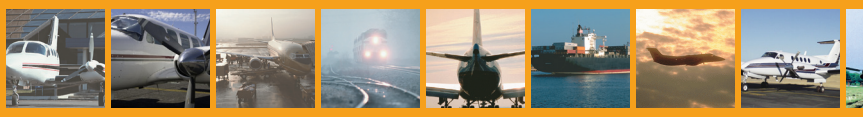
Australian Government
Australian Transport Safety Bureau

The Australian



Chief Commissioner's message

In November last year, the ATSB launched its new-look website. The function and design of the new site is based on the findings from the market research we recently conducted with stakeholders. You asked and we responded.

Besides the contemporary look and feel, the new website helps us better communicate key safety messages from our transport safety investigations and research reports. It also improves overall accessibility and usability for our users.

You will notice that we've added some new features to enhance your overall experience with the site. These include:

- a scrolling news items section on the homepage that gives you quick updates on ATSB investigations and activities
- an improved investigations hub that provides better access to all relevant data and information on our active and completed investigations
- a progress bar that provides a visual on the status of ATSB investigations
- a latest reports section on the homepage that lets you scroll and access recent investigation and research reports
- an easier way to submit an accident/incident notification through improved secure online forms.

The new-look website forms part of our commitment to improving the way we communicate key safety messages and updates to industry and the community.

The new site was particularly useful during the early stages of our investigation into the uncontained engine failure of Qantas Flight QF32. Through the news item section on the home page, we provided daily updates for several weeks following the occurrence. I am pleased to say that this was well received by industry.

Be sure to bookmark our website (www.atsb.gov.au) and try our free online subscription service to receive ATSB updates and reports via email.

If you have any feedback about the new website, you can email us on our website feedback form.

Martin Dolan
Chief Commissioner

Risk of aviation oxygen cylinder rupture extremely remote

The rupture of an oxygen cylinder on board a Qantas Boeing 747 was a unique event and highly unlikely to happen again, according to an ATSB investigation.

On 25 July 2008, an oxygen cylinder ruptured in the plane's forward cargo hold about an hour into a flight from Hong Kong to Melbourne. Part of the ruptured cylinder punctured the fuselage wall and damaged the cabin, causing the plane to depressurise rapidly. The plane then made an emergency descent and landed at the nearest suitable airport in Manila, Philippines. None of the 369 passengers and crew on board were injured.

ATSB Chief Commissioner, Mr Martin Dolan, said investigators conducted a comprehensive investigation to determine the cause of the rupture, despite missing the key piece of evidence.

'This was an unusual and challenging investigation as the key piece of evidence, the ruptured cylinder, was ejected from the plane and is at the bottom of the South China Sea,' Mr Dolan said.

'Since we didn't have the ruptured cylinder, we exhaustively tested and evaluated identical cylinders, including cylinders from the same manufacturing batch. Through these tests we did not identify any aspect of the cylinder design or manufacture that could pose a threat.

'As well, the published maintenance procedures were found to be valid and thorough, and inspection regimes appropriate. The investigation also found no record of any other related instances of aviation oxygen cylinder rupture.

'Given the widespread and long-term use of this type of cylinder, it was clear that this occurrence was a unique event.

'In light of the investigation's findings, it is our view that the risk of a similar rupture and consequent aircraft damage remains extremely remote.'

The ATSB investigation report also provides safety advice for operators and organisations involved with aviation oxygen cylinders and operators of pressurised passenger transport aircraft. This advice included improving aircraft passenger briefings to ensure passengers are able to readily use emergency oxygen supply when required. This has already been addressed by Qantas. ■

ATSB investigation report AO-2008-053

Aviation Safety Investigator

QF30—how the investigation unfolded

Neville Blyth is the ATSB's technical analysis manager. His involvement with the investigation into the explosive decompression onboard Qantas Flight QF30 began on 25 July 2008. Neville was called out of a meeting to be told that a Boeing 747 aircraft had been diverted to Manila with a two-metre hole in its fuselage. The aircraft was still in flight, but the ATSB was already mobilising a response.

It soon became evident that an oxygen cylinder had ruptured in the forward cargo hold of the aircraft. Part of the ruptured cylinder punctured the fuselage wall, causing the plane to rapidly depressurise while another part of the cylinder damaged the passenger cabin. The aircraft then made an emergency descent and landed in Manila, Philippines.

When the ATSB investigation team arrived they discovered the ruptured cylinder was ejected from the aircraft over the South China Sea. As a result, the team didn't have the key piece of evidence to examine. Neville explains this lack of evidence meant it was not going to be a conventional investigation.

"Without the ruptured cylinder we basically had to draw generalised conclusions from the limited evidence we had. In other words we had to examine a number of hypotheses—using inductive reasoning to get to the bottom of the cause." Neville says.

The approach taken by Neville and the team involved developing hypothetical scenarios based on the available evidence and systematically trialling and eliminating these hypotheses over the course of the investigation.

'The investigation process began with the close, forensic examination of the remaining physical evidence such as damage around the door and cabin along with witness statements.' Neville says.

'We then identified five key hypothetical scenarios or possibilities on how the cylinder could have been damaged. These included: the cylinder having a manufacturing flaw; the cylinder being damaged before the last overhaul; the cylinder being damaged during the last overhaul; the cylinder being damaged after the last overhaul; the cylinder having been damaged during the accident flight.'

Neville explains that the investigators thoroughly explored each of these scenarios in-depth using identical cylinders, some of which were from the same manufacturing batch.

'We wanted to determine whether there was any aspect of the cylinder design, including materials and manufacture methods, which could lead to a fault. We also looked at the batch of cylinders to see if they had an inherent flaw or weakness,' Neville says.

The team worked for many months testing the hypothetical scenarios on the identical cylinders. They undertook oxygen gas analysis, endoscopic examination, magnetic particle inspection, temperature and impact tests, flattening tests, stress analysis, hydrostatic pressure tests and an artificially flawed cylinder test. No stone was left unturned.

Despite the extensive testing regime, the team was unable to identify any particular factor that could be associated with the ruptured cylinder on QF30.

'We basically eliminated all of our five scenarios following exhaustive testing, examination and analysis of the identical oxygen cylinders,' Neville explains. 'In other words, the cause of the cylinder rupture on QF30 remains unknown.'

While the outcome was inconclusive, the investigation did confirm that the cylinder type did not pose a threat to the safety or airworthiness of the design.

'As a result of our rigorous and comprehensive approach to the investigation we can confidently say that this was a unique event and is highly unlikely to happen again.'

The ATSB investigation report into this incident, which details the ATSB's approach to the investigation along with the findings, is available on the ATSB website: www.atsb.gov.au. ■

ATSB investigation report AO-2008-053

Investigation briefs

The importance of being aware

ATSB investigation AO-2007-065

The fatal collision between two aircraft at Latrobe Valley Aerodrome, Victoria highlights the importance of pilots being aware of other aircraft traffic in the area while flying.

On 1 December 2007, a Cessna 172 aircraft and an Avid Flyer collided in midair while conducting circuit operations at the aerodrome. The Cessna was being flown by a student pilot who was conducting a series of solo circuits and the Avid was being flown by an experienced pilot.

The Cessna collided with the Avid from above and behind after both aircraft had turned onto the final leg of the circuit. The Avid then descended uncontrolled and crashed into the ground, killing the pilot. The Avid was equipped with a ballistic parachute recovery system but it had not been armed before the flight. Although the Cessna sustained damage from the collision, the student pilot was able to land the aircraft.

The ATSB investigation (AO-2007-065) reveals the student pilot was probably unaware of the Avid's presence before turning onto the final leg. This is despite the fact that both aircraft had been in the circuit for some time before colliding.

There was no evidence that the aerodrome's common traffic advisory frequency procedures were a factor in the occurrence. However, a radio over-transmission that was made before the collision possibly contributed to the student becoming unaware of the Avid's position.

The ATSB recently released *'A pilot's guide to staying safe at non-towered aerodromes'*. See the article entitled 'Safety at aerodromes without control towers' ■

Boeing issues recommendations to identify axle failures

ATSB investigation AO-2009-047

Boeing has issued advice to Boeing 737 operators and maintenance providers detailing enhanced inspection recommendations to assist in identifying grinding damage that could lead to possible axle failures.

Boeing's recommendations come as a result of an ATSB investigation into a 25 July 2009 occurrence where a Boeing 737 lost a nose wheel tyre while taxiing towards the runway at Melbourne Airport. The right wheel detached from the nose landing gear due to an axle fracture.

The investigation found the nose wheel had separated as a result of a fatigue crack through the right, inboard bearing journal. The crack formed due to residual stresses in the steel surface associated with grinding damage during manufacture.

The ATSB investigation prompted the aircraft operator to conduct an immediate, fleet-wide inspection of axles with similar service history. Boeing also audited the landing gear supplier's processes and production records to determine the extent of the grinding problem. ■

Misaligned take-off risk

ATSB investigation AR-2009-033

Airservices Australia has issued a safety bulletin encouraging increased vigilance in avoiding misaligned take-offs at Melbourne Airport.

The Bulletin, which has been distributed to all domestic and international operators, coincides with pavement and lighting construction work at Melbourne Airport which is set to continue until July 2011.

Melbourne Airport is undertaking an asphalt overlay on Runway 16/34 and Runway 09/27 and plans to realign the existing airfield ground lighting on Runway 09/27 and Runway 16/34, and replace cracked concrete pavement on Runway 09/27 and Taxiway Papa.

Works will frequently occur at night. During some stages of the work there will be displaced thresholds for Runway 16, and no centreline lighting.

In releasing the Bulletin, Airservices Australia drew attention to a recent ATSB research report on '*Factors Influencing Misaligned Take-off Occurrences at Night*'. This report examined occurrences where pilots have misjudged their position on the runway due to darkness and a combination of runway, weather and task conditions.

The bulletin identifies eight common factors that increased the risk of a misaligned take-off or landing occurrence. The factors included: distraction or divided attention of the flight crew; confusing runway layout; displaced threshold or intersection departure; poor visibility or weather; air traffic control clearance/s issued during runway entry; no runway centreline lighting; flight crew fatigue; and recessed runway edge lighting.

The Airservices Australia Safety Bulletin is available from the Airservices Australia website www.airservicesaustralia.com.au ■

QF32 investigation prompts early safety actions

In a preliminary investigation report, the ATSB outlines safety actions that have already been taken in response to an uncontained engine failure on board a Qantas A380 aircraft over Batam Island, Indonesia on 4 November 2010.

'The investigation highlights Australian and international cooperation in the interests of aviation safety,' said the ATSB's Chief Commissioner, Martin Dolan. 'The ATSB is the lead investigator, but many others are involved and their cooperation has been essential'.

'We're still in the early stages of investigation,' Mr Dolan added, 'but significant action has already been taken to minimise the risk of a recurrence'.

The report identifies an overspeed-related failure in the intermediate pressure turbine disc in the aircraft's No 2 engine. Sections of the fractured disc and other engine components penetrated the aircraft's left wing and a number of other areas on the aircraft, resulting in significant structural and systems damage to the aircraft.

As a result of the investigation, the ATSB has issued a safety recommendation about potential engine problems in some Airbus A380 aircraft. The problem relates to a possible manufacturing issue with the high pressure/intermediate pressure (HP/IP) bearing structure oil pipes of some engines, which could lead to fatigue cracking, oil leakage and potential engine failure from an oil fire within the HP/IP bearing buffer space.

In response to the recommendation Rolls-Royce, affected airlines and safety regulators have taken action to ensure the continued safe operation of A380 aircraft. The action involves the close inspection of affected engines and the removal from service of any engine which displays the suspected problem. In addition, the European Aviation Safety Agency has approved a modification to the engine control software to reduce the risk of an overspeed-related turbine disc failure.

In Australia, Qantas is carrying out the necessary inspections in coordination with the Civil Aviation Safety Authority.

'We stress that this is a preliminary report,' Mr Dolan said. 'It is intended to set out the sequence of events as we understand it so far and to highlight the safety issue we have identified. A comprehensive report will be completed within a year of the occurrence.'

The report also describes the flight crew's actions in dealing with the consequences of engine failure and in landing the aircraft safely in Singapore without injury to any of the 469 crew and passengers on board.

The ATSB's preliminary factual report outlines a number of areas for further investigation. They include additional examination of the turbine disc and other engine components, onboard recorded information, damage to the aircraft and its systems, and of the response by flight, cabin and emergency services crews.

A copy of the preliminary factual report is available on the ATSB website www.atsb.gov.au ■

ATSB investigation report AO-2010-089

747 engine failure and air turn-back

The preliminary report into an accident involving an Australian operated Boeing 747 aircraft, which occurred not long after leaving San Francisco on 30 August 2010, has revealed the number-4 (right most) engine sustained an internal mechanical failure in the turbine area, rupturing the casing and ejecting debris that punctured a hole in the cowling. The plane's flaps and wing skin also incurred minor damage.

ATSB investigators inspected the engine and aircraft in San Francisco, and attended the subsequent detailed disassembly and technical examination in Hong Kong. Representatives from the engine manufacturer, aircraft operator and airframe manufacturer also observed the examination.

During the examination, it was evident that the internal turbo-machinery had been significantly disrupted, with extensive damage sustained by the intermediate pressure (IP) and low pressure (LP) turbine rotors. All of the turbine blades had separated from the IP turbine disk; blades from the three LP turbine stages were either fractured through the airfoil section or separated from the disk; the LP stage 1 nozzle guide vanes were destroyed and the remaining LP nozzle stages were substantially damaged.

While 'uncontained' engine failures are relatively uncommon, the circumstances must be examined thoroughly and any significant safety lessons are learnt from the incident.

The investigation is continuing and will include:

- further examination and testing of engine components with a view to identifying the factors that contributed to the engine failure
- examination of the provisions for the containment of debris during engine mechanical
  failures in the HP/IP turbine area
- review and analysis of the recorded flight data
- review of the engine maintenance records
- review of safety within the aircraft cabin during and after the engine failure.

The final report is not expected to be published until August 2011.

Safety at aerodromes without control towers

Because Australia's population is spread so widely, most aerodromes are located in uncontrolled airspace. Consequently, they do not have an air traffic control presence. Instead, pilots are responsible for making themselves aware of other nearby aircraft and for maintaining separation.

A booklet released by the ATSB reminds pilots of their responsibilities and the precautions they need to observe around aerodromes which do not have air traffic control towers.

'Generally, operations at non-towered aerodromes can be considered to be safe,' said Martin Dolan, the Chief Commissioner of the ATSB. 'Continued safety relies on all pilots maintaining awareness of their surroundings and of other aircraft, and on their flying in compliance with procedures, while being observant, courteous and cooperative.'

Between 2003 and 2008, the ATSB was notified of 709 airspace-related safety occurrences at, or in the vicinity of non-towered aerodromes. Of these, 60 were considered serious incidents (mostly near mid-air collisions) and six constituted accidents (four mid-air and two ground collisions). The booklet, *A Pilot's Guide to staying safe in the vicinity of non-towered aerodromes*, provides advice to pilots on how to avoid the risks. It provides strategies for alerting other aircraft to one's presence and maintaining awareness of other aircraft.

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 at any one time. In addition, the traffic density can vary greatly. For example, 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.

This dynamic environment can present a challenge for even experienced pilots. The reports of accidents and incidents at non-towered aerodromes received by the ATSB have raised a number of concerns relating to aircraft separation, situational awareness, adherence to circuit and approach procedures and airmanship. Pilots need to remember that there may be a variety of aircraft with different sizes, flight rules and performance levels all operating at the same time in the same airspace.

One of the most important strategies for ensuring safety at non-towered aerodromes is maintaining good communications. Pilots operating at non-towered aerodromes are expected to make a series of standard broadcasts on the Common Traffic Advisory Frequency (CTAF), regarding their position and intentions. Broadcasting on the CTAF effectively helps to reduce the risk of a mid-air collision or reduced separation by supporting pilots' visual lookout for traffic and situational awareness, and assisting them to mutually separate their aircraft. This is known as radio-alerted 'see-and-avoid'.

However, maintaining a total reliance on the radio is dangerous. The report also documents many cases where standard radio calls were not made and/or not heard due to a variety of reasons, resulting in pilots being unaware of other traffic. Whether you fly into non-towered or towered aerodromes, maintaining a vigilant lookout at all times is also important.

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.

The Civil Aviation Safety Authority has also released two important Civil Aviation Advisory Publications to support recent changes to Civil Aviation Regulation 166 and to reinforce safe flying practices in the vicinity of non-towered aerodromes. ■

ATSB investigation report AO-2008-044(2)

REPCON briefs

Australia's voluntary confidential aviation reporting scheme

REPCON allows any one 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 (either the reporter or any person referred to in the report) that information will remain confidential.

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 and well-meaning 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.

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

Unsafe practices at an aerodrome

Report narrative:

The reporter expressed safety concerns that incidents/accidents are increasing and operating procedures appear to be deteriorating at a named aerodrome. Occurrences and deteriorating operating procedures include not restraining aircraft when unattended, collisions with other aircraft and structures, dangerous hand starting procedures, unconventional circuits being flown and non standard radio calls.

Action taken by REPCON:

REPCON supplied CASA with the de-identified report CASA advised that it was aware of increased activity at the aerodrome as a result of aircraft operating from the Aerodrome. CASA has recently conducted surveillance activity on operations in the vicinity of the aerodrome and is satisfied that aircraft operators are meeting their safety obligations in accordance with the applicable civil aviation legislation. Further surveillance activity is planned. Without more specific information, CASA is unable to action or comment further on the issues raised in the REPCON.

Safety of cabin crew in turbulence

Report narrative:

The reporter expressed safety concerns about cabin crew not being seated with seatbelts secured during turbulence while passengers are seated with seatbelts secured and the seat belt sign illuminated. The reporter estimated that over the last seven years flying with the operator, with an estimated 300 to 400 sectors, that only once were cabin crew observed to resume their seats in turbulence. This occurred when the turbulence was so severe that crew found it extremely difficult to stand. During the flights where the crew did not resume their seats in turbulence the food service was continued and cabin crew moved through the cabin with hot liquids and food.

The reporter believes that CAO (Civil Aviation Order) 20.16.3 requires all passengers and crew to occupy a seat during turbulent conditions. On other airlines the reporter has flown with, whenever the seat belt sign is illuminated due to turbulence, both passengers and crew are instructed to be seated and fasten seatbelts.

Action taken by REPCON:

REPCON supplied the operator with the de-identified report and the operator advised that CAO 20.16.3 states:

> 3.1 Each crew member and each passenger shall occupy a seat of an approved type:
>
> a) during take-off and landing; and
>
> b) during an instrument approach; and
>
> c) when the aircraft is flying at a height less than 1000 feet above the terrain; and
>
> d) in turbulent conditions.

The operator advised that the CAO does not define the level of severity of the turbulence at which crew and passengers must be seated. The operator ensures that passengers are seated at a lesser level of turbulence than for cabin crew this is stated in their procedure manual. Contained therein are procedures for dealing with the levels of severity of turbulence and also included is the following note:

> NOTE: Crew should be seated immediately if they feel their safety is in jeopardy at any stage.

The operator also noted that CAO 20.16.3 and Civil Aviation Regulations (1988) 251 lists duties for cabin crew that require certain actions if turbulence is encountered. The operator believes that assumes cabin crew are to perform functions other than immediately resume their seat in all cases of turbulence encounters. The operator therefore, in keeping with the drafting of the relevant CAO, published procedures detailing duties of cabin crew in turbulence as long as the overriding embodied intent is to ensure the safety of both passengers and crew.

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

> CASA has reviewed the report and will request that the operator review their turbulence procedures in accordance with Civil Aviation Regulation 251 s1(d).

The operator has subsequently advised they are in the process of revising their turbulence procedures. ■

How can I report to REPCON?

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