AIRCRAFT ACCIDENT SHORT REPORT

CA18/3/2/1219: Unsuccessful forced landing after engine failure.

Date and time	:	24 September 2018; 0515Z
Location	:	A farm 5nm south-west of Hoedspruit Civil Aerodrome, Gauteng
Aircraft registration	:	ZU-EGU
Aircraft manufacturer and model	:	Micro Aviation Bantam B22J
Last point of departure	:	Hoedspruit Civil Aerodrome, Gauteng
Next point of intended landing	:	Hoedspruit Civil Aerodrome, Gauteng
Location of incident site with reference to easily defined geographical points (GPS readings if possible)	:	On a farm 5nm south-west of Hoedspruit Civil Aerodrome, S24°22'42.00" E30°57'00.07" at an elevation of 1780 ft
Meteorological information	:	Surface Wind: 170°/08kt, Temperature: 25°C, Dew Point: 16°C, Visibility: 10km CAVOK QNH: 1021hPa
Type of operation	:	Private (Part 94)
Persons on board	:	1 + 1
Injuries	:	None
Damage to aircraft	:	Substantial damage

All times given in this report is Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Purpose of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (2011), this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to establish blame or liability.***

Disclaimer:

This report is produced without prejudice to the rights of the South Africa Civil Aviation Authority (SACAA), which are reserved

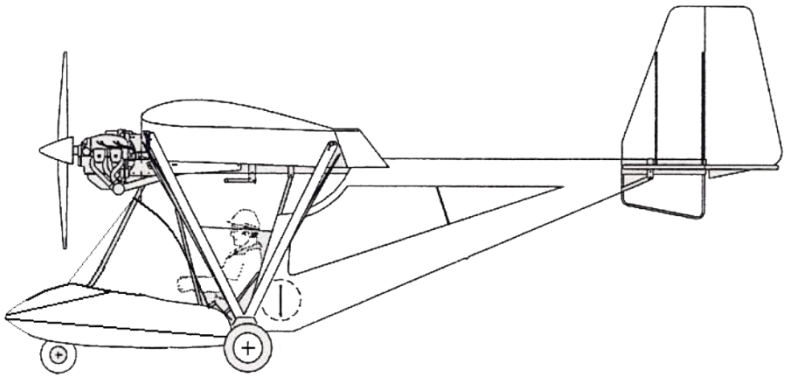

Figure 1*:* An illustration of the aircraft
(Source: Aircraft Flight Manual)

1. SYNOPSIS

1.1. On Monday 24 September 2018, the pilot and a student took-off at 0500Z from Hoedspruit Civil Aerodrome for a training flight around the Hoedspruit area.

1.2. The pilot stated that 10 minutes into the flight he heard a loud bang from the engine bay. The engine started to run rough and eventually stopped.

1.3. The pilot identified an open field and executed a forced landing which was unsuccessful. The aircraft came to a stop with its tail section high and the nose perpendicular to the ground.

1.4 The pilot and student were not injured, however, the aircraft was substantially damaged.

1.5 The investigation revealed that the accident was caused by failure of cylinder number 4 exhaust valve, which led to the aircraft's engine failure. The cause of the exhaust valve could not be determined.

2. FACTUAL INFORMATION

2.1. HISTORY OF FLIGHT

2.1.1. On 24 September 2018 at 0500Z, the pilot and a student took-off from Hoedspruit Civil Aerodrome for a training flight around the area. The aircraft had 25 liters of fuel on-board and routed in a south-westerly direction. The flight operated normally and climbed to 2000 feet (ft) above mean sea level (AMSL), cruising at 50 knots (kts).

2.1.2 According to the pilot, all the parameters during flight were within limits. He stated that 10 minutes into the flight he heard a loud bang from the engine bay. Thereafter, the engine started to run rough and eventually stopped.

2.1.3 The pilot identified an open field and executed a forced landing which was unsuccessful. The aircraft came to a stop with its tail section high and nose perpendicular to the ground.

2.1.4 The aircraft was substantially damaged. The pilot and the student sustained no injuries.

Figure 2: The aircraft at the accident site

Figure 3: The aircraft during its recovery

2.1.5 The accident occurred during daylight conditions at a geographical position determined to be S24°22'42.00" E30°57'00.07" at an elevation of 1780 ft. Figure 4 shows Google Earth image of the airfield and the wreckage location

Figure 4: Google Earth image of Hoedspruit Civil Aerodrome and where the aircraft came to rest. (Source: Google Earth)

2.1.6 TEST AND RESEARCH

2.1.6.1. The engine (Jabiru 2200 with Serial number 22A2484) was disassembled by an approved Aircraft Maintenance Organisation (AMO). The number 4 cylinder exhaust valve was identified as the reason for engine failure. It was discovered that number 4 cylinder exhaust valve was broken and that was the cause of the rough-running engine as this cylinder was not producing enough compression to keep the engine at constant power. The engine had been in operation for 555.6 hours since new.

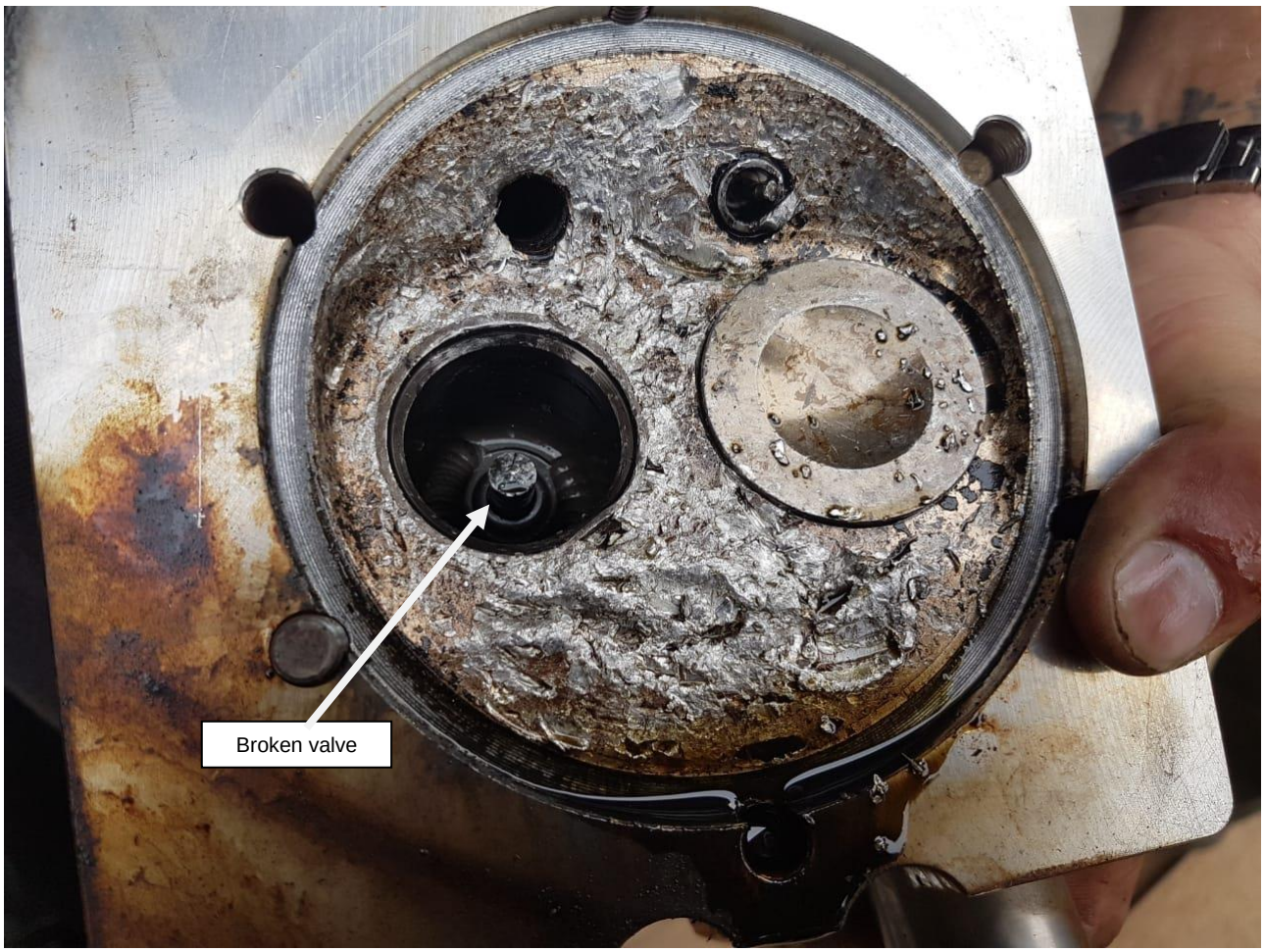

Figure 5: The number 4 cylinder exhaust valve head with the broken exhaust valve.
(Source: AMO)

The last inspection completed on the engine was on 16 August 2018 at 539.8 hours. Maintenance records indicate that the service bulletin JSL014-5 (Jabiru Cylinder Head Inspection) was complied with during the 500-hour inspection on 15 January 2018.

The broken valve was not made available to investigators as it was misplaced. Thus, no tests were done to determine the cause of the number 4 cylinder exhaust valve failure.

2.1.6.2. In 2014, the Australian Civil Aviation Safety Authority (CASA) responded to the high and increasing rate of engine failures among aircraft powered by engines manufactured by, or under licence from Jabiru Aircraft Ltd and issuing the following document.

Consultation Draft
Operating limitations on aircraft fitted with engines manufactured by Jabiru Aircraft Pty Ltd

Summary of Proposed Instrument

November 2014

Introduction

CASA is responding to a high, and increasing, rate of engine failures among aircraft that are powered by engines manufactured by, or under licence from, Jabiru Aircraft Pty Ltd (Jabiru). Such aircraft are referred to in this document as 'Jabiru powered aircraft'.

The issues appear to be the result of several failure modes, which require separate investigation.

CASA has formed the view that its functions under the *Civil Aviation Act 1988* require it to mitigate certain risks to passengers, trainee pilots and persons on the ground.

Accordingly, while CASA works with Jabiru to identify the causes of these engine failures and to implement appropriate corrective actions, CASA proposes a set of operating limitations on Jabiru powered aircraft.

Purpose and scope of the proposed instrument

The instrument will impose operating limitations on Jabiru powered aircraft that are issued with a CASR Part 21 authorisation by way of conditions under CASR 11.068.

The instrument will also impose the same operating limitations on Jabiru powered aircraft that operate under the exemptions in CAO 95.55, by way of a direction under CASR 11.245.

The proposed instrument will:

1. only permit operations by day under the visual flight rule, unless approved by CASA;

2. require that Jabiru powered aircraft are operated in a manner that minimises the risk of a forced landing into a populous areas;

3. define 'populous area' by reference to whether an area is populous at the time of the operation, meaning that (for example) a sports field would generally be a populous area at a time when that field is in use;

4. prohibit the carriage of passengers;

5. prohibit the use of Jabiru powered aircraft for solo operations by student pilots, who generally are less able to respond effectively to an engine failure event;

6. require that a notice be located in each Jabiru powered aircraft, conspicuous to each occupant of the aircraft, that states the limitations in paragraphs (4) and (5) above and notes that the occupants fly at their own risk.

CASA has considered whether to impose further limitations to better protect pilots. On balance, CASA considers that pilots are in a position to make their own assessment of whether to fly in a Jabiru powered aircraft, and to determine their ability to deal with an engine failure event. The proposed instrument therefore does not affect solo operations by qualified pilots, or flying training type activities involving an instructor and a student (including flight reviews and other recurrent checks).

Impact on industry

The instrument will impact on private passenger operations and flying training operations involving solo student flights. The impact is unavoidable in circumstances where CASA is responding to urgent safety risks. However, CASA has formulated the limitations to be no more burdensome than the requirements of safety demand.

The limitations will be lifted, progressively if appropriate, when appropriate corrective actions have been identified and implemented.

Closing date for comment

CASA will consider all comments received as part of this consultation process when determining the final terms of the instrument. Comments must be forwarded to the Project Leader, Lee Ungermann, at sport@casa.gov.au, by close of business on Thursday 20 November 2014.

3 FINDINGS

3.1 The pilot was issued with a National Pilot Licence on 4 April 2002, with an expiry date of 5 January 2019. The aircraft type was endorsed on the pilot's licence. His last skills test was carried out on 6 January 2017.

3.2 The pilot was issued with a class 2 medical certificate on 24 April 2018, with an expiry date of 30 April 2019.

3.3 The pilot had a total of 5076.7 flying hours and 2218.0 hours were on type.

3.4 The aircraft was issued with an Authority to Fly on 31 August 2018, with an expiry date of 15 August 2019.

3.5 The last maintenance carried out on the aircraft was an annual inspection on 16 August 2018 at 539.8 hours.

3.6 The airframe hours at the time of the accident were 555.6 hours and the aircraft had accumulated 15.8 hours since its last mandatory periodical inspection (MPI).

3.7 The number 4 cylinder exhaust valve failed and caused the engine to stop. The cause of the valve failure could not be detained as the valve was misplaced/lost following the dismantling of the engine.

3.8 The Australian CASA published a document in November 2014 seeking to limit the operation of all aircraft fitted with Jabiru engines to visual flight rules (VFR) by day in areas that were not populated, had no carriage of passengers, had no solo operations by students with less experience, and had warning placards which indicate restriction for passengers and students.

4 PROBABLE CAUSE/CONTRIBUTING FACTOR

4.1 Engine failure resulting on an unsuccessful forced landing in a ploughed field. The cause of engine failure was attributed to failure of number 4 cylinder exhaust valve and the cause of the valve failure could not be determined.

5 REFERENCES USED ON THE REPORT

1 Engine teardown report from the AMO.

2 http://www.caa.co.za/Accidents%20and%20Incidents%20Reports/9397.pdf

3 https://jabiru.net.au/wp-content/uploads/2018/05/JSL014-5_Jabiru_Cylinder_Head_Inspection_DRAFT_.pdf

4 https://www.casa.gov.au/files/consult-draft-cd1425sspdf

6 SAFETY RECOMMENDATION

6.1 The Regulator, SACAA, should consider the adoption of the Australian CASA document published in November which impose strict limitations on Jabiru aircraft operation.

7 ORGANISATION

7.1 None.