



**Australian Government**

**Australian Transport Safety Bureau**

# Fuel imbalance Boeing 737, VH-VOL

28 km SW of Gold Coast Airport, Queensland, 15 April 2012

**ATSB Transport Safety Report**  
Aviation Occurrence Investigation  
AO-2012-053  
Final

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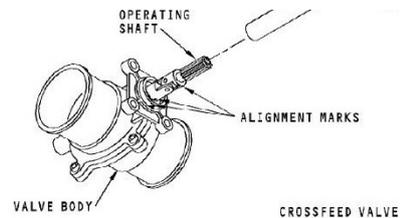
# Fuel imbalance - Boeing 737, VH-VOL

AO-2012-053

## What happened

On 15 April 2012 at 1302 Eastern Standard Time<sup>1</sup>, a Virgin Australia Boeing 737 aircraft, registered VH-VOL (VOL), departed Gold Coast Airport, Queensland on a scheduled flight to Melbourne, Victoria. During climb, the crew observed that both engines were being supplied fuel only from the right fuel tank. This resulted in a fuel quantity difference between the left and right fuel tanks. In response, the crew executed the fuel leak engine checklist<sup>2</sup> which confirmed that no engine fuel leak existed. With centre tank fuel available, the crew selected the centre fuel tank pumps on, which resulted in the fuel imbalance stabilising. As the crew were unable to confirm that fuel from the left tank could be used once the centre tank pumps were selected off, or that no fuel leak existed, they elected to divert to Brisbane, Queensland and declare a PAN<sup>3</sup>.

Engine fuel feed crossfeed valve



Source: The Boeing Company

Once tracking to Brisbane had been established, the Captain confirmed with air traffic control that operations were normal, and a normal approach and landing was expected. The aircraft landed overweight on Runway 19 without further incident. After landing, Airport Emergency Services conducted a visual inspection of the aircraft as a precautionary measure, and escorted the aircraft to the terminal bay.

## Engine fuel feed - crossfeed valve

Due to operational requirements, there was a delay in the departure of VOL from the Gold Coast Airport. During that period, the crossfeed valve<sup>4</sup> was selected open and centre tank pumps configured to prevent a fuel imbalance as a result of extended ground operations. Prior to departure, the aircraft was reconfigured for flight, which included the crossfeed valve being selected closed. The operation of the crossfeed valve, as indicated by the crossfeed valve open light was normal.

## Previous incidents

Boeing had received several reports from operators relating to fuel imbalance occurrences during flight on 737-800 and -900 series aircraft. These aircraft had accumulated between 22,928 and 27,390 hours in service when the imbalances were reported and the flight crew were able to correct the imbalance using existing procedures. Investigations identified excessive wear in the crossfeed valve disk spline, which prevented the valve from fully closing that resulted in valve leakage. Boeing determined the wear did not represent a safety issue because the condition was indicated to the crew as a fuel imbalance before the valve performance degraded to the point that the crossfeed valve could not be opened when required. In September 2010, Boeing issued service letter 737-SL-28-073-B which introduced a modified valve body assembly, and recommended action for operators to address crossfeed valve leakage occurrences.

<sup>1</sup> Eastern Standard Time (EST) was Universal Coordinated Time (UTC) +10 hours.

<sup>2</sup> In the event of abnormal system operation the flight crew refer to Flight Crew Operations Manual - Quick Reference Handbook (QRH) for procedural requirements.

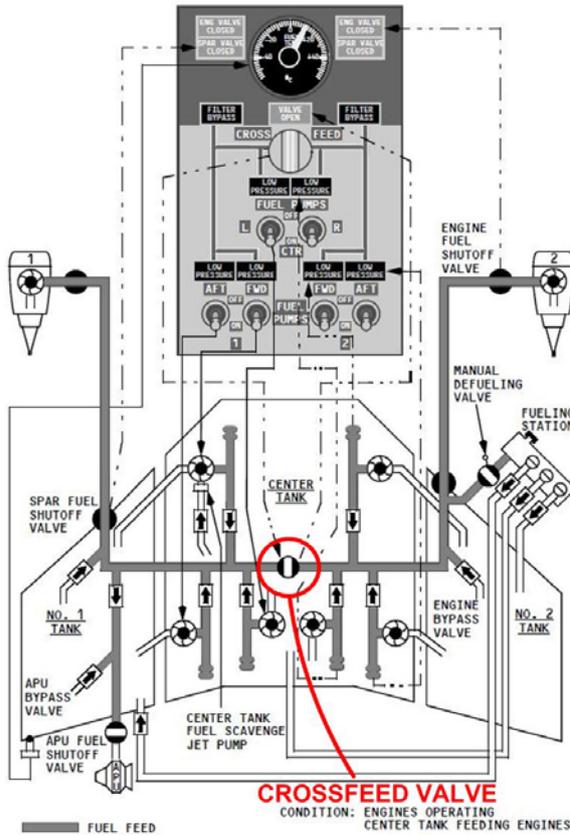
<sup>3</sup> An internationally recognised radio code announcing, an urgent condition which concerns the safety of an aircraft or its occupants, but where the flight crew does not require immediate assistance.

<sup>4</sup> The crossfeed valve enables fuel flow between the left and right engine manifolds when the crossfeed valve is open (normal position is closed). With the connection of the two engine fuel feed manifolds, one fuel tank supplies fuel to both engines.

**VOL crossfeed valve examination**

The crossfeed valve was installed on VOL since manufacture. At the time of the occurrence, the aircraft had a total time in service of 31,858 hours. Due to the reported history of crossfeed valve malfunction, the valve was removed from the aircraft and dispatched to an overhaul organisation for rectification. The subsequent inspection identified wear to the sealing materials and Teflon within the valve body as consistent with the existence of a leak within the valve. However, the overhaul organisation was unable to confirm whether the sealing material degradation would explain a high volume fuel leakage rate. The condition of the valve spline was not identified. The worn sealing material and Teflon was replaced by the overhaul organisation with the incorporation of the modified valve body assembly.

**Figure 1: Fuel system schematic**



Source: *The Boeing Company*

**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.

**Operator**

Virgin Australia Airlines had previously established an inspection program for the crossfeed valves in accordance with Boeing recommendations.

The operator also has a program in place to replace existing crossfeed valves with the modified version at scheduled maintenance servicing. This program is currently under review for acceleration.

## Aircraft details

Occurrence category:	Incident	
Occurrence type:	Operational - Fuel related	
Registration:	VH-VOL	
Manufacturer and model:	Boeing Company 737-8FE	
Type of operation:	Air Transport High Capacity	
Persons on board:	Crew – 6	Passengers – 171
Injuries:	Crew – Nil	Passengers – Nil
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.