SOUTH AFRICAN CIVIL AVIATION AUTHORITY

Section/division Accident and Incident Investigations Division Form Number: CA 12-57

LIMITED OCCURRENCE INVESTIGATION REPORT – DRAFT

Reference Number	CA18/2/3/10460								
Classification	Accident		**Date**	08 June 2024		**Time**	0740Z		
Type of Operation	Private (Part 94)								
Location									
Place of Departure	Stellenbosch Aerodrome (FASH), Western Cape Province		Place of Intended Landing		Caledon Airfield (FACG), Western Cape Province				
Place of Occurrence	Strawberry farm, approximately 500 metres (m) from the threshold of Stellenbosch Aerodrome (FASH) Runway 19								
GPS Co-ordinates	Latitude	33°59.1476′ S	Longitude	018°49.4180′ E		Elevation	337 ft		
Aircraft Information									
Registration	ZU-DWK								
Make; Model; S/N	Jabiru; J160C (Serial Number: 018)								
Damage to Aircraft	Substantial			Total Aircraft Hours		2 540.8			
Pilot-in-command									
Licence Type	Commercial Pilot Licence (CPL) Aeroplane		Gender	Male		Age	40		
Licence Valid	Yes	Total Hours	1 265	Total Hours on Type		274			
Total Hours 30 Days	2.5		Total Hours on Type Past 90 Days		78				
People On-board	1+1	**Injuries**	0	**Fatalities**	0	**Other (on ground)**	0		

What Happened

On Saturday morning, 8 June 2024, a pilot and a passenger on-board a Jabiru J160C aircraft with registration ZU-DWK were engaged in a private flight from Stellenbosch Aerodrome (FASH) in Western Cape province to Caledon Airfield (FACG) in the same province when the accident occurred. Visual meteorological conditions (VMC) by day prevailed at the time of the flight which was conducted under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot reported that the flight was the second after the 100-hour maintenance inspection. On the day of the accident, the pilot conducted the pre-flight checks and found no anomalies with the aircraft. The aircraft had approximately 95 litres (L) of Aviation Gasoline (Avgas) 100LL in the tanks. After the pre-flight checks, he started the engine and taxied the aircraft to the threshold of Runway (RWY)19. Thereafter, he advanced the throttle to 3 000 revolutions per minute (RPM) and commenced with the take-off run. After reaching the rotation speed, the aircraft climbed and cleared the threshold of RWY 01. During the initial climb, the pilot felt a severe vibration of the aircraft as well as noticed a decrease in engine RPM from 2 960 to 1 390. Subsequently, the aircraft's stall warning activated. The pilot lowered the aircraft's nose to increase the airspeed with the intention to conduct

a forced landing on a field; the aircraft crash-landed on a strawberry crop field (farm) near FASH. The aircraft's fuselage, wings, empennage, landing gears and the propeller blades were damaged. The pilot sustained minor injuries and the passenger was unharmed. Third party damage was limited to the strawberry crops and the plastic sunshade that was used to cover (protect) the crops.

The accident occurred during daylight at a strawberry farm, approximately 500m from the threshold of FASH Runway 19, at Global Positioning System (GPS) co-ordinates determined to be 33°59.1476′ South, 018°49.4180′ East, and at an elevation of 337 feet (ft).

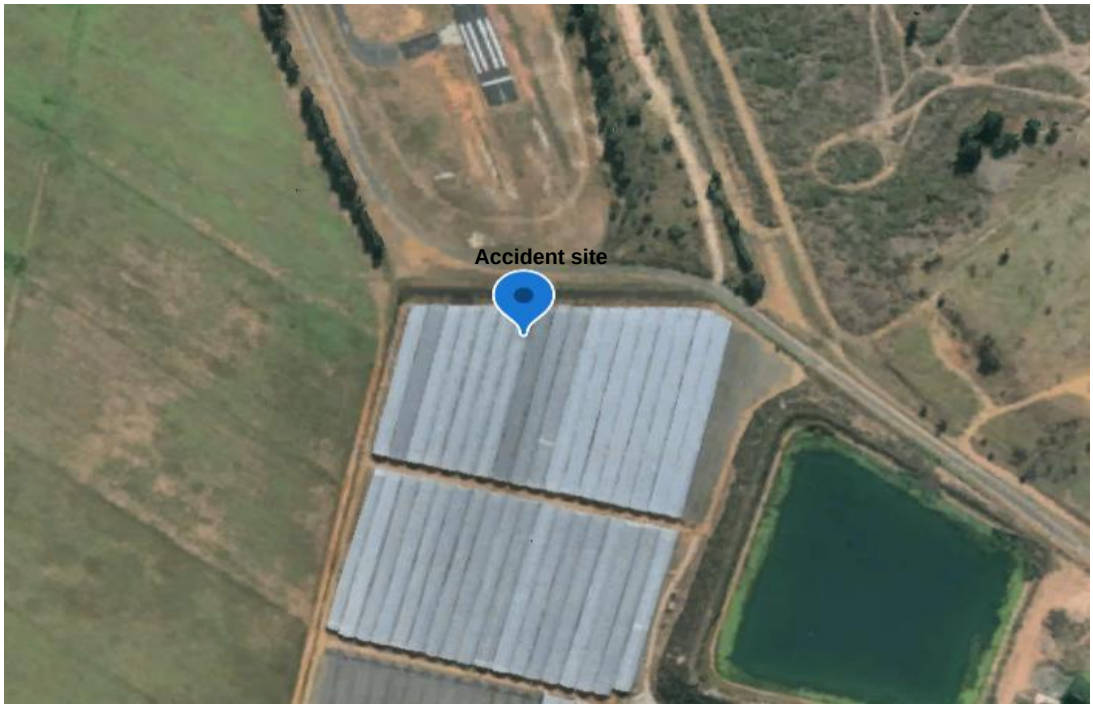


Figure 1: Aerial view of the accident site. (Source: Google Earth)

Figure 2: The aircraft rested on the strawberry crops which were covered with a plastic sunshade. (Source: Pilot)

Figure 3: The teared plastic sunshade and the damaged crops. (Source: Pilot)

Figure 4: Unbent propeller blades after the crash. (Source: Pilot)

Post-accident Examination

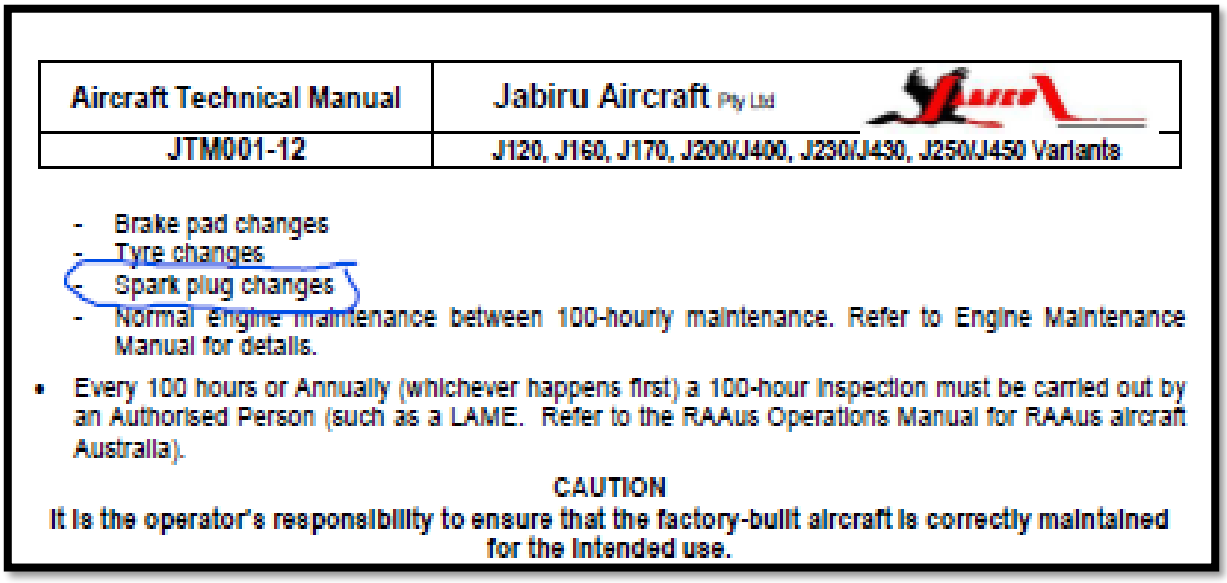
The pilot stated that on 28 May 2024 (prior to the aircraft accident), the engine had shut down during the pre-flight run-up checks. The pilot had to restart the engine and taxi back to the hangar where an inspection revealed that there was a carbon build-up on the engine's spark plugs. The spark plugs were cleaned, and an engine run was conducted, after which the aircraft was found serviceable. At approximately 10.5 hours (hrs) of flight time, the aircraft's mandatory periodic inspection (MPI) was conducted, followed by a post-maintenance flight and all was deemed satisfactory.

It was noted that the spark plugs are to be changed at every 100 hours as per the maintenance manual. However, the spark plugs were not changed during the MPI, and the task was signed out as not applicable (N/A).

Post-accident, the aircraft was recovered to the aircraft maintenance organisation (AMO) facility at FASH where an engine ground run was conducted by an approved person (AP). The engine met all the parameters as outlined in the operator's manual during the ground run.

The carbonisation of the engine spark plugs is likely a contributing factor to the loss of engine power after take-off.

Note: Carbon deposits are conductive and can create a path for spark plug misfire.



Aircraft Technical Manual	Jabiru Aircraft Pty Ltd
JTM001-12	J120, J160, J170, J200/J400, J230/J430, J250/J450 Variants

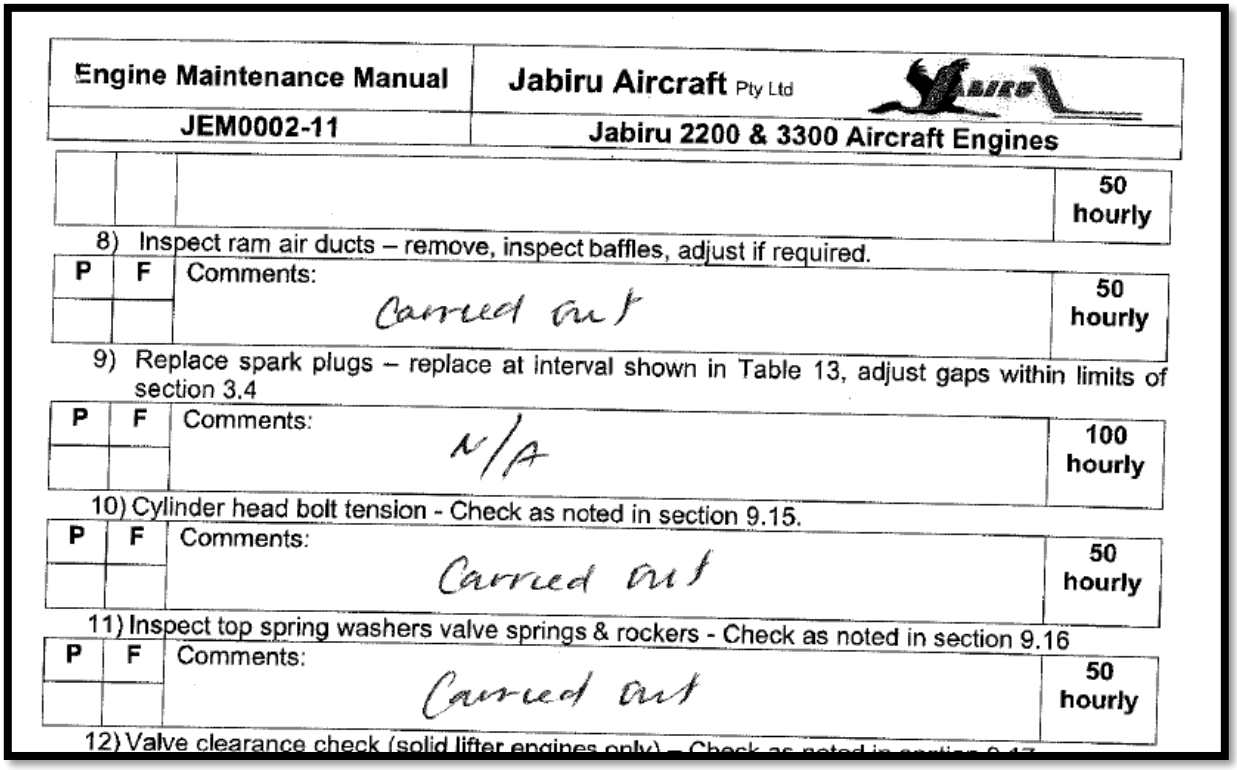
- Brake pad changes
- Tyre changes
- Spark plug changes
- Normal engine maintenance between 100-hourly maintenance. Refer to Engine Maintenance Manual for details.

• Every 100 hours or Annually (whichever happens first) a 100-hour inspection must be carried out by an Authorised Person (such as a LAME. Refer to the RAAus Operations Manual for RAAus aircraft Australia).

CAUTION

It is the operator's responsibility to ensure that the factory-built aircraft is correctly maintained for the intended use.

Figure 5: Spark plugs must be changed at 100-hour inspection.
(Source: Jabiru Technical Manual JTM001-12)



Engine Maintenance Manual	Jabiru Aircraft Pty Ltd
JEM0002-11	Jabiru 2200 & 3300 Aircraft Engines

			50 hourly

8) Inspect ram air ducts – remove, inspect baffles, adjust if required.

P	F	Comments:	
		Carried out	50 hourly

9) Replace spark plugs – replace at interval shown in Table 13, adjust gaps within limits of section 3.4

P	F	Comments:	
		N/A	100 hourly

10) Cylinder head bolt tension - Check as noted in section 9.15.

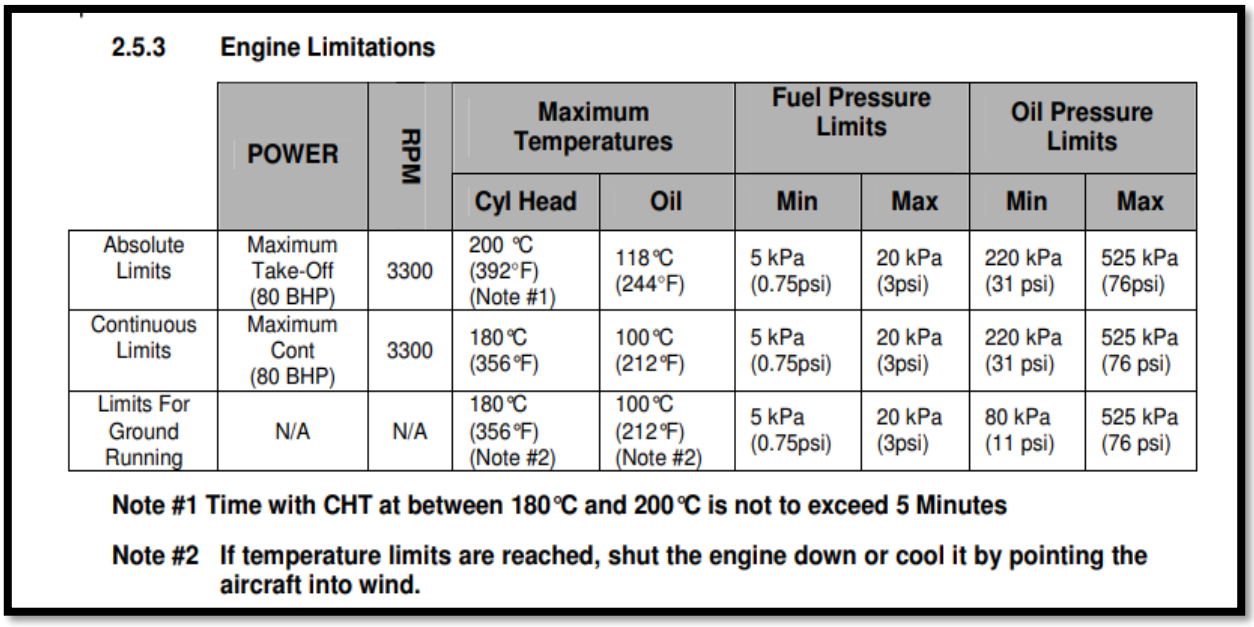
P	F	Comments:	
		Carried out	50 hourly

11) Inspect top spring washers valve springs & rockers - Check as noted in section 9.16

P	F	Comments:	
		Carried out	50 hourly

12) Valve clearance check (solid lifter engines only) – Check as noted in section 9.17

Figure 6: The work pack indicates that the spark plugs were not changed. (Source: Operator)



2.5.3 Engine Limitations

	POWER	RPM	Maximum Temperatures		Fuel Pressure Limits		Oil Pressure Limits	
			Cyl Head	Oil	Min	Max	Min	Max
Absolute Limits	Maximum Take-Off (80 BHP)	3300	200 ℃ (392°F) (Note #1)	118℃ (244°F)	5 kPa (0.75psi)	20 kPa (3psi)	220 kPa (31 psi)	525 kPa (76psi)
Continuous Limits	Maximum Cont (80 BHP)	3300	180℃ (356℉)	100℃ (212℉)	5 kPa (0.75psi)	20 kPa (3psi)	220 kPa (31 psi)	525 kPa (76 psi)
Limits For Ground Running	N/A	N/A	180℃ (356℉) (Note #2)	100℃ (212℉) (Note #2)	5 kPa (0.75psi)	20 kPa (3psi)	80 kPa (11 psi)	525 kPa (76 psi)

Note #1 Time with CHT at between 180℃ and 200℃ is not to exceed 5 Minutes

Note #2 If temperature limits are reached, shut the engine down or cool it by pointing the aircraft into wind.

Figure 7: Engine limitations of the aircraft. (Source: JMT001-12)

4.5.5 Engine Management – Ground Running

The 2200 engine fitted to the J160-C is cooled by air flowing over the engine and oil cooler. During ground running care must be taken to ensure that there is adequate airflow and that safe engine temperatures are maintained. The guidelines presented below will assist in controlling temperatures.

- Minimise ground running times – especially in hot weather[1].
- Carry out as many checks as possible before starting the engine.
- Always carry out engine run-up tests with the aircraft pointing into wind.
- In hot weather, after performing run-up checks, leave the aircraft pointing into wind and idling at 1200rpm for 30 seconds to aid cooling.
- If the aircraft is required to wait – such as for runway clearance – temperatures must be monitored, and if they approach ground running limits (listed in Section 2 of this flight manual & displayed as yellow markings on engine gauges) the aircraft must be turned into wind or shut down to prevent any further temperature increase.
- Wind must be coming from within approximately 45° of the aircraft heading to be effective in aiding engine cooling.
- If there is no wind or low wind the engine must be shut down if ground-running temperature limits are reached.

Figure 8: Engine ground run procedure. (Source: JMT001-12)

Aircraft Description (Source: Jabiru J160 Aircraft Manual)

The Jabiru aircraft is a two-seat, high-wing monoplane composite aircraft of monocoque construction. It is equipped with fixed tricycle landing gear of composite construction. The steerable nose gear is a welded metal, trailing link assembly with rubber springs. It is powered by a Jabiru 2200 4-cylinder, air-cooled, horizontally opposed engine producing 80 horsepower (hp). This aircraft has a maximum cruising speed of 100 knots and a top speed of 110 knots with a stall speed of 42 knots. It offers a range of approximately 500 nautical miles (nm) and features a fuel capacity of 50 litres. The aircraft has a wingspan of 31.9 feet, a length of 6.80 metres, and a height of 2.35 metres. With a maximum take-off weight of 600 kg and an empty weight of around 360 kg, it is capable of a climb rate of 600 feet per minute. It requires a landing distance of approximately 160 metres.

Meteorological Information

The weather information below was obtained from the meteorological aerodrome report (METAR) that was issued by the South African Weather Service (SAWS), recorded at Cape Town International Airport (FACT) on 8 June 2024 at 0730Z. FACT is located 22 kilometres (km) from the accident site.

Wind Direction	Variable	Wind Speed	2kts	Visibility	9999m
Temperature	13° C	Cloud Cover	None	Cloud Base	None
Dew Point	10° C	QNH	1032hPa		

Findings

1. Personnel Information

1.1. The pilot had a Commercial Pilot Licence (CPL) that was initially issued on 28 January 2021 by the Regulator (SACAA) under the provisions of Part 61 of the CAR. The licence was reissued on 26 February 2024 with an expiry date of 31 January 2025. The pilot had the Night, Instrument and Instructor Grade II ratings in accordance with (IAW) the existing regulations.

1.2. The pilot had a Class 1 aviation medical certificate that was issued on 6 March 2024 with an expiry date of 31 March 2025.

1.3. The pilot conducted an engine run that exceeded the required time (5 minutes) which subsequently increased the temperature of the engine manifold; thus, contributing to loss of engine power after take-off.

2. Aircraft Information

2.1. The aircraft was issued a Certificate of Registration (C of R) on 4 April 2019.

2.2. The aircraft had an Authority-to-fly (ATF) Certificate that was issued on 29 May 2020. The aircraft Certificate of Airworthiness (C of A) was renewed on 28 May 2024 with an expiry date of 31 May 2025.

2.3. The last 100-hour mandatory periodic inspection (MPI) of the aircraft was conducted and certified on 31 May 2024 at 2539.9 Hobbs hours. The accident occurred at 2540.8 Hobbs hours, which meant that the aircraft had accrued an additional 0.9 hours since the last MPI.

2.4. The aircraft was issued a Certificate of Release to Service (CRS) on 7 June 2024 with an expiry date of 26 November 2024 or at 2639.9 airframe hours, whichever occurs first.

2.5. The aircraft maintenance organisation (AMO) which conducted the last MPI of the aircraft had an AMO Certificate that was issued on 31 October 2023 with an expiry date of 31 October 2024.

2.6. The engine revolutions per minute (RPM) had decreased from 2960 to 1390 during the initial climb, followed by an engine power decrease.

2.7. On 28 May 2024, the aircraft's engine had shut down during the ground run. The inspection revealed carbonisation of the spark plugs. The spark plugs are meant to be changed every 100 hours in accordance with the maintenance manual. However, the aircraft's spark plugs were not changed, and the work pack was signed out as not applicable.

3. Meteorological Information

3.1. The weather was not a contributing factor to the accident.

Probable Cause(s)

The engine lost power due to carbon build-up on the spark plugs which were not replaced as prescribed in the maintenance manual, as well as the engine ground run that had exceeded the maximum time (to run) as per the maintenance manual. As a result, the pilot executed an unsuccessful forced landing on a strawberry farm.

Contributing Factor(s)

1. Insufficient oversight of maintenance procedures by the approved person.
2. Exceedance of ground engine run duration.

Safety Action(s)

None.

Safety Message

Pilots and operators should adhere to and practise the following:

1. Maintenance protocols: strict adherence to maintenance schedules, particularly the replacement of spark plugs at the specified intervals, should be enforced. Failure to replace the spark plugs according to the maintenance manual should be reviewed, and regulatory measures may need to be updated to ensure that maintenance tasks are thoroughly documented and followed.

2. Pilot training and awareness: pilots should adhere to the operating handbook when conducting engine start-up and engine run, thereby, ensuring that the duration for engine run is not exceeded. This should be emphasised in pilot training programmes because such acts could affect the aircraft performance.

About this Report
The decision to conduct a limited investigation is based on factors including whether the cause is known and the evidence supporting the cause is clear, the level of safety benefit likely to be obtained from an investigation, and that will determine the scope of an investigation. For this occurrence, a limited investigation has been conducted, and the Accident and Incident Investigations Division (AIID) has relied on the information submitted by the affected person/s and organisation/s to compile this limited report. The report has been compiled using information supplied in the initial notification, as well as from follow-up desktop inquiries to bring awareness of potential safety issues to the industry in respect of this occurrence, as well as possible safety action/s that the industry might want to consider in preventing a recurrence of a similar occurrence. *All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.*
Purpose
In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011 and ICAO Annex 13, 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 apportion blame or liability.
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This report is issued by:

Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa