



Australian Government

Australian Transport Safety Bureau

In-flight engine shutdown involving Bombardier DHC-8, VH-XKI

Meekatharra Airport, Western Australia, 18 April 2017

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Addendum

Page	Change	Date

Inflight engine shutdown involving Bombardier DHC-8, VH-XKI

What happened

On 18 April 2017, at about 0934 Western Standard Time (WST), a Bombardier DHC-8-315 aircraft, registered VH-XKI, departed from Meekatharra Airport, Western Australia (WA), for a charter flight to Leinster, WA. There were two flight crew, two cabin crew and 49 passengers on board.

The aircraft had departed from Perth Airport, WA, at about 0540 that morning, on a charter flight to Leinster, with Meekatharra as the alternate airport. While the aircraft was en route to Leinster, the flight crew received an updated weather report, which indicated there was fog present at Leinster. The flight crew conducted one approach at Leinster and as they did not get visual with the runway, they diverted to Meekatharra. While on the ground at Meekatharra, the captain received a report from their¹ operations department in Perth that the weather at Leinster had improved. The captain elected to depart Meekatharra with sufficient fuel for the flight to Leinster while maintaining Meekatharra as the alternate airport.

The captain reported that the aircraft performed as normal during the take-off run. After take-off, the landing gear was retracted, followed by the flap.² At some point between retracting the flap and 1,000 ft above ground level, the flight crew experienced a vibration through the airframe and noticed a change in the pitch of the aircraft noise (deep pitch sound). The flight crew noticed the right propeller was at about 500 RPM (normal governed flight range is 900–1200 RPM) and the engine torque was excessively high.³ The low propeller RPM and high engine torque led them to conclude the malfunction was an ‘unscheduled feather’⁴ incident.⁵

While the aircraft climbed to the lowest safe altitude, the flight crew shutdown the right engine, in accordance with their emergency operating procedures. Once at their lowest safe altitude, the flight crew engaged the autopilot, completed the checklist actions and made a PAN⁶ radio broadcast to air traffic control. Noting that the aircraft was above the maximum landing weight, the flight crew reviewed the performance charts, and concluded that the runway at Meekatharra was suitable for an emergency landing and elected to return. The flight crew briefed the cabin crew that they were going to land overweight with one engine shutdown and therefore to prepare the cabin for an emergency landing. The aircraft landed without incident. No persons were injured and the aircraft was not damaged.

Unscheduled autofeather

The autofeather system meets the regulatory requirements for an automatic take-off thrust control system, and in the event of an engine failure, the system:

- trims the opposite engine power by a pre-determined amount to permit continued safe take-off without pilot intervention

¹ Gender-free plural pronouns: may be used throughout the report to refer to an individual (i.e. they, them and their).

² Movable surface forming part of the trailing edge of the wing, which alters wing camber, cross section and area in order to exert a powerful effect on low-speed lift and drag.

³ Engine torque limits were 90% maximum continuous, 100% maximum 5 minutes, 115% maximum 20 seconds.

⁴ Feathering: the rotation of propeller blades to an edge-on angle to the airflow to minimise aircraft drag following an in-flight engine failure or shutdown.

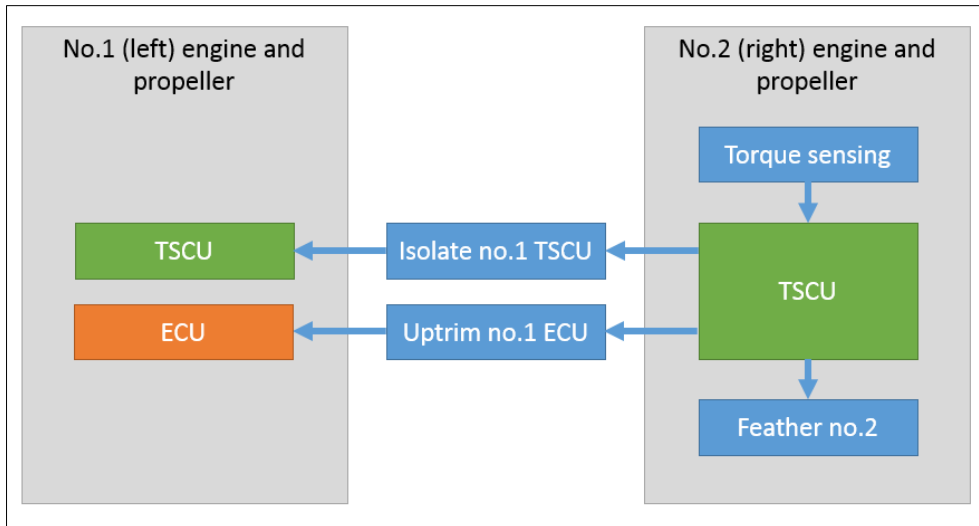
⁵ The aircraft was fitted with an auto-feather system, which will automatically feather the propeller of a failed engine within specified operating parameters.

⁶ 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.

- feathers the propeller of the failing engine to minimise the drag after a three second time delay.

In the event of an engine failure on take-off (less than 29 per cent torque sensed), the failed engine torque signal conditioning unit (TSCU) initiates autofeathering by switching its logic from 'arm' to 'arm and fail.' A relay signals the engine control unit (ECU) of the other engine to increase power (uptrim) to compensate for the failed engine (Figure 1). After 3 seconds, the TSCU logic transitions from 'arm and fail' to 'fail and feather'. This isolates the second engine's TSCU to disable its autofeather system to ensure both propellers cannot be feathered at the same time, and energises the failed engine feathering solenoid to feather the propeller of the failed engine.

Figure 1: Autofeather overview for no.2 (right) engine failure



Source: ATSB (information from aircraft manufacturer)

Aircraft inspections

The operator's maintenance organisation downloaded the flight data recorder for analysis by the engine manufacturer. It was determined that an uptrim signal was sent to the left engine by the right engine TSCU and the right engine experienced an over-torque event of 146% for 25 seconds.⁷ Both engine control units provided several fault codes, which were investigated with no defects found. The right engine TSCU and propeller hub and blades were replaced in accordance with the directions from the respective manufacturers. The right engine reduction gearbox⁸ and oil system were inspected with no defects found. In addition, the right engine electronic controller was replaced for troubleshooting purposes.

In 2002 the aircraft manufacturer published an in-service engineering and technical support letter titled 'Autofeather arming and uncommanded autofeather events'. The purpose of the letter was to identify uncommanded autofeather events and suggest solutions. The maintenance organisation referred to this letter for troubleshooting and completed the procedures for 'autofeather during power applications' and 'autofeather during take-off or climb with the system armed (uncommanded)'. No defects were found. It was determined from the flight data analysis that a heavy landing inspection was not required. After several engine ground runs were conducted at take-off power with the autofeather system armed, without any faults, the aircraft was flown to Perth. The flight to Perth was reported as uneventful and the aircraft was returned to service.

⁷ The over-torque was likely the result of the engine attempting to maintain normal propeller operating speed at the time that the propeller was attempting to feather.

⁸ The reduction gearbox is installed between the engine and the propeller and reduces the high rotational speed of the turbine engine to the slower rotational speed of the propeller.

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

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

Maintenance inspections

The operator’s continuing airworthiness management organisation has scheduled recurrent inspections of the reduction gearbox oil system and are following up with the engine manufacturer for their findings concerning the removed engine electronic controller and torque signal conditioning unit.

Safety message

The aircraft captain reported that they felt the incident was handled well by the flight crew and cabin crew. They found that the use of automation was effective in reducing their workload while responding to the malfunction. Despite the fact that both cabin crew were relatively new to the company, the captain could clearly hear them making their emergency landing calls to the passengers in accordance with their emergency operating procedures. The captain reported that the incident was completely unexpected, which highlighted to them the need for, and benefit of, regular simulator training.

General details

Occurrence details

Date and time:	18 April 2017 – 0934 WST	
Occurrence category:	Incident	
Primary occurrence type:	Propeller / rotor malfunction	
Location:	Meekatharra Airport, Western Australia	
	Latitude: 26° 36.70' S	Longitude: 118° 32.87' E

Aircraft details

Manufacturer and model:	Bombardier Inc. DHC-8-315	
Registration:	VH-XKI	
Serial number:	587	
Type of operation:	Charter – passenger	
Persons on board:	Crew – 4	Passengers – 49
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

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.