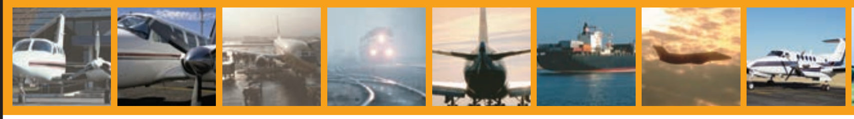
Australian Government
Australian Transport Safety Bureau

The Australian



Commissioner's message

The ATSB recently published the Annual Report for 2010-11, our second as an independent statutory agency. The report looks back on a year in which we consolidated the ways that we conduct transport safety investigations. It was also a year characterised by important expansion in our safety research, analysis and education functions.

We completed 113 aviation accident and incident investigations in 2010-11, several of which attracted substantial national and international interest. Among these was the investigation into the uncontained engine failure on an Airbus A380 aircraft over Batam Island, Indonesia on 4 November 2010 which identified fatigue cracking within a stub pipe feeding oil into one of the engine's bearing structures. As a result of this work, safety actions were immediately undertaken by Qantas, CASA, Airbus, Rolls-Royce plc, and the European Aviation Safety Agency, enabling the resumption of safe flight by aircraft equipped with this engine type.

Other investigations identified safety issues relating to the protection of Boeing 747-438 aircraft systems from liquids, potentially unreliable airspeed indications in Airbus A330 and A340 aircraft, the supervision of agricultural pilots, training and supervision of charter pilots, potentially hazardous helicopter winching procedures, turbulence caused by buildings at airports, airspace design and management and problems with the management by air traffic control of compromised separation of aircraft.

Another satisfying development has been our expansion in research, analysis and education. As well as improving the quality and usefulness of our statistical publications, we are turning good research into practical education material.

The ATSB Annual Report for 2010-11 is available at atsb.gov.au.

Martin Dolan
Chief Commissioner

R22 drive belt concerns

As a result of several accidents and incidents involving Robinson R22 helicopter V-belts, the ATSB has initiated a safety issue investigation into the reliability of Robinson Helicopter R22 drive belt systems.

An update posted on the ATSB website (AI-2009-038) reports that no significant safety issues have been identified to date in the manufacture or design of the drive belts that might present an airworthiness issue for continued safe operation of the Robinson R22 helicopter fleet. However, the update stresses that the belts represent a critical link in the main rotor drive system and, failures are often rapid and may be preceded by the onset of vibration or the smell of burning rubber.

Some of the factors that can influence the reliability of the R22 drive system are:

Regular inspection: Any form of drive belt damage such as blistering, cracking and tie band (webbing) separation indicates that the belts require replacement.

Operation: Pilots must monitor Manifold Air Pressure (MAP) to avoid exceeding the placarded power limits, as listed in the Robinson R22 flight manual. Exceeding the drive system limitations may result in sudden belt failure

Environment: Operating the helicopter in environments where dust and grit can contaminate the drive system, or where the ambient temperature is high, can also influence the service life of the belts and sheaves.

Sheave alignment: Correct sheave alignment after installation of the drive belts is critical in ensuring the belt longevity.

High gross weight operation: Pilots must ensure that the approved gross weight limits are not exceeded while operating the helicopter.

Clutch actuator: Robinson Safety Notice SN-33 suggests that a problem with the drive belts may be imminent if during flight the clutch light flickers or stays on for longer than normal.

Under these circumstances the pilot is advised to land immediately.

Following a fatal, a fatal Robinson R22 accident on 6 July 2011 (AO-2011-060) that occurred near Julia Creek, Queensland, where it is suspected that the helicopter sustained an in-flight failure of the drive belts, the ATSB issued a Safety Advisory Notice that urged pilots, operators and maintainers to pay particular vigilance to the R22 helicopter drive belt system.

A final report on the safety issue investigation is expected to be released in the first quarter of 2012. ■

Pilot unknowingly affected by hypoxia

The Australian Transport Safety Bureau has issued a safety advisory notice reminding pilots about the dangers of hypoxia, and urging all operators of single-pilot, turbine-powered pressurised aircraft to install aural cabin altitude pressure warning systems. This warning comes as a result of an ATSB investigation into an air system event that occurred in Western Australia.

The incident occurred on 16 July, 2009, when the pilot of a Beechcraft King Air C90, registered VH-TAM, departed Perth Airport on a flight to Wiluna, Western Australia, carrying one passenger. Unbeknownst to the pilot, however, the left landing gear squat switch was operating only intermittently. As a result, the aircraft was prevented from pressurising in flight. To make matters worse, the cabin altitude warning system was not operating, thanks to the incorrect connection of the switch wiring during previous maintenance.

Photo of VH-TAM courtesy of Carsten Bauer

As the aircraft climbed towards the planned cruise altitude of flight level (FL) 210, the pilot undertook the schedule checklist items. During the Transition checks, however, the pilot's attention was divided, as the aircraft encountered rough weather moderate turbulence. In addition, he was having some difficulties with aircraft's autopilot.

Those autopilot difficulties continued once they reached FL 210. When the pilot checked the dual altimeter, he noted a reading on the outer scale (measuring cabin altitude) of 20,000 ft. He felt some concern at this, but found he could not reason out a solution to alleviate that concern. Subsequently, he became fixated on the distance-to-run figures on the GPS display, convinced those figures represented the aircraft's groundspeed. As a result, he believed that the aircraft was being subjected to an unexpected 100 kt headwind and, with permission from ATC, he descended to escape the winds.

After the plane had been cruising at FL150 for a significant period of time, the pilot realised that he had been affected by hypoxia. Hypoxic hypoxia is a result of inadequate oxygen being available to the lungs, which in turn decreases the amount of oxygen available to the arterial blood and so to the body tissues. Some of the subjective symptoms of hypoxic hypoxia include euphoria, light headedness, dizziness and feelings of warmth. Hence, hypoxic hypoxia can also create a false sense of well-being, even as it is in the process of degrading the subject's mental and physical performance. In most cases, the initial signs of hypoxia are subtle and the pilot has limited time to recognise the signs, make decisions, and carry out the actions to rectify the situation.

Once he realised what was happening, the pilot descended further before landing safely at his destination.

Pressurisation-related accidents and incidents have long been a matter of concern for the ATSB, with a number of investigation reports, research publications and safety actions having been published on the topic. In general, there is a high chance of surviving a pressurisation system failure, provided that the failure is recognised and the corresponding emergency procedures are carried out expeditiously. Flight crews should maintain a high level of vigilance with respect to the potential hazards of cabin pressurisation system failure. Auditory warnings have proven particularly effective in eliciting responses from pilot. There is an immediacy to an auditory warning that may not be apparent with visual warnings, and an auditory warning allows events both in and outside a pilots' field of view to be monitored.

The investigation report, and the Safety Advisory Notice warning pilots of the need for aural cabin altitude pressure warning systems, can be found on the ATSB website: www.atsb.gov.au ■

Starved and exhausted

Safe flight depends on reliable power. If an engine does not get the fuel it needs, the results are often not good. The latest publication in the Australian Transport Safety Bureau's Avoidable Accidents series, titled *Starved and exhausted: Fuel management aviation accidents*, addresses the issues of fuel exhaustion and fuel starvation, describes several fuel-related accidents and serious incidents, and discusses procedures that pilots can use before and during a flight to help them be absolutely sure that they will have sufficient fuel flowing to the engine to land at their destination airport with fuel reserves intact.

'The two main reasons that fuel stops getting to an engine during flight are fuel exhaustion and fuel starvation,' explains Michael Watson, Aviation Safety Investigator. 'Fuel exhaustion happens when there is no useable fuel remaining to supply the engines. Fuel starvation happens when the fuel supply to the engines is interrupted, although there is still sufficient fuel on board. Together these are what we refer to as fuel mismanagement events.'

It is actually quite difficult to make a realistic assessment of how widespread fuel mismanagement events are in Australia. On average, the ATSB is notified of 21 fuel exhaustion or starvation occurrences each year. However, for every occurrence when power fails because fuel is no longer getting to the engine, it is likely that there were many occurrences when there was less fuel available than there should have been. It is also likely that not all fuel mismanagement occurrences are reported to the ATSB.

Nevertheless, the existing data indicates that fuel mismanagement is threetimes more likely to involve fuel starvation than exhaustion, and is mostly likely to occur in private operations and charter operations. In addition, there can be serious consequences. Of the reported fuel exhaustion occurrences from 2001 to 2010, 82 per cent led to a forced or precautionary landing off an airport or ditching (but luckily no fatalities or serious injuries). In contrast, for reported fuel starvation occurrences, only 46 per cent led to a forced or precautionary landing or ditching, while 22 per cent led to a diversion to another airport or a return to the takeoff airport. However, 11 (7 per cent) led to collision with terrain, and there were 10 fatalities and 18 serious injuries in the 10 years.

Starved and exhausted outlines important messages to ensure accurate fuel management.

On average, the ATSB is notified of 21 fuel exhaustion or starvation occurrences each year.

'It starts with knowing exactly how much fuel is being carried at the commencement of a flight,' notes Watson. 'This is easy to know if the aircraft tanks are full, or filled to tabs. However, if the tanks are not filled to a known setting, then a different approach is needed to determine an accurate quantity of usable fuel.'

'It also relies on an accurate method of knowing how much fuel is being consumed. Many variables can influence the fuel flow, such as changed power settings, the use of different fuel leaning techniques, or flying at different cruise levels to those planned.'

'Finally, keeping fuel supplied to the engines during flight relies on the pilot's knowledge of the aircraft's fuel system and being familiar and proficient in its use. Adhering to procedures, maintaining a record of all fuel selections during flight, and ensuring the fullest tank is selected before descending towards your destination will lessen the likelihood of fuel starvation at what may be a critical stage of the flight.'

Starved and exhausted: Fuel management aviation accidents, along with the rest of the Avoidable Accidents series, is available for free download from the ATSB website www.atsb.gov.au ■

Investigation briefs

Fuel exhaustion

Investigation AO-2010-025

In April 2010, a Victa Airtourer 115 was conducting a private visual rules return flight from Cambridge Airport Tasmania. This was its fifth flight since refuelling. At about 1020, after the pilot commenced the return to Cambridge, the engine suddenly lost all power. The pilot conducted a forced landing onto a road, resulting in substantial damage to the aircraft but no injury to the pilot, the only person on board.

The subsequent investigation found that the power loss was due to exhaustion of the aircraft's fuel supply. Exhaustion occurrences are normally either the result of a gross error in the fuelling of an aircraft before flight, or the result of a number of seemingly minor aspects in fuel planning and management during the flight.

In this case, a number of safety issues were identified concerning the measurement of the quantity of fuel on board, and consumed before and during the flight. Those issues contributed to the pilot's belief that there was more fuel on board the aircraft than was actually the case. The pilot had used a dipstick to assess that there was sufficient fuel for the flight, and that the fuel quantity indicator provided a similar indication of fuel quantity, showing the tank was about half full. Unfortunately, the pilot used an incorrect (but not uncommon) method of using the dipstick that resulted in an over-reading of the fuel onboard. Furthermore, a close inspection of the aircraft's flight and fuel log would have revealed that the fuel gauge and the dipstick indications showed a fuel usage that was half the expected usage. Cross-checking the dipstick reading against the fuel gauge indication was the correct thing to do, however a quick mental calculation would have shown a significant discrepancy between the indicated fuel quantity and the expected fuel usage. The discrepancy could have alerted the pilot that something was wrong with the available fuel quantity information

Incidences of fuel exhaustion are often seen to happen close to the flight's destination and if it occurs when the aircraft is close to landing, it may offer the pilot less time and opportunity to successfully manage the situation. ■

Starvation

Investigation 200603140

In June 2006, a Beechcraft A36 Bonanza was conducting a private flight from Kununurra, Western Australia to Bathurst Island in the Northern Territory. Airtrafficservices data recorded the aircraft overflying the airport and that the pilot joined the circuit on left downwind for a landing on runway 15. The aircraft impacted terrain 2.4 km north-west of the airport. The pilot, who was the sole occupant of the aircraft, sustained fatal injuries.

The ATSB investigation assessed the aircraft as being intact prior to the impact with terrain. The investigators did not identify any anomaly that could have affected its normal operation. However, data recovered from an onboard engine data recording system was consistent with an interruption of the fuel flow, and the loss of engine power about 42 seconds before impact.

The aircraft had been equipped with four fuel tanks, two main tanks (one in each wing), and one tip tank in each wing, with the use of the tip tanks restricted to level flight only. There was evidence from the wreckage that there had been sufficient fuel in each of the main tanks. The pilot had a written fuel log indicating the left tip tank had been selected on reaching cruise altitude, and the right tip tank selected when the left tip tank was nearly empty. It is likely that the pilot omitted to select a main tank before descending from cruise altitude, and the right tip tank ran dry at a low altitude with insufficient time available to restore fuel supply to the engine.

Although the tip tanks had been used during the cruise and the fuel log confirmed that fact, the use of a pre-descent checklist to ensure that the correct tank was selected well before approaching the ground could have reduced the likelihood of this starvation event. Running dry at a low altitude reduced the opportunity to recover from the power loss. ■

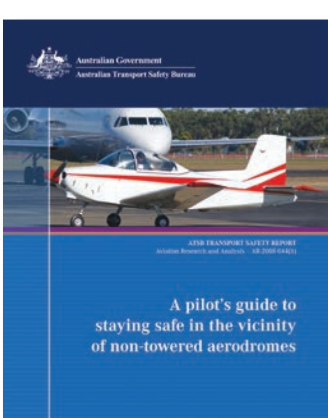
Accident site and surrounds of the Beechcraft A36 Bononza

Non towered aerodromes an on-going concern

Aerodromes with control towers form a substantial part of the Australian aviation landscape. This is not only because the majority of Australian aerodromes do not have an air traffic presence, but because they cater to such a wide and varied body of aircraft. At any one time, non-towered aerodromes can have a mix of passenger-carrying aircraft, instrument or visual flight rules aircraft, smaller general aviation aircraft or amateur-built aircraft, agricultural or military aircraft, helicopters, balloons, and gliders all operating.

In addition, the traffic density can be intense. The aerodromes at Broome (WA), Kununurra (WA), Wagga Wagga (NSW), Wollongong (NSW), Toowoomba (Qld), Horn Island (Qld), Bathurst (NSW), Geraldton (WA), and Port Macquarie (NSW) aerodromes all have over 20,000 movements per year. At some of these (and many other) non-towered aerodromes, there are a significant number of passenger transport flights utilising large jet and turboprop aircraft, as well as recreational and general aviation aircraft.

As a result of this significant role in Australian aviation, safety at non-towered aerodromes has long formed a part of the Australian Transport Safety Bureau's focus. The ATSB has produced a research report, a guide for pilots and a safety brief, all focussing on the unique challenges and dangers that are present. Still, despite the efforts of the ATSB, safety issues continue to crop up at non-towered aerodromes with concerning frequency.



In the years from 2003 to 2008, the ATSB was notified of 709 airspace-related safety occurrences at, or in the vicinity of non-towered aerodrome. Of these 60 were considered serious incidents and six constituted accidents. The ATSB urges patrons of non-towered aerodromes to read the free publications on the ATSB website www.atsb.gov.au, and apply the lessons to their own flying.

You can find the booklet 'A pilot's guide to staying safe in the vicinity of non-towered aerodromes' on the ATSB website, at www.atsb.gov.au. The guide has been released in association with a larger and more detailed report into non-towered aerodrome operations, and aims to provide pilots with an appreciation of the types of safety events that are associated with operations at non-towered aerodromes, and provide education on expected behaviours to assist pilots in being prepared for the risks. ■

A warning regarding PT6A engines

CASA has released an Airworthiness Bulletin (AWB 72-005), alerting all operators and maintainers of PT6A engines of the potentially dangerous installation of FAA PMA T-102-401-01 compressor turbine blades in unapproved PT6A engine variants andto raise awareness of the restrictions placed on the use of these blades.

This Bulletin comes as the result of an ATSB investigation into the total power loss suffered by a Cessna 208 aircraft in Queensland. On 31 December 2009, the Cessna 208 was engaged in parachuting operations from Cairns Airport, carrying the pilot and 15 parachutists were on board. While climbing through 12,500 ft in preparation for a parachute drop, the engine lost all power. The pilot performed an initial check and scan of the engine instruments, and advanced the emergency power lever, but the engine remained unresponsive. The parachutists exited the aircraft and the pilot completed a glide approach for an uneventful landing at Cairns Airport.

The ATSB investigation found that the failure of the Pratt & Whitney PT6A-114 engine had probably been precipitated by fracture of the compressor turbine blades. Separation of the hot section revealed significant damage to the compressor turbine rotor assemble. All of the blades were fractured through the airfoil section; the majority of them close to the blade platform. Many of the blade sections exhibited the deformation, cracks and nicks associated with impacting circulating blade debris. The compressor turbine shroud and vane ring had also sustained extensive impact damage and gouging.

Compressor turbine rotor assembly

The FAA parts manufacturing approval information indicated that part number T-102401-01 compressor turbine blades that had been installed in the engine during the most recent overhaul were not approved for the PT6A-114 model. A review of the operating parameters indicated that PT6A engine variants not approved for installation of the T-102401-01 blades typically exhibit maximum operating temperatures higher than the other engine variants that were approved from the PMA blades.

CASA recommended that operators and maintainers of PT6A check their engine maintenance logs to ensure that the compressor turbine blade part number(s) installed are correct for the engine variant according to FAA PMA approval information. ■

REPCON briefs

Australia's voluntary confidential aviation reporting scheme

REPCON allows any person who has an aviation safety concern to report it to the ATSB confidentially. All personal information regarding any individual (either the reporter or any person referred to in the report) remains strictly confidential, unless permission is given by the subject of the information.

The goals of the scheme are to increase awareness of safety issues and to encourage safety action by those best placed to respond to safety concerns.

REPCON would like to hear from you if you have experienced a 'close call' and think others may benefit from the lessons you have learnt. These reports can serve as a powerful reminder that, despite the best of intentions, well-trained people are still capable of making mistakes. The stories arising from these reports may serve to reinforce the message that we must remain vigilant to ensure the ongoing safety of ourselves and others.

Air traffic controller fatigue

Report narrative:

The reporter expressed a safety concern regarding air traffic controllers regularly falling asleep at the console while operating single person nightshifts.

Response/s received:

REPCON supplied the operator with the de-identified report. The following is a version of their response:

Airservices has a number of towers (TWR) and Terminal Control Units (TCU) with low air traffic levels that operate single person operations at night time, including Cairns TWR and TCU, Adelaide TWR and TCU and Perth TCU.

Airservices considers the welfare of our controllers operating in this environment paramount.

Airservices conducted a review on night shift staffing, following a decision by the Federal Aviation Administration (FAA) in regards to single person night operations. This review resulted in the implementation of a standardised approach to manage these operations.

Currently, Airservices has personal duress alarms at locations where single person night shifts operate. The activation of the alarms alerts the nearby TCU or Tower and security at Melbourne or Brisbane Centre. If contact cannot be established, security staff at Melbourne or Brisbane will take action as per standardised checklist to determine the welfare of the controller. These alarms are tested weekly as part of facility testing.

Furthermore, during low traffic periods when there are no arrivals or departures, coordination between the TWR and TCU, or interaction with the Eurocat system for one hour or more, an intercom call will be initiated by the respective units. The one-hour period is determined through console timers. If the TCU or TWR fails to respond to the intercom call within 5 minutes, additional actions are taken until contact is re-established. These actions include repeated intercom checks, attempts to contact via telephone and requesting the Aviation Rescue and Fire Fighting (ARFF) unit to attend to the relevant unit.

In addition, fatigue management of controllers on night shifts in the Brisbane and Melbourne ATS (air traffic services) Centres is managed within the team environment utilising short breaks and 24-hr supervision. Rest breaks are part of Airservices fatigue management system and are designed to minimise the likelihood of a controller becoming fatigued.

Finally, Airservices regularly reviews and continuously improves upon its Fatigue Risk Management System (FRMS) to ensure the highest possible protection for our staff and the travelling public. As a current priority, Airservices is updating its FRMS. The renovated FRMS will include new work scheduling principles, education programs, incident investigation requirements and a new fatigue reporting system.

REPCON supplied CASA with the de-identified report and a version of the operator's response. The following is a version of the response that CASA provided:

CASA has reviewed this REPCON and notes the response from Airservices.

Exceedance of takeoff weight

Report narrative:

The reporter expressed a safety concern regarding the aircraft's possible exceedence of the maximum take-off weight (MTOW).

The reporter stated that the Piper Chieftain departed with 10 people plus baggage on board for a 1.5 to 2 hour flight. At no time was the pilot observed weighing the passengers or weighing the baggage.

Reporter comment: I believe that a Piper Chieftain with 10 passengers, on a 1.5 to 2 hour flight would be approaching MTOW, without factoring in baggage.

Response/s received:

REPCON supplied CASA with the de-identified report. The following is a version of the response that CASA provided:

CASA found no evidence of the operator's aircraft flying in excess of maximum take-off weight. CASA will continue to monitor the operator through surveillance and audit activities.

How can I report to REPCON?

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