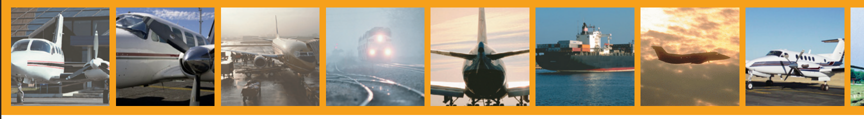
The Australian



Australian Government

Australian Transport Safety Bureau

Executive Director's Message

The ATSB is releasing a publication titled *Past Present Future*. It is the story of the ATSB, and the earlier organisations that came together to form the Bureau. The publication's release celebrates the 10-year anniversary of the formation of the ATSB on 1 July 2009.

I am proud to have been the Executive Director of the ATSB since its creation, helping to maintain and improve transport safety in Australia and internationally.

In the aviation sector, the ATSB team has worked to improve safety through investigations that have included: an Avgas fuel investigation, which influenced international fuel processing and standards; the internationally recognised investigation into the *Ansett* Boeing 767 aircraft that were grounded due to missed maintenance inspections; and a Robinson R22 helicopter investigation, which led to directives on the life limits of an R22's main rotor blades.

The ATSB also conducted the investigation into the tragic accident at Lockhart River in Queensland on 7 May 2005 in which all 15 people on-board the Fairchild Metro 23 aircraft died. The investigation into Australia's worst civil aviation disaster since 1968 has resulted in greater regulatory attention being given to the regional aviation sector.

Pioneering work to develop analysis models culminated in the ATSB publication *Analysis, Causality and Proof in Safety Investigations*. The ATSB analysis model ensures that human and organisational factors are examined in the interests of improving safety systems. ATSB research also makes sure the bigger picture is taken account of by identifying important safety trends.

Within the region, the ATSB's participation in the *Garuda Indonesia* Boeing 737 fatal accident at Yogyakarta airport was the inception of the Indonesian Transport Safety Assistance Package (ITSAP). Under ITSAP, Australian transport safety professionals are working closely with their Indonesian counterparts in an effort to build additional capacity to meet the challenges facing Indonesia.

If you would like to learn more about the history of accident investigation in Australia, you can download a copy of *Past Present Future* from the ATSB's website at <www.atsb.gov.au>

Kym Bills, Executive Director

Reporting trends in charter operations

In December 2007, the ATSB released a research report that examined immediately reportable matters (IRMs) (otherwise known as accidents and serious incidents) involving regular public transport (RPT) operations. The purpose of this report was to inform the aviation community of any important safety trends, and to provide the travelling public with a better appreciation of the types of occurrences that are reported to the ATSB.

To present a complete picture of air transport operations, which encompasses both RPT and charter operations, the ATSB has conducted a follow-on study that reviews IRMs in charter operations for the period 1 January 2001 to 31 December 2006.

Similar to the previous report, a subset of generally more serious IRMs were reviewed including: accidents; violations of controlled airspace (VCA); breakdowns of separation (BOS) and airproxes; fire, smoke, explosions or fumes; crew injury or incapacitation; fuel exhaustion; and uncontained engine failures. Charter flying activity, measured as flying hours and number of charter operators, was also reviewed.

The study found that the charter industry appears to be in a period of transition with some sectors of the industry expanding while others have contracted. Overall activity initially declined followed by higher activity from 2004 to 2006. Despite this increase, the number of hours flown in 2006, the latest year reviewed, was not as high as the historical peak in charter hours observed in 1999. The number of charter operators decreased in 2005 and 2006, so fewer operators have conducted more of the hours flown in those years.

Total IRMs reported and the individual IRM categories examined were generally stable across the period 2001 to 2006, with the exception of accidents. The rate of accidents involving charter aircraft dropped significantly between 2001 and 2006, while at the same time the rate of reported incidents increased. The most common type of accident experienced in charter operations was wheels-up landings, either due to mechanical problems with the landing gear or due to crew operation of the landing gear. The more severe occurrence types involved collisions, loss of control of the aircraft, and loss of power from the engine.

Occurrences involving fire, smoke or fumes and airspace related occurrences such as VCA and BOS/airprox remained stable with no statistically significant increase in the rate. The number of occurrences involving fuel exhaustion was small and, consequently, variable between years. The other IRM categories; crew injury/incapacitation and uncontained engine failures, were rare.

This review provided encouraging data on the charter accident rate, emphasised the stability of the rate of airspace related occurrences, and the rarity of uncontained engine failures and crew incapacitation in charter operations. ■

ATSB Research and Analysis Report AR-2007-057

Fuel system event

On 2 September 2008, at about 0845 EST, while climbing through flight level (FL) 250, en route from Brisbane, Qld to Honiara, Solomon Islands, a regular fare-paying passenger-carrying Embraer RJ 190-100 LR aircraft, registered VH-SXK, sustained a fuel leak from both main wing tanks. The flight crew reported that, as they flew through moderate turbulence, they were notified by the cabin crew (the aircraft had two flight crew, three cabin crew and 40 passengers) that 'vapour' was streaming from both wing tanks. The pilot in command walked back to check and confirmed that fuel was streaming at a high rate from both wings.

The flight crew notified air traffic control that they had a problem and requested and received a clearance to return to Brisbane Airport. During the return to the airport, the aircraft reached a maximum level of FL370, with fuel still leaking. The cabin crew reported that the fuel venting/leakage momentarily stopped about 8 minutes later, but then resumed on descent into Brisbane, when the aircraft flaps were extended at about 4,000 ft above mean sea level.

After landing at Brisbane Airport, aerodrome rescue and fire fighting crews inspected the aircraft and reported no fuel leakage.

The operator downloaded the data from the aircraft's flight data recorders and provided it to the ATSB for analysis. The data documented that, just prior to the occurrence, the aircraft was passing through FL250 at 290 KIAS when it encountered turbulence. The turbulence recorded values ranged from 0.6 to 1.4 positive absolute g, a range of about 0.8 g, which lasted for about two and a half minutes.

The data also confirmed that the maximum computed airspeed was 299.75 KIAS, momentarily decreasing to 270 KIAS before returning to 290 KIAS.

Vertical speed varied from -1,232 to 4,880 ft/min, with associated variations in pitch angle.

The data confirmed the fuel disparity between fuel burn and fuel removed from the fuel tanks, with a difference of around 680 kg (1,500 lbs). The operator reported that the aircraft departed with 12,800 kg of fuel and that after landing and taxiing, 9,600 kg remained, with a total of 600 kg lost due to the venting/leakage.

The venting/leakage was determined to be the result of a design issue related to maintaining positive air pressure in the fuel surge tanks in the aircraft's wings. The fuel vapours noted by the cabin crew during the climb were the result of venting/leaking from the wing fuel surge tanks and eventually from the NACA inlet. The fuel leakage noted by the cabin crew during the approach to land at Brisbane Airport was likely the result of residual fuel released during the flap extension.

In 2007, the aircraft manufacturer had identified the problem (following a similar occurrence on a similarly designed model aircraft). An operational bulletin was issued recommending aircraft operating procedures to mitigate the likelihood of a fuel leak. However, the operator did not have access to the bulletin using the aircraft manufacturer's electronic on-line document system.

Although the operator was unaware of the problem, on this occasion the aircraft was being operated generally within the recommended operating parameters when the fuel leakage occurred. The turbulence sustained by the aircraft during climb out, along with a momentary airspeed increase and the large variations in vertical speed, probably contributed to the fuel leakage.

The aircraft manufacturer has developed a new float vent valve design to eliminate the problem. The design change has been introduced into newly manufactured aircraft and a service bulletin with recommendations to replace the current float vent valve with a redesigned valve will be issued in 2009. ■

ATSB Aviation Occurrence Investigation AO-2008-060

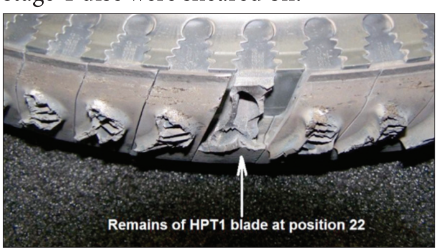
Investigation briefs

Engine in-flight shutdown

Occurrence 200704288

On 13 July 2007 at about 1420 Western Standard Time, a Boeing Company 717-200 aircraft, registered VH-NXK, was being operated on a scheduled passenger service from Newman, WA to Perth when the right engine failed during the climb to cruise. The flight crew disconnected the autopilot, actioned the Engine Fire/Severe Damage checklist, and commenced decent to flight level 140. The flight crew broadcast a PAN to air traffic services. The aircraft returned to Newman Aerodrome and landed safely.

The operator's maintenance organisation carried out an internal inspection of the failed engine and found that all of the blades on the high pressure turbine stage-1 disc were sheared off.



The engine was removed from the aircraft for shipment to the engine manufacturer for investigation and repair. A serviceable engine was fitted and the aircraft was returned to service.

A subsequent investigation by the engine manufacturer revealed that a high pressure turbine stage 1 (HPT1) blade had separated from the blade disc below the blade platform. The manufacturer identified that the failure was due to low-cycle fatigue, causing the remaining HPT1 blades to separate from the disc. That led to the subsequent engine in-flight shutdown. The mechanism of the failure was similar to previous engine failures that had occurred since November 2003.

At the time of the incident, the aircraft operator was engaged in a programme to replace all of the life improvement package 3 standard HPT1 blades in their fleet of engines with a new HPT1 blade. ■

Navigation event

Occurrence 200703484

On 31 May 2007, the pilot of a Beech Aircraft Corp. Super King Air, registered VH-XCB, was conducting an Area Navigation (RNAV) Global Navigation Satellite System (GNSS) non-precision approach (NPA) at Ballarat, Vic. in instrument meteorological conditions (IMC) as part of a check flight for renewal of a command instrument rating. While conducting the approach, the check pilot visually determined that the aircraft was displaced outside the permitted lateral tolerances of the published final approach track. The pilot's primary flight display showed that the aircraft was within permitted tolerances. There were no associated messages or alerts.

An examination of the aircraft's navigation equipment by an avionics technician found the installation was not approved for the procedure. A technical problem prevented the equipment from meeting approval standards.

Although some documentation of the navigation receiver's installation was incomplete and there were unanswered questions about the approval and operational status of the installed navigation equipment, the significant safety issue concerned operation under the instrument flight rules (IFR), during which RNAV (GNSS) NPAs were frequently flown. The aircraft had been flown by many professional pilots who believed that the aircraft was approved for RNAV (GNSS) NPAs and who had neither ascertained the operational status of the navigation equipment installed from the aircraft's flight manual supplement (FMS), nor attempted to resolve the reason for at least one previous unexplained tracking error while flying an RNAV (GNSS) NPA in visual meteorological conditions.

The operator of the aircraft annotated the aircraft's maintenance release to reflect that the Global Positioning System (GPS) was not approved for use in the conduct of RNAV (GNSS) NPAs. ■

Ditching event

Occurrence 200802048

On 3 April 2008, a Piper PA-32-300 Cherokee Six aircraft, registered VH-ZMP, took off from Brampton Island, Qld for a charter flight to Mackay, with a pilot and four passengers on board. This was the sixth flight since the aircraft had been refuelled. When climbing through approximately 400 ft, the engine surged and lost power. The pilot turned the aircraft left approximately 30 degrees to face into the wind and to be parallel with the wave tops on the sea below and ditched the aircraft between Brampton Island and Carlisle Island.

The aircraft decelerated rapidly and came to rest, floating in an upright position for about 1 minute. All of the occupants evacuated and were later recovered by a rescue helicopter. The engine power loss was consistent with fuel starvation. There had been insufficient time to resume power by selecting reserve fuel from such a low altitude before ditching.

The aircraft had an inner fuel tank and an outer fuel tank in each wing. Each fuel tank independently fed a fuel selector. The operator's fuel management policy was to use the tip tanks for flight fuel and to use the main tanks for 60 litres of reserve fuel. Both tip tanks were filled at Mackay for flight fuel as a standard procedure and fuel selection was alternated between the tip tanks for each flight.

Following the event, the aircraft operator amended the aircraft fuel management procedures to require a minimum of 30 L of fuel in the selected fuel tank for any take off. ■

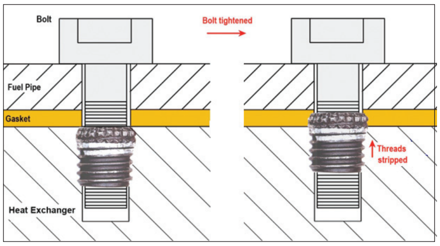
Fuel system event

Occurrence 200705014

On 13 August 2007, a Boeing 737-700 aircraft, registered VH-VBR, was operating on a scheduled flight from Brisbane to Hamilton Island, Qld. On reaching cruise altitude, the flight crew became aware of a fuel imbalance situation due to fuel loss from the number-2 (right) engine. At 1311 Eastern Standard Time and approximately 148 km SE of Rockhampton, Qld, the crew conducted an in-flight shut down of the right engine. The aircraft was subsequently diverted to Rockhampton where a single-engine approach and landing was completed without further incident.

A subsequent examination of the number-2 engine revealed that fuel was leaking from the main fuel return pipe where it connected into the oil/fuel heat exchanger. The pipe connection was of flanged plate design, held in position by four bolts tightened into threaded inserts on the oil/fuel heat exchanger body. The threaded inserts had failed, pulling free of the heat exchanger body.

Bolt tightening sequence showing thread stripping and insert migration into the gasket



As a result of a number of in-service failures of the fuel return pipes, the oil/fuel heat exchangers were subject to several modification requirements including the replacement of the threaded inserts with key locked inserts. The fitment of the key lock inserts resulted in a higher torque value for the fuel return pipe attachment bolts.

The investigation found that the failure of the inserts was the result of over tightening that had occurred during previous maintenance. The oil/fuel heat exchanger had not been subjected to the key lock insert modification.

As a result of this occurrence, the aircraft operator notified the maintenance provider of the incident and received assurance that their process, procedures and oversight were adequate to prevent a recurrence. ■

In-flight engine failure

Occurrence 200704598

On 25 July 2007, a twin engine Cessna 441 (Conquest II) aircraft carrying three passengers was being operated on a scheduled passenger flight from Port Augusta to Adelaide, SA. At 1035 Central Standard Time, while cruising at flight level 210, the aircraft's right engine failed suddenly approximately 23 km north of Ardrossan, SA.

When the failed Garrett TPE331-8 turboprop engine was removed from the aircraft and subsequently disassembled, it was revealed that the compressor bearing at the front end of the engine had catastrophically failed. That bearing provided both axial and lateral support for the turbine section. Once that support was lost, the engine's rotating turbine section shifted forward under the influence of thrust loads, resulting in rotor-to-case contact and rapid engine failure.

The compressor bearing had been installed as a new item into the engine at the time of the last major overhaul. It had subsequently accumulated some 1,295 hours of service prior to the failure. The ATSB examination found that the inner and outer races, and the bearing balls, had spalled from rolling contact fatigue. In addition to the spalling damage, considerable levels of residual magnetism were found within the compressor bearing as well as other engine components. The presence of residual magnetism provided strong evidence that direct electrical current had passed through the engine sometime during service.

The aircraft had been inspected two months prior to the engine failure for a suspected lightning strike. Despite the operator not finding any evidence of lightning strike at that time, magnetisation of the engine components as found during the ATSB examination was indicative that the aircraft had indeed been struck. The passage of such electrical currents from a lightning strike creates undetected electrical damage that manifests itself through localised welding and pitting of bearing surfaces. Over time this then develops into spalling of the bearing, which creates vibration, overheating, and ultimate bearing failure. ■

Wirestrike

Occurrence 200807955

On 25 December 2008, at about 0845 Eastern Daylight-saving Time, a Cessna Aircraft Company 172M aircraft, registered VH-ROO, struck a powerline that was located on a property at Kernot, 25 km north-west of Leongatha Aerodrome, Vic.

The aircraft impacted the ground about 100 m from the powerline and caught fire. The pilot, who was the sole occupant, was fatally injured.

The pilot was conducting a private flight from his property (located approximately 3 km from the accident site) to Tyabb airport and then proceeded to overfly the property at Kernot. Information from a number of witnesses suggested that the pilot had a history of low flying.

Examination of the wreckage did not identify any mechanical defects that would have affected the safe operation of the aircraft. Evidence from a number of sources suggested that the pilot was aware of the location of the powerline and was familiar with the area.

There was no operational reason, such as adverse weather, or for takeoff or landing for the pilot to be below 500 feet above ground level at the time of the accident. Based on reports of the pilot's previous low flying it was likely that the pilot made a deliberate decision to overfly the property at a 'very low' level on this occasion.

The investigation concluded that the pilot overflew a property at Kernot at very low level and did not see powerlines that were located about 600 m from the house in sufficient time to avoid a wirestrike. After breaking the powerlines, the aircraft impacted the ground and caught fire.

This accident reinforces the inherently hazardous nature of low-level flying. ■

REPCON briefs

Australia's voluntary confidential aviation reporting scheme

REPCON is established under the Air Navigation (Confidential Reporting) Regulations 2007 and allows any person who has an aviation safety concern to report it to the ATSB confidentially. Unless permission is provided by the person that personal information is about, the personal information will not be disclosed. Only de-identified information will be used for safety action. To avoid doubt, the following matters are not reportable safety concerns and are not guaranteed confidentiality:

(a) matters showing a serious and imminent threat to a person's health or life

(b) acts of unlawful interference with an aircraft

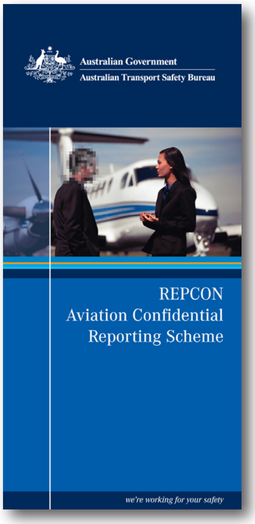
(c) industrial relations matters

(d) conduct that may constitute a serious crime.

Note 1: REPCON is not an alternative to complying with reporting obligations under the Transport Safety Investigation Regulations 2003 (see www.atsb.gov.au).

Note 2: Submission of a report known by the reporter to be false or misleading is an offence under section 137.1 of the Criminal Code.

If you wish to obtain advice or further information, please call REPCON on 1800 020 505.



Introduction of a new headset

R200800102

Report narrative:

The reporter expressed safety concerns about the introduction of a new headset into one of the operator's aircraft types and listed a number of safety issues with the new headsets as compared to the previous headsets.

The safety issues listed included: an electrical buzzing noise in the headset that was very distracting; reduced situational awareness and loss of audible cues in the flight deck and surrounds; and headaches with prolonged use resulting in a reduced ability to concentrate.

The reporter also indicated that below 10,000 feet, crew have been instructed to use only one ear cup of the headset resulting in: speech from the other crew members being very difficult to understand; disorienting audio cues; frequently missed or misinterpreted radio calls from ATC; and muffled EICAS (Engine Indicating and Crew Alerting System) warnings.

REPCON comment:

REPCON supplied the operator with the de-identified report. The operator advised that the new headset was chosen over the old headset due to the superior noise attenuation qualities, as well as some deficiencies in the old headset when used with the crew oxygen mask and goggles. The new headset provides Active Noise Reduction (ANR) via the battery pack. Part of the program involves re-wiring the aircraft such that the aircraft electrical system will supply power to the ANR facility. Given that the re-wiring program would take at least 18 months, the battery pack arrangement is used as a stop-gap until the re-wiring program is completed.

Unfortunately, the battery pack also creates interference that amplifies the electronic noise normally heard at a low level when using ANR headsets. This is unavoidable in any ANR headset. The degree of amplification is variable across the fleet. One aircraft is currently modified to power the ANR facility and uses this headset with no additional background hum and all reports have been very positive.

In relation to the specific issues raised in the REPCON report:

The operator claims that the impact of the background hum and associated headaches on individuals is very subjective. Some Flight Crews have refused to fly with the headset due to the hum, whereas other Flight Crews have refused to operate the very same aircraft until the headsets were re-installed. The operator added that it could not make comment on individual circumstances and impacts except that this type of headset is quite different to what has been used for the previous two decades.

The potential reduction in situation awareness and audible cues are known characteristics of all ANR headsets, not just the one provided. With the inboard ear uncovered (as was the procedure with the previous headset) the covered ear should allow clearer audio reception. The benefit of ANR headsets is in eliminating extraneous noise and making voice and radio interpretation clearer - the major impact on most Flight Crews is the reduction in radio reception volume required for the same (if not better) audio quality.

EICAS warnings have been tested in the aircraft and simulator with no adverse impact noted - this is a certification issue for Regulators if a headset were to degrade aural warnings. This is especially so in an aircraft where aural warnings are provided through area speakers as opposed to headset piping. Further, the physics of the use of ANR headsets can show that aural warning perception remains unchanged with commensurate changes in noise attenuation in both the ambient and aural warning output. The headset has the manufacturer and FAA TSO (Technical Standard Order) approval for use on the aircraft type referred to in the REPCON report. The latter is important, in that the manufacturer or FAA can limit aircraft applicability if they so desire.

REPCON supplied CASA with the de-identified report and a version of the operator's response. CASA had noted an issue with the headsets during operational surveillance of the operator. CASA noted that the problem will be fixed when the headsets are hard-wired to the aircraft power system. CASA will continue to liaise with the operator regarding the proposed timeframe to complete the modification.

IFR operations using a VFR only approved GPS

R200800114

Report narrative:

The reporter expressed safety concerns about the operator conducting IFR operations using a VFR only approved GPS unit as the primary means of navigation. The reporter believes that direct routing, SIDS and STARS are often accepted when ATC make a request to deviate from the flight plan and that ATC must be aware that the aircraft does not have an approved GPS for that request as it would be on the flight plan information.

REPCON comment:

REPCON provided Airservices with the de-identified report. Airservices provided the following response:

From an ATC point of view, if it is an IFR flight, it would be processed as such and controllers should check the 'field 18' remarks in the flight plan for GPS. What is not clear is how a controller would know the GPS unit is only approved for VFR use. In the Aeronautical Information Publication (AIP), section ENR 1.10-14 does not show that permutation.

REPCON supplied CASA with the de-identified report and a version of Airservices response. CASA advised that they support Airservices' position. It is a pilot responsibility to indicate accurately the navigation capability on the flight plan and advise capability in flight if given clearance requirements that cannot be complied with. CASA has published and continues to publish pilot guidance material on requirements for IFR navigation utilising GPS. CASA is following up the issue with the operator concerned.

Emergency exit briefing

R2008000106

Report narrative:

The reporter expressed safety concerns that no briefing was given by cabin crew to passengers seated next to the emergency exit doors on how to operate those doors.

REPCON comment:

REPCON supplied the operator with the de-identified report. The operator advised that the crew indicated that the flight had been delayed and subsequently was behind schedule and the exit row passengers were briefed during the initial cabin pre-flight procedures. However, two passengers boarded very late and were seated in the emergency exit rows. This was not realised until after takeoff and the seat belt sign had been turned off.

REPCON supplied CASA with the de-identified report and a version of the operator's response. CASA advised that they will address this matter as part of its operational surveillance and ensure that it forms part of the operators internal audit schedule.

REPCON reports received	
Total 2007	117
Total 2008	121
First Quarter 2009	41
What happens to my report?	
For Your Information issued	
Total 2007	58
Total 2008	99
First Quarter 2009	42
Alert Bulletins issued	
Total 2007	1
Total 2008	12
First Quarter 2009	0
Who is reporting to REPCON?#	
Aircraft maintenance personnel	29%
Air Traffic controller	4%
Cabin crew	2%
Facilities maintenance personnel /ground crew	1%
Flight crew	32%
Passengers	6%
Others*	26%

\# 29 Jan 2007 to 30 April 2009

* examples include residents, property owners, general public

How can I report to REPCON?

On line: ATSB website at <www.atsb.gov.au>
Telephone: 1800 020 505
by email: repcon@atsb.gov.au
by facsimile: 02 6274 6461
by mail: Freepost 600,
PO Box 600, Civic Square ACT 2608
For further information on REPCON, please visit our website <www.atsb.gov.au> or call REPCON on: 1800 020 505.