard Time on 30 May 2005, a Boeing Co 747-300, registered JA8184, was being pushed back from its gate at Sydney International Airport for a scheduled passenger flight to Osaka, Japan. During pushback, the ground staff heard a loud cracking noise. The pushback was stopped and an inspection by the ground crew identified a structural failure in the left wing landing gear forward trunnion fork.




Examination of the trunnion fork revealed that it had failed due to fatigue cracking that had originated on the inner surface of the trunnion fork bore. It was found that the wall thickness at the crack origin was below the minimum allowed by the design and that the inner surface of the bore did not meet the specifications of the design. These factors contributed to the formation and development of the fatigue crack, which lead to the final failure on pushback.

The trunnion fork had amassed a total of 25,095 landing cycles and had been overhauled by the operator on four occasions. During the overhaul the item was inspected for cracks and on each occasion the item was passed. The inspection procedure was general for the item and did not specifically indicate that the area where the cracking originated required particular attention. The surface finish of the inner surface of the bore may have masked indications of any cracks that may have been present.

As a result of this occurrence, the aircraft manufacturer and the aircraft operator have commenced actions to determine the extent of the problem in the remaining fleet and improvements in the inspection of items during maintenance. ■

## Runway separation

Occurrence 200600633

On 24 January 2006 at 0644 Western Standard Time, a Boeing Company 737-800 (737) aircraft, registered VH-VXR, was lined up on the threshold of runway 06 at Perth Airport, WA, when the aerodrome controller (ADC) issued the crew a clearance for the aircraft to take off. The crew reported that at about the same time, a British Aerospace Plc 146-300 (146) aircraft, registered VH-NJN, crossed runway 06 in the vicinity of taxiway Charlie. The 737 copilot, the non-flying pilot, advised the ADC that '…we'll just wait for the 146 crossing the runway'. The crew delayed the aircraft's takeoff until the 146 had vacated and was taxiing away from the runway.

The ADC and Coordination controller considered that a runway separation standard would exist prior to the 737 commencing takeoff. The 737 crew reported that they were concerned at the taxi speed of the 146 and delayed the commencement of their takeoff until it had vacated the runway.

The incident highlighted the use of a Manual of Air Traffic Services (MATS) procedure for a situation for which it was not designed. The use of the adapted procedure by controllers has possibly reduced safety when used for runway crossing situations.

As an outcome from the investigation Airservices Australia has advised the Australian Transport Safety Bureau that it intends to:

- review the use of take off/landing clearance procedures during runway crossing situations, by aircraft and vehicles.
- review runway crossing procedures with a view to assessing the need for a specific runway standard for situations involving aircraft or vehicles crossing a runway during landing/take-off operations.
- review the use of memory prompts or aids by tower controllers in situations involving aircraft taxiing across a runway during landing/take-off operations. ■