



Australian Government

Australian Transport Safety Bureau

Engine malfunction and in-flight shutdown involving Boeing 777 A6-EGA

650 km NW of Adelaide, South Australia, 7 September 2016

ATSB Transport Safety Report
Aviation Occurrence Investigation
AO-2016-113
Final – 17 January 2017

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

Publishing information

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Addendum

Page	Change	Date

Engine malfunction and in-flight shutdown involving Boeing 777 A6-EGA

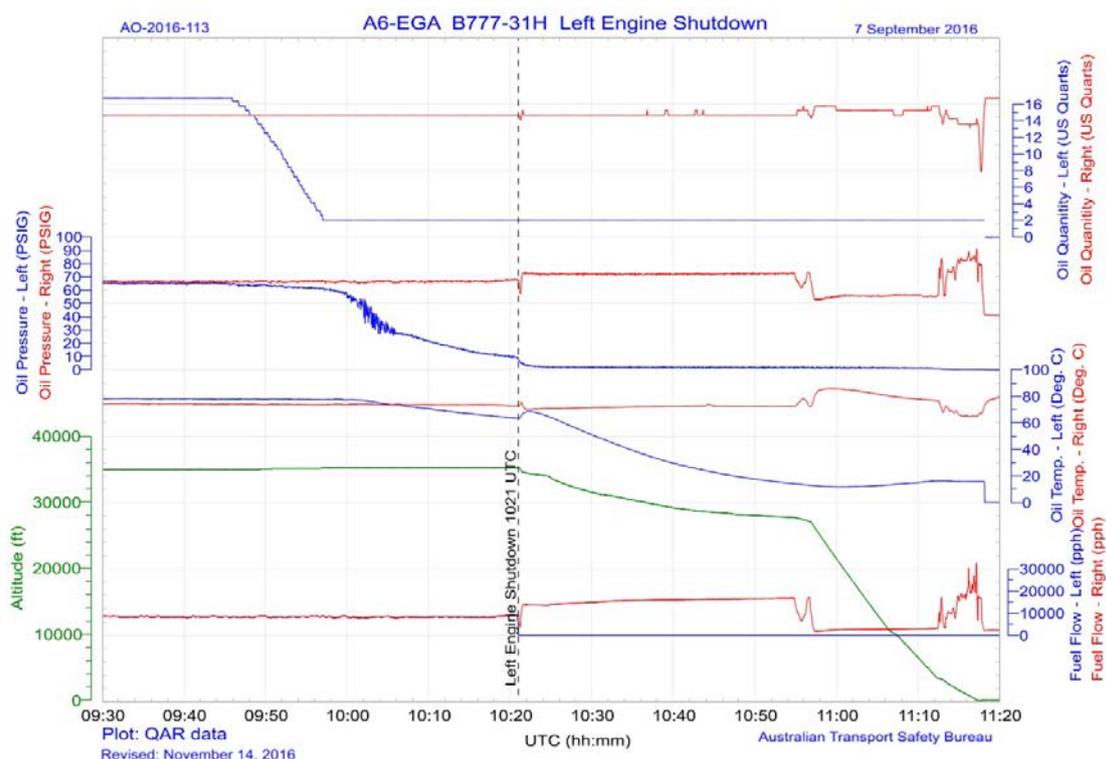
What happened

On 7 September 2016, an Emirates Boeing 777-31HER aircraft, registered A6-EGA, was operating a scheduled passenger flight from Dubai, United Arab Emirates, to Brisbane, Queensland. On board were 22 crewmembers and 308 passengers.

At about 1916 Central Standard Time (CST), the left engine oil quantity started to decrease from 16.4 quarts, stabilising at 2 quarts at 1927, when the aircraft was about 650 km north-west of Adelaide, South Australia, and at flight level (FL) 353.¹ The flight crew contacted company engineering and operations staff and advised them of the situation.

The flight crew received a left engine low oil engine-indicating and crew-alerting system (EICAS) message and conducted the associated non-normal checklist. At about 1951, the flight crew shut the left engine down (Figure 1).

Figure 1: Flight data plot including oil pressure and engine shutdown



Source: Aircraft operator analysed by ATSB

The flight crew contacted air traffic control, declared a PAN² and conducted a diversion to Adelaide Airport, which was the nearest suitable airport. The flight crew commenced a gradual

¹ Flight level: 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 353 equates to 35,300 ft.

² PAN PAN: an internationally recognised radio call announcing an urgency condition which concerns the safety of an aircraft or its occupants but where the flight crew does not require immediate assistance.

descent to FL 270, and were subsequently cleared for the area navigation (RNAV) approach to runway 05 at Adelaide. The aircraft landed without incident, and arrived at the parking bay at 2056. There was no damage to the aircraft or injuries to crew or passengers.

A subsequent engineering inspection found the left oil supply line to bearings numbers 4 and 5 had fractured and the associated clamp was broken (Figure 2).

Captain comments

The captain commented that the flight crew managed the situation in accordance with their procedures. The weather in Adelaide was beautiful and the aircraft performed well and handled exactly as it did in the simulator in training.

Engine manufacturer investigation

The manufacturer is investigating the following aspects:

- Turbine centre frame (TCF) Supply Tube 2061M79G02:
 - evaluating high cycle fatigue (HCF) capability of the TCF tube when a clamp is separated/broken
 - studying tube dynamic behaviour, due to broken clamps and its interaction with external components.
- Numbers 4 and 5 Oil Supply Tube 2034M68G01:
 - evaluating effects of missing piston ring and clamp separation on the external hardware
 - correlating finite element analysis (FEA) (stress analysis) with event findings
 - running analysis to verify integrity of current system.
- Clamp Damage:
 - mapping broken clamp findings from operator data and shop inspections
 - reviewing installation procedures and design characteristics and their effect.

Figure 2: Fractured oil supply line



Source: Aircraft operator

Safety analysis

The left oil supply line to bearings numbers 4 and 5 fractured, resulting in a loss of oil and oil pressure from the left engine. The flight crew received a left low oil pressure warning and followed the associated checklists, shut down the left engine and diverted the aircraft to Adelaide.

Findings

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

- The oil supply line to bearings 4 and 5 fractured at a welded joint and its support clamp was broken, resulting in an oil leak and therefore low oil pressure and quantity in the left engine.
- Following the receipt of a left low oil pressure warning, the flight crew completed the non-normal checklist, shut down the left engine and conducted a diversion to Adelaide.

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 safety action in response to this occurrence.

Aircraft operator

The operator performed a fleet-wide inspection and found no leaks or cracks on any other engine.

Safety message

This incident provides an excellent example of effective crew resource management techniques when faced with an abnormal situation. Additionally, regular proficiency checks in the simulator including scenarios of a single engine failure allow flight crew to respond appropriately in the event of such an occurrence in flight.

General details

Occurrence details

Date and time:	7 September 2016 – 1940 CST	
Occurrence category:	Incident	
Primary occurrence type:	Engine failure or malfunction	
Location:	650 km NW of Adelaide Airport, South Australia	
	Latitude: 30° 11.37' S	Longitude: 134° 28.90' E

Aircraft details

Manufacturer and model:	The Boeing Company 777	
Registration:	A6-EGA	
Operator:	Emirates	
Serial number:	38984	
Type of operation:	Air transport high capacity – passenger	
Persons on board:	Crew – 22	Passengers – 308
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Minor damage to the left engine	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB 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 operations involving the travelling public.

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.