



Australian Government

Australian Transport Safety Bureau

Cabin pressurisation fault, Saab 340B, VH-VEZ

20 km south-west of Goulburn, New South Wales on 25 March 2023



ATSB Transport Safety Report

Aviation Occurrence Investigation (Short)

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Addendum

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Executive summary

What happened

On the morning of 25 March 2023, a Link Airways Saab 340B aircraft departed Canberra Airport for the first flight of the day. As the aircraft climbed towards the cruising altitude, the flight crew noticed a higher than normal cabin altitude of 6,500 ft. In response the crew descended the aircraft and remained below 10,000 ft for the remainder of the flight to Sydney Airport.

What the ATSB found

The ATSB established that a broken section of door seal seat was found after the last flight on 24 March 2023. However, due to an incorrect assessment that the broken section was simply a piece of cosmetic trim, the off-going flight crew inappropriately applied the company's non-safety of flight defect deferral process in phone consultation with the continuing airworthiness maintenance organisation representative and a licenced aircraft maintenance engineer.

On the following morning 25 March 2023, the on-coming flight crew noted an additional section of broken door seal seat, which was misidentified as the previously deferred defect, and the aircraft was assessed as serviceable for flight.

The combined effect of the 2 sections of broken door seal seat resulted in the aircraft's pressurisation system being unable to maintain normal cabin altitude in flight.

What has been done as a result

Following the occurrence, Link Airways provided retraining and guidance to the involved parties on the importance of accurate identification of cosmetic trim, including terminology and level of detail required when raising defects. The Link Airways internal investigation report was distributed to flight operations and maintenance personnel as a reminder to be aware of the risk of communication errors.

Safety message

Communication between aircrew and maintenance engineers is critical to the continuing airworthiness of aircraft. Despite this, issues often arise due to differences in technical knowledge or language, time pressures, and remote communications such as phone or written messages.

Aircrew and maintenance engineers should remain vigilant of the potential for misunderstanding and use confirming techniques such as follow up questioning, demonstration, or the use of photos or video to ensure accurate and effective communication.

Aircrew and maintenance engineers are further reminded to include as much detail as practical when recording defects or rectifications in aircraft technical logs to minimise ambiguity and ensure clarity of communication.

The investigation

Decisions regarding the scope of an investigation are based on many factors, including the level of safety benefit likely to be obtained from an investigation and the associated resources required. For this occurrence, a limited-scope investigation was conducted in order to produce a short investigation report, and allow for greater industry awareness of findings that affect safety and potential learning opportunities.

The occurrence

On 25 March 2023, a Link Airways Saab 340B turbo-prop aircraft, registered VH-VEZ, was being operated for commercial passenger transport between Canberra, Australian Capital Territory and Sydney, New South Wales. On board were the captain as pilot flying,¹ first officer as pilot monitoring, a cabin manager and 32 passengers.

At about 0625 local time on the climb out of Canberra, the flight crew noticed a higher than normal cabin altitude.² In response, they levelled the aircraft at an altitude of about 12,000 ft. They noted that the cabin altitude held at 6,500 ft. Pressurisation system fault, and cabin pressure warnings were not indicating, and that the pressurisation system was correctly configured. In addition, the cabin manager reported a loud whistling noise from the forward left door.

The crew informed air traffic control of the pressurisation issue and requested clearance for a cruise altitude of 10,000 ft. Clearance was granted, the aircraft was descended, and cabin altitude was maintained at 6,500 ft. To minimise passenger discomfort caused by the loud whistling, the flight crew elected to reduce the airspeed to a maximum of 200 kts for the remainder of the flight.

During arrival planning, the crew realised that the execution of a normal 1,500 ft/minute descent would quickly cause the cabin altitude to match the aircraft altitude. From that point onward, the cabin altitude would decrease at 1,500 ft/minute potentially causing discomfort to passengers. To minimise this potential, the crew requested, and received, clearance to conduct an early descent into Sydney at a rate of 500 ft/minute, landing at 0656.

Link Airways did not have maintenance facilities in Sydney to assess and repair the aircraft. Therefore, Canberra-based engineering, having considered the crew's description of the issue, assessed that the aircraft pressurisation system was operating correctly and that the degradation in cabin altitude was due to an excessive leak from the forward left door. As such, the defect was assessed as not affecting the safety of the flight and engineering approved the return passenger flight to Canberra not above an altitude of 10,000 ft. The door seal seat was subsequently repaired in Canberra and the aircraft was returned to service.

Context

Door seal system

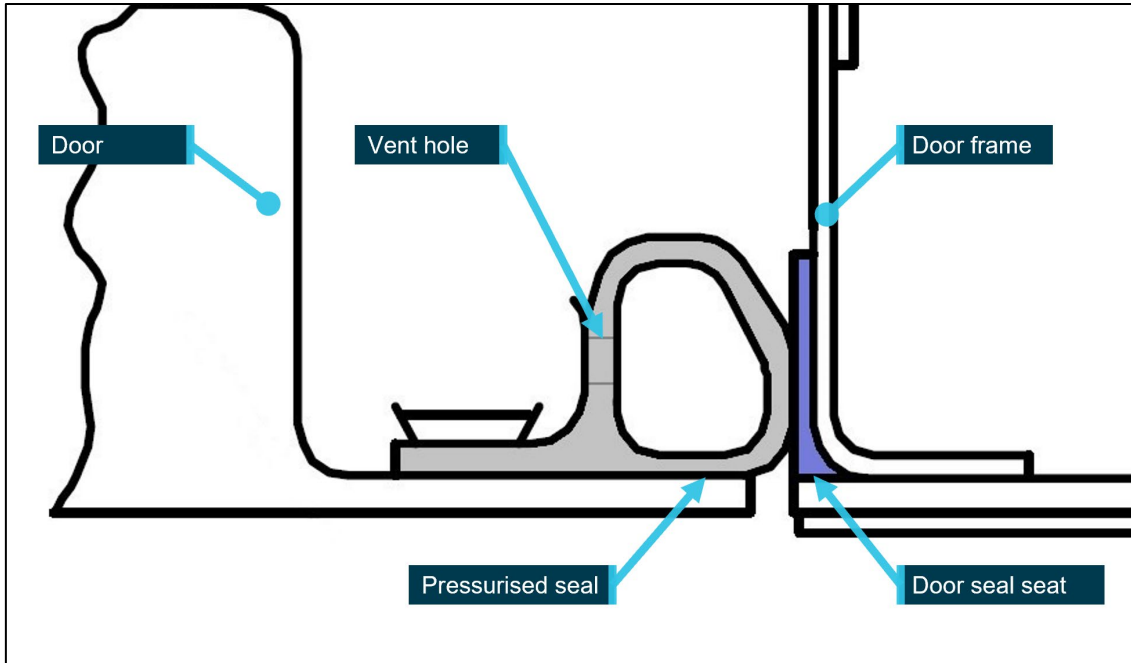
Pressurised aircraft use door seals to help maintain cabin air pressure in flight. The Saab 340B uses a pressurised hose-type seal which is attached to the door. The seal is compressed between the door and door frame when closed and small vent holes in the seal allow cabin air pressure to inflate the seal (Figure 1).

¹ Pilot Flying (PF) and Pilot Monitoring (PM): procedurally assigned roles with specifically assigned duties at specific stages of a flight. The PF does most of the flying, except in defined circumstances; such as planning for descent, approach and landing. The PM carries out support duties and monitors the PF's actions and the aircraft's flight path.

² Cabin altitude: altitude corresponding to the air pressure in the cabin.

The seal seat is installed in multiple sections around the perimeter of the fuselage door frame (Figure 2). The seat provides a smooth, consistent surface for the seal to act on and assists in the sealing action of the inflatable door seal. Both defects relevant to this occurrence were in the lower, aft section of seal seat.

Figure 1: Door seal system



Source: Saab Aircraft. Modified for clarity and annotated by the ATSB

Non-safety of flight defect deferral procedure

The company’s continuing airworthiness management organisation exposition defines the non-safety of flight defect (NSOFD) procedure, allowing the deferral of defects in accordance with Part 42 of Civil Aviation Safety Regulations.³

Deferral of defects under this procedure require, among other provisions, that the defect does not adversely affect the airworthiness of the aircraft and that the aircraft remains in conformance with its type certificate. Defects other than certain operational or emergency equipment⁴ must be assessed by an appropriately licenced aircraft maintenance engineer.

Previous defect deferral

On 24 March 2023, VH-VEZ terminated in Canberra at about 2235. The cabin manager noticed a 15 cm section of door seal seat had broken away from its position on the aft door frame around the forward left door (Figure 2) and brought it to the attention of the terminating captain. There were no engineering staff on-site at the time to rectify the defect.

The terminating captain incorrectly identified the piece as a section of door trim rather than a section of door seal seat and contacted the company’s continuing airworthiness maintenance organisation (CAMO), by phone, to request a defect deferral in accordance with the company’s

³ Part 42 of CASR Continuing airworthiness requirements for aircraft and aeronautical product. Subdivision 42.D.6.1– Dealing with defects.

⁴ Operational or emergency equipment that is not required by the certification basis (type certificate) for the aircraft, or under Civil Aviation Safety Regulations for the flight.

NSOFD procedure. The CAMO contacted a licenced aircraft maintenance engineer by phone and requested that they assist the terminating captain⁵ in applying a NSOFD for a piece of door trim.

After discussion between the terminating captain and maintenance engineer, the terminating first officer, under supervision of the terminating captain, raised a defect in the aircraft maintenance log:

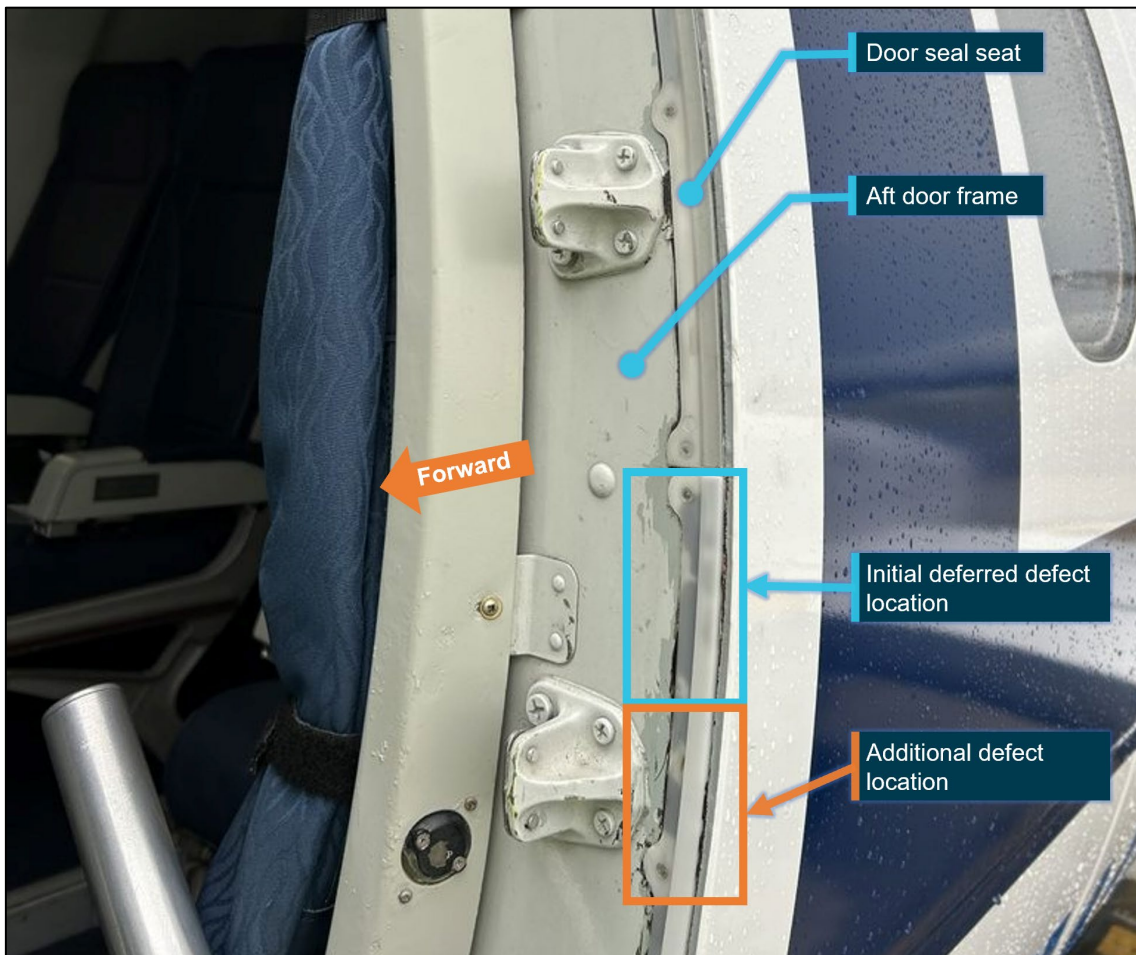
Piece of main door trim snapped off on lower right of door frame.

Rectification of the defect was deferred for a maximum of 120 days, in accordance with the company NSOFD procedure.

Pre-flight inspection

Prior to the first flight of the day on 25 March 2023, when opening the forward left door, the incident flight crew found an additional 10 cm section of broken door seal seat from the same area as the previously identified defect (Figure 2). The captain noted the NSOFD deferral in the aircraft maintenance log, assessed the second broken fragment as the previously identified and deferred defect, and therefore deemed the aircraft as serviceable for flight.

Figure 2: Exemplar image showing the location of the door seal seat defects



Source: Link Airways. Annotated by the ATSB

⁵ Remote assistance permitted in accordance with the company NSOFD procedure.

Safety analysis

Application of non-safety of flight defect deferral

Part 42 of Civil Aviation Safety Regulations⁶ allows continued operation of aircraft with minor defects that are not immediately repairable. The operator's non-safety of flight defect (NSOFD) deferral process was written and approved in accordance with these regulations.

The application of the NSOFD deferral process was applied by the terminating flight crew and the approving licenced aircraft maintenance engineer based on an incorrect assessment that the defect was to a piece of internal trim with no consequence to aircraft serviceability. While a piece of door cosmetic trim would be considered a deferrable defect, the door seal seat defect adversely affects aircraft airworthiness and is therefore not eligible to be deferred under the NSOFD process.

It is important that the licenced aircraft maintenance engineer accurately identifies a defect and its potential effect on aircraft systems prior to applying a maintenance deferral. In this case the use of photo or video to supplement the phone call between the involved pilot and licenced aircraft maintenance engineer would probably have enabled the engineer to identify the detached components as not eligible for repair deferral. This in turn would have resulted in the aircraft being repaired prior to further flight.

Misidentification of additional defect

The ability to defer defects on aircraft is reliant on the ability to accurately communicate the defect between aircrew and maintenance engineering as well as off going and on coming shifts.

The existence of a second defect was not understood by the on-coming flight crew and was not identified until sometime after the incident flight. The specific level of contribution of each section of broken door seal seat could not be determined, however it is likely that the combined effect of both pieces of broken door seal seat was greater than either individual piece, and resulted in degradation of the aircraft's pressurisation system.

The United States Federal Aviation Administration Human Factors Guide for Aviation Maintenance and Inspection notes:

Effective shift turnover depends on three basic elements:

1. The outgoing worker's ability to understand and communicate important elements of the job or task being turned over to the incoming worker.
2. The incoming worker's ability to understand and assimilate the information being provided by the outgoing worker.
3. A formalized process for exchanging information between outgoing and incoming workers and a place for such an exchange to take place.

Where the possibility of ambiguity exists, it is important that aircrew and maintenance staff take the necessary steps to clarify the message being communicated. This will assist defect identification generally and, in this instance, would have prevented continued operation of an unserviceable aircraft.

⁶ Part 42 of CASR Continuing airworthiness requirements for aircraft and aeronautical product. Subdivision 42.D.6.1– Dealing with defects.

Findings

ATSB investigation report findings focus on safety factors (that is, events and conditions that increase risk). Safety factors include 'contributing factors' and 'other factors that increased risk' (that is, factors that did not meet the definition of a contributing factor for this occurrence but were still considered important to include in the report for the purpose of increasing awareness and enhancing safety). In addition 'other findings' may be included to provide important information about topics other than safety factors.

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

From the evidence available, the following findings are made with respect to the pressurisation fault involving SAAB 340, VH-VEZ near Goulburn, New South Wales on 25 March 2023.

Contributing factors

- The misidentification of the cabin door seal seat as door trim resulted in the company deferral process being incorrectly applied.
- An additional piece of broken door seal seat was misidentified as the section deferred the previous night. In combination with the previously deferred item, this resulted in degradation of cabin pressurisation during the following flight.

Safety actions

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.

Safety action Link Airways

Link Airways provided retraining and guidance to the involved parties on the importance of accurate identification of cosmetic trim, including terminology and level of detail required when raising defects. The Link Airways internal investigation report was distributed to flight operations and maintenance personnel as a reminder to be aware of the risk of communication errors.

General details

Occurrence details

Date and time:	25 March 2023 – 0625 Eastern Standard Time	
Occurrence class:	Incident	
Occurrence categories:	Air/Pressurisation	
Location:	20 km south-west of Goulburn Airport, New South Wales	
	Latitude: 34° 52.893' S	Longitude: 149° 31.671' E

Aircraft details

Manufacturer and model:	Saab 340B	
Registration:	VH-VEZ	
Operator:	Vee H Aviation Pty Ltd	
Serial number:	340B-450	
Type of operation:	Part 121 Australian air transport operations – Larger aeroplanes	
Activity:	Commercial air transport	
Departure:	Canberra Airport	
Destination:	Sydney Airport	
Persons on board:	Crew – 3	Passengers – 32
Injuries:	Crew – 0	Passengers – 0

Sources and submissions

Sources of information

The sources of information during the investigation included:

- Link Airways
- the incident and terminating flight captains
- the involved LAME
- Saab Aircraft

Submissions

Under section 26 of the *Transport Safety Investigation Act 2003*, the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. That section allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the following directly involved parties:

- Link Airways
- the incident and terminating flight crews
- the involved LAME
- Saab Aircraft

A submission was received from:

- Link Airways

The submission was reviewed and, where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

About the ATSB

The ATSB is an independent Commonwealth Government statutory agency. It is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers.

The ATSB's purpose is to improve the safety of, and public confidence in, aviation, rail and marine transport through:

- independent investigation of transport accidents and other safety occurrences
- safety data recording, analysis and research
- 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, as well as participating in overseas investigations involving Australian-registered aircraft and ships. It prioritises investigations that have the potential to deliver the greatest public benefit through improvements to transport safety.

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

Purpose of safety investigations

The objective of a safety investigation is to enhance transport safety. This is done through:

- identifying safety issues and facilitating safety action to address those issues
- providing information about occurrences and their associated safety factors to facilitate learning within the transport industry.

It is not a function of the ATSB to apportion blame or provide a means for determining 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. The ATSB does not investigate for the purpose of taking administrative, regulatory or criminal action.

Terminology

An explanation of terminology used in ATSB investigation reports is available on the ATSB website. This includes terms such as occurrence, contributing factor, other factor that increased risk, and safety issue.