SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10396								
Classification	Accident		**Date**	2 December 2023			**Time**	0722Z	
Type of Operation	Private (Part 141)								
Location									
Place of Departure	Klerksdorp Airfield (FAKD), Gauteng Province		Place of Intended Landing			Klerksdorp Airfield (FAKD), Gauteng Province			
Place of Occurrence	Private farm, 7 nautical miles from Klerksdorp Airfield (FAKD)								
GPS Co-ordinates	Latitude	26°45'57.6"S	Longitude	26°39'42.2"E		Elevation	4 444ft		
Aircraft Information									
Registration	ZS-ESW								
Make; Model; S/N	Piper Aircraft Corporation; PA 28-140 Cherokee (Serial Number: 28-22004)								
Damage to Aircraft	Substantial			Total Aircraft Hours		6434.5			
Pilot-in-command									
Licence Type	Commercial Pilot Licence (CPL)			Gender	Female		Age	24	
Licence Valid	Yes	Total Hours	364		Total Hours on Type		202		
Total Hours 30 Days	0.5		Total Flying on Type Past 90 Days		5.5				
People On-board	2+0	**Injuries**	0	**Fatalities**	0	**Other (on ground)**	0		

What Happened

On Saturday morning, 2 December 2023, an instructor and a student pilot on-board a PA-28-140 Cherokee with registration ZS-ESW were engaged in simulated forced landing exercises approximately 6 nautical miles (NM) north-west of Klerksdorp Aerodrome (FAKD), North West province, when the accident occurred. Visual meteorological conditions (VMC) by day prevailed at the time of the flight. The instructor did not file a flight plan. The flight was conducted under the provisions of Part 141 of the Civil Aviation Regulations (CAR) 2011 as amended.

The instructor stated that they took off from FAKD at approximately 0658Z to conduct the simulated forced landing exercises. Two simulated forced landing exercises were successfully completed. During the third exercise whilst on the left turn at approximately 800 feet (ft) above ground level (AGL) and flying at a low speed, the aircraft encountered a strong downdraft. The student pilot pulled up the aircraft's nose which caused the aircraft to stall. This event occurred whilst the student pilot was completing the fault-finding checks as per the Pilot's Operating Handbook (POH).

The instructor stated that she took over the control of the aircraft and lowered the nose, selected the flaps up and applied power to recover from the stall, which was successful. Once recovered from the stall, the instructor increased the aircraft's speed to climb. She stated that because of the heat and the wind at the time, it became impossible for the aircraft to gain altitude; it kept climbing and

descending again and again, in the process losing height. The instructor deduced that they are unlikely to successfully climb and she selected a field on which to conduct a forced landing. Thereafter, she closed the mixture and the throttle, turned off the fuel selector and the magnetos, applied full flaps and turned off the master switch; she then forced landed the aircraft on the field. The instructor stated that during the landing roll, she kept the nose in a high attitude to avoid the nose wheel from settling on the ground. The aircraft impacted two perimeter fences and a wooden post before it came to a stop.

The aircraft was substantially damaged. The crew was not injured during the accident sequence.

A visual inspection was conducted post-accident, and the following damage was recorded: the left- and the right-wing leading edges were dented in the mid-section, and the propeller blades had scratch marks.

Figure 1: The dented left-wing leading edge. (Source: Operator)

Figure 2: The dented right-wing leading edge. (Source: Operator)

Figure 3: The propeller blade with scratch marks. (Source: Operator)

The weather information below was sourced from the meteorological aerodrome report (METAR) that was issued by the South African Weather Service (SAWS) for FAKD on 2 December 2023 at 0700Z.

Satellite Image

The Day Natural Colour RGB (DNC) satellite images of the MeteoSat Second Generation (MSG) show no presence of clouds over FAKD prior (Figure 5 at 0645Z), during (at 0700Z) and post the time of the accident (at 0715Z).

The area of concern is indicated by a white location pin on the satellite image. As such, visual meteorological conditions (VMC) prevailed before, during and after the accident.

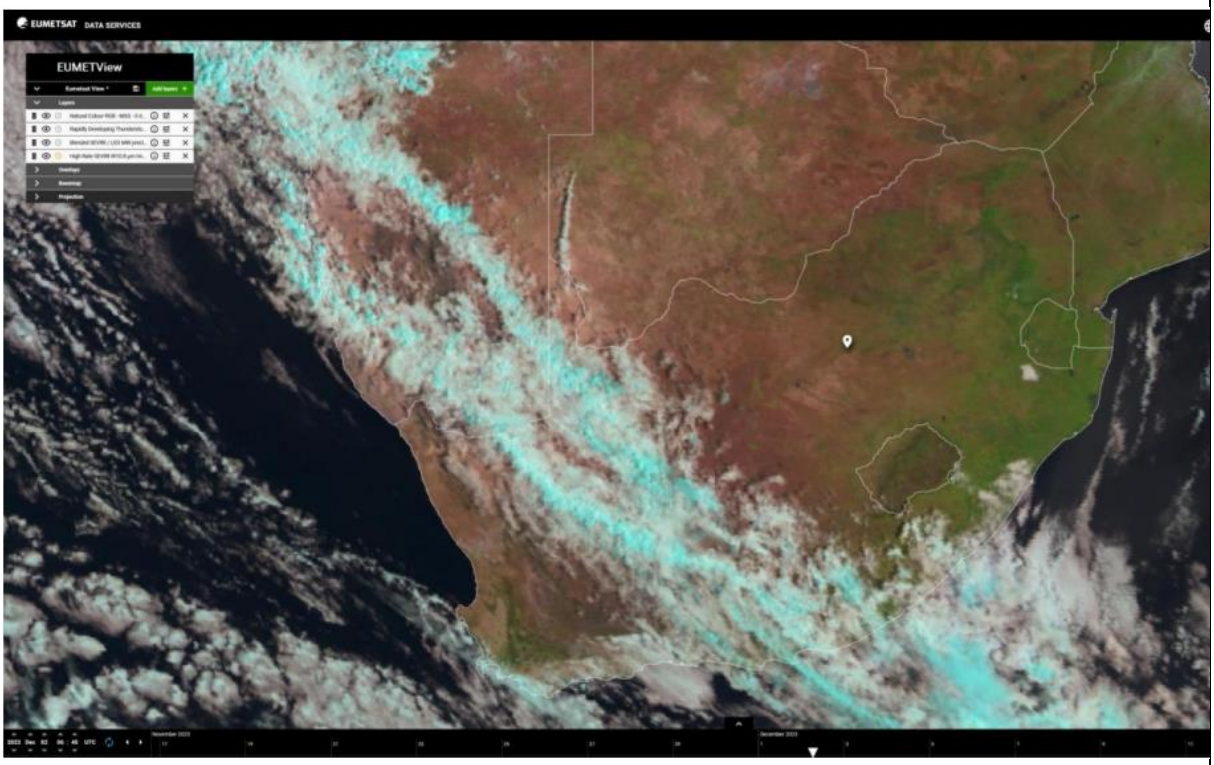

Figure 4: Day Natural Colour satellite image valid for 0715Z on 2 December 2023. (Copyright MSG)

METAR FAKD 020722Z 36009/13KT CAVOK 27/05 Q1021 NOSIG=

Wind Direction	360°	Wind Speed	09/13kt	Visibility	9999m
Temperature	27°C	Cloud Cover	Nil	Cloud Base	Nil
Dew Point	05°C	QNH	1021hPa		

Conclusion:
There was no indication of significant weather that may have contributed to the accident as far as observations and model data is presented in this report. Surface wind was light to moderate, which may suggest little to no low-level turbulence over the area and during the time of the accident. In addition, VMC conditions prevailed at the time the accident occurred.

Given the above forecast and observations, there was no significant weather that may have contributed to the accident.

According to the instructor, the aircraft lost power as a result of a downdraft, and the instructor vectored the aircraft to a field to perform a forced landing. However, during the landing roll, the aircraft struck two perimeter fences and a wooden pole, which resulted in damage to the aircraft.

Findings

The Instructor

1. The instructor was initially issued a Commercial Pilot Licence (CPL) on 1 September 2022. Her last licence validation was conducted on 23 August 2023 and the licence was reissued with an expiry date of 31 August 2024. The aircraft was endorsed on the instructor's licence. A Class 1 medical certificate was issued to the instructor on 21 July 2023 with an expiry date of 31 July 2024.

The Student Pilot

2. The student pilot was initially issued a Private Pilot Licence (PPL) on 25 May 2012. His last licence validation was conducted on 16 November 2020 and the licence was reissued with an expiry date of 30 September 2021. At the time of the accident, the student pilot was undergoing training to revalidate his PPL. The PA28-140 aircraft was endorsed on the student pilot's licence. His Class 2 medical certificate was issued on 20 October 2023 with an expiry date of 31 October 2025 with no medical waivers.

3. At the time of the accident, the student pilot had a total of 118.8 flying hours on the aircraft type.

The Aircraft

4. The aircraft's Certificate of Registration (C of R) was issued to the current owner on 26 May 2015. The Certificate of Airworthiness (C of A) was initially issued on 12 June 1984. The latest C of A was reissued on 7 June 2023 with an expiry date of 30 June 2024.

5. According to the aircraft 's Certificate of Release to Service (CRS) and logbooks, the last 100-hour annual inspection was certified on 20 June 2023 at 6417.85 total airframe hours with an expiry date of 19 June 2024 or at 6517.85 airframe hours, whichever occurs first. At the time of the accident, the aircraft had accumulated 6434.5 airframe hours. The aircraft had accrued a further 16.65 airframe hours after the last annual inspection.

6. Examination of the flight folio and the defects report showed no outstanding defects that required rectification to the aircraft's engine before the accident. The aircraft logbooks and maintenance history documents were reviewed, and they were found to be in order. All applicable Service Instructions (SI), Service Bulletins (SB) and Airworthiness Directives (ADs) were complied with. The last maintenance on the aircraft was conducted by an approved person (AP) with a valid Approved Person Certificate. The AP was qualified to conduct maintenance on the aircraft type.

7. The investigation team reviewed the instructor's report acquired through the pilot's questionnaire. The weather report information in the pilot's questionnaire contradicted the weather report that was issued by the South African Weather Service (SAWS) for the day and time of the accident.

The following inspections were conducted:
The engine was inspected and subjected to a bench test for power checks at an approved aircraft maintenance organisation (AMO). No anomalies were found. The engine was run to maximum power.

The flight folio fuel records, weight and balance sheet and the fuel bowser fuel records were reviewed. It was observed that the aircraft was refuelled with 60 litres on 21 November 2023; it was flown for 1.7 hours and the remaining fuel in the fuel tanks was 5 litres. On 24 November 2023 the aircraft was refuelled with 76 litres which brought the fuel quantity to 81 litres. Thereafter, the aircraft was flown for 1.7 hours, which equated to approximately 65 litres of fuel consumed. Therefore, 16 litres of fuel remained in the tanks at the time of the accident. The above fuel calculations do not include run-up checks and the take-off phase.

The instructor produced (only) three (3) verified fuel receipts from the fuel bowser. The flight folio, weight and balance sheet and the fuel records from the fuel bowser indicated the following:

Table 1: Record of Fuel upliftment (Source: Flight folio)

Date	Journey From/To		Hobbs Start	Hobbs/ Tach Stop	Flight Duration	Landings	Fuel Type	
							Uplift	Burned
17/11/2023	FAKD	FAKD	922.0	922.6	0.8	1	_	38L/h
21/11/2023	FAKD	FAKD	922.6	924.6	1.7	1	60L	38L/h
24/11/2023	FAKD	FAKD	924.6	926.1	0.8	1	76L	38L/h
27/11/2023	FAKD	FAKD	926.1	928.5	0.9	1	_	38L/h

29/11/2023	FAKD	FAKD	928.5	930.7	0.4	1	_	38L/h
2/12/2023	FAKD	FAKD	6434.9	6435.3	0.4	1	_	38L/h

Therefore, the provisions of Part 91.07.12 of the CAR 2011 as amended were not complied with.

Fuel and oil requirements:

Part 91.07.12

(1) *A pilot-in-command of an aircraft shall not commence a flight unless he or she is satisfied that the aircraft is carrying a sufficient amount of usable fuel and sufficient oil to complete the planned flight safely and to allow for deviations from the planned operation.*

(2) The pilot-in-command shall ensure that the amount of useable fuel to be carried shall, as a minimum, be based on—the following data—

(i) current aircraft-specific data derived from a fuel consumption monitoring system, if available; or

(ii) if current aircraft-specific data is not available, data provided by the aeroplane manufacturer; and

(b) the operator conditions for the planned flight including—

(i) anticipated aeroplane mass;

(ii) notices to Airmen;

(iii) current meteorological reports or a combination of current reports and forecasts;

(iv) air traffic services procedures, restrictions and anticipated delays; and

(v) the effects of deferred maintenance items and/or configuration deviations.

The pre-flight calculation of usable fuel required shall include—

(a) Taxi fuel, which shall be the amount of fuel expected to be consumed before take-off; taking into account local conditions at the departure aerodrome and auxiliary power unit (APU) fuel consumption;

(b) Trip fuel, Which shall be the amount of fuel required to enable the aeroplane to fly from take-off or the point of in-flight re-planning until landing at the destination aerodrome taking into account the operating conditions of paragraph (b) of sub-regulation 91.07.12 (2);

Final reserve fuel, which shall be the amount of fuel calculated using the estimated mass on arrival at the destination alternate aerodrome or the destination aerodrome, when no destination alternate aerodrome is required—

(i) for *the reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes, under speed and altitude conditions specified by the Director.*

Fuel System:

Fuel is stored in a two twenty-five-gallon tanks which are secured to the leading-edge structure of each wing by screws and nut plates to allow easy removal for service or inspection. The fuel consumption per hour is 10 gallons per hour.

The fuel selector control is located on the left panel, forward of the pilot's seat. The button on the selector cover must be depressed and held while the handle is moved to the "OFF" position. The button releases automatically when the handle is moved back into the ON position.

To obtain the standard fuel quantity of 36 gallons, fill the tanks to the bottom of the filler neck indicator. To obtain the standard plus the reserve quantity a total of 50 U.S gallons, fill the tanks to the top of the filler neck. An auxiliary electric fuel pump is provided for use in case of failure of the engine driven pump. The electric should be on for all take offs and landings and when switching tanks.

The fuel strainer is equipped with a quick drain and is located on the front lower left corner of the fire wall. This strainer should be drained during preflight to check for water or sediment and proper fuel (a special bottle is furnished for this operation). To drain the lines from the tanks, the tank selector valve must be switched to each tank in turn, with the electric pump on, and the gascolator drain valve opened. Each tank has an individual quick drain located at the bottom, inboard, rear corner. Fuel quantity and pressure are indicated on gauges located in the engine gauge cluster on the left of the side of the instrument panel.

An engine priming system is installed to facilitate starting. The primer is located on the immediate left of the throttle quadrant.

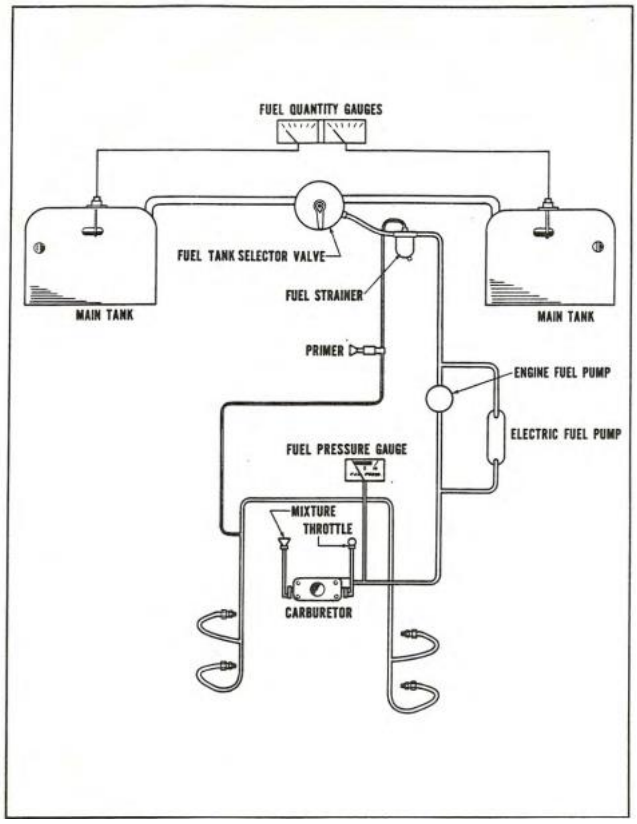

Diagram 1: Fuel system schematic. (Source: PA28-140 POH)

8. The instructor reported that the aircraft encountered a downdraft, however, evidence from the South African Weather Service (SAWS) indicated that fine weather conditions prevailed at the time of the flight; therefore, the weather did not contribute to this accident.

9. The evidence that was gathered from the flight folio's fuel records, weight and balance sheet and fuel bowser records indicated that the aircraft had fuel exhaustion during the simulated forced

landing exercises which was consistent with the instructor's statement that she elected to conduct the forced landing with the engine power off.

Probable Cause

In-flight engine shutdown because of fuel exhaustion which resulted in an unsuccessful forced landing.

Contributing Factor

Poor or no flight planning.

Safety Action(s)

None.

Safety Message

To avoid injury, death or damage to property, pilots are advised to adequately plan for their flights and adhere to the planned routes to avoid the risk of fuel exhaustion.

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 desk top 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 issued by:
Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa