SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/3/2/1486										
Classification	Serious Incident			**Date**	19 June 2025			**Time**	0930Z		
Type of Operation	Training (Part 141)										
Location											
Place of Departure	Lanseria International Airport (FALA), Gauteng Province			Place of Intended Landing			Lanseria International Airport (FALA), Gauteng Province				
Place of Occurrence	Northern Farm Nature Reserve										
GPS Co-ordinates	Latitude	25° 55' 37.09" S		Longitude	27° 58' 03.06" E		Elevation	5 420 ft			
Aircraft Information											
Registration	ZS-SJZ										
Make; Model; S/N	Diamond Aircraft Industries; DA-20-C1 (Serial Number: C0524)										
Damage to Aircraft	Substantial			Total Aircraft Hours	6957.78						
Pilot-in-command											
Licence Type	Commercial Pilot Licence (CPL)			Gender	Male		Age	23			
Licence Valid	Yes	Total Hours	422.2	Total Hours on Type	309.0						
Total Hours 30 Days	84.3	Total Flying on Type Past 90 Days	150.2								
People On-board	1+1	**Injuries**	0	**Fatalities**	0	**Other (on ground)**	0				

What Happened

On Thursday, 19 June 2025, a Grade 3 flight instructor (FI) and a student pilot (SP) on-board a Diamond DA-20-C1 aircraft with registration ZS-SJZ departed from Lanseria International Airport (FALA) in Gauteng province to conduct take-off and landing (circuits) training at the same aerodrome. The flight was conducted under visual meteorological conditions (VMC) by day and under the provisions of Part 141 of the Civil Aviation Regulations (CAR) 2011 as amended.

The SP stated that he conducted a pre-flight inspection of the aircraft with no anomalies noted. The aircraft took off from Runway 07 (RWY 07) with a planned engine failure after take-off (EFATO) simulation. Four circuits were conducted satisfactorily, including the first EFATO simulation. During the fifth circuit whilst taking off and at a height of approximately 500 feet (ft) above ground level (AGL), the crew initiated the second EFATO simulation exercise. As the aircraft was at 226ft AGL and descending, the FI instructed the SP to commence with the engine power recovery. The SP opened the throttle but the engine power did not increase. The FI took over the control of the aircraft to recover the engine power, but he was unsuccessful. The FI then assessed their surrounding and identified a field ahead of their flight path on which to execute a forced landing.

The aircraft landed on the field covered with tall thick grass. During the landing roll, the aircraft impacted a fence, bounced and leaped over a dirt road. It then impacted a second fence with its nose landing gear about 14 metres (m) from the dirt road. The aircraft continued to roll forward for 24m with the nose section scrapping the grass before it came to a full stop. The aircraft sustained substantial damage to the nose landing gear, and minor damage to the leading edges of both wings due to impact with the fence poles. Both crew members disembarked from the aircraft unassisted and with no injuries. The serious incident occurred approximately 2 nautical miles (nm) east of FALA.

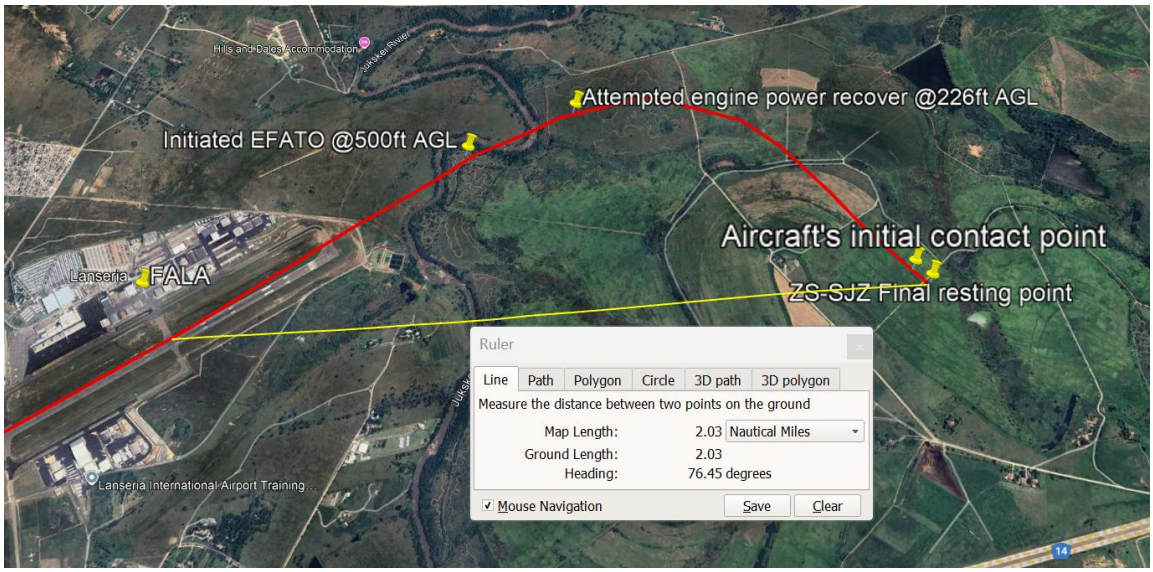

Figure 1: Overview of the aircraft's approximate flight path. (Source: Google Earth Map)

Figure 2: The aircraft as it came to a full stop.

Figure 3: The damaged nose landing gear.

Post-serious Incident Investigation

On 25 June 2025, the investigating team visited the operator's maintenance facility at FALA to conduct an engine-run test. During the test, it was observed that the No.4 exhaust valve was stuck in a partially open position, preventing the proper release of exhaust gases. This restriction caused significant back pressure in the cylinder which resulted in combustion gas backfiring and abnormal engine vibration. Further inspection revealed that the rocker arm cover for the affected valve had become loose. When removed, it was found that the rocker arm attachment studs had sheared off, which led to loss of valve actuation. As a result, the valve could not fully open or close during the engine cycle. The malfunction led to loss of compression in engine cylinder No.4 and contributed directly to engine power loss and the subsequent stoppage.

The root cause was traced to possible improper torque application on the rocker arm studs which compromised valve operation under load.

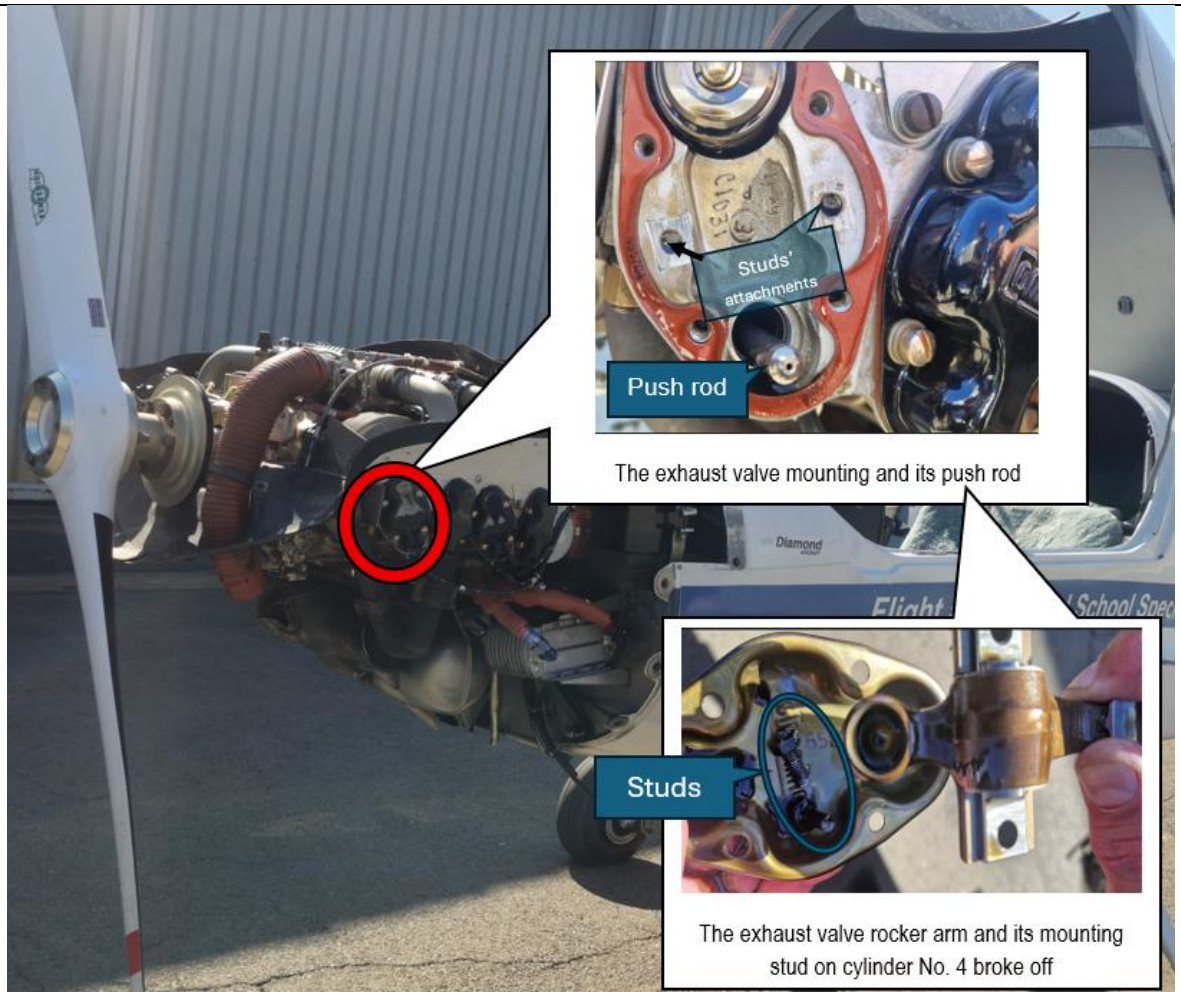

Figure 4: The damaged No.4 cylinder.

Maintenance records showed that a Continental engine, model R-IO-240-B32B with serial number 1047211, was installed in the aircraft on 1 February 2025 as a new unit with zero hours. The airframe had 6 763.28 hours at the time of installation.

At the time of the serious incident, the engine had accumulated 194.5 hours, and the airframe had a total of 6 957.78 hours. The engine was still relatively new, and there were no manufacturer-issued directives such as mandatory service bulletins or technical instructions requiring inspection of the engine cylinder studs.

The aircraft experienced an engine power loss during a training exercise following an EFATO simulation. The loss of power was traced to the failure of the No.4 cylinder exhaust valve system. The exhaust valve rocker arm became inoperative due to the failure of its mounting studs. As a result, the exhaust valve failed to open which caused the combustion gases to back up, building excessive pressure within the combustion chamber. This led to a disruption in normal combustion and propulsion of the engine No.4 cylinder, ultimately resulting in a noticeable engine power loss that led the pilot to conduct a forced landing.

Findings

1. Pilot

1.1. The flight instructor (FI) had a Commercial Pilot Licence (CPL) that was initially issued by the Regulator (SACAA) on 8 November 2023. The latest CPL was reissue on 28 October 2024 with an expiry date of 31 October 2025. The FI's Class 1 aviation medical certificate was issued on 21 October 2024 with an expiry date of 31 October 2025.

1.2. The FI had a total of 422.2 hours of which 309.0 hours were accumulated on the aircraft type.

1.3. The Student Pilot (SP) had a Student Pilot Licence (SPL) that was issued by the Regulator on 3 April 2023 with an expiry date of 23 June 2025. The SP's Class 2 aviation medical certificate was issued on 28 February 2023 with an expiry date of 28 February 2028.

1.4. The SP had a total of 38.8 flying hours which were accumulated on the aircraft type.

2. Aircraft

2.1. The latest mandatory periodic inspection (MPI) of the aircraft was conducted and certified on 12 June 2025 at 6023.16 hours after which a Certificate of Release to Service (CRS) was issued with an expiry date of 11 June 2026 or at 7023.7 hours, whichever comes first. The aircraft had a total of 6 957.78 hours at the time of the serious incident. It had accumulated a total of 33 hours since the last MPI.

2.2. The aircraft had a valid Certificate of Airworthiness (C of A) that was issued by the Regulator on 17 March 2009 with an expiry date of 31 March 2026. The aircraft's Certificate of Registration (C of R) was issued to the current owner on 10 February 2009.

2.3. The aircraft maintenance organisation (AMO) which conducted the MPI had an AMO Certificate that was issued on 5 May 2025 with an expiry date of 30 May 2026. The aircraft type was endorsed on the AMO's operational specifications.

2.4. The approved training organisation (ATO) had an ATO Certificate that was issued on 1 December 2022 with an expiry date of 31 August 2027. The aircraft type was endorsed on ATO's operational specifications.

3. Environment

3.1. Clear weather conditions prevailed at the time of the flight; the weather conditions did not contribute to this serious incident.

4. Mission

4.1. During an EFATO simulating exercise, the aircraft lost engine power which was caused by the failure of the No.4 cylinder exhaust valve rocker arm. The rocker arm became inoperative due to the broken mounting studs which led to the exhaust valve remaining closed and causing a build-up of combustion gas pressure in the cylinder, thus, disrupting engine power.

Probable Cause(s)

Unsuccessful forced landing following an engine power loss due to the failure of the No.4 engine cylinder exhaust valve rocker arm.

Contributing Factor(s)

1. The rocker arm became inoperative due to the broken mounting studs which led to the exhaust valve remaining closed and causing a build-up of combustion gas pressure in the cylinder, thus disrupting engine power.

2. Possible improper torque application on the rocker arm studs which compromised valve operation under load.

Safety Action(s)

None.

Safety Message and/or Safety Recommendation/s

None.

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 enquiries 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.

Disclaimer

This report is produced without prejudice to the rights of the AIID, which are reserved.

This report is issued by:

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