



Australian Government

Australian Transport Safety Bureau

Depressurisation event involving a Metro 3, VH-SEF

93 km south-east of Narrabri Aerodrome, 23 September 2012

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Depressurisation event involving a Metro 3, VH-SEF

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What happened

On 23 September 2012 at 1855 Eastern Standard Time¹, a Metro 3 aircraft, registered VH-SEF (SEF), and operated by Brindabella Airlines, departed Narrabri on a scheduled passenger flight to Sydney, New South Wales. On board were seven passengers and two flight crew.

Passing through transition², the Captain was the pilot flying and asked the First Officer (FO) for the transition checks, which included a check of the cabin altitude³. The transition checks were completed with no abnormalities found. Passing through FL140⁴, the Captain noted that he was not feeling well and that he was not as accurate as usual. The Captain asked the FO how he was feeling and he responded that he felt fine.

Passing through FL160, the Captain noted that his symptoms were increasing in severity and he was feeling quite ill. The Captain again asked the FO how he was feeling and he replied that he still felt fine. The Captain requested that he take over flying the aircraft and to check the cabin altitude again⁵. At the same time, the Captain reached for his oxygen mask and took a few breaths, noting that his symptoms started to improve.

The Captain noted that the FO was taking longer to reply than usual to his request for a check of the cabin altitude, when the cabin altitude warning light illuminated⁶. There was no audible alert fitted to SEF nor was there required to be. At this stage, the Captain had not switched the intercom to his oxygen mask, so he prodded the FO to draw his attention to the warning light. The FO then stated that the cabin altitude was at 17,000 ft. The Captain took over flying the aircraft and instructed the FO to perform the stage 1 memory items for emergency descent and to request an immediate descent to 10,000 ft. By the time the crew reached the checklist item that required the passenger oxygen to be turned on, SEF had descended to 10,000 ft, consequently the crew elected not to perform this item of the checklist. The Captain turned the cabin lights on and activated the PA and noted that all the passengers were responsive.

The crew proceeded through the standard checklist and noted that the pressurisation system would not pressurise the cabin in automatic mode. The crew then attempted to pressurise the cabin in manual mode, however they found the cabin altitude erratic and difficult to maintain. They elected to continue to Sydney, not above 10,000 ft, with the cabin unpressurised.

Metro 3



Source: Brendan Scott

¹ Eastern Standard Time (EST) was Coordinated Universal Time (UTC) + 10 hours

² Below 10,000 ft, Australian aircraft measure their altitude by reference to the ground. Above 10,000 ft, they measure altitude in terms of flight levels. 10,000 ft also represents the height past which unpressurised aircraft should not climb.

³ The purpose of an aircraft pressurisation system is to maintain sufficient cabin pressure for passengers to remain comfortable while the aircraft cruises at high altitudes. Cabin pressure is measured by reference to external air pressure at a given height. From the time a flight is commenced, the cabin altitude progressively climbs to a maximum of 9,000 ft.

⁴ At altitudes above 10,000 ft in Australia, an aircraft's height above mean sea level is referred to as a flight level (FL). FL 370 equates to 37,000 ft.

⁵ The cabin altitude indicating gauge was located on the FO's side of the cabin and not readily visible to the Captain.

⁶ During a depressurisation event, a warning light will illuminate in the cockpit if the cabin altitude reaches 10,000 ft. Flight crew are required to descend the aircraft to the lowest safe altitude or 10,000 ft

Aircraft information

Following the incident, the pressurisation system and pressurisation warning system were inspected:

- The pressurisation system was tested, with no fault found.
- The cabin altitude warning switch was found to be out of tolerance and replaced. At the time of the incident, there was no routine maintenance regime for the cabin altitude warning system.

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

Brindabella Airlines

As a result of this occurrence, Brindabella Airlines has advised the ATSB that they are taking the following safety actions:

- **Transition checks**

The cabin altitude transition check has been amended, so that rather than just responding with “checked”, the pilot with the cabin altitude indicating system on their side, will respond with “Cabin altitude is (indicated cabin altitude)”. The other pilot will respond with “checked”.

- **System of maintenance**

The system of maintenance for the Metro has been amended, to include test of the Cabin Pressure Warning System at an interval of 900 hours.

- **Training**

Simulator training to be considered that replicates this incident that is, a gradual loss of cabin pressure coupled with a failure of the warning system, this would be included in re-currency simulator training sessions.

ATSB comment

When suffering from the effects of hypoxia, a pilot's ability to react to an aural warning is impaired less rapidly than the ability to react to a visual warning. In an uncommanded cabin depressurisation the occupants' physical and mental functions will suffer progressive impairment and early recognition and rectification of the situation is vital.

On 17 December 2000, the ATSB issued safety recommendation R20000288 to the Civil Aviation Safety Authority (CASA) which recommended that CASA mandate the fitment of aural warnings to operate in conjunction with the cabin altitude warning system on all Beechcraft Super King Air and other applicable aircraft.

The current status of this safety recommendation is available from the ATSB web site:

- www.atsb.gov.au/publications/recommendations/2000/r20000288.aspx

Safety message

People on board an aircraft that experiences a loss of pressure when flying above 10,000 ft will suffer the effects of hypoxia. This is a condition where the body is starved of enough oxygen to function normally and can ultimately lead to death⁷.

The signs and symptoms of hypoxia become more likely to occur if there are a few other risk factors added to the equation, such as cold temperatures and physical activity. Time of useful consciousness (TUC) refers to the time between the development of an oxygen problem and the point at which a pilot can no longer take effective corrective action (Figure 1). Symptoms of hypoxia vary from individual to individual and include loss of short term memory, an increase in reaction time, mental 'tunnel vision', loss of muscle coordination, deterioration of hearing and impairment of vision.

In July 2006, the ATSB published a report titled: 'Depressurisation Accidents and Incidents Involving Australian Civil Aircraft 1 January 1975 to 31 March 2006.'

In general, the results of the study showed that 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 crew should maintain a high level of vigilance with respect to the potential hazards of cabin pressurisation system failure.

Dr Newman in an article for Flight Safety Australia writes "If you do not feel well, oxygen will do you no harm – and it may well save your life"⁸

The following publications provide further information on Hypoxia:

- *Black Out*, Flight Safety Australia, www.casa.gov.au/fsa/2005/aug/21-23.pdf
- *Depressurisation Accidents and Incidents Involving Australian Civil Aircraft*, 1 January 1975 to 31 March 2006 –ATSB, www.atsb.gov.au
- CASA has produced an educational video for pilots called 'Oxygen first' which explains the symptoms of hypoxia and how to take the appropriate action. As the title suggests, the first action for a pilot must be putting on their oxygen mask, www.casa.gov.au

Figure 1: Time of Useful Consciousness

ALTITUDE (FT)	TIME (MIN)	EFFECTS OF OXYGEN LOSS ON THE BRAIN
15,000	30 or more minutes	• Impaired reasoning and judgement • Inability to speak • Difficulty processing visual information • Loss of muscle coordination • Abnormal movement • Muscular weakness • Hyperventilation
18,000	20–30 minutes	
22,000	5–10 minutes	
25,000	3–5 minutes	
30,000	1–3 minutes	
35,000	30–60 seconds	
40,000	15–20 seconds	
45,000	9–15 seconds	EVENTUALLY • Loss of consciousness • Gradual paralysis of heart and muscle used in breathing • Brain cells begin to die
50,000	6–9 seconds	

Source: Flight Safety Australia, CASA

⁷ New Warning about hypoxia, CASA media release, 18 August 2005

⁸ Black Out, Flight Safety Australia July-August 2005.

Aircraft details

Manufacturer and model:	Fairchild SA227-AC	
Operator:	Brindabella Airlines	
Registration:	VH-SEF	
Type of operation:	RPT	
Location:	93 km SSE of Narrabri, NSW	
Occurrence type:	De-pressurisation	
Persons on board:	Crew – 2	Passengers – 7
Injuries:	Crew – 0	Passengers – 0
Damage:	None	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; and fostering safety awareness, knowledge and action.

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

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

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

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

About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.