SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/3/2/1456								
Classification	Serious Incident		**Date**	18 October 2024			**Time**	1130Z	
Type of Operation	Private (Part 91)								
Location									
Place of Departure	Potchefstroom Airfield (FAPS), North West Province		Place of Intended Landing	Beaufort West Airport (FABW), Western Cape Province					
Place of Occurrence	Open field, 12 nautical miles from FABW								
GPS Co-ordinates	Latitude	32° 09' 34" S	Longitude	22° 57'02" E		Elevation	4000 ft		
Aircraft Information									
Registration	ZS-SKX								
Make; Model; S/N	Hoffmann Flugzeugbau GMBH; Dimona H36 Motor Glider (Serial Number: 3626)								
Damage to Aircraft	None		Total Aircraft Hours	4589.2					
Pilot-in-command									
Licence Type	Private Pilot Licence (PPL)		Gender	Male		Age	62		
Licence Valid	Yes	Total Hours	1 778	Total Hours on Type	22				
Total Hours 30 Days	4.5		Total Flying on Type Past 90 Days	7					
People On-board	1+1	**Injuries**	0	**Fatalities**	0	**Other (on the ground)**	0		

What Happened

On Friday, 18 October 2024, a pilot and a passenger on-board a Dimona H36 Motor Glider with registration ZS-SKX took off on a private flight from Potchefstroom Airfield (FAPS) in North West province to Beaufort West Airport (FABW) in the Western Cape province. Visual meteorological conditions (VMC) by day prevailed at the time of the flight which was conducted under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot reported that he conducted a pre-flight inspection of the motor glider and found no anomalies. Thereafter, 82 litres (L) of Avgas 100LL fuel were uplifted, which was the fuel capacity of the motor glider. The pilot took off from FAPS, climbed to and cruised at an altitude of 6 500 feet (ft) whilst maintaining a speed of 150 kilometres per hour (km/h) at 2 500 revolutions per minute (RPM). Approximately 60 nautical miles (nm) from FABW (about an hour to the set destination), the fuel quantity indicator readings showed 40L as the remaining fuel amount in the tank and was dropping significantly towards the empty mark. All engine parameters in the cockpit operated normally, but the fuel flow indicator was fluctuating. About 30 minutes after the anomaly started, the fuel gauge showed fuel as empty. Thereafter, the engine surged as the fuel flow

ceased; this was followed by the engine stoppage. The pilot declared an emergency (Pan Pan) to FABW tower and requested a straight-in approach. At 3800ft on approach, the pilot realised that the aircraft would not be able to glide to FABW successfully. He then used thermals in an attempt to gain height. However, the thermals proved insufficient as they were inadequate. Communication between the pilot and the FABW tower continued and the pilot declared a Mayday. The motor glider remained airborne for about 18 minutes whilst the pilot scanned the area for the best landing field. After identifying the landing field, he landed the motor glider successfully. The motor glider was not damaged, and both occupants disembarked from the motor glider without assistance and uninjured.

The pilot informed FABW tower via a cellular phone that he had landed safely.

The serious incident occurred during daylight at Global Positioning System (GPS) co-ordinates determined to be 32°09'34" South 022°57'02" East, at an elevation of 4 000 feet (ft).

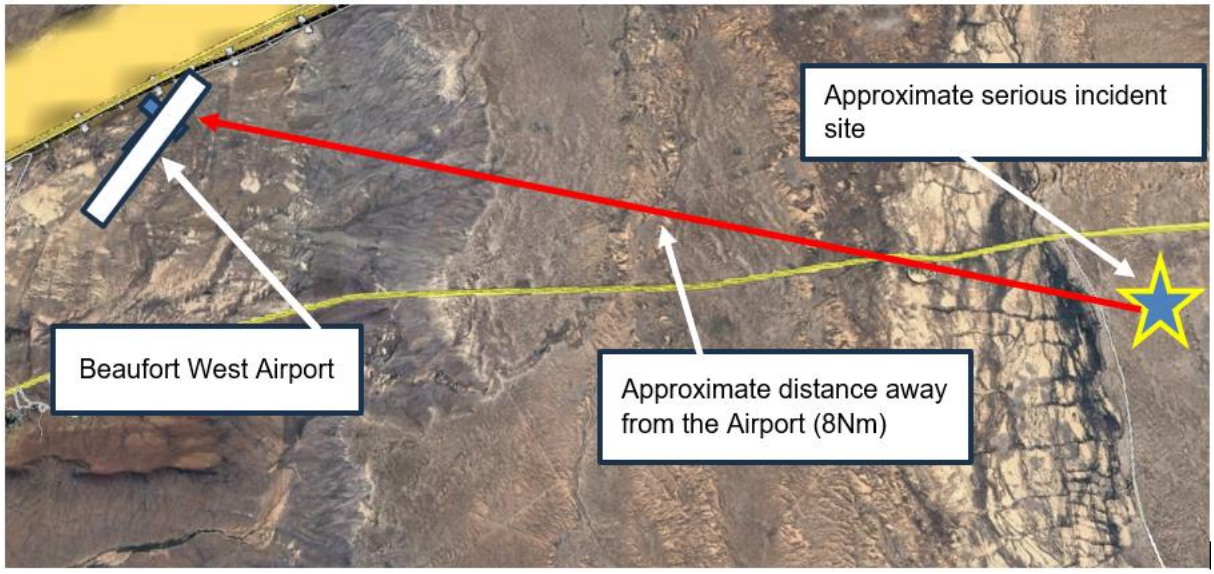


Figure 1: Aerial view of FABW and the distance to the serious incident site. (Source: Google Earth)

Figure 2: The motor glider at the incident site with dissipating cumulus clouds visible in the background. (Source: Pilot)

Post-incident Investigation

On Saturday afternoon, 19 October 2024, the aircraft maintenance engineers (AMEs) recovered the motor glider to the South African Civil Aviation Authority (SACAA)-approved aircraft maintenance organisation (AMO) at FABW. On Monday, 21 October 2024, the investigator-in-charge (IIC) granted the engineers permission to investigate the cause of the sudden fuel depletion. (The IIC conducted this investigation remotely).

The engineers reported the following after their assessments:
The 82-litre aluminium tank was found empty, it was removed and inspected for cracks and leaks. Some minor fuel leakage was noted on the fuel gauge sender unit on the top of the tank; the tank was later tightened. Fuel lines were inspected and chaffs, wear or cracks were not found; all were in good condition. However, one flexible fuel pipe was found disconnected from its fittings (see Figure 3). It was evident that during the last annual inspection, the flexible fuel pipe was incorrectly tightened. As a result, it became loose and, due to vibration during flights, it eventually disconnected. This disconnection caused the fuel to leak which led to the engine stopping mid-flight. According to the engineers, the flexible fuel pipe is located on the bottom part of the fuel tank and is not visible during the pre-flight checks; it could only be accessed during annual inspections when all panels are removed. The flexible fuel pipe was reconnected to its fittings and tightened as per the instructions outlined in the Motor Glider Manual. The tank was reinstalled and 10L of fuel was added to conduct a leak test; no leaks were noted. The fuel pump was run, and normal fuel pressure was observed.

The last annual inspection of the motor glider was conducted and certified on 24 October 2023 at 4 583.4 airframe hours. At the time of the serious incident, the motor glider had a total of 4589.2 airframe hours. The motor glider had accrued 5.3 hours since the last annual inspection.

Figure 3: The disconnected flexible fuel pipe. (Source: Engineers)

Fuel System Description and Operation (Source: Dimona H36 Motor Glider Pilot's Operating Handbook [POH])

The aircraft is equipped with an 82-litre tank, constructed from aluminium. The tank is installed between the main and the rear bulkheads. The fuel tank cover, when secured, is the floor of the baggage compartment. The filler cap for the tank is outboard on the left side of the motor glider and is connected to the tank by a cast rubber neck assembly. The tank vent is part of the fuel quantity sending unit and passes through the fuselage lower skin, parallel to the drain fitting to the exterior of the motor glider. The fuel tank cap is not vented. The entire tank assembly is grounded by a copper net impregnated within the polyester fabric. This grounding net is connected to the entire ground system in the motor glider with static ground cables.

The flexible fuel pipe is located at the bottom of the fuel tank to the fitting. The fitting goes to a tee fuel drain under the motor glider and feeds the main fuel to the carburettors.

The Range

At a cruise speed of 180 km/h, the range is 960 km (with no reserve).

Wind factor is not considered in 4.6 flight time. At a speed of 150 km/h at an altitude of 5 000ft, the range is 1 000 km (with no reserve) in 6.6 flight time.

Wind factor is not considered.

The Dimona H36 motor glider has a 28 to 1 glide ratio. (A glide ratio is the measure of an aircraft's ability to glide horizontally compared to the vertical distance it descends).

With the glide ratio being 28 to 1, it means that for every 1000 ft, the motor glider could travel forward by 2.8nm without the engine running.

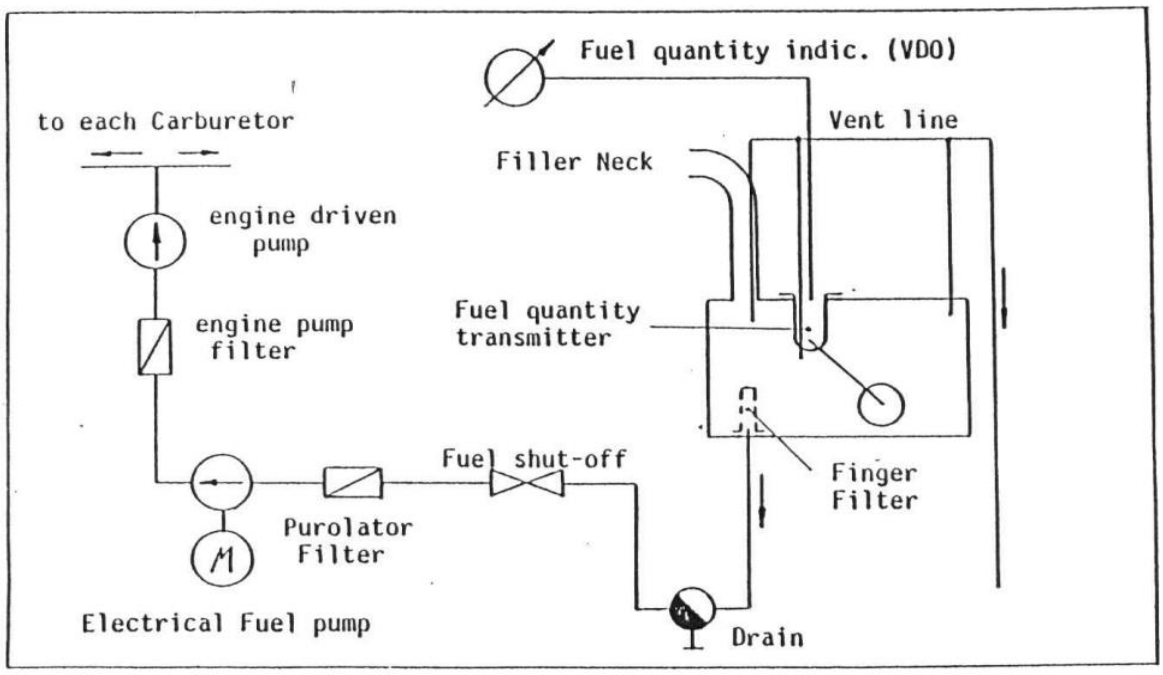


Illustration 1: Fuel system schematic.

The weather information entered in the table below was sourced from the meteorological aerodrome report (METAR) that was issued by the South African Weather Service (SAWS) for FABW on 18 October 2024 at 1200Z.

Wind Direction	240°	Wind Speed	9kts	Visibility	9999m
Temperature	24°C	Cloud Cover	SCT	Cloud Base	Nil
Dew Point	4°C	QNH	850hPa		

Findings

Pilot

1. The pilot was initially issued a Private Pilot Licence (PPL) on 19 December 2022. His last licence validation was conducted on 25 January 2024 and the licence was issued with an expiry date of 31 January 2025. The aircraft type was endorsed on the pilot's licence. The pilot was properly licence and qualified for the flight.

2. The pilot's Class 2 aviation medical certificate was issued on 31 January 2024 with an expiry date of 31 January 2025. The pilot was medically fit, qualified and authorised to operate the flight.

Motor Glider

1) The motor glider's Certificate of Registration (C of R) was issued to the current owner on 11 November 2023. The Authority-to-fly (ATF) was initially issued on 12 September 2019. The ATF was reissued on 29 November 2023 with an expiry date of 31 October 2024. The motor glider was maintained in accordance with the manufacturer and Regulator's requirements.

2) The last annual inspection of the motor glider was conducted and certified on 24 October 2023 at 4583.4 airframe hours. At the time of the serious incident, the aircraft had a total of 4589.2 airframe hours. The motor glider had accrued 5.3 hours since the last inspection.

3) The motor glider was issued a Certificate of Release to Service (CRS) on 24 October 2023 at 4583.4 airframe hours with an expiry date of 24 October 2024 or at 4683.4 airframe hours, whichever occurs first.

4) A pre-flight inspection of the motor glider was conducted before the flight and the motor glider was deemed ready to undertake the flight. No defects were recorded in the flight folio before the flight.

5) The official weather report aligns with the pilot's statement that the thermals were weak. There were no clouds over the area of the serious incident to support the formation of thermals; this, therefore, makes the weather a contributing factor as the pilot was unable to use thermals to reach his destination.

6) Although the engineers reported that the flexible fuel pipe was re-tightened during installation in the last maintenance, it is evident that the flexible fuel pipe was not tightened in accordance with the instructions outlined in the Motor Glider Manual. This meant that maintenance was not undertaken correctly as the flexible fuel pipe became loose and disconnected from its fittings due to vibration which resulted in fuel leakage and the subsequent engine failure.

Probable Cause

The motor glider experienced an in-flight engine stoppage due to fuel exhaustion which was caused by a loosened flexible fuel pipe that eventually disconnected due to vibration. This led to fuel leakage and the resultant engine failure.

Contributing Factors

1. Weak thermals were insufficient to support altitude gain. The pilot successfully executed a forced landing on an open field.
2. Poor maintenance.

Safety Action(s)

None.

Safety Message

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 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

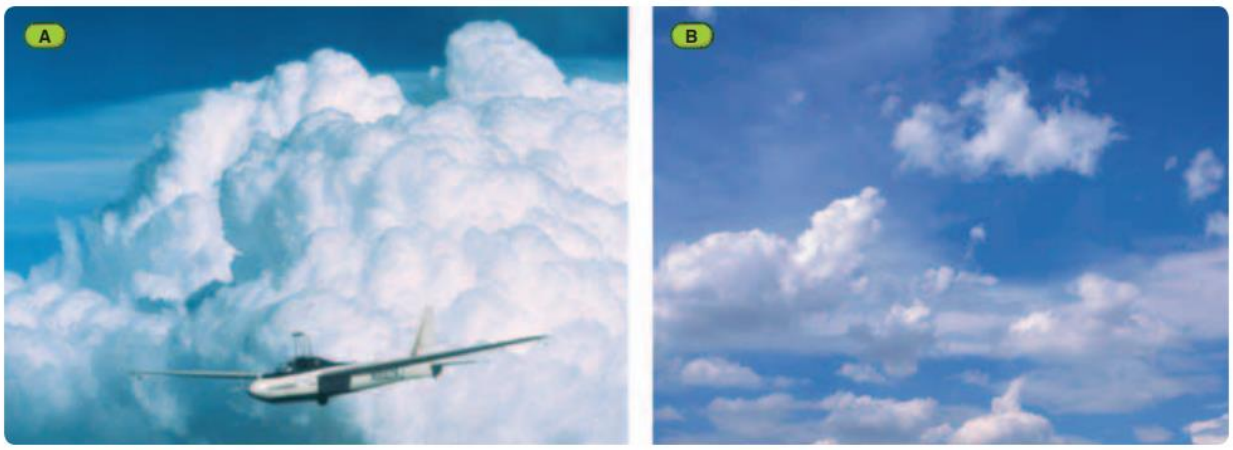
This report is issued by:
Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa

Attachment A
HRV Cloud Enhance satellite image for 1200Z on 18 October 2024 (Copyright (2019) EUMETSAT).

Thermal Soaring Locating Thermals

(Source: Glider Handbook, Chapter 10: Soaring Techniques)

When locating and utilizing thermals for soaring flight, called thermaling, glider pilots must constantly be aware of any nearby lift indicators. Successful thermaling requires several steps: locating the thermal, entering the thermal, centering the thermal, and, finally, leaving the thermal. Keep in mind that every thermal is unique in terms of size, shape, and strength. Cumulus Clouds According to the last chapter, if the air is moist enough and thermals rise high enough, cumulus clouds, or Cu (pronounced like the word "cue") form. Glider pilots seek Cu in the developing stage, while the cloud is still being built by a thermal underneath it. The base of the Cu should be sharp and well defined. Clouds that have a fuzzy appearance are likely to be well past their prime and probably have little lift left or even sink as the cloud dissipates. Glider pilots use thermals to gain altitude. [Figure 10-1]



[Figure 10-1]. Photographs of **(A)** mature cumulus probably producing good lift, and **(B)** dissipating cumulus.