Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT

Aviation Occurrence Investigation – 200607801

Final

Wirestrike - Nelson, Vic. - 24 December 2006

VH-ALO

Auster Aircraft Co. J1/A1

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Postal address: PO Box 967, Civic Square ACT 2608
Office location: 15 Mort Street, Canberra City, Australian Capital Territory
Telephone: 1800 621 372; from overseas + 61 2 6274 6440
Accident and incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6247 3117; from overseas + 61 2 6247 3117
E-mail: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

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Australian Transport Safety Bureau
PO Box 967, Civic Square ACT 2608 Australia
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Figure 1 - Google Earth satellite photograph.

Abstract

On 24 December 2006, an Auster J1/A1 aircraft, registered VH-ALO, departed from a private airstrip at Nelson Victoria with the pilot being the sole occupant on board.

During the initial climb out, the aircraft was observed making a low-level right turn towards two hangars where three people were standing to watch the departure.

The aircraft was observed striking powerlines. The aircraft impacted the ground inverted, at a steep angle. The pilot was fatally injured.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal bureau within the Australian Government Department of Infrastructure, Transport, Regional Development and Local Government. ATSB investigations are independent of regulatory, operator or other external bodies.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to enhance safety. To reduce safety-related risk, ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not the object of an investigation to determine blame or liability. However, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

The ATSB has decided that when safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed (for example the relevant regulator in consultation with industry) to assess the costs and benefits of any particular means of addressing a safety issue.

About ATSB investigation reports: How investigation reports are organised and definitions of terms used in ATSB reports, such as safety factor, contributing safety factor and safety issue, are provided on the ATSB web site www.atsb.gov.au.

FACTUAL INFORMATION

History of flight

On 24 December 2006, the owner-pilot of an Auster Aircraft Company J1/A1 aircraft, registered VH-ALO, planned to ferry the aircraft from a private airstrip at Nelson, Vic, to Akuna station, SA. The pilot was the sole occupant.

At approximately 0930 Eastern Daylight-saving Time[1], the pilot commenced a takeoff to the west. Three people were standing between two hangars that were to the north of the airstrip, where they had positioned themselves to watch the takeoff and bid the pilot farewell. They reported that the aircraft became airborne before it reached the taxiway leading from the hangars to the runway (Figure 1). When the aircraft was adjacent to the taxiway, it made a low-level right turn towards them.

Two of the witnesses, who were experienced pilots, recalled that the aircraft appeared to be in controlled flight following the take-off and that the engine sounded normal. They reported that the aircraft climbed suddenly just prior to striking powerlines. Following the wirestrike, there was an absence of engine noise as the aircraft climbed slowly on a north-westerly heading before it appeared to aerodynamically stall and impact the ground almost vertically. The pilot was fatally injured.

Figure 1 depicts the aircraft's approximate track, which was derived from the witness information, overlaid in yellow on a satellite photograph of the airstrip. One of the hangars, which is highlighted in blue, had not been constructed when the satellite photo was taken.

Figure 1: Aerial view of the aircraft flight path

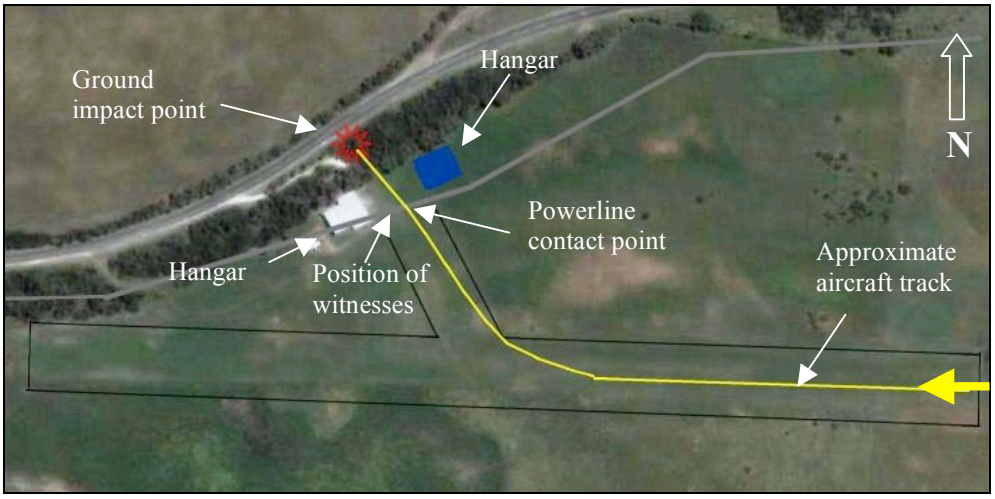
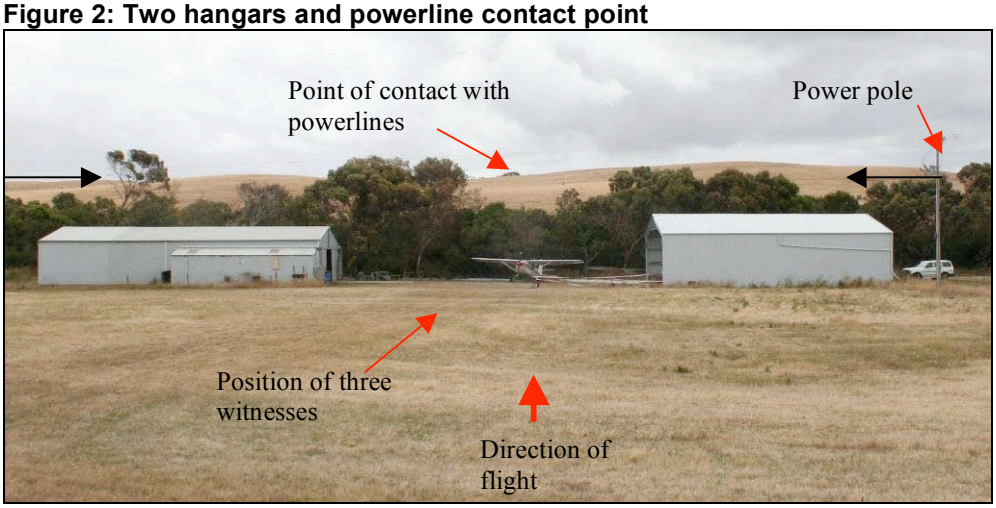


Photo courtesy of Google Earth

1 The 24 hour clock is used in this report to describe the local time of day. Eastern Daylight-saving Time was Co-ordinated Universal Time (UTC) + 11 hours.

Figure 2 shows the aircraft contact point with the powerlines. The three witnesses were located between the two hangars, almost directly beneath the powerlines. The aircraft impacted the ground directly behind the trees seen between the two hangars. The powerlines are indicated by black arrows.

Figure 2: Two hangars and powerline contact point



Pilot information

Pilots licence	Private Pilot (Aeroplane) Licence
Total flying experience	1,458 hrs
Flying experience on type	528.3 hrs
Medical certificate	Class 2 – valid to October 2008

Two of the witnesses reported that the pilot arrived at Nelson by road at approximately 2000 on the evening prior to the accident and went to bed at approximately 2230. At approximately 0830 the following morning, the pilot arrived at the private airstrip and proceeded to refuel and conduct a pre-flight inspection of the aircraft. The witnesses stated that they talked to the pilot and he appeared to be alert, well rested, and in a jovial mood.

Medical and pathological information

The results of the post-mortem examination indicated that the pilot died from injuries received from the ground impact. The report also stated that:

> The deceased had underlying natural disease in the form of an enlarged heart and marked coronary atherosclerosis[2].
>
> It is possible that this condition may have caused some degree of pilot incapacitation thus contributing to the accident.

The toxicology report stated that there were no alcohol or drugs detected in the pilots system, apart from a very small amount of Paracetamol consistent with normal therapeutic usage. The pilot's last civil aviation class 2 medical was carried out on 3 October 2006.

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2 Atherosclerosis – Disease affecting arterial blood vessels which causes them to narrow.

Survivability

The pilot received severe head injuries as a result of the aircraft ground impact forces. One of the witnesses stated that he observed the pilot enter the aircraft and secure his lap seatbelt but he did not secure his shoulder harness. Following the accident, it was also noted that the pilot was not secured by his shoulder harness.

Previous information has shown[3] that the use of a shoulder harness in conjunction with a lap seat belt can greatly improve the chances of survival in the event of an aircraft accident.

Airstrip information

The airstrip was privately owned and was mainly utilised for positioning aircraft for maintenance at an aircraft maintenance facility located at the airstrip. No commercial flying operations were conducted at the airstrip. The airstrip owner stated that pilots wanting to utilise the airstrip needed to obtain his express permission. If they had not flown to the airstrip before, he would brief them by phone and in some cases he would fax them a hand drawn map of the airstrip. A copy of the hand drawn map was viewed by the Australian Transport Safety Bureau (ATSB) and it clearly showed the location of the powerlines in relation to the runway. The pilot of VH-ALO had flown into and from the airstrip on a number of prior occasions and was familiar with the airstrip.

The airstrip had a grass surface, was approximately 600 metres long and 20 metres wide, and was oriented in an east-west direction with a wind sock located at the eastern end.

As the airstrip was privately owned and operated, there were no regulatory requirements or standards applicable. CASA published a Civil Aviation Advisory Publication (CAAP) No: 92-1 (1) which was titled, *A guideline for aeroplane landing areas* based on the requirements of *Civil Aviation Regulation* 92 (1) Civil Aviation Regulation 92 (1) placed the responsibility for establishing the suitability of landing areas with the pilot in command.

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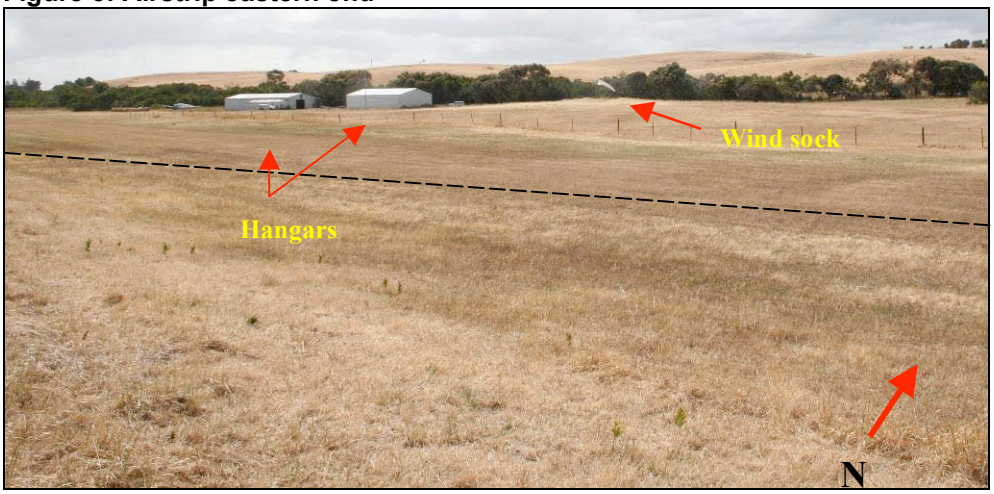
3 US Federal Aviation Administration - Seat Belts and Shoulder Harnesses, smart protection in small aeroplanes.

Civil Aviation Safety Authority – Proposed Airworthiness Directive – General Series – Discussion Paper – Upper Torso Restraints for Occupants in Small Aircraft.

Australian Transport Safety Bureau – Recommendation R19980281 – Passenger Seat Upper Body Restraint.

Figure 3 is a picture taken from the airstrip's eastern end with the hangars and wind sock in the background, the powerlines ran directly in front of the two hangers. The airstrip centreline has been highlighted with black dashes.

Figure 3: Airstrip eastern end



Powerline information

There were two powerline wires that ran parallel to each other at a height of approximately 12 metres above ground level. Only one of the wires that were struck was lifted off the adjacent pole, but it was not cut. The adjacent wire remained in place. The powerlines ran parallel to the road which was adjacent to the airstrip.

Wire marking indicators were not fitted to the powerlines. The requirements for mapping and marking of powerlines and their supporting structures are published in Australian Standard AS 3891.1, 1991, Part 1, *Permanent marking of overhead cables and their supporting structures,* and AS 3891.2, 1992, Part 2, *Marking of overhead cables for low level flying.* A review of the standards indicated that the powerlines that were struck by the aircraft did not require marking in accordance with either standard.

The ATSB was advised that the pilot had previously mentioned an awareness of the powerlines to the airstrip owner. He remarked on their location and how he had to taxi under the powerlines to gain access to the maintenance hangers.

Meteorological information

There were no routine weather forecasts or weather reports for Nelson. The nearest locations with weather observations were Mount Gambier, SA and Portland, Vic. Given that the local weather was likely to vary from those locations, a more accurate measure of weather on the day was taken from the witnesses, two of whom were aircraft pilots. The witnesses stated that the weather conditions at the time of the aircraft accident were clear with high cloud and a 12 to15 kt westerly wind.

Aircraft Information

The aircraft was a high-wing monoplane with a normally aspirated 4-cylinder engine and a fixed-pitch laminated timber propeller. Its main structure consisted of welded steel tubing and timber, which was wrapped in a resin impregnated fabric forming the outer skin surface. The aircraft had a seating capacity of three, two in the front and one in the rear (Figure 4).

Figure 4: VH-ALO

Manufacturer	Auster Aircraft Co.
Model	J1/A1
Serial number	2164
Registration	VH-ALO
Year of manufacture	1946
Aircraft total time airframe hours	3,730.1
Date of last maintenance	23 December 2006
Last maintenance type	Annual inspection
Engine manufacturer/model	Gipsy Major
Propeller type	Fixed-pitch laminated timber

The weight of the aircraft was calculated to be within the maximum take-off weight as stipulated in the certificate of airworthiness.

Wreckage Examination

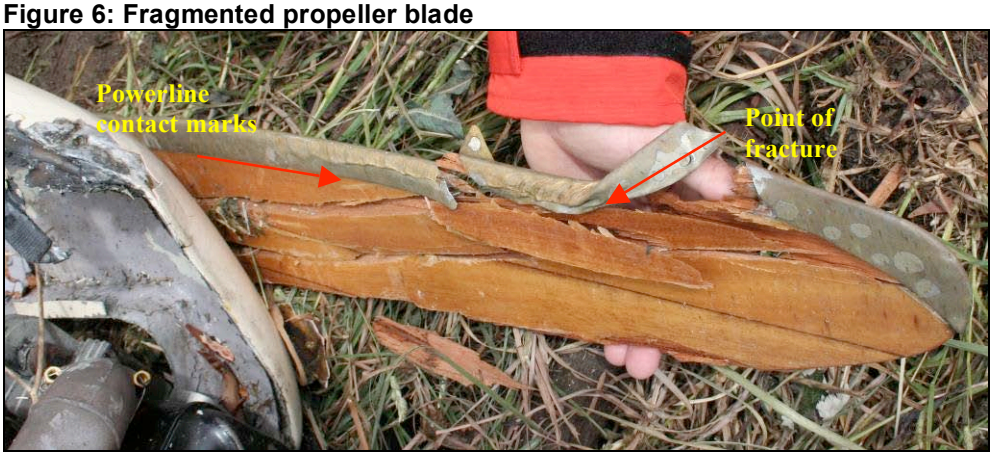
The aircraft impacted the ground inverted at an angle of approximately 60 degrees nose down (Figure 5). An examination of the engine and flight control cable runs indicated that they were continuous with no anomalies. The aircraft was examined with no pre-impact defects evident and all of the aircraft components and flight controls surfaces were accounted for at the accident site. There were no indications of wirestrike damage on the airframe, with the only indications of a wirestrike found on the propeller.

Figure 5: Aircraft wreckage

Fragmented sections of the wooden propeller were found in close proximity to the section of powerline that it struck. Powerline impact marks on the propeller indicated that the engine was generating significant power when the propeller blade came in contact with the powerlines. The engine was inspected externally on-site with no faults evident.

Figure 6 shows the reassembled pieces of the propeller blade. Note the powerline contact marks along the leading edge and the leading edge section that is bent forward, indicating the point where the power line caused the propeller blade to fracture.

Figure 6: Fragmented propeller blade



A damaged hand held Global Positioning System (GPS) was found in the aircraft. The GPS was recovered by the ATSB for further examination and the information stored in the GPS was successfully downloaded. However, it did not reveal any relevant information in relation to the accident flight.

Aircraft maintenance and documentation

A review of the aircraft's maintenance documentation indicated that all scheduled maintenance was carried out in accordance with the Civil Aviation Safety Authority (CASA) maintenance schedule (Schedule 5). All applicable Airworthiness Directives were carried out. All of the maintenance was appropriately documented and a current maintenance release was issued for the aircraft. The pilot had certified for a daily inspection on the aircraft just prior to the accident flight.

The aircraft had undergone a periodic inspection and a repair to the tail section which was completed on the day before the accident flight. Following the accident, the aircraft was examined in the area of the tail repair with no evidence of any pre-impact defects.

Departure procedures

The Civil Aviation Safety Authority (CASA) published the regulatory requirements for takeoff and initial climb. Civil Aviation Regulation 166 'Operating in vicinity of a non-controlled aerodrome' included the following:

> (2) (h) after take-off, maintain the same track from the take-off until the aircraft is 500 feet above the terrain unless a change to the track is necessary for terrain avoidance.

The *Aeronautical Information Publication* (AIP) published by Airservices Australia also included information about departures from non-controlled aerodromes in the En Route section (ENR). ENR 59.1 stated that:

> Pilots of departing aircraft should:
>
> a. if departing in the direction of circuit, climb on the extended runway centreline to circuit height. When past the departure end of the runway continue straight ahead or make a 45 degree turn in the circuit direction.
>
> b. if departing contrary to circuit direction, pilots should wait until 500 feet above circuit height before turning, and broadcast on the CTAF.

Wirestrike research

In September 2006, the Australian Transport Safety Bureau (ATSB) reissued an aviation research paper titled *Wirestrike Accidents in General Aviation: Data Analysis 1994 to 2004*. The paper is available at: http://www.atsb.gov.au/publications/2006/wirestrikes_20050055.aspx

The report found that 119 wirestrike accidents and 98 wirestrike incidents were reported between 1994 and 2004.

While the research showed that the majority of the wire strike accidents were associated with aerial agriculture operations, there were 18 wire-strike accidents (15 percent of the total) involving private/business operations. Of those 18 accidents, 11 (61 percent) occurred within the vicinity of the landing area.

Of the 119 wirestrike accidents, information about whether or not the pilot had prior knowledge of the wire was established in 82 cases. Significantly, it was found that a large proportion of those pilots had prior knowledge of the wire (63 percent) before

coming into contact with it. Although the report did not investigate the human factors involved in wirestrikes it stated:

> Evidence that many pilots already knew of the existence and location of powerlines supports claims that distraction is one of the major causes of wirestrikes during agriculture and other airwork. Other human factors that may be involved might include stress, fatigue, workload and visibility.

Distraction research

In February 2006, the Australian Transport Safety Bureau (ATSB) published an aviation research paper titled *Dangerous distraction: An examination of accidents and incidents involving pilot distraction in Australia between 1997 and 2004.* The paper is available at:
http://www.atsb.gov.au/publications/2005/distraction_report.aspx

The report found that 325 pilot distraction occurrences were identified in Australia between 1997 and 2004 using the ATSB database. The pilot distractions were grouped into several categories. There were 11 occurrences from the category of pilot distraction from an object or person on the ground.

ANALYSIS

From the witness's descriptions, it appeared that the pilot had deliberately initiated a low-level turn shortly after takeoff, with the intention of flying directly over the witness's position between the two hangers. The witnesses stated that the aircraft appeared to pull up just prior to striking the powerline, indicating that the pilot had either just sighted the powerline prior to striking it, or it was a part of his manoeuvre to avoid the trees which were approximately thirty metres in front of the aircraft.

Two of the witnesses stated that the engine noise went quiet after the aircraft struck the powerlines, this would indicate that the engine actually stopped when the propeller struck the powerlines. The wirestrike would have also alarmed the pilot and adversely affected the forward momentum of the aircraft. As a result, the aircraft aerodynamically stalled at a low altitude and impacted the ground at a steep angle, fatally injuring the pilot.

The pilot's comment about the powerlines on a previous occasion, and the need to pass underneath the lines when taxiing to and from the hangar area, indicated that the pilot was aware of the location of the powerlines. The ATSB research paper indicated, however, that awareness of powerline locations does not always prevent wirestrike accidents.

There were indicators in this accident that the pilot had his attention diverted from the primary task of flying by the close proximity of the aircraft to the witnesses and the hangers and the trees directly in front of the aircraft flight path. It is at least possible and, on balance, likely that the pilot became focussed on the execution of the low-level flight over the witnesses and, anticipating a pull-up to avoid the trees behind the hangars, forgot about the powerline location. Alternatively, he may not have noticed the powerlines or the adjacent power pole until it was too late to avoid them.

Had the pilot complied with the requirement in CAR 166 to maintain the runway track until 500 ft above the terrain, he would have greatly reduced the risk of contact with obstacles such as the hangars, trees or powerlines. Powerlines are difficult to see and this is especially true while flying at low level.

The powerlines were not fitted with any high visibility markers, nor were they required to be according to the applicable Australian Standard or Civil Aviation Safety Authority guidelines. While markers would have increased the visibility of the wires, they should not be seen as a substitute for conformance to sound operating practices.

The post-mortem examination discovered a pre-existing heart condition. Given the witness accounts of the aircraft operating normally up to the point of impact with the wires, it is apparent that the aircraft was under control by the pilot to that point. While there was no other evidence that the pilot became incapacitated prior to the wirestrike, the pilot was at some risk of incapacitation while flying.

The pilot was wearing his lap seat belt, but not the shoulder harness that was fitted to the aircraft. The use of a shoulder harness in conjunction with the lap seat belt may have improved the pilot's chances of survival in the accident.

FINDINGS

Contributing safety factors

- The pilot conducted a non-standard takeoff by turning right soon after becoming airborne and flying at a low level towards the witnesses on the ground.
- The aircraft struck a powerline above the observers, shattering its wooden propeller, before aerodynamically stalling and impacting the ground at a steep angle.

Other safety factors

- The pilot was not wearing the shoulder harness that was fitted to the aircraft.

Other key findings

- The powerlines were not located in a place that would normally be considered a risk to aircraft operations at the airstrip.
- The powerlines were not fitted with high visibility markers nor were they required to be according to Australian Standards affecting the marking of powerlines.
- The pilot had a pre-existing heart condition.

SAFETY ACTION

Civil Aviation Safety Authority

As a result of this accident, the Civil Aviation Safety Authority advised the Australian Transport Safety Bureau that it had published an article in the November-December 2007 issue of *Flight Safety Australia* magazine titled 'Shoulder harnesses save lives'. The article highlights the need to wear safety harnesses in their entirety to improve the chances of aircraft occupant survival in the event of an accident.