SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED SERIOUS INCIDENT INVESTIGATION REPORT

Reference Number	CA18/3/2/1380								
Classification	Serious Incident		**Date**	14 October 2021		**Time**	1540Z		
Type of Operation	Private (Part 91)								
Location									
Place of Departure	Skukuza Airport (FASZ), Mpumalanga Province		Place of Intended Landing			Rand Airport (FAGM), Gauteng Province			
Place of Accident	Semi-prepared field, 3 nautical miles south of FAGM								
GPS Co-ordinates	Latitude	26º17'17.1" S	Longitude	28º10'37.8" E		Elevation	5 438 feet		
Aircraft Information									
Registration	ZS-IOP								
Model/Make	Cessna A150L (Serial Number: A150-0326)								
Damage to Aircraft	None		Total Aircraft Hours			10 030.7			
Pilot-in-command									
Licence Type	Commercial Pilot Licence (CPL)		Gender	Male		Age 62			
Licence Valid	Yes								
Total Hours on Type	325.6		Total Flying Hours			2 225.3			
People On-board	1+1	Injuries	0	Fatalities	0	Other (on ground)	0		

What Happened

On 14 October 2021, a pilot and a passenger on-board a Cessna A150L with registration ZS-IOP took off on a private flight from the Rand Airport (FAGM) in Gauteng province to Kruger Mpumalanga International Airport (FAKN) and, later, to Skukuza Airport (FASZ) in Mpumalanga province before returning to FAGM. The flight was conducted under visual flight rules (VRF) by day and no flight plan was filed for the flight. Fine weather conditions prevailed at the time of the serious incident. The flight was conducted under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot reported that prior to departure, he obtained a weather report from the South African Weather Service (SAWS). The pilot further stated that he carried out a pre-flight inspection in accordance with the Pilot's Operating Handbook (POH), and that fuel (consumption) was planned for the flight.

According to the pilot, the flight from FASZ to FAGM was uneventful; however, whilst about 2 nautical miles (nm) in-bound FAGM, the fuel remaining in the aircraft was too low and the pilot noticed a reduction in engine performance. To prevent an engine out situation, the pilot elected to perform a

forced landing on a semi-prepared field approximately 3 nautical miles (nm) south-east (SE) of FAGM; the aircraft landed safely.

The aircraft was not damaged, and both occupants were not injured during the serious incident.

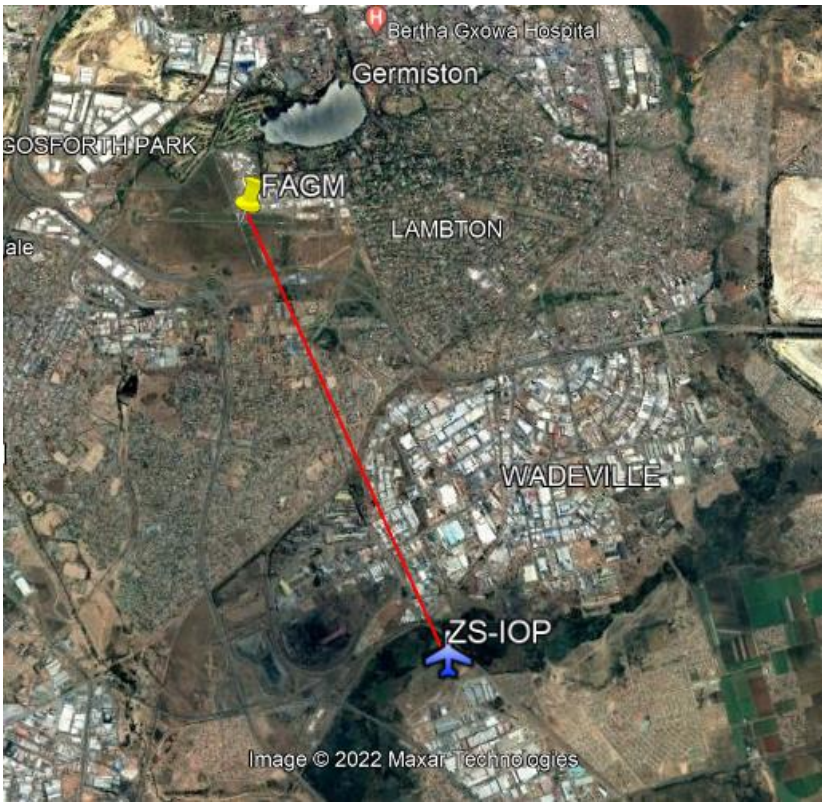

Figure 1: The approximate landing site of the aircraft. (Source: Google Earth)

What was found:

- The pilot had a Commercial Pilot Licence (CPL) and was a Grade 2 instructor.
- According to the pilot's questionnaire, this was a private flight. The pilot indicated that on the day of the serious incident, the aircraft had a total of 21 United States Gallons (USG) of fuel on-board at take-off, which translated to an endurance of 3.0 hours. Available records show that the aircraft was refuelled with 68 litres (17 USG) of Avgas 100LL on 13 October 2021 in preparation for the flight on 14 October 2021.
- According to the authorisation sheet, the pilot logged 5.7 hours. The total fuel required for the flight was 22.94 USG, including a minimum fuel required at destination of 30 minutes according to the planning criteria for aeroplanes. The unusable fuel, according to the POH, is 3.5 USG, which translated to a total of 19.44 USG of usable fuel.
- According to the Pilot's Operating Handbook (POH) Cruising Performance table, fuel consumption at 6 000 feet and with engine revolutions per minute (rpm) of 2 400 (pilot recorded) and a temperature of above 20°C would be computed to be 3.7 gallons per hour (GPH).
- The pilot was in contravention of the CAR Part 91.07.02. The aircraft ran out of fuel and the pilot was not able to reach his destination. The planning criteria for aeroplanes is that the aircraft must

have a minimum fuel requirement equating to 30 minutes remaining in the tanks at the time of reaching the intended landing aerodrome for a VFR flight; this was not adhered to.

- Considering all the factors above, the fuel required for the incident flight was 24.59 USG.

The South African Civil Aviation Technical Standard Part 91 (SACATS) 91.07.02 Planning criteria for aeroplanes:

Extract in Part 91, 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.

- According to the engineers who recovered the aircraft after the incident, there was no fuel found in both tanks. The aircraft was inspected and topped up with 60 litres (15 USG) of fuel before it was flown back to base where it landed safely.
- The fuel gauge was removed from the aircraft and sent to another aircraft maintenance organisation (AMO) for operational testing. The following checks were carried out: functionality test on the airframe fuel system found the left-side system calibration with 0 (zero) deviation from empty indication; right-side system calibration was slightly high but within tolerance as per original equipment manufacturer (OEM) maintenance publication; work was performed in accordance with manual: D971, Main Revision 3 dated 15 June 1975, Section temporary revision 3 dated 7 October 2002. A certificate relating to maintenance of aircraft (CRMA) for the above test was issued on 18 October 2021.
- The aircraft was found to perform normally with no anomalies and was released back to service.
- According to the Type Certificate holder, the engine recommended by the manufacturer is a Continental O-200-A as well as a McCauley propeller HCM6948.

91.07.12 Fuel and oil requirements

(3) 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);

(c) Contingency fuel, which shall be the amount of fuel required to compensate for unforeseen factors. It shall be 5 per cent of the planned trip fuel or of the fuel required from the point of in-flight re-planning based on the consumption rate used to plan the trip fuel but in any case shall, in the case of aeroplanes, shall not be lower than the amount required to fly for 5 minutes at holding speed at 1 500 ft above the destination aerodrome in standard conditions;

***Note.**—Unforeseen factors are those factors that could have an influence on the fuel consumption to the destination aerodrome, such as deviations of an individual aeroplane from the expected fuel consumption data, deviations from forecast meteorological conditions, extended delays.*

(d) Destination alternate fuel, which shall be—

(i) where a destination alternate aerodrome is required, the amount of fuel required to enable the aeroplane to—

(aa) perform a missed approach at the destination aerodrome;

(bb) climb to the expected cruising altitude;

(cc) fly the expected routing;

(dd) descend to the point where expected approach is initiated; and

(ee) conduct the approach and landing at the destination alternate aerodrome; or

(ii) where two destination alternate aerodromes are required, the amount of fuel, as calculated in sub-regulation 91.07.12 (3), required to enable the aeroplane to proceed to the destination alternate aerodrome which requires the greater amount of alternate fuel; or

(iii) where a flight is operated without a destination alternate aerodrome, the amount of fuel required to enable the aeroplane to fly for 15 minutes at holding speed at 1 500 ft above the destination aerodrome elevation in standard conditions; (e) 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 a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes, under speed and altitude conditions specified by the Director;

(ii) for a turbine engine aeroplane, the amount of fuel required to fly for 30 minutes at holding speed at 1 500 ft above aerodrome elevation in standard conditions;

(f) Additional fuel, which shall be the supplementary amount of fuel required if the minimum fuel calculated in accordance with sub-regulations 91.07.12 (a), (b), (c), (d) or (e) is not sufficient to—

(i) allow the aeroplane to descend as necessary and proceed to an alternate aerodrome in the event of engine failure or loss of pressurisation, whichever requires the greater amount of fuel based on the assumption that such a failure occurs at the most critical point along the route;

(aa) fly for 15 minutes at holding speed at 1 500 ft above aerodrome elevation in standard conditions; and

(bb) Make an approach and landing;

(ii) allow an aeroplane engaged in EDTO to comply with the EDTO critical fuel scenario as established by the Director.

(iii) meet additional requirements not covered above

Probable cause

The aircraft ran out of fuel, resulting in loss of engine power and a subsequent forced landing.

Contributory factors

Inadequate flight planning.

Disregard of Part 91.07.12 of the CAR 2011 as amended “Fuel and Oil Requirements” and Part 91.07.2 “Planning Criteria for Aeroplanes”.

Safety Actions

None.

Safety Message

Pilots are reminded to always adhere to the CAR and manufacturer requirements prior to initiating any flight as this will ensure proper flight planning and prevent injuries and damage to property.

Purpose of the Investigation

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 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 apportion blame or liability****.*

About this Report

Decisions regarding whether to investigate, and the scope of an investigation are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, no 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 brief report. The report has been compiled using information supplied in the initial notification, as well as follow-up information 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 accident.

This report provides an opportunity to share safety message/s in the absence of an investigation.

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.

Disclaimer

This report is issued by:

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