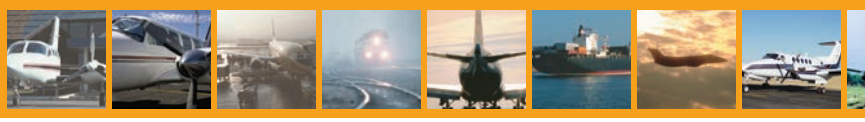
Australian Government
Australian Transport Safety Bureau

The Australian



## If in doubt, notify the ATSB

Most people know the ATSB as Australia's national transport investigator—the agency that investigates aviation and other transport accidents to find the cause and prevent them from happening again.

To help us do our safety job in aviation, we are also the notification point for all aviation safety occurrences in Australia. This means that whenever there's an aviation incident or accident—no matter how seemingly minor—you should notify us.

We use this information in two ways: to decide whether to investigate an occurrence; and to make real practical improvements to aviation safety. The data we get from notifications helps us analyse trends, find patterns in aviation safety and alert the relevant people to any ongoing problem or risk.

But to do this effectively, we need to be told about these occurrences. This is where we rely on the people at the fore of the aviation industry: the operators, pilots, engineers, and safety managers. Besides being a legal requirement, your notification to the ATSB is invaluable to helping prevent another accident. Ultimately your notification could save a life.

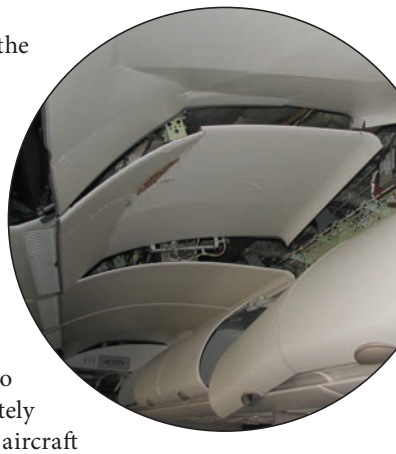
If you're not sure if an incident or accident is 'notifiable', the best rule of thumb is to report it to the ATSB anyway. That includes recreational and sports aviation as well.

We know that people are generally pretty good at reporting already. But it could be even better. One example: we'll soon be publishing a safety investigation report that reveals that at least 40 per cent of aviation wirestrikes are not reported to the ATSB. This is a startling find and we strongly encourage everyone involved in a wirestrike to tell us about it.

We're currently finalising some changes to the rules for notification to make them clearer and simpler. In the meantime, you can find more information on the notifications process by calling 1800 011 034 or by clicking the 'Submit a mandatory accident or incident notification' icon on the ATSB website www.atsb.gov.au.

Martin Dolan
Chief Commissioner

## Rare software glitch causes sudden pitch down



A limitation in software design caused the sudden pitch down of a Qantas A330 aircraft en route from Singapore to Perth in October 2008, according to the ATSB report into the incident.

At least 110 of the 303 passengers and nine of the 12 crew members were injured. Of these, 51 received hospital medical treatment.

The ATSB found that the in-flight upset was a unique event and extremely unlikely to happen again. During the flight, approximately 154 kilometres west of Learmonth, WA, the aircraft suddenly pitched down, due to a combination of problems involving two aircraft systems: the flight control computers and one of the aircraft's three air data inertial reference units (ADIRUs).

Due to a limitation in software design, the flight control computers commanded the aircraft to pitch down in response to a very rare pattern of incorrect angle of attack data from one of the ADIRUs.

ATSB Chief Commissioner, Mr Martin Dolan, said that Airbus had taken prompt action to reduce the likelihood of another similar accident.

'Very soon after the accident, the manufacturer issued new pilot procedures to manage the effects of any future cases of a similar ADIRU failure,' Mr Dolan said.

'The aircraft manufacturer then redesigned its software. Passengers, crew and operators can be confident that the same type of accident will not happen again.'

An extensive investigation into what triggered the ADIRU failure mode concluded that it was very unlikely to have been caused by electromagnetic interference from the Harold E. Holt Naval Communications station at Exmouth or from a personal electronic device such as a laptop or mobile phone. A range of other possible mechanisms were also discounted.

Mr Dolan stated that the ATSB investigation covered a range of complicated issues, including some that had rarely been considered in depth by previous accident investigations.

'Given the increasing complexity of aircraft systems, this comprehensive investigation has offered an insight into the types of issues that will become increasingly relevant for future investigations. It identified a number of specific lessons for the manufacturers of new, complex, safety-critical systems,' Mr Dolan said.

The report AO-2008-070 is available on the ATSB website www.atsb.gov.au ■

# Aviation Safety Investigator

## Buckle up

Passengers on board a Sydney-bound Qantas A380 Airbus were reminded of the importance of 'buckling up' when the aircraft struck severe turbulence during a flight on 9 January 2012.

About three hours from Singapore, the Captain switched on the seat belt lights as the aircraft was being manoeuvred to keep clear of thunderstorms. Ninety seconds later, the aircraft encountered two very short, but severe sets of turbulence.

Despite the severity of the turbulence, only seven passengers were injured in the incident. None of these passengers were wearing seat belts—most of the injured were believed to be walking through the cabin when the turbulence struck.

The low number of injuries was most likely because the vast majority of passengers were seated with their seat belts fastened before the turbulence hit. In fact, media coverage of the incident quotes several passengers who noted how fortunate they were for having their seat belts fastened during the event.

This incident follows the October 2008 accident where a Qantas Airbus A330 en route from Singapore to Perth that suddenly pitched down while in-flight due to a rare technical problem in the aircraft's systems. At least 60 passengers, who were seated without their seat belts fastened, were injured.

Although some of those wearing a seat belt were also injured, most of the injuries occurred when unrestrained occupants were thrown into the aircraft's ceiling. The injury rate and severity was much greater for those who were not wearing a seat belt. ■

## Potentially catastrophic data error

The incorrect entry of take-off data resulted in a near catastrophe for an Emirates A380 Airbus at Melbourne Airport on 20 March 2009. While taking off, the aircraft's tail struck the runway three times. It then overran the runway before hitting infrastructure more than 170 metres away.

'These sorts of errors have potentially serious safety consequences,' said ATSB Chief Commissioner, Mr Martin Dolan. 'It is encouraging to see the significant safety action that is occurring as a result of the ATSB's investigation.'

Mr Dolan was speaking about the release of the ATSB's final investigation report on the accident, when flight EK407, with 18 crew and 257 passengers, sustained a tailstrike on departure from Melbourne Airport, Victoria.

The ATSB found that the accident was a result of the crew using incorrect take-off performance parameters. The initial error was likely due to mistyping, when a weight of 262.9 tonnes, instead of the intended 362.9 tonnes, was entered into a laptop computer (or 'electronic flight bag') to calculate the aircraft's take-off settings. The error passed through several subsequent checks without detection.

The ATSB's investigation examined a number of systemic safety issues surrounding the accident. The investigation was supported by an ATSB research report titled *Take-off performance calculation and entry errors: A global perspective*.

'We now understand what caused the error and why it wasn't picked up,' Mr Dolan said. 'We also know there have been a number of other accidents and incidents that involved similar errors in a range of different aircraft operated by different airlines around the world.'

'All of those events had two basic elements in common: the error in entering the weight was not detected before take off, and the degraded take-off performance was not detected until well into the take-off run, if at all.'

Mr Dolan noted that, currently, the only checks in place to prevent these types of accidents are procedural and vulnerable to human error. 'But a lot of work is being done to minimise the risk of similar events in future,' he said.

> 'The aviation industry as a whole realises the seriousness of these issues and is working towards a solution.'

'This includes developing technological aids to assist flight crew in recognising both when take-off parameters are inappropriate and when take-off performance is degraded below a safe level' noted Mr Dolan. 'The aviation industry as a whole realises the seriousness of these issues and is working towards a solution.'

To stress that further action is still needed with technological aids, the ATSB has issued a safety recommendation to the United States Federal Aviation Administration. It has also issued safety advisory notices to a number of international aviation organisations. These notices highlight the importance in the meantime of managing the problem pilots face in deciding whether the parameters calculated for a particular take off are appropriate.

A full copy of the investigation report AO-2009-012 is available on the ATSB website www.atsb.gov.au ■

# Poor fuel management remains a safety risk

## Is there enough left in the tank?

### An avoidable tragedy

A fatal helicopter accident in the Northern Territory has highlighted the importance of pilots and operators using consistent, reliable procedures to independently verify the fuel quantity in their aircraft's tanks.

On 4 October 2010, the pilot of a Robinson Helicopter R22 Beta was mustering cattle on a station property about 170 km east of Katherine, NT.

When the station owner was unable to make radio contact with the pilot he immediately conducted an aerial search. The search found that the helicopter had crashed heavily into the ground and the pilot did not survive the impact.

The ATSB's investigation found that the helicopter's engine had stopped while operating at low altitude. The cause of the engine stoppage was most likely due to fuel exhaustion, which happens when there is insufficient useable fuel to supply the engine.

To maximise the performance of the R22 during mustering, the station's pilots generally minimised the helicopter's weight by only uplifting enough fuel for the expected duration of the flight. If the pilot took off with less than a full tank of fuel he may have thought that there was more fuel on board the helicopter than was actually the case.

On the day of the accident, neither the fuel uplifted and consumed, nor the flight time was formally recorded by the station pilots.

### Safe flight depends on reliable power

Fuel exhaustion and fuel starvation are the two main reasons for the interruption of fuel supply.

Fuel exhaustion and starvation incidents and accidents have led to forced landings, diversions to other aerodromes and, in the worst cases, fatal crashes. And it's not just single pilot operations that are at risk—all pilots, including those flying with multiple crew, are vulnerable to human error and its consequences.

The ATSB urges all pilots and operators to review their fuel management practices and procedures to ensure they are effective, consistent and reliable.

The ATSB's latest Avoidable Accident report, *Starved and exhausted: Fuel management aviation accidents*, helps pilots and operators better understand and manage the risk of fuel exhaustion and starvation. You can download the report free of charge from the Safety Awareness section at www.atsb.gov.au or request printed copies by emailing ATSBinfo@atsb.gov.au ■

**Accident site of VH-THI**


### Preventing fuel exhaustion and starvation

Poor fuel management in some aircraft operations continues to pose a serious risk to aviation safety.

### Fuel exhaustion

Many accidents involving fuel exhaustion and starvation are avoidable through good fuel management practices and procedures.

Pilots and operators can reduce the chance of fuel exhaustion by:

- using more than one source of information to obtain consistent results about the fuel on board before flight
- implementing a consistent procedure, and checking it regularly, to establish and monitor the exact rate of fuel consumption
- monitoring the flight to ensure that sufficient fuel will remain on board in the event of unplanned delays.

### Fuel starvation

Fuel starvation usually happens when the selected tank is run dry. The chance of fuel starvation can be reduced by following procedures and by:

- ensuring the pilot is familiar with the operation of their aircraft's fuel system during normal and abnormal operations
- adhering to pre-flight procedures and checks to ensure the correct tank is selected before takeoff and landing
- using a fuel log during flight to provide a record of the fuel usage from each tank
- selecting the appropriate tank before descending and ensuring it has adequate fuel for landing. ■

# Your notification improves safety, saves lives

If you were involved in a serious car accident, one of the first things you'd do is alert the authorities (if you were able to do so). After all, that important phone call could save a life and prevent injuries.

In the same way, by notifying the ATSB of aviation accidents and incidents you could make a real difference to the safety of your fellow pilots.

As the national transport safety investigator, the ATSB is the Australian Government agency you should notify for all aviation accidents and incidents. While we use your notification to determine whether to investigate an occurrence, looked at as a whole, notifications also give us a bigger picture of aviation safety trends and patterns.

> The best rule of thumb is to report any accident or incident to the ATSB. We much prefer over reporting to under reporting.

Like a jigsaw piece in a bigger puzzle, certain notifications can often be joined together to reveal a broader, systemic safety problem. Once we've identified an accident or incident trend from your notifications, we can make tangible improvements to safety through safety advisory notices, recommendations and further safety investigations.

In 2011, for instance, the ATSB began a safety issue investigation into the Robinson Helicopter R22 drive belt system following several notifications of accidents and incidents involving the R22 V-belt. While the investigation is still ongoing, the ATSB has already found key factors that can affect the reliability of the drive belt system and directly alerted R22 pilots and operators on how to manage the issue.

Besides the obvious safety benefits of reporting an occurrence, there are also legal requirements to report certain accidents and incidents to the ATSB. Even if there are no injuries or there is minimal aircraft damage, you should still let the ATSB know.

Also, when considering whether to report or not, remember that the ATSB does not investigate to lay blame or apportion liability. We investigate to improve safety and prevent an accident from happening again.

The best rule of thumb is to report any accident or incident to the ATSB. We much prefer over reporting to under reporting.

You can find more information on accident and incident notifications—including when, what and how to notify—on the ATSB website or by calling the ATSB notifications number on 1800 011 034. ■

### Notify the ATSB of an accident or incident

You can report an accident or serious incident (an Immediately Reportable Matter – IRM) to the ATSB 24 hours a day, seven days a week.

- call 1800 011 034 (you can also use this number if you need advice or clarification on reporting matters)
- submit written reports by any means—but online notifications are preferred by the ATSB if possible. Simply click the 'Submit a Mandatory Notification' button on the homepage of the ATSB website www.atsb.gov.au

## ATSB encourages installation of audible cabin pressure warning systems

The Australian Transport Safety Bureau has reinforced its call for operators of single-pilot, turbine-powered, pressurised aircraft to consider installing an aural cabin altitude pressure warning system that operates separately from their aircraft's visual warning system.

Unrecognised hypoxia in an unpressurised cabin continues to pose a serious safety threat. In many cases, pilots have either not noticed existing visual warning systems, or those systems failed to operate correctly.

Audible warning systems provide a voice prompt warning through the aircraft's cockpit speakers and the pilot's headset. Considering the potential outcome if an aircraft's existing visual depressurisation warning is missed, or fails to operate, an additional and independent warning system could prove invaluable.

In response to Safety Advisory Notice AO-2009-044-SAN-068 (Flight Safety Australia Issue 84) the ATSB has had a number of requests from operators to help locate vendors of alarm systems. While not endorsing any particular product, the ATSB is aware of the following suppliers:

**Electric Force Measurement**
P: 03 9859 8356
W: www.electricforcemeasurement.com.au

**Anders Sundström**
P: +46 703 180 712
E: anders.sundstrom@lnctv.com

The ATSB's investigation report AO-2009-044 and Safety Advisory Notice can be found on the ATSB website www.atsb.gov.au ■


**Typical King Air C90 cabin pressurisation controller with adjacent three-position cabin pressure control switch indicated by arrow**

# Investigation briefs

## Importance of pre-flight planning

Investigation AO-2011-051

A fatal helicopter accident on the NSW south coast has again highlighted the importance of thorough pre-flight planning and informed in-flight decision-making.

On 24 April 2011, the owner-pilot of a Robinson R44 helicopter departed Nerrigundah, with one passenger on board, for a private flight to a property near Berry, NSW.

Takeoff was delayed and by the time the flight departed, there was not enough daylight left for the pilot to complete the flight under the day visual flight rules.

During the flight, the pilot observed cloud, moderate rain and low visibility along the planned track and decided to divert to a private helicopter landing site to maintain visual meteorological conditions.

The pilot reduced airspeed and descended over water to what he believed to be 100 feet. Now flying in darkness, the pilot lost visual reference and the helicopter collided with the sea in Lilli Pilli Bay. The pilot survived and the passenger was fatally injured.

The safety lessons from this accident have relevance to every flight:

- pre-flight preparation and planning is vital
- always check the weather forecast and other operational details before takeoff and in-flight
- have a backup plan and be prepared to use it
- make decisions early—if there's any doubt, turn about.

The booklet *Accidents involving Visual Flight Rules pilots in Instrument Meteorological Conditions* and investigation report AO-2011-051 are available on the ATSB website at www.atsb.gov.au ■

## Recording service life in overweight operations

Investigation AO-2008-084

On 29 December 2008 the pilot of a PZL-M18A Dromader aircraft was conducting agricultural spraying near Nyngan NSW. Witnesses reported seeing something detach from the aircraft before it rolled and crashed into the ground. The pilot was killed in the accident. The ATSB's investigation found that during the flight a 1.8 metre section of the aircraft's right wing had detached from the aircraft.

While not directly related to the in-flight breakup the ATSB also identified that a number of operators of PZL-M18 Dromader aircraft were not calculating the correct flying hours when the take-off weight was over 4,700 kilograms.

That resulted in the overestimation of those aircrafts' remaining service life and meant that it could not be assured that they were being operated within their safe service life.

The investigation has prompted the following safety actions:

- the operator examined its fleet and retrospectively applied the correct service life factors and adjusted their processes to apply correct service life factors to all future flights
- CASA contacted operators of M18 Dromader aircraft to ensure that procedures are in place to record aircraft time-in-service for overweight operations and that overweight flight time is factored into the calculation of Dromader airframe service life.

The final report is available on the ATSB website at www.atsb.gov.au ■

## PT6A-67 series engine bolt failure

Investigation AO-2010-006

Bolts that had not been cold rolled during manufacture and overhaul on PT6A-67 series engines caused total power loss for the pilot of a medical evacuation flight in WA.

On 29 January 2010, during a flight in a single-engine Pilatus PC-12/45 aircraft with four people on board, the pilot felt a shudder and heard a loud noise as the aircraft passed through flight level 180. Subsequently, the engine CHIP light illuminated indicating the detection of metal chips in the engine oil. The pilot continued the climb and immediately turned back towards Derby.

The engine lost oil pressure, engine torque decreased and the inter-turbine temperature increased. The aircraft's rate of climb began to reduce and the pilot established into level flight before further reducing engine power. The pilot shut down the engine when the OIL QTY warning light came on.

The ATSB's investigation found that the engine propeller reduction gearbox had seized when four of the six reduction gear assembly carrier bolts failed due to fatigue.

The engine manufacturer determined that a quantity of assembly carrier bolts had not undergone the necessary cold rolling during manufacture. Service bulletins were issued that identified affected gearboxes and provided recommended compliance times for the removal from service of suspect carrier bolts.

The investigation also found that the Society of Automotive Engineers specification AS7477D was ambiguous in relation to the need to cold roll the head-to-shank fillet radius of MS9490-34 carrier bolts. The Society published a revised specification in October 2011, clarifying the need for cold rolling of those bolts.

The final report is available on the ATSB website at www.atsb.gov.au ■

# 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.

### New company procedure

**Report narrative:**

The reporter expressed safety concerns over a new procedure being trialled at Sydney Airport which involves taxiing the aircraft to the arrival gate without starting the auxiliary power unit (APU). The new procedure requires flight crew to listen to both company radio frequency as well as the ground frequency after landing, to monitor the status of ground power serviceability. Both these frequencies are reported to get very busy at this airport. The reporter is concerned that there is an increased risk of a runway incident with this increase in monitoring workload.

**Response/s received:**

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

A limited trial associated with APU management is being conducted. The purpose of the trial is to quantify the benefits and identify any issues associated with the APU management procedure. Based on feedback from flight crew and review during the trial period, the requirement to monitor the company radio frequency for this procedure has since been removed.

**ATSB comment:**

Two days after the de-identified report was sent to the operator, the reporter advised REPCON that the requirement to monitor both company and ground frequencies was removed from the new procedure.

The operator also advised that since their previous response, the procedure to taxi to the arrival gate without starting the APU was cancelled after four weeks of trials. Now the APU is kept running to the gate and there is no need for monitoring of additional frequencies for this purpose.

### Flight crew and cabin crew fatigue

**Report narrative:**

The reporter expressed a safety concern regarding the increase in fatigue levels in both flight and cabin crew members.

The reporter stated that it is common for crew members to be rostered on for the maximum duty time, but in reality this means that the crews will have to extend due to normal delays. It is expected that crews will be 'happy' to extend their duty to complete the flight. The reporter also stated that the work load is increasing constantly with a trend for 6-day weeks, multiple sector days, long duties and extensions appearing. The operator is currently using the dispensation to Civil Aviation Order (CAO) 48 to the maximum extent, with the result being an increase in crew fatigue levels.

**Response/s received:**

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

I have carried out a random audit of our fatigue management system and Flight and Duty times recorded and rostered.

My findings are as follows:

- The average 14 day duty cycle for the High Capacity crews are ranging from 60 – 85 hours well within the 100 hour limit. It is very rare for a crew member to have cumulative duty in excess of 90 hours on this fleet.
- The average 14 day duty cycle on the Low Capacity is approximately 75 hours.
- We do fly seven days per week although there is only one scheduled flight on Saturdays and one scheduled flight on Sundays. Crews very rarely do a weekend flight on subsequent weekends.
- The Flight and Duty exemption restrictions are adhered to at all times.

I have reinforced to crews that fatigue management is both the pilot's and the company's responsibility and if a flight crew member is not adequately rested and in a physically and mentally fit state to fly, then they must inform their fleet manager or myself who will remove them from the roster.

Operations do not expect pilots to automatically accept duty extensions. It is, and always has been, the decision of the pilot to extend a duty in accordance with the fatigue management system.

I do not believe the author is correct in his observations.

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:

This matter has been reviewed by CASA with the operator's Chief Pilot. CASA is satisfied with the operator's response and its internal investigation. ■

### How can I report to REPCON?

Online: www.atsb.gov.au/voluntary.aspx
Telephone: 1800 020 505
Email: repcon@atsb.gov.au
Facsimile: 02 6274 6461
Mail: Freepost 600
PO Box 600, Civic Square ACT 2608