Australian Government
Australian Transport Safety Bureau

Engine failure and forced landing involving Jabiru J430, VH-OFR

17 km S of Bundaberg, Queensland, 18 June 2017

ATSB Transport Safety Report
Aviation Occurrence Investigation
AO-2017-063
Final – 7 September 2017

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

Publishing information

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Addendum

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Engine failure and forced landing involving Jabiru J430, VH-OFR

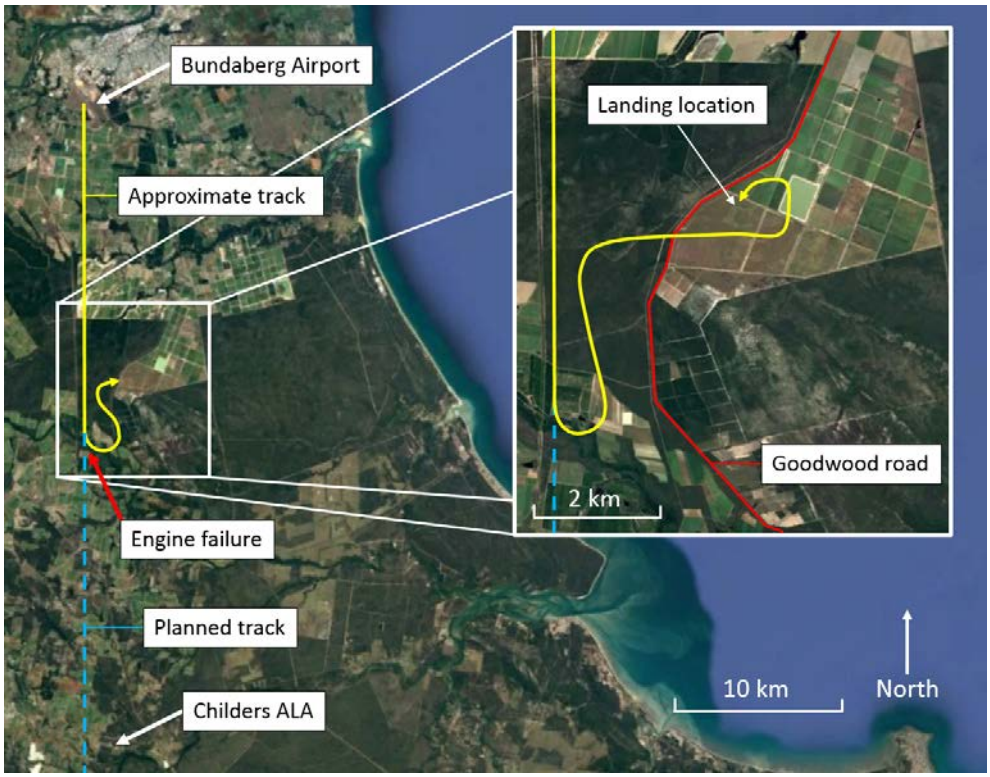
What happened

On 18 June 2017, a Jabiru J430 aircraft, registered VH-OFR (OFR), departed Bundaberg Airport, Queensland to operate a private flight to Williamtown Airport, New South Wales, with a pilot and passenger on board.

At 0816 Eastern Standard Time (EST), as the aircraft climbed through about 4,500 ft above mean sea level, the pilot noticed engine RPM reducing. The pilot reduced power and attempted to determine a reason for the power loss. At the same time, the pilot disconnected the autopilot and levelled the aircraft. The pilot was unable to determine a reason for the power loss and elected to advance the throttle to use remaining power to maintain height.

About a minute after advancing the throttle, the engine failed. The pilot used the aircraft electronic flight instrument system to locate the nearest airfields suitable for a forced landing. The electronic flight instrument system showed Childers aeroplane landing area (ALA) 9.8 NM to the south of his position and Bundaberg Airport 12.1 NM north (Figure 1). Due to a headwind towards Childers, the pilot determined that the aircraft could not glide to Childers and elected to turn back towards Bundaberg.

Figure 1: Overview of the flight showing an approximate flown track, the planned flight track, point of engine failure, Goodwood road and forced landing location.



Source: Google earth, annotated by ATSB

After turning towards Bundaberg, the pilot advised air traffic control (ATC) of the engine failure and that he was looking for a suitable area for a forced landing. ATC contacted an aircraft which had departed Bundaberg after OFR and requested the crew help locate OFR and provide assistance.

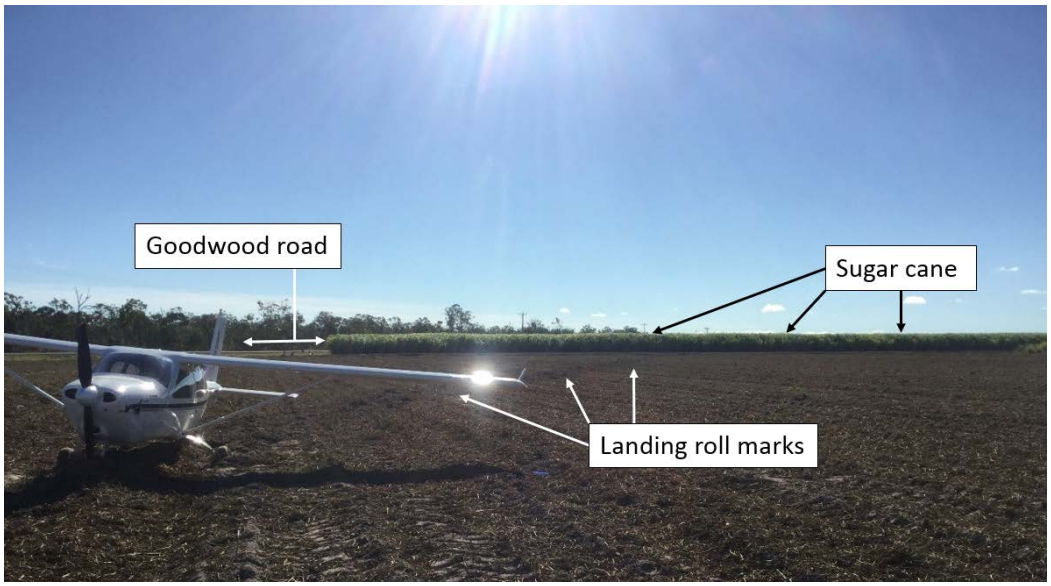
After establishing contact with the flight crew of the other aircraft, the pilot of OFR tracked east towards Goodwood Road, identifying it as a potential forced landing location. Unfortunately, traffic

on the road prevented a safe landing. The pilot then identified a field to the east of Goodwood Road as suitable for a forced landing, and conducted a left circuit into the field. During the late stages of the approach, the pilot made a steep left turn to line up with furrows in the field. During this turn, the left wingtip clipped sugar cane in an adjacent field. The pilot continued the turn, and as the aircraft touched down in the field, the left wingtip and left main landing gear touched the ground simultaneously. The pilot levelled the aircraft for the landing. During the landing roll, the left main landing gear partially collapsed (Figure 2).

After coming to a stop, the pilot contacted the flight crew of the other aircraft to advise that the aircraft had landed safely and then shut down the aircraft.

The pilot and passenger were not injured, the aircraft sustained minor damage.

Figure 2: OFR after landing showing the sugar cane, Goodwood road, the landing roll marks and furrows.



Source: Queensland Police, annotated by ATSB

Engine history

VH-OFR was an owner built and maintained aircraft operated in the Experimental category.

The original engine, a Jabiru 3300A, was manufactured in February 2010. After 403.7 hours of operation, the pilot overhauled the engine with the assistance of a friend familiar with the engine type. During the overhaul, the engine was heavily modified using parts sourced mostly from another engine manufacturer. The pistons were balanced using a belt sander and die grinder (Figure 3).

Figure 3: Belt sanding and die grinding of a piston (left) and fragments of the number five piston (right).

Source: Jabiru

During the overhaul, the cylinders were also bored out to provide greater piston clearance. After conducting the overhaul, the pilot was satisfied with the performance of the engine.

At the time of the incident the engine had accumulated 816.2 hours.

Engineering examination

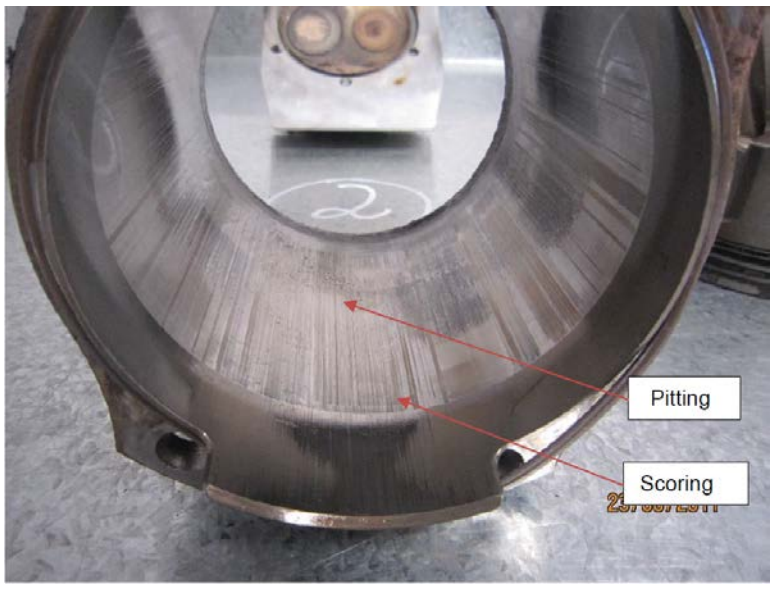
The original engine manufacturer, Jabiru Aircraft, conducted an examination of the engine and provided the following observations:

- Balancing of the pistons using a die grinder or belt sander is not a recommended procedure.
- Cylinder five had severe damage to the combustion chamber face and a bent exhaust valve (Figure 4). The piston was completely fragmented.
- All cylinders showed scoring. Cylinder two also had corrosion pitting on the cylinder wall (Figure 5).

Figure 4: Cylinder five combustion chamber face showing damage and the bent exhaust valve.

Source: Jabiru

Figure 5: Corrosion pitting and scoring within cylinder two.



Source: Jabiru

Jabiru noted that they did not have complete knowledge of the design changes incorporated into the engine and did not have a detailed service history of the engine. The examination was unable to determine a conclusive cause of the engine failure.

Pilot/maintainer comments

The pilot, who was also the maintainer of the aircraft, provided the following comments:

- When electing to overhaul the engine, the pilot contacted numerous sources and enlisted the assistance of a friend with extensive experience with Jabiru engines. The modifications to the engine were made to improve both performance and reliability.
- In the month prior to the incident, the pilot had noted an increase in oil consumption, however, he was not concerned as this was below the limit of 100 ml/hr specified for Jabiru engines.
- There were no abnormal engine indications prior to the loss of power.
- After determining that he could not glide to Childers, the pilot elected to turn back towards Bundaberg due to the better availability of emergency services and facilities.
- During the turn to line up for landing, the pilot had to lower the aircraft nose significantly to maintain speed to avoid an aerodynamic stall. As a result, the aircraft descended the last 300 ft of the approach very rapidly.
- The field selected for landing was a recently harvested peanut plantation. The loose surface of the field helped the pilot maintain control when the left wingtip struck the ground. This also assisted in bringing the aircraft to a stop in about 150 m.
- The pilot had about 120 hours of gliding experience and was confident with unpowered flight. The gliding experience assisted him in completing a successful forced landing.

Safety analysis

The engine in the aircraft was heavily modified, and the impact of these modifications on the reliability of the engine was unknown. As the aircraft climbed, the engine experienced a failure in cylinder five which destroyed the piston and led to a complete power loss.

The damage caused to the engine after the failure within cylinder five prevented the cause of the failure from being determined.

Findings

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

- The engine experienced a failure within cylinder five, leading to a complete engine power loss. The cause of the failure could not be determined.

Safety message

Sport aviation, such as Experimental category operations can be an economical way to participate in aviation.

This benefit comes with an increased risk to occupants of experimental and amateur built aircraft. The ATSB report: *Amateur built aircraft, Analysis of accidents involving VH-registered non-factory-built aeroplanes 1988–2010* found that amateur built aircraft had an accident rate three times higher than comparable factory built aircraft conducting similar operations. Over half of the accidents were precipitated by mechanical events, which were mainly complete or partial engine failures. The report contained the following safety message:

> Builders of amateur-built aircraft should select, install and maintain aircraft engines carefully as engine issues are the most likely reason why an accident will occur.

The Civil Aviation Safety Authority website: *Sport aviation safety explained*, provides guidance to assist participants in sport aviation in becoming informed participants and further information for understanding the risks associated with these operations.

The heightened risks of operating in a sport aviation category such as the Experimental category can be reduced through training. Furthermore, exposure to different sectors of aviation allows participants to increase their skills. The pilot involved in this incident had experience in unpowered aircraft, he was comfortable with unpowered flight and was able to use this experience to ensure a safe forced landing.

General details

Occurrence details

Date and time:	18 June 2017 – 0816 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Engine failure	
Location:	17 km S of Bundaberg, Queensland	
	Latitude: 25° 02.52’ S	Longitude: 152° 21.02’ E

Aircraft details

Manufacturer and model:	Jabiru Aircraft J430	
Registration:	VH-OFR	
Serial number:	763	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Minor	

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.