SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10368						
Classification	Accident		**Date**	27 September 2023		**Time**	0743Z
Type of Operation	Private (Part 105)						
Location							
Place of Departure	Mossel Bay Aerodrome (FAMO), Western Cape Province		Place of Intended Landing	Mossel Bay Aerodrome (FAMO), Western Cape Province			
Place of Occurrence	On a private holding, 980 metres north-east of Mossel Bay Aerodrome (FAMO)						
GPS Co-ordinates	Latitude	34° 09' 04" S	Longitude	022° 04' 09" E		Elevation	536 ft
Aircraft Information							
Registration	ZS-CXX						
Make; Model; S/N	Cessna 182-F (Serial Number: 182-54516)						
Damage to Aircraft	Substantial		Total Aircraft Hours	5 955.7			
Pilot-in-command							
Licence Type	Private Pilot Licence (PPL)		Gender	Male		Age	49
Licence Valid	Yes	Total Hours	729.2	Total Hours on Type		165.9	
Total Hours 30 Days	11.7		Total Flying on Type Past 90 Days	12.4			
People On-board	1+4	**Injuries** 0	**Fatalities**	0	**Other (on ground)**		0

What Happened

On Wednesday, 27 September 2023 at 0715Z, a pilot and four skydivers on-board a Cessna 182-F with registration ZS-CXX took off from Mossel Bay Aerodrome (FAMO) in the Western Cape province to the designated zone for paragliding. The intention was to drop off the skydivers overhead FAMO from flight level (FL) 105 and return to FAMO. A visual flight rules (VFR) flight plan was filed with George Aerodrome (FAGG). The flight was conducted under visual meteorological conditions by day and under the provisions of Part 105 of the Civil Aviation Regulations (CAR) 2011 as amended.

According to the pilot, he stated that the previous day, the aircraft landed with 21 US gallons of fuel as per the fuel gauge indication, of which 5 US gallons was unusable; thus, the aircraft had a total of 16 US gallons of usable fuel. On the day of the accident, the pilot conducted pre-flight inspection, and all was normal. As the pilot had planned to fly for approximately 36 minutes, he did not uplift fuel prior to the flight. *According to the Pilot's Operating Handbook (POH), the fuel consumption of the aircraft is 12.6 US gallons per hour*. The pilot further stated that the aircraft was configured for paradrop operation (passenger seats removed, passenger door removed, and wind deflector fitted on the passenger door post). After the parachuters boarded the aircraft, the engine was started, and the aircraft taxied to Runway 28 to commence with the flight. The take-off and climb were uneventful,

and the aircraft continued in the heading of 280º. Whilst at 5 500 feet (ft) above mean sea level (AMSL), the pilot steered the aircraft towards Vleesbaai before he turned towards the FAMO whilst climbing to flight level 105 (10 500 ft). Once established overhead the aerodrome, the skydivers jumped off the aircraft. Thereafter, the aircraft descended whilst routing to Dana Bay area. Whilst at 7 000 ft, the engine spluttered and, moments later, it stopped. The pilot called FAGG on frequency 128.2-Megahertz (MHz) and declared an emergency by broadcasting PAN, PAN, PAN and, thereafter, informed the air traffic control officer (ATCO) that he was in a gliding range off the aerodrome (FAMO) at a heading of 280º. The aircraft came up short of RWY 28 and landed on a private holding in Mossel Bay which was 980m north-east of the runway threshold. During the landing roll, the aircraft impacted a perimeter fence of the private holding before it stopped. The pilot contacted FAGG ATCO and informed him that he was safe on the ground as FAMO is an unmanned aerodrome. The aircraft sustained substantial damage; however, the pilot was not injured.

The aircraft maintenance organisation (AMO) recovered the aircraft after the accident. According to the technical report supplied by the AMO, the aircraft sustained damage to the left wing strut, left wing leading edge and propeller blades; there was no visible damage to the right wing. The engine was turned by hand several times, and there was no indication of internal damage. Both wing tanks were checked using a dipstick, and there was no evidence of fuel in the tanks.

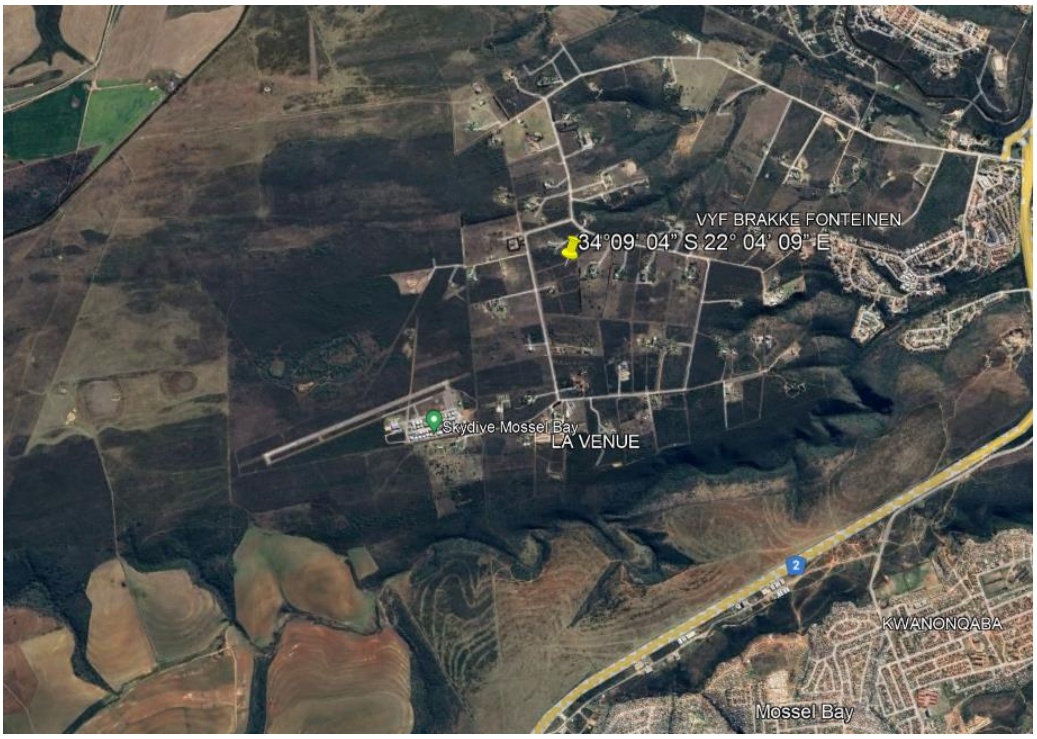

Figure 1: The yellow pin indicates the accident site. (Source: Google Earth)

Figure 2: The fence that the aircraft impacted: (Source: Operator)

Figure 3: The scratch marks on the propeller blades due to impact with the fence.

Figure 4: Damage sustained on the left-wing leading edge and strut. (Source: Operator)

Fuel Limitations:

According to the POH, the aircraft is fitted with two standard tanks with a capacity of 30.5 US gallons (115.9 litres) each, totalling 61 US gallons (231.8 litres), of which 5 US gallons (19 litres) is unusable. According to the flight folio, the aircraft was refuelled with 45 litres of fuel on 26 September 2023; it was then flown for approximately 1.0 hours. According to the POH, the fuel required for start, taxi and take-off is 1.7 US gallons, and 30 minutes reserve fuel is 4 US gallons. The pilot stated that the fuel left after the previous flight was approximately 80 litres (21 US gallons).

Total Fuel (US gallons)	21
Start, Taxi, and Take-off	1.7
Climb	4.9
Unusable	5
Usable fuel	9.4
Minimum fuel required at 18USG/hour (total - start, taxi, take-off and climb - unusable\reserve)	31.7
Fuel consumption (power setting of 2 400 RPM)	12.6 GPH (gallons per hour)
Flight time (from start to engine stoppage)	36 minutes (fuel used 10.8 USG)

1. ***Planning criteria for aeroplanes SACATS 91.07.12 1 (3)***

Except provided in Part 91, Part 93, Part 121 and Part 135, an owner or operator must base the fuel policy, including calculation of the amount of fuel and oil to be carried by an aeroplane, on the following planning criteria –

(1) when the flight is conducted in accordance with the instrument flight rules and a destination alternate aerodrome is not required in accordance with regulation 91.07.7(6), flight to the aerodrome of intended landing and thereafter for at least 45 minutes at the normal cruising altitude consumption rate;

(2) when the flight is conducted in accordance with the instrument flight rules and a destination alternate aerodrome is required, flight to the aerodrome of intended landing, thence from the aerodrome of intended landing to an alternate aerodrome and thereafter for at least 45 minutes at the normal cruising altitude consumption rate;

(3) ***when the flight is conducted in accordance with the visual flight rules by day, flight to the aerodrome of intended landing and thereafter for at least 30 minutes at the normal cruising altitude consumption rate; or***

(4) When the flight is conducted in accordance with the visual flight rules by night, flight to the aerodrome of intended landing and thereafter for at least 45 minutes at the normal cruising altitude consumption rate.

ENGINE FAILURE DURING FLIGHT

1. *Airspeed ---70 KIAS*
2. *Carburetor Heat --- ON*
3. *Fuel Selector Valve ---BOTH*
4. *Mixture --- RICH*
5. *Ignition Switch --- BOTH (or START if propeller is stopped)*
6. *Primer --- IN and LOCKED*

Forced Landing Procedure:

EMERGENCY LANDING WITHOUT ENGINE POWER

1. *Airspeed --- 70 KIAS (Flaps UP)*
   65 KIAS (Flaps DOWN)
2. *Mixture --- IDLE CUT-OFF*
3. *Fuel Selector Valve --- OFF*
4. *Ignition Switch Valve --- OFF*
5. *Wing Flaps --- AS REGUIRED (40° recommended)*
6. *Master Switch --- OFF*

7. *Doors ---UNLATCHED PRIOR TO TOUCHDOWN*
8. *Touchdown --- SLIGHTLY TAIL LOW*
9. *Brakes --- APPLY HEAVILY*

ENGINE FAILURE

If an engine failure occurs during the takeoff run, the most important thing to do is stop the airplane on the remaining runway. Those extra items on the checklist will provide added safety after a failure of this type.

Prompt lowering of the nose to maintain airspeed and establish a glide attitude is the first response to an engine failure after takeoff. In most cases, the landing should be planned straight ahead with only small changes in direction to avoid obstructions. Altitude and airspeed are seldom sufficient to execute a 180° gliding turn necessary to return to the runway. The checklist procedures assume that adequate time exists to secure the fuel and ignition systems prior to touchdown.

After an engine failure in flight, the best glide speed as shown in figure 3-1 should be established as quickly as possible. While gliding toward a suitable landing area, an effort should be made to identify the cause of the failure. If time permits, an engine restart should be attempted as shown in the checklist. If the engine cannot be restarted, a forced landing without power must be completed.

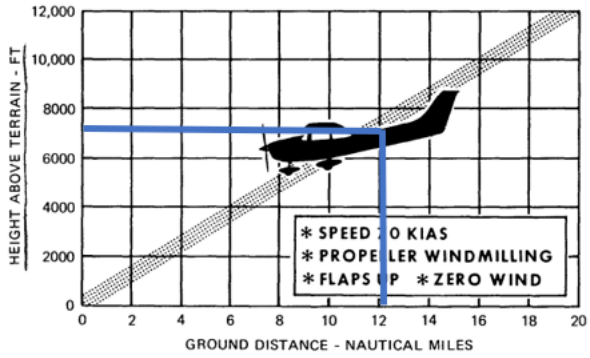

Chart 1: Maximum glide distance. (Source: POH)

At the time the engine stopped; the aircraft was at a height of 7 000 ft. According to Chart 1, the aircraft had approximately 12 nautical miles (nm) glide distance range available before touchdown (given that the indicated airspeed is kept at 70 knots with flaps up and with wind at zero degrees).

FORCED LANDINGS (Source: Cessna 182 POH)

If all attempts to restart the engine fail and a forced landing is imminent, select a suitable field and prepare for the landing as discussed in the checklist for Emergency Landing Without Engine Power.

Before attempting an "off airport" landing with engine power available, one should drag the landing area at a safe but low altitude to inspect the terrain for obstructions and surface conditions, proceeding as discussed under the Precautionary Landing with Engine Power.

The weather information in the table below was obtained from the South African Weather Service (SAWS) on 27 September 2023 at 0730Z for FAGG, which is located 22 nm from FAMO.

Wind Direction	030º	Wind Speed	03 kts	Visibility	9999
Temperature	16ºC	Cloud Cover	SCT	Cloud Base	3100
Dew Point	11ºC	QNH	1027		

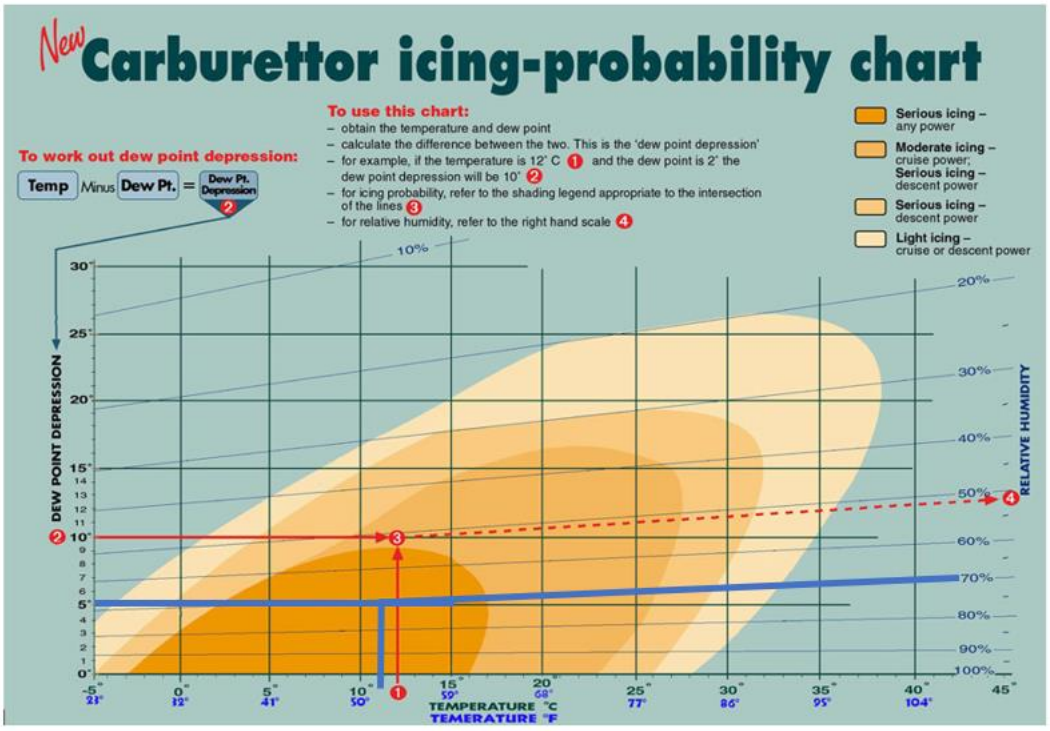

Chart 2: Carburettor icing chart.

According to the weather report supplied by the SAWS, the temperature at the time of the accident was 16º Celsius (C) with dew point at 11ºC; this gives a dew point depression of 5ºC. Therefore, this condition results in the relative humidity of 70% and, thus, places the aircraft in a serious icing condition at any power setting as depicted in Chart 2.

Findings

Personnel Information

1. The pilot was initially issued a Private Pilot Licence on 17 January 2020. The licence was renewed on 28 January 2023 with an expiry date of 31 January 2025. The pilot had flown a total of 729.2 hours of which 165.9 hours were on the aircraft type. The aircraft type was endorsed on his licence and on the pilot's logbook.

2. The pilot was issued a Class 2 aviation medical certificate on 23 June 2023 with an expiry date of 30 June 2025 with a medical waiver. The pilot was properly licensed to conduct the flight and was medically fit in accordance with Part 67 of the CAR 2011.

Aircraft Information

3. The last mandatory periodic inspection (MPI) that was conducted on the aircraft prior to the accident flight was on 4 May 2023 at 5 906.90 airframe hours. The aircraft accrued 48.8 hours since the last MPI with the total of 5 955.7 hours since new.

4. The aircraft had a valid Certificate of Airworthiness (C of A) that was initially issued on 21 December 2012. The C of A was reissued on 27 October 2022 with an expiry date of 30 November 2023.

5. The Certificate of Release to Service (CRS) was issued on 24 May 2023 with an expiry date of 24 May 2024 or at 6 006.90 hours, whichever comes first. The Certificate of Registration (C of R) was issued to the current owner on 5 December 2013. There were no defects reported prior to the accident flight, therefore, the aircraft was airworthy.

6. According to available information, there was no supplemental type certificate (STC) in place for the aircraft configuration at the time of the accident as required in Part 43.02.15 1(a) read together with Part 21.05.1 (1).

7. On the day of the accident, it was reported that the aircraft was not refuelled as the pilot deduced that there was fuel remaining in the aircraft from the previous flight the day before, which was presumably 80 litres (21 US gallons). The aircraft was last refuelled on 26 September 2023 according to the flight folio; the aircraft was then flown for 1.0 hours on the same day. According to the fuel calculations for the day of the accident, the aircraft had 9.4 US gallons usable fuel for the flight, which translated to 30 minutes of flight time if the wind and power settings are not considered.

8. According to the South African Civil Aviation Technical Standards (SA-CATS) Part 91. 07.12 (3), for a VFR flight by day, the pilot-in-command (PIC) of the aircraft should ensure a 30-minute reserve fuel in the aircraft. The PIC did not make provisions for this requirement which was not in line with the provisions of Part 91.07.12. (3).

9. According to the maximum glide chart, the height at which the aircraft could glide without power is 12nm. The engine stopped whilst the aircraft was overhead Dana Bay which is 2.7nm from FAMO; thus, it is probable that the pilot landed the aircraft even though it had enough height and glide distance.

10. The wind speed at the time of the accident was not considered a factor for not opting for the glide approach.

11. According to the carburettor icing chart, the aircraft was flown in a weather condition with a high probability of serious carburettor icing at any power setting with a relative humidity of 70%. Carburettor icing was not considered to have had a bearing on the engine as the aircraft ran out of fuel.

Probable Cause(s)

In-flight engine stoppage due to fuel exhaustion which was followed by an unsuccessful forced landing.

Contributing Factor(s)

Inadequate flight planning.

The pilot did not use the full gliding distance of 12nm, and the nearest aerodrome (FAMO) was 2.7nm from the point where the engine stopped.

Safety Action(s)

None.

Safety Message

1. In the interest of safety, the Regulator (SACAA) should ensure that prior to issuing an Air Operating Certificate (AOC), the aircraft conforms to the type certification and design, and that they are fit for the purpose.

2. To avoid injury and damage to property, operators and pilots are advised to follow the manufacturers' prescripts and the CAR 2011 Part 43 and Part 21 as amended, as well as ensure that modifications are approved by the Regulator before the aircraft are operated.

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 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