AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

Reference:	CA18/2/3/9841

Aircraft registration	ZS-UUA	**Date of accident**	2 December 2019	**Time of accident**	1555Z
Type of aircraft	Scheibe SF25D Falke		**Type of operation**	Commercial (Part 96)	
Pilot-in-command licence type	Commercial Pilot Licence	**Age**	67	**Licence valid**	Yes
Pilot-in-command flying experience	Total flying hours	24 961.1		Hours on type	280.6
Last point of departure	Plettenberg Bay Aerodrome (FAPG), Western Cape Province				
Next point of intended landing	Plettenberg Bay Aerodrome (FAPG), Western Cape Province				
Damage to the Glider	Destroyed				

Location of the accident site with reference to easily defined geographical points (GPS readings if possible)

Plettenberg Bay Botanical Estate (GPS position: 34°05’22.31” South; 023°20’18.45” East), elevation 443 feet

Meteorological information	Surface wind; 248°/17kts gusting 24kts, temperature; 21.9°C				
Number of people on-board	1 + 1	**No. of people injured**	0	**No. of people killed**	2

Synopsis

On Monday afternoon, 2 December 2019, a motorised glider — a Scheibe SF25D — with registration ZS-UUA took off on a commercial flight from Plettenberg Bay Aerodrome (FAPG) with the intention to land back at FAPG. On-board the glider were the pilot and the passenger. The passenger was issued a ticket prior to the flight as this was a commercial flight. Approximately 270 metres (m) short of the threshold of Runway 30 at FAPG, the motorised glider impacted terrain in a steep nose-down attitude. The two occupants on-board the glider were still alive when the first responders arrived at the scene. Emergency services were informed of the accident and had responded swiftly to the accident site. However, the passenger succumbed to his injuries later at the scene, and the pilot succumbed to his injuries in hospital on the same evening.

A close circuit television (CCTV) camera attached to an apron floodlight and positioned facing the approach side of Runway 30 captured the motorised glider on final approach in a wings level attitude, then the right wing dropped and the glider pitched nose down and remained in a steep nose-down attitude until it impacted the ground. The motorised glider was destroyed during the accident sequence.

The flight was conducted in visual meteorological conditions under Part 96 of the Civil Aviation Regulations (CAR) 2011 as amended.

Probable Cause/s and/or Contributory Factors

The pilot failed to maintain flying speed and, most probably, the glider entered an inadvertent stall due to the wind gradient, which the pilot underestimated.

SRP date	8 June 2021	Publication date	10 June 2021

Abbreviations	
°C	Degrees Celsius
%	Percentage
AFM	Aircraft Flight Manual
AGL	Above Ground Level
AIID	Accident and Incident Investigations Division
AME	Aircraft Maintenance Engineer
AMO	Aircraft Maintenance Organisation
AMSL	Above Mean Sea Level
AOC	Air Operating Certificate
ATF	Authority to Fly
BKN	Broken (Cloud)
CARs	Civil Aviation Regulations
CAVOK	Ceiling and Visibility Okay
CCTV	Close Circuit Television
CG	Centre of Gravity
C of R	Certificate of Registration
CVR	Cockpit Voice Recorder
CRMA	Certificate Relating to Maintenance of Aircraft
FAPG	Plettenberg Bay Aerodrome
FDR	Flight Data Recorder
FOM	Flight and Operations Manual
Ft	Feet
GmbH	Gesellschaft mit beschränkter Haftung (German) Translated to English means – “Company with limited liability”
GPS	Global Positioning System, a satellite-based navigation system
hPa	Hectopascal
Kg	Kilogram
km/h	Kilometres per hour
Kts	Knots
kW	Kilowatt
LH	Left-hand
M	metre(s)
Mm	Millimetres
m/s	metres per second
METAR	Meteorological Routine Aerodrome Report
MTOW	Maximum Take-off Weight
NTCA	Non-Type Certified Aircraft
OEM	Original Equipment Manufacturer
OM	Operations Manual
PIC	Pilot-in-command
QNH	Barometric Pressure Adjusted to Sea Level
RH	Right-hand
RSA	Republic of South Africa
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
SN	Serial Number
SG	Specific Gravity
Z	Zulu (Term for Universal Co-ordinated Time - Zero hours Greenwich)

Reference number	**:** CA18/2/3/9841
Name of Owner	**:** SB Lithgow
Name of Operator	**:** Garden Route Gliding CC
Manufacturer	**:** Scheibe Flugzeugbau GmbH
Model	**:** Scheibe SF25D (Falke)
Nationality	**:** South African
Registration markings	**:** ZS-UUA
Place	**:** Plettenberg Bay Botanical Estate, Western Cape Province
Date	**:** 2 December 2019
Time	**:** 1555Z

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 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****.*

Investigations Process:

The accident was notified to the Accident and Incident Investigations Division (AIID) on 2 December 2019 at about 1600Z. An investigator travelled to Plettenberg Bay the next day, and further co-ordinated with all authorities on site by initiating the accident investigation process according to CARs Part 12 and investigation procedures. The AIID of the Republic of South Africa (RSA) is leading the investigation as it is the State of Occurrence.

Notes:
1. Whenever the following words are mentioned in this report, they shall mean the following:

- Accident — this investigated accident
- Aircraft — the Scheibe SF25D Falke involved in this accident
- Investigation — the investigation into the circumstances of this accident
- Pilot — the pilot involved in this accident
- Report — this accident report

2. Photos and figures used in this report were taken from different sources and may be adjusted from the original for the sole purpose of improving clarity of the report. Modifications to images used in this report are limited to cropping, magnification, file compression; or enhancement of colour, brightness, contrast; or addition of text boxes, arrows or lines.

Disclaimer:

1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1 The pilot accompanied by a passenger took off in a motorised glider, the Scheibe SF25D Falke with registration ZS-UUA, from Plettenberg Bay Aerodrome (FAPG) with the intention to land back at FAPG. According to available information, the passenger was issued a ticket as this was a local scenic flight (commercial flight). The passenger had also signed an indemnity form before the flight, which was conducted under the Air Operating Certificate (AOC) of Garden Route Gliding.

1.1.2 There were no eyewitnesses to this accident, however, someone had heard the impact and decided to go investigate; that is when he spotted the wreckage and rushed to the scene. Both occupants were still alive when he arrived at the scene. He immediately informed the medical and rescue services who arrived within 15 minutes from the time of the call. The passenger, seated on the left, succumbed to his injuries at the scene. The pilot was admitted to hospital but, later, succumbed to his injuries that same evening.

1.1.3 The aircraft was found to have impacted the level grass-covered terrain, 270m short of the threshold of Runway 30 at FAPG. The cockpit/cabin area was substantially deformed during the impact sequence. According to the meteorological aerodrome routine report (METAR) that was issued at 1600Z for FAPG on the day, the prevailing wind was 240° at 14 knots.

1.1.4 Footage was obtained from a close circuit television (CCTV) camera that was mounted on a floodlight pole, located near the terminal building at FAPG. The CCTV camera faced a south-easterly direction, towards the threshold of Runway 30. The glider was visible on the CCTV camera footage while on approach for landing Runway 30. From the footage, the glider was on approach in a wings level attitude; the windsock, which was near the camera, indicated a crosswind from the seaside. There was also a windsock near the threshold of Runway 30 as illustrated in Figure 1. As the glider continued with approach, the right wing dropped and, shortly thereafter, the glider pitched nose down. The glider remained in a nose-down attitude until it impacted the open terrain.

1.1.5 The accident occurred during daylight at a geographical position determined to be 34°05’22.31” South 023°20’18.45” East, at an elevation of 443 feet, which was within the Plettenberg Bay Botanical Estate.

Figure 1: Google Earth overlay of the accident site in relation to the threshold of Runway 30.

1.2 Injuries to Persons

Injuries	Pilot	Crew	Pass.	Total On-board	Other
Fatal	1	-	1	2	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	-	-	-	-	-
Total	1	-	1	2	-

1.3 Damage to Aircraft

1.3.1 The motorised glider was destroyed during the accident sequence.

1.3.2 To free the two occupants from the wreckage, emergency personnel had to cut open the cockpit area. The engine, forward fire wall structure and the instrument panel of the aircraft were pulled forward using a winch fitted to one of the emergency vehicles to free the occupants. The areas that were cut open were

pointed out to the investigator by one of the people who were present at the scene while emergency personnel attended to the two occupants.

Figure 2: The motorised glider as it came to rest.

1.4 Other Damage

1.4.1 No other damage was caused during the accident sequence.

1.5 Personnel Information

1.5.1 Pilot-in-command (PIC)

Nationality	South African	Gender	Male	Age	67
Licence Number	0270059181	Licence Type	Commercial and National Pilot		
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instrument, Instructor Grade 1, Tug pilot, Tow pilot, Test pilot (Class 2)				
Last Medical Date	25 July 2019				
Medical Expiry Date	31 January 2020				
Medical Class	Class 1				
Restrictions	VDL: Wear corrective lenses for defective distant vision				

	VNL: Wear multifocal spectacles and carry a spare set of spectacles.
Previous Accidents	None

Note: Previous accidents refer to past accidents the pilot was involved in.

Flying experience:

Total Hours	24 961.1
Total Past 90 Days	58.4
Total on Type Past 90 Days	20.5
Total on Type	280.6

*NOTE: The pilot's flying hours entered in the table above were obtained from his South African Civil Aviation Authority (SACAA) pilot file, as well as from logbook copies that were made available to the investigator that reflected his flying hours conducted over the period 22 March 2018 until the last entry, dated 28 November 2019.

1.5.2 Passenger

The passenger, who was on-board the glider, had a South African Private Pilot Licence (PPL), licence number 027 016 8222. He had the following aircraft types endorsed on his licence: X328 (AL 60 Turbine Kudu); P28A (Piper PA-28/140/150/151/160/161/180/181); Z099 (Shadow).

According to available information, his last aviation medical examination was conducted on 9 November 2019, which was 23 days prior to the accident flight.

1.6 Aircraft Information

1.6.1 The Scheibe SF-25 Falke

The Scheibe SF-25 Falke (English: Falcon) is a German touring motor glider developed from the earlier Bergfalke glider by Scheibe Flugzeugbau. The glider first flew in 1963, since then, a number of variants were built with various engine options. Source: www.en.Wikipedia.com.org.wiki/Scheibe

This glider in question was fitted with a Limbach L2000 EA engine, which is a four-cylinder, four stroke boxer engine, air cooled, single magneto ignition, one carburettor, wet sump lubrication. Take-off power is 59kW at 3 400rpm and continuous power is 51kW at 3 000rpm, with an average fuel consumption of 12 litres an hour. Source: www.limflug.de

Figure 3: A photograph of the glider ZS-UUA.

1.6.2 Airframe:

Manufacturer / model	Scheibe SF-25D Falke	
Serial number	4681D	
Manufacturer	Scheibe Flugzeugbau GmbH	
Year of manufacture	1969	
Total airframe hours (at time of accident)	7 244.1	
Last Annual Inspection (hours & date)	7 181.7	12 December 2018
Hours since last Annual Inspection	62.4	
Authority to Fly (issue date)	8 February 2019	
Authority to Fly (expiry date)	8 February 2020	
C of R (issue date) (Present owner)	10 November 2003	
Operating categories	Production Built	
Type of Fuel Used in the Motorised Glider	Avgas 100LL	
Previous Accidents	None	

1.6.3 Engine:

Manufacturer / model	Limbach L2000 EA2
Serial number	1107-6
Hours since new	1 684.2
Hours since overhaul	59.0

1.6.4 The engine: Original Equipment Manufacturer (OEM)

According to the engine OEM, the engine was manufactured in 1987; it was then installed in six different aircraft in Germany over the period 1987 to 1999. The engine was returned to the factory in 1999 following crankshaft damage. The OEM had no information as to when the engine was imported to South Africa, but according to the records, several spare parts were purchased from them, including a new crankshaft, by a person in Port Elizabeth on 23 March 2005. According to the engine logbook, which is in the investigator's possession, the engine was installed to the glider on 18 January 2007. From the accident photographs, with specific emphasis on the engine, the OEM indicated that certain components had been modified in an unauthorised manner. These include the following:

(i) Cylinder heads
(ii) Ignition system
(iii) Fuel pump (which was the wrong part) as well as the fuel pump drive

On page 40 of the engine logbook, a certificate relating to maintenance was included, which stated that the engine was subjected to a major overhaul. However, the Certificate Relating to Maintenance of Aircraft (CRMA) was not dated. The next logbook page (page 41) stated that the engine was installed on 18 December 2018.

1.6.5 Engine teardown inspection

An engine teardown inspection was conducted by an approved person (AP) who made the following observations: *On investigation, we could not find firm evidence that would indicate that the engine was or was not turning at the moment of impact, other than the fact that both propeller blades had broken off, which would point to an engine under power on impact.*

It was observed that the impact was violent as a piece of the wooden propeller had compressed into a recess in the front of the engine. If we look at the angle between the white aluminum straight edge, that is held against the plane formed along the

silencer, oil filter and front of the engine, and the horizontal axis, it would appear that at one stage during impact, the engine was at an angle of approximately 36° to the horizontal axis.

No mechanical failure was observed that would have prevented normal engine operation during flight and ground impact.

Figure 4: The engine after the upper crankcase section was removed.

1.6.6 Propeller:

Manufacturer / model	P-Prop 150” x 90” (fixed pitch, right hand)
Serial number	N3789FEG6
Hours since new	Not available in logbook
Hours since overhaul	59.0

According to the airframe and propeller logbook, the propeller was fitted to this glider on 24 October 2015 as a new propeller. The propeller was removed from the glider on 18 December 2018 and was sent to the OEM based in South Africa for overhaul. The propeller was returned to the owner and was refitted to the glider on 25 January 2019.

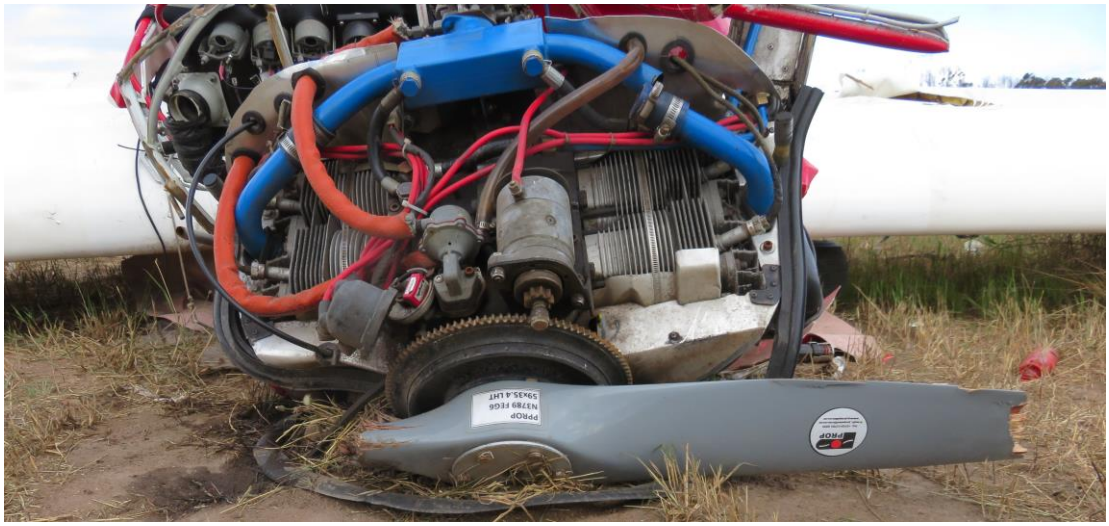


Figure 5: A photograph of the propeller as it was found on site.

1.6.7 The Weight and Balance calculated by investigators indicates the following:

Item	Weight (kg)	Arm (mm)	Moment (kg/mm)
Glider empty weight	415.9	2 275	946 172
Pilot	92	1 880	172 960
Passenger	134	1 880	251 920
Zero fuel weight	**641.9**	**2 136**	**1 371 052**
Fuel (8 litres - SG 0.72)	5.7	2 850	16 245
Approximate weight of the glider on impact	**647.7**	**2 142**	**1 387 297**

1.6.8 The Flight and Operations Manual (FOM) for the glider was located at the accident scene. The FOM document states the following on page 6 under the heading Operating Data and Limitations: *The maximum permissible all up weight of the aircraft is 610kg.* The flight and operations manual was found not to have been an approved SACAA document.

The same maximum all up weight (MAUW) of 610kg was entered on page 2 of the Operations Manual (OM) under the heading Equipment Operated.

The OEM was consulted and had made available the original FOM for the Scheibe SF25D model, which states that the maximum permissible all up weight for this glider is 580kg.

The maximum take-off weight (MTOW) of the glider, according to the South African Register, is 580kg. The document is attached to this report as Annexure A.

During the on-site investigation, it was noted that there were several placards on the instrument panel of which one states that the maximum permissible mass is 590kg (see Figure 4). According to available information received from the OEM, they had not built a glider with a MTOW of 590kg.

According to the weighing report in the airframe logbook, the glider was last weighed on 12 December 2018 and the empty weight was 415.9kg.

The weights of the pilot and the passenger used in the table above were obtained from their respective post-mortem reports. It should be noted that the body gets weighed when it is received by the Department of Health Forensic Pathology Services.

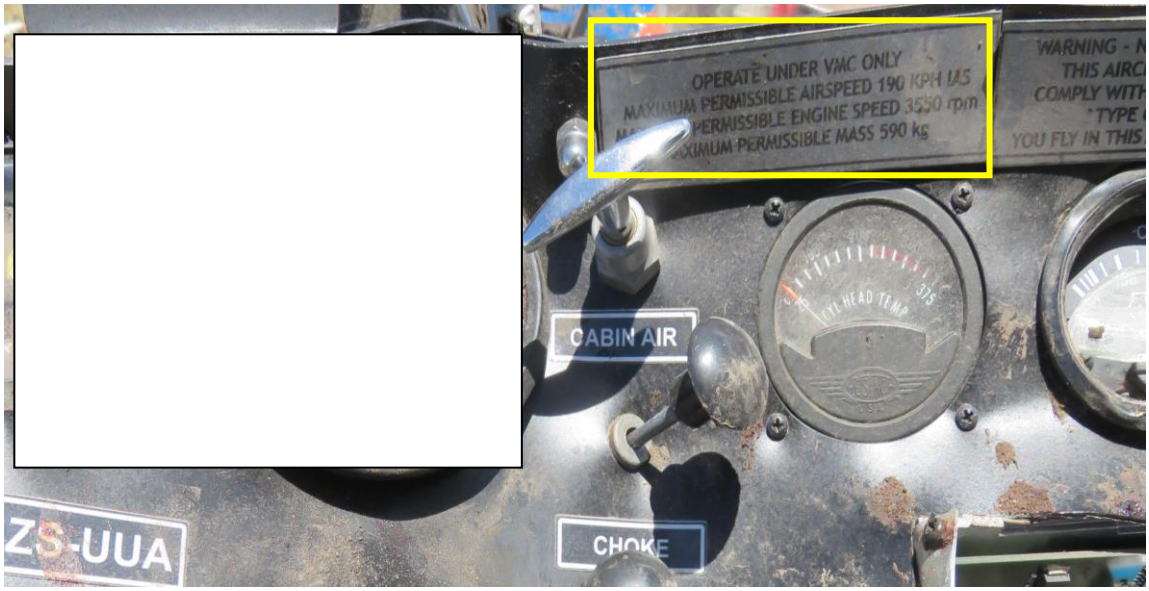


Figure 6: The placard, in the yellow window, indicates the maximum permissible mass as 590kg.

Page 17 of the FOM, sub-heading 4 and 4.1 Centre of Gravity (CG) Position and Load Sheet (the manual that was recovered on site) states:

*"Remember: The pilot is responsible for correct loading of the aircraft**

The centre of gravity position in flight has a considerable influence on flight characteristics. For this reason, observance of the stipulated centre of gravity range is very important.

The following range of all-up-weight centre of gravity position is approved:

Max. forward position: 2143 mm
Max. rearward position: 2334 mm"

1.6.9 The following all up weight centre of gravity positions were obtained from the Flight and Operations Manual and made available to the investigator by the OEM. **It should be noted that for the purpose of this investigation, the Flight and Operations Manual (FOM) from the OEM was used.**

Max. forward position: 2157 mm
Max. rearward position: 2386 mm

Page 20 of the glider FOM, sub-heading 4.2 Loading Plan states:

Load in the cockpit (crew including parachutes):
Max. 180kg on both seats combined (The weight of the two occupants was 226kg, which was 25% over the specified limit)
Minimum weight - 55kg
Baggage: Max - 10.0kg

Take care that the loading (fuel and possible baggage taken into account) does not exceed the maximum permissible value given by Flight Limitations Placard.

The all up weight on impact was 11.6% over the maximum certified take-off weight of the glider. The forward CG limits were also exceeded.

1.7 Meteorological Information

1.7.1 An official weather report was requested from the South African Weather Service (SAWS). The meteorological routine aerodrome report (METAR) that was available for FAPG at 1600Z on the day reflected the following weather conditions (the METAR was captured 5 minutes after the accident occurred):

METAR - FAPG 021600Z 24014KT //// // ////// 22/16 Q1010=

The METAR indicated that the wind was from 240° (true direction) at a speed of 14 knots (25.9 km/h, 7.2 m/s), the temperature was 22°C, the dew point was 16°C and

the barometric pressure adjusted to sea level (QNH) was 1010 hectopascal (hPa).

1.7.2 The report further stated that there was Stratocumulus (low cloud) along the Garden Route, clearly visible on the satellite image that was taken at 1415Z on the day. From the low-level wind chart in the report, which was captured at 1500Z, strong south-westerly winds were noted over a large area. *"It is likely that these winds (and gusts) could have caused low-level turbulence in the FAPG area on the day."*

1.7.3 There was an automatic weather station located at FAPG and the investigator had requested that the SAWS make this weather data available, which captured weather data at 5-minute intervals. The 24-hour data sheet for 2 December 2019 was made available to the investigator and it was noted that the following weather conditions prevailed (see the tables below). The weather data start at 1525Z, which was 30 minutes prior to the accident, followed by 1550Z, which was 5 minutes before the accident, as well as the weather information at the time of the accident, which occurred at 1555Z.

1.7.3.1 Weather data at FAPG on 2 December 2019 at 1525Z.

Item	**Data**
Place	FAPG
Date	2 December 2019
Time	1525Z
Wind direction	250° (True)
Wind speed (7.9 m/s)	15.4 kts
Wind gust (14 m/s)	27.2 kts
Temperature	22.3°C
Humidity	62.2%

1.7.3.2 Weather data at FAPG on 2 December 2019 at 1550Z.

Item	**Data**
Place	FAPG
Date	2 December 2019
Time	1550Z
Wind direction	244° (True)
Wind speed (7.4 m/s)	14.4 kts
Wind gust (11.6 m/s)	22.5 kts
Temperature	21.8°C
Humidity	71.5%

1.7.3.3 Weather data at FAPG on 2 December 2019 at 1555Z.

Item	**Data**
Place	FAPG
Date	2 December 2019
Time	1555Z
Wind direction	248.2° (True)
Wind speed (8.7 m/s)	17 kts
Wind gust (12.6 m/s)	24.5 kts
Temperature	21.9°C
Humidity	69.4%

1.7.4 The two tables of weather data below were captured after the accident occurred at 1615Z and 1635Z, respectively. These tables illustrate how the wind direction had changed since the accident and how the wind strength had reduced.

1.7.4.1 Weather data at FAPG on 2 December 2019 at 1615Z

Item	**Data**
Place	FAPG
Date	2 December 2019
Time	1615Z
Wind direction	257.2° (True)
Wind speed (6.4 m/s)	12.4 kts
Wind gust (10.5 m/s)	20.4 kts
Temperature	21.5°C
Humidity	71.2%

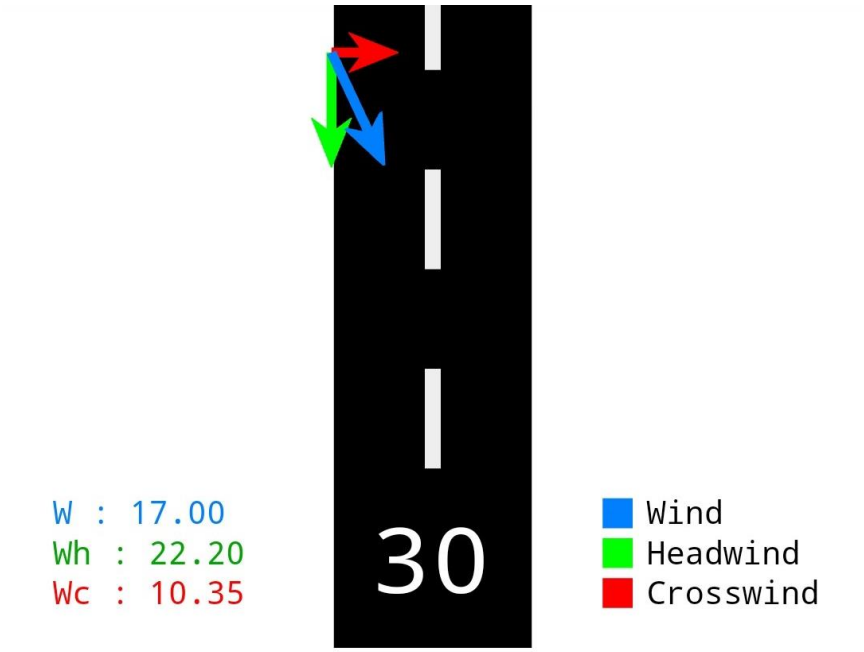
1.7.4.1 Weather data at FAPG on 2 December 2019 at 1635Z

Item	**Data**
Place	FAPG
Date	2 December 2019
Time	1635Z
Wind direction	268.2° (True)
Wind speed (4.9 m/s)	9.5 kts
Wind gust (9.4 m/s)	18.2 kts
Temperature	21.2°C
Humidity	69.3%

1.7.5 Prevailing winds at the time of the accident.

Source: www.e6bx.com/wind-components/ (Please note that written permission to use this information was obtained from the e6bx.com service).

The variation of 27° west (as contained on the aerodrome chart in Annexure B) was added to the true heading of 248° for the purpose of this calculation to standardise the wind direction to a magnetic heading to be in line with the runway heading.



Runway Number : Between 1 and 36	30
Wind Direction :	275
Wind Speed :	17
Gust Speed (if any) :	24.5
	Apply gusts at 50%
Head Wind :	22.20
Cross Wind :	10.35

1.8 Aids to Navigation

1.8.1 The glider was equipped with standard navigational equipment as approved by the Regulator (SACAA) for the glider type. There were no recorded defects with the navigational equipment prior to the flight.

1.8.2 A Garmin Pilot III GPS unit was found in the glider, mounted to the instrument panel via a purpose-made bracket. The unit was found intact and was recovered for download purposes.

1.9 Communication

1.9.1 The glider was equipped with standard communication equipment as approved by the Regulator for the glider type. There were no recorded defects with the communication equipment prior to the flight. This was an unmanned aerodrome and, therefore, there were no ground base voice recordings.

1.10 Aerodrome Information

1.10.1 The accident occurred approximately 270m short of the threshold of Runway 30 at FAPG within the Plettenberg Bay Botanical Park, which was a new residential development at the time. An aerodrome chart for FAPG is attached to this report as Annexure B.

1.11 Flight Recorders

1.11.1 The motorised glider was not equipped with a flight data recorder (FDR) or cockpit voice recorder (CVR), nor was it required by regulation to be fitted to this aircraft type.

1.11.2 Portable GPS unit download:

A portable Garmin GPS III Pilot unit was found on-board the glider. The unit was recovered from the accident site as it contained minor damage and was taken to an approved avionics maintenance facility to assist with the download of any possible data pertaining to the flight. Unfortunately, there was no data captured pertaining to the accident flight on the unit.

Figure 7: The GPS unit that was found on-board the glider.

1.12 Wreckage and Impact Information

1.12.1 The glider impacted terrain while on short final approach for Runway 30 at FAPG. The glider was in a steep nose-down attitude when it impacted terrain, this was confirmed by the video footage that was located at the aerodrome, positioned in the direction of the approach path for Runway 30. Following ground impact, the glider skidded for approximately 20m before coming to a stop. The propeller, engine, forward nose section and cockpit area displayed extensive deformation associated with the attitude of the glider on impact. Both wings moved forward several degrees and the speed brakes were deployed. The aft fuselage and empennage displayed minor damage.

1.12.2 Several pieces of the wooden propeller were observed from the point of impact, along the impact line until the point where the glider came to rest. One of the propeller blades was destroyed all the way to the hub assembly where it attaches to the crankshaft flange. The second blade also displayed substantial evidence of rotation.

1.12.3 To free the two occupants from the cockpit, emergency services personnel had to cut open the cockpit area. The cut areas were pointed out to the investigator during the on-site investigation by one of the people who were at the scene. From the available photographic evidence that was provided to the investigator, approximately 18 people were on site, including emergency medical personnel, fire rescue services and members of the public. It was also noted from the photographs that a mechanical winch, which was fitted to one of the vehicles, was used to pull the engine and cockpit section forward to free the two occupants from the wreckage.

Figure 8: Aft view of the glider as it came to rest, with the windsock visible at the aerodrome.

Figure 9: Front view of the glider as it came to rest.

Figure 10: Close-up view with one of the propeller blades destroyed up to the hub assembly.

Figure 11: A view of the left wing, which displayed substantially less damage than the right wing.

Figure 12: A view of the right wing, which displayed substantially more damage than the left wing.

1.13 Medical and Pathological Information

1.13.1 The post-mortem and blood toxicology reports were still outstanding at the time of compiling this report. Should any of the results have a bearing on the circumstances leading to the accident, they will be treated as new evidence that will necessitate the reopening of this investigation.

1.13.2 The pilot had a valid Class 1 aviation medical certificate which was issued on 25 July 2019 with an expiry date of 31 January 2020.

1.13.3 The passenger was the holder of a Private Pilot Licence (# 027 016 8222). According to available information, his last aviation medical examination was on 9 November 2019, which was 23 days prior to the accident flight.

1.14 Fire

1.14.1 There was no evidence of a pre- or post-impact fire.

1.15 Survival Aspects

1.15.1 The accident was not considered survivable as the cockpit/cabin area was substantially deformed during the impact sequence, and the engine had moved backwards into the cockpit area, causing injuries to both occupants.

1.16 Tests and Research

1.16.1 None.

1.17 Organisational and Management Information

1.17.1 The operator was issued a Class III Air Service Licence number G798D on 8 September 2004. The licence made provision for the operation of category A4 aircraft.

1.17.2 The operator was in possession of a valid Air Operating Certificate (AOC) No. CAA/G798D, which was approved for Part 96 operations as stipulated in the Civil Aviation Regulations 2011. The AOC was issued by the SACAA on 1 April 2019 with an expiry date of 31 March 2020. The motorised glider ZS-UUA was duly authorised to operate under the AOC.

1.17.3 Operations Manual (OM):

The operator was in possession of an Operations Manual (OM), which consisted of Parts 1 to 7. The OM was approved by the SACAA on 18 April 2018.

On page 2 of the OM under the heading Equipment Operated, three aircraft were listed that were approved for operations under the AOC. The MAUW for the glider ZS-UUA was captured as 610kg.

On page 19 of the OM under the heading Authority, Duty and Responsibility of the Pilot-in-command, the following is stated:

The Pilot-in-command exercises full authority in relation to the operation of the aircraft. He is responsible for the safety of the passenger.

The Pilot-in-command may deviate from the procedures of the Operations Manual in an emergency situation if such actions will be deemed to enhance or ensure the safety of the aircraft and its occupants.

The Pilot-in-command shall set priorities and his decisions shall give absolute priority to safety and have due regard for economy and passenger convenience.

(a) Manuals

The primary duty of all pilots shall be to operate the aircraft in a safe manner at all times and in accordance with all relevant manuals and to maintain an up-to-date knowledge of the following publications:

Operations Manual
Aircraft Flight Manual
Civil Aviation Regulations
AIPs
Notams

(b) The pilot-in-command shall operate the aircraft in accordance with:

- *the terms and conditions of the certificate of airworthiness issued in respect of such an aircraft,*
- *the operating limitations, the markings and placards as prescribed by the appropriate authority of the State of Registry, and the mass limitations of the aircraft*

Non-type certificated aircraft shall only be operated under VFR by day and over such routes and diversions there from, which will facilitate a safe forced landing to be executed in the event of an engine failure.

(c) Control of Aircraft

During flight, the pilot shall at all times be in direct control of, and responsible for, the aircraft. He is directly responsible for the safety of passengers and aircraft and the maintenance of discipline.

The passenger was issued a ticket for this flight as required by the operator in the OM on page 21 under the heading Authority, Duty and Responsibility of the Pilot-in-command. The passenger had also signed an indemnity form prior to the flight.

Before take-off, the pilot shall ensure that the passenger has a valid ticket and that the location and use of safety equipment, e.g. harnesses, life jackets and canopy release mechanisms, has been explained and understood, this normally will have been explained by the ground staff but in their absence, this will become the pilot's responsibility.

On page 32 of the OM under the heading Amount of Fuel Carried, the following information was approved by the SACAA, however, this was not as per the fuel requirements as called for in the CARs.

The gliders burn approx. 10 litres per hour under touring conditions. A minimum fuel load is 13 litres. This accommodates a flight of 30 minutes plus a 45 minutes reserve. Extra fuel weight can limit the gross cockpit weight and affect climb rates. It must be taken into account that the fuel consumption doubles whilst operating at Max Continuous Power Settings for extended periods of time.

On page 32 of the OM under the heading Mass and Centre of Gravity, the following information was approved by the SACAA, however, these standard weights were inaccurate.

Each glider has a placard giving min and max cockpit load. The pilot will be aware of his own mass and will use the following standard passenger weights plus fuel load as indicated on the fuel gauge to estimate all up cockpit load.

Standard passenger weights:

Male - 86kgs
Female - 71kgs
Children - 35kgs

No hand baggage is allowed to be taken on scenic flights. Cameras, handbags, purses, etc. are not considered as hand baggage.
It is not difficult to determine that a passenger is too heavy as he will not fit into the cockpit. It is the responsibility of the Pilot-in-command to ensure that the loading mass shall comply with the limitations specified on the cockpit placard.

Wind limitations (Operations Manual pg. 50)

The wind limitations or maximum demonstrated crosswinds are specified in the appropriate section of the Pilot Operating Handbook. The operator shall regard a maximum demonstrated crosswind component as a limitation. Pilots must be continually vigilant for unexpected wind and particularly gusty weather.

Wind shear (Operations Manual pg. 53)

The best form of defence against wind shear is awareness and avoidance. Pilots must be alert to geographical and meteorological conditions conducive to wind shear. Flying at the coast with high winds will generally produce wind shear conditions. As a general rule, on landing approach, 20km of airspeed should be added for every 10kts of reported surface wind. Pilots must bear in mind that in strong westerly winds, severe turbulence can be experienced at the threshold of Runway 30 and are advised to land deep. Flight in areas of reported severe wind shear is prohibited.

Normal Operating Procedures (Operations Manual pg. 51)

It is the pilot's responsibility to implement all the checklists and ensure the safety of the aircraft. Operational information is recorded in appropriate section of the Pilot Operating Handbook.

1.17.4 The last annual inspection that was carried out on the motorised glider prior to the accident flight was certified by an approved person (AP) on 18 December 2018 at 7 181.1 airframe hours.

1.18 Additional Information

1.18.1 Plettenberg Bay Aerodrome surveillance camera footage:

The Plettenberg Bay Aerodrome (FAPG) had several surveillance cameras installed.

One of these cameras was positioned facing the direction of the final approach path for Runway 30. The camera was located on an apron flood light pole (Figure 13)

and captured the glider on final approach for Runway 30. *In each of the following four snapshots below (Figures 14 – 17), a time stamp has been entered. This was the actual time as it was displayed/captured on the surveillance camera footage.*

This camera footage was obtained from the aerodrome licence holder. The distance of the camera to the accident site was approximately 1 100m.

Figure 13: The flood light next to the apron at FAPG with the CCTV camera attached.

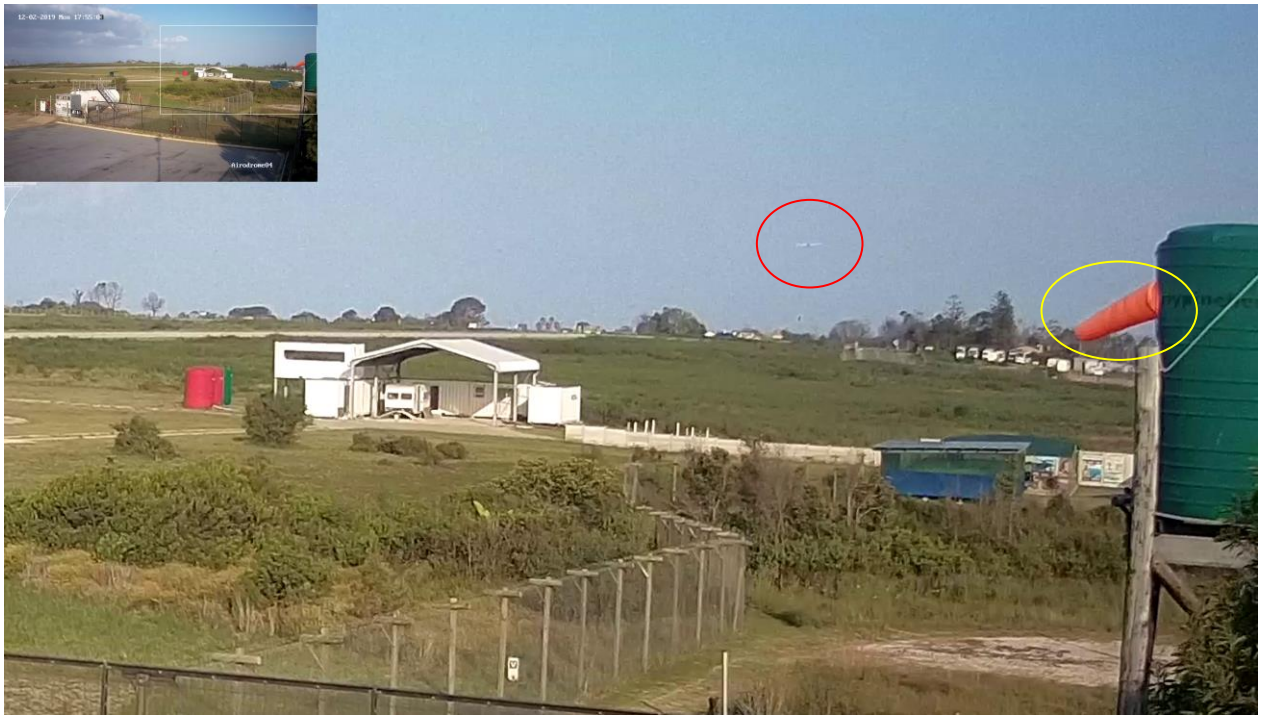


Figure 14: Snapshot from the video (17:55:03) with glider on approach for Runway 30 in wings level attitude.

Figure 15: Snapshot from the video (17:55:05) with the glider on approach in a right-wing low attitude.

Figure 16: Snapshot from the video (17:55:08) with the glider in a nose-down attitude.

Figure 17: Snapshot from the video (17:55:10), the glider still in a nose-down attitude until ground impact.

1.18.2 Stalling Characteristics and Slow Flight:

Source: Scheibe Flugzeugbau SF25D Falke, Flight and Operations Manual, sub-heading 2.10, pg. 16

"The stall speed (at full flight weight) is approximately 67km/h (36 knots) both with the engine running and with the engine stopped. At this speed, the flow begins to break away at the wing root; the ailerons and the rudder are still fully effective. When it is pulled the second time, the Falke tilts forward at the front centre of gravity. At the rear centre of gravity, deep stall with full stick and full aileron and rudder effectiveness is possible within calm air. In both cases, by releasing the stick, the normal flight attitude can be restored immediately. In gusty weather, tilting is done using a wing. If, with the engine running at high speed, after the stall speed has been determined, the pitot tube on the side rafts gets into the propeller jet and the speedometer simulates a speed that does not actually exist, the airspeed needle does not stay at a fixed position but vibrates strongly and jumps back and forth in the range between 50 and 100km/h, so that the excessive flight condition can be clearly recognised. When pulling over in a 30° curve, the Falke tilts relatively slowly to the right in such a way that the normal flight position can be established when the horizontal position of the wings is reached. When the engine is stopped, the stall behaviour is the same as when the engine is running."

1.18.3 Civil Aviation Regulations 2011:

Aircraft Flight Manual

Part 91.03.2 (1) *The owner or operator of an aircraft shall keep an approved AFM for each aircraft of which he or she is the owner or operator and shall keep such manual current with amendments and implement changes issued by an appropriate authority.*

(2) The flight crew members of the aircraft shall, on each flight, operate such aircraft in accordance with the AFM, unless an unforeseen emergency dictates otherwise.

Aeroplane Flight Manual

Part 135.04.4 (1) *An air service operator shall operate its aeroplanes in accordance with the approved Aeroplane Flight Manual (AFM) required by regulation 91.03.2.*

(2) An operator shall maintain a system that ensures timely receipt and insertion of all AFM revisions as published by the aeroplane manufacturer or as required by the Director.

1.19 Useful or Effective Investigation Techniques

1.19.1 The following investigation technique proved to be useful and effective during this investigation:

• CCTV recording taken from a camera that was positioned near the apron building on a floodlight pole was very useful as it captured the final approach phase of the glider prior to ground impact. The camera, however, did not record any sound.

2. ANALYSIS

2.1 General

From the available evidence, the following analysis was made with respect to this accident. These shall not be read as apportioning blame or liability to any organisation or individual.

2.2 Man (Pilot)

The pilot was appropriately licensed and was medically fit to conduct the flight. He was also the owner of the glider since 10 November 2003. The pilot was in possession of a Class 1 aviation medical certificate; his last medical examination date prior to the accident was on 25 July 2019. He was well-qualified and had the necessary expertise to fly the glider. The pilot had adequate knowledge of the environment as he had been flying from FAPG for quite some time.

2.3 Passenger

The passenger on-board the accident flight had a Private Pilot Licence.
The glider was equipped with dual flight controls. There was no evidence to indicate that the passenger, who had paid for the flight, was not manipulating the controls of the glider during this flight. It is highly unlikely that a pilot will pay for a scenic flight as a passenger when he/she could have hired an aircraft on which he/she was type

rated and conduct the flight themselves. The fact that the passenger held a PPL raises the question – *who was flying the glider on approach?* It was, however, not possible to determine this. The OM states that the pilot should always remain in control of the glider; one then had to ask, *why would dual controls be installed in the glider if this was an operational requirement?* This procedure was contradictory in managing the risk when flying with paying passengers with dual controls installed. Furthermore, it could not be determined if maximum aft control stick movement (used in order to pitch the nose up of the glider) was possible, noting the passenger's weight.

2.4 Machine (Glider)

No evidence could be found which indicated that the structural integrity of the glider was compromised prior to ground impact, and all the flight control surfaces were accounted for. The aft structure, including the empennage, displayed very little to no damage. Several control cables in the cockpit area were cut by emergency rescue personnel who responded to the accident scene so as to free the two occupants from the cockpit; these cables were pointed out to the investigator by one of the first responders to the accident scene. From the photographs of the rescue operation that were made available to the investigator, a total of 18 people were observed to have assisted in the operation. Also visible on these photographs was that the spoilers were observed to have been deployed (up position), however, when the investigator arrived on site, these devices were not in the configuration captured in the photographs. The engine and instrument panel were pulled forward to free the occupants by means of a mechanical winch that was fitted to one of the rescue vehicles. The last two video snapshots show the tail plane being above the wings, which indicate a significant nose-down attitude. It is clear from the wreckage deformation that the glider struck the ground in a steep nose-down attitude at a high rate of descent. The engine was producing power, this was indicative by the destructed propeller, and no anomalies were found during the engine teardown inspection.

2.5 Weight and Balance

With reference to the weight and balance, four different sources had provided three different maximum take-off weights for this glider.

(1) The first reference to the maximum permissible weight was a placard, which was located on the instrument panel and which indicate the maximum permissible

weight to be 590kg (see Figure 4 in this report).

(2) The FOM for this glider was recovered from the accident site and indicated the permissible all up weight to be 610kg.

(3) Following consultation with the OEM, the original flight and operations manual for the Scheibe SF25D was obtained. The document indicates the maximum all up weight as 580kg.

(4) The South African Aircraft Register also indicates the maximum take-off weight as 580kg (see attached document; Annexure A).

These conflicting maximum take-off weights were concerning. No reference could be obtained as to where the weight of 590kg displayed on the cockpit placard originated from as this was in direct conflict to the FOM that was recovered on site, which indicated the MAUW to be 610kg. It was also noted that the FOM that was recovered on site was not a SACAA-approved document even though this was an approved operator conducting commercial operations.

The weight and balance calculations conducted in this report contest the information found on site (i.e. the placard value of 590kg as well as the FOM information recovered on site).

The maximum take-off weight of the glider as documented by the South African Aircraft Register was 580kg. This is the same information contained in the original FOM that was received from the OEM.

From the FOM that was recovered on site and the FOM that was received from the OEM, there was a difference in the forward and aft CG position distances, which have been addressed under sub-heading 1.6 of this report.

Aircraft Flight Manual

"91.03.2 *(1) The owner or operator of an aircraft shall keep an approved AFM for each aircraft of which he or she is the owner or operator and shall keep such manual current with amendments and implement changes issued by an appropriate authority.*

(2) The flight crew members of the aircraft shall, on each flight, operate such aircraft in accordance with the AFM, unless an unforeseen emergency dictates otherwise."

The OM for the operator, page 32, refers to the weights that need to be used during the pilot's calculation of the weight and balance prior to flight. This sub-heading provides standard weights for passengers (male – 86kg, female – 71kg, children – 35kg). It also provides guidance on the fuel load to be carried on-board. The passenger weight as reflected in the OM was not considered for the weight and balance as it allowed for an unaccounted weight of 48kg, which originated from the discrepancy between the passenger weight as per the post-mortem of 134kg and the 86kg as mentioned in the OM.

The passenger weights presented on page 32 of the OM were, furthermore, found to be inaccurate and not in accordance with Part 91.07.11 and SA-CATS-91, subheadings; Mass Values for Flight Crew, which indicate a weight of 85kg for flight deck crew as well as mass values for passengers and baggage.

The SA-CATS 91 document provides the following passenger weights (see table below) to be used for aircraft with 19 seats or less:

Passenger seats	**1 – 5**	**6 – 9**	**10 – 19**
Male	104kg	96kg	92kg
Female	86kg	78kg	74kg
Children	35kg	35kg	35kg

"On flights where no hand baggage is carried in the cabin or where hand baggage is accounted for separately, 6kg may be deducted from the above male and female masses. Articles such as an overcoat, an umbrella, a small handbag or purse, reading material or a small camera are not considered as hand baggage for the purpose of this paragraph."

The passenger weight allowed for, according to the information contained in the document SA-CATS 91, was 98kg (104 – 6) and a pilot weight of 85kg.

For the purpose of this investigation where the weight and balance of the glider was of fundamental importance, the calculations on 1.6.7 of this report were used in line with the original FOM received from the OEM. The pilot and the passenger weights used were as per the respective post-mortem reports.

The variant in the passenger actual weight and that which is provided in SA-CATS 91 were considered substantial and, therefore, the weight of 98kg would not have allowed for an accurate calculation as it allowed for a 36kg discrepancy, which

could not be ignored or allowed to be unaccounted for on an aircraft with a maximum take-off weight of 580kg as it was regarded as critical. There was also a maximum cockpit / cabin weight limitation of 180kg as per the FOM, which was not addressed in the OM. This weight limitation was also exceeded by 46kg or 26%.

It was concluded that the glider was overweight at the time of the accident, and the forward CG position was exceeded as per the FOM received from the OEM.

It was further noted that the fuel load data contained on page 32 of the OM was also in error as it calls for a minimum fuel load of 13 litres at a fuel consumption of 10 litres per hour. The 13 litres include fuel for a 30-minute flight as well as a 45-minute reserve. The minimum fuel load should have been 15.5 litres, if the requirements as set out in Part 91.07.12 of the CARs were adhered too, which are stated under the following sub-headings; (i) taxi fuel, (ii) trip fuel, (iii) contingency fuel that equates to 5% of the planned trip but not less than 5 minutes, (iv) destination alternate - 15 minutes, (v) and final reserve fuel of 45 minutes.

2.6 Mission

The flight was nothing out of the norm for the pilot who was the owner of the glider since 2003 and who was well familiar with the area and flying conditions.

2.7 Environment

From the automatic weather station at FAPG, it was possible with the assistance of the SAWS to retrieve data, which was captured at 5-minute intervals over the 24-hour period for 2 December 2019. It could be observed from the first three tables on sub-paragraphs 1.7.3.1 to 1.7.3.3 that there was very little change in the wind direction. Further to that, the wind as well as the wind gusts that were recorded during the 30-minute period indicated that a moderate to strong wind prevailed. The two tables (sub-paragraphs 1.7.4.1 to 1.7.4.2), which depict the wind at intervals of 20 and 40 minutes after the accident occurred, display data which indicate the wind strength had substantially diminished and the wind direction had changed approximately 20°.

According to the weather information that was obtained, a fresh wind from a south-westerly direction at 17 knots prevailed during the approach phase of the flight. The wind gust at the time was recorded at 24.5 knots, which resulted in a crosswind component of approximately 10 knots and a headwind of 22 knots. This was evident from the windsock which was located near the FAPG terminal building (visible in

Figures 14 to 17 of this report) and was approximately 1 100m from the accident site. There was also a windsock located in line with the threshold of Runway 30 (see Figure 8), which would have been clearly visible to the pilot during approach from where he could have made a proper assessment of the prevailing wind conditions. A pilot would be expected to increase the approach speed accordingly to allow for a prompt and effective recovery at any sign of a stall, however, no change in the nose-down attitude of the glider was observed prior to ground impact, probably due to the motorised glider being at a low height as it was landing.

The possibility of carburettor icing was considered seeing that the temperature (22°C) and dew point (16°C) were relatively close to each other, which allowed for such a condition. This hypothesis was, however, disregarded as the engine was under power on impact, which was shown by the destruction of the propeller blades; an observation supported during the engine teardown inspection.

2.8 Operational factors

This was a commercial flight conducted under the provisions of Part 96 of the CARs 2011. The operator was in possession of a valid Air Operating Certificate. The passenger was issued a ticket and had also signed an indemnity form. The FOM for the glider ZS-UUA that was recovered at the accident site was not an approved document by the SACAA. Should this have been an approved manual as issued by the OEM, there would not have been conflicting information on this glider operation limitations, especially regarding the weight and balance and CG limitations as addressed in sub-heading 1.6 of this report. As part of the flight preparations, the pilot-in-command was required to conduct a proper weight and balance prior to the flight. No such document for this flight was made available to the investigator. For the accident flight under investigation, it could be proven that the glider was operated with a mass that exceeded the permissible take-off weight limit. The forward centre of gravity limit was exceeded as specified by the OEM at the time of impact. These shortcomings represent a factor that systemically contributed to the accident.

2.9 Final Approach

Video footage was obtained with the glider visible on final approach for Runway 30. The glider was observed to be in level flight as it approached the runway. At 17:55:05 (camera time) the attitude of the glider changed with the right wing dropping by approximately 20°. Immediately following the change in attitude, the

glider pitched nose down, with the tail plane visible above the wings, the glider remained in the nose-down attitude until ground impact. There was a GPS unit on-board, which was recovered; but the unit did not capture the flight and could, therefore, be assumed it was not switched on for the flight.

According to the FAA Airplane Flying Handbook, if the FOM or AFM does not list a final approach speed in their manual, they recommend a speed of 1.3 x Vso (stall speed in a landing configuration).

Due to the prevailing wind and associated wind gust at the time, the pilot was required to increase the final approach speed to ensure they were flying above the stall speed should they encounter wind shear, which was the case during this approach. The increase in airspeed allow more effectiveness of the flight controls, which would have assisted in controlling the glider during the prevailing headwind and crosswind conditions. It was, however, not possible to determine the actual final approach speed of the glider when it pitched nose down prior to ground impact.

Another question to be considered is: "*was the final approach stable or should the pilot have opted for a go-around?*" With the video footage available, the glider appeared to be on a stable approach with the wings level, flying on the runway centreline. The only time a change was observed in the glider's attitude was at 17:55:05 (camera time), when the right wing dropped by approximately 20°. Following this change in attitude, the glider returned to a wings level attitude briefly, and immediately thereafter, the nose pitched down and the glider remained in a nose-down attitude until ground impact.

2.10 The Regulator

The Regulator had issued an AOC to the operator and had approved the OM. It was found that the FOM for this glider was not an approved document by the Regulator. This resulted in erroneous information captured in the OM, which was approved by the Regulator without verification. The MAUW of 610kg that was entered in the OM for the glider ZS-UUA was found to be in contradiction to what was available on the South African Register Information Sheet for this glider, which reflected the MAUW to be 580kg, which correlate with the information contained in the FOM that was received from the OEM for the Sheibe SF25D. No unscheduled oversight audit was conducted from when the AOC was issued to the operator until the accident flight.

2.11 The glider failed to maintain flying speed and, most probably, entered an inadvertent stall as the pilot flying might have underestimated the wind gradient at the time. The fact that once the nose dropped and no change in attitude of the glider was observed until ground impact is indicative of the elevator's ineffectiveness in raising the nose, and this was most probably aggravated by the forward centre of gravity (CG) position which was exceeded, as well as the overweight condition of the motor glider at the time. This resulted in a situation that was not rectifiable within the height that was available to the pilot.

3. CONCLUSION

3.1. General

The following findings, causes and contributing factors were made with respect to this accident. These shall not be read as apportioning blame or liability to any organisation or individual.

To serve the objective of this investigation, the following sections are included in the conclusions heading:

- **Findings –** Statements of all significant conditions, events or circumstances in this accident. The findings are significant steps in this accident sequence, but they are not always causal or indicate deficiencies.
- **Causes –** Actions, omissions, events, conditions, or a combination thereof, which led to this accident.
- **Contributing factors –** Actions, omissions, events, conditions, or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the accident occurring, or mitigated the severity of the consequences of the accident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil or criminal liability.

3.2. Findings

Pilot

3.2.1 The pilot was in possession of a valid Commercial Pilot Licence (CPL) as well as a National Pilot Licence (NPL); and had the glider type endorsed on his licence. He had flown 280.6 hours on the glider type.

3.2.2 The pilot was in possession of a valid aviation medical certificate (Class 1) that was issued on 27 July 2019 with an expiry date of 31 January 2020.

3.2.3 The pilot was well familiar with the glider and the area.

Passenger

3.2.4 According to available information, the passenger had a Private Pilot Licence (# 027 016 8222). He renewed his aviation medical on 9 November 2019, which was 23 days prior to the accident flight.

3.2.5 This was a commercial flight which was conducted under the provisions of Part 96 of the CARs 2011.

3.2.6 The passenger was issued a ticket prior to the flight, which was in accordance with the operator's approved OM. He had signed an indemnity form prior to the flight.

3.2.7 The flight was conducted under visual flight rules (VFR) by day, which was in accordance with the operator's approved operations manual, VFR Policy on page 34.

The Glider

3.2.8 The glider had a valid Authority to Fly that was issued on 8 February 2019, with an expiry date of 8 February 2020.

3.2.9 The certificate of registration for this glider was issued on 10 November 2003.

3.2.10 The last annual inspection that was carried out on the motorised glider prior to the accident flight was certified on 12 December 2018 at 7 181.7 airframe hours. Subsequent to the inspection, a further 55.0 hours were flown prior to the accident flight.

3.2.11 The glider was issued a Certificate of Release to Service on 12 December 2018, valid until 11 December 2020 or at 7 281.7 airframe hours, whichever occurs first.

3.2.12 The FOM that was located at the accident site was not a SACAA-approved document.

3.2.13 The FOM that was located at the accident site indicated that the MTOW to be 610kg, the placard on the instrument panel reflected the maximum permissible weight to be 590kg and the FOM received from the OEM reflected the weight as 580kg; and so did the South African Aircraft Registration information sheet.

3.2.14 The CG positions between the two documents also differed, with the FOM received from the OEM indicating that the forward CG position was exceeded at the time of accident.

3.2.15 According to the FOM, the maximum allowable cockpit load of 180kg was exceeded by 46kg (226kg) or 26%.

The Operator

3.2.16 The operator was in possession of a Class III Air Service Licence number G798D.

3.2.17 The operator was in possession of a valid AOC that was issued by the SACAA on 1 April 2019 with the expiry date of 31 March 2020.

3.2.18 The OM was approved by the SACAA on 18 April 2018.

3.2.19 The incorrect MTOW for the glider ZS-UUA was entered on page 2 of the OM.

3.2.20 The OM did not mention the maximum allowable cockpit/cabin weight of 180kg as per the FOM that was received from the OEM.

3.2.21 The incorrect fuel load was entered in the approved OM on page 32.

3.2.22 The incorrect standard weights for passengers were captured in the approved OM on page 32.

The Regulator

3.2.23 The operator was issued an Air Operating Certificate (AOC) No. CAA/G798D by the SACAA on 1 April 2019 with an expiry date of 31 March 2020.

3.2.24 The SACAA approved the OM on 18 April 2018. It was found that the OM contained several inaccuracies.

3.2.25 The FOM of the glider that was located on the accident site was not an approved document by the SACAA.

3.2.26 No evidence could be found that an ad-hoc audit inspection was conducted by the operator prior to the accident flight.

Environment

3.2.27 Strong wind conditions prevailed during the flight, with the wind gusting from the sea towards the land indicated by the windsock visible in the CCTV camera screenshots (Figures 14 to 17).

3.2.28 The headwind at the time of approach was approximately 22 knots, which would have required the pilot to increase his approach speed to ensure flight control effectiveness was not compromised.

GPS download

3.2.29 The approach speed could not be determined as the GPS unit that was on-board and intact did not capture any data for this flight.

3.2.30 The glider failed to maintain flying speed and, most probably, entered an inadvertent stall as the pilot flying might have underestimated the wind gradient at the time. The fact that once the nose dropped and no change in attitude of the glider was observed until ground impact is indicative of the elevator's ineffectiveness in raising the nose, and this was most probably aggravated by the forward centre of gravity (CG) position which was exceeded, as well as the overweight condition of the motor glider at the time. This resulted in a situation that was not rectifiable within the height that was available to the pilot.

3.3 Probable Cause/s

3.3.1 The pilot failed to maintain flying speed and, most probably, the glider entered an inadvertent stall due to the wind gradient which the pilot underestimated.

3.4 Contributory Factor/s

3.4.1 As the wing loading increase, so does the stalling speed. The wing loading depends on the glider's flying weight at the time. In this case, the all up weight of the glider was exceeded by approximately 11.6% at the time of impact, which would have had a direct effect on the stall speed.

3.4.2 The glider involved in the accident was operated with a centre of gravity position that was outside the forward limit. This situation contributed to the loss of control.

3.4.3 The passenger, who also had a Private Pilot Licence, was overweight and his physique could have limited optimum control stick movement, especially when aft control stick inputs were made.

3.4.4 The passenger had a Private Pilot Licence and, thus, it is probable that he may have been the pilot flying. However, the investigation could not conclusively determine who of the two pilots was flying the aircraft prior to impact.

3.4.5 The requirements for operating the glider under Part 96 (Commercial Operation of Non-type Certificated Aircraft) at the time of the accident were not met.

3.4.6 The OM that was approved by the SACAA contained several inaccuracies, especially regarding the glider MAUW and the mass and centre of gravity.

3.4.7 The FOM for the glider that was located on site was not an approved document by the SACAA, however, the operator was allowed to continue to fly commercially.

4. SAFETY RECOMMENDATIONS

4.1 General

The safety recommendations listed in this report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation and are based on the conclusions listed in heading 3 of this report. The AIID expects that all safety issues identified by the investigation are addressed by the receiving States and organisations.

4.2 Safety Recommendations

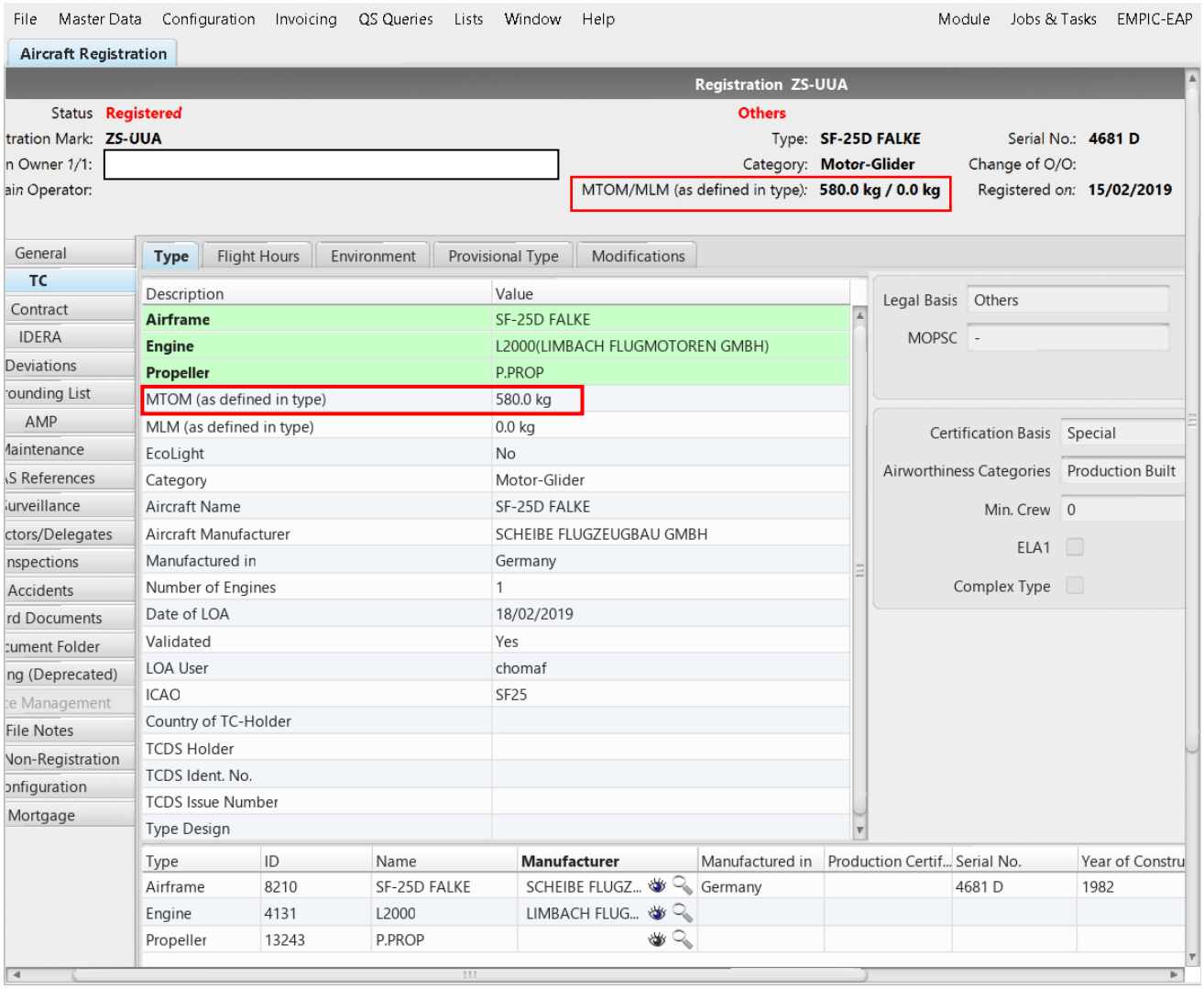
4.2.1 It is recommended to the Director of Civil Aviation that an audit of the operator be conducted with specific emphasis on the OM and the weighing of passengers prior to each flight. Several contradictions are noted in this investigation regarding the weights of the occupants, which are critical to every flight, especially in cases where an aircraft can only take two occupants.

4.2.2 It is recommended that the Director of Civil Aviation mandates the inspection for conformity to manufacturers' issued standard on all FOMs and placards used by similar aircraft type as the one involved in this accident.

5. APPENDICES

5.1 Annexure A (South African Aircraft Register information sheet for ZS-UUA)
5.2 Annexure B (Plettenberg Bay Aerodrome Chart)

ANNEXURE A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Module Jobs & Tasks EMPIC-EAP
Aircraft Registration
Registration ZS-UUA
Status Registered
Others
tration Mark: ZS-UUA
n Owner 1/1:
ain Operator:
Type: SF-25D FALKE
Category: Motor-Glider
MTOM/MLM (as defined in type): 580.0 kg / 0.0 kg
Serial No.: 4681 D
Change of O/O:
Registered on: 15/02/2019
General
TC
Contract
IDERA
Deviations
ounding List
AMP
Maintenance
S References
urveillance
ctors/Delegates
nspections
Accidents
rd Documents
ument Folder
ng (Deprecated)
e Management
File Notes
Non-Registration
onfiguration
Mortgage
Type
Flight Hours
Environment
Provisional Type
Modifications
Description
Value
Airframe
SF-25D FALKE
Engine
L2000(LIMBACH FLUGMOTOREN GMBH)
Propeller
P.PROP
MTOM (as defined in type)
580.0 kg
MLM (as defined in type)
0.0 kg
EcoLight
No
Category
Motor-Glider
Aircraft Name
SF-25D FALKE
Aircraft Manufacturer
SCHEIBE FLUGZEUGBAU GMBH
Manufactured in
Germany
Number of Engines
1
Date of LOA
18/02/2019
Validated
Yes
LOA User
chomaf
ICAO
SF25
Country of TC-Holder
TCDS Holder
TCDS Ident. No.
TCDS Issue Number
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Special
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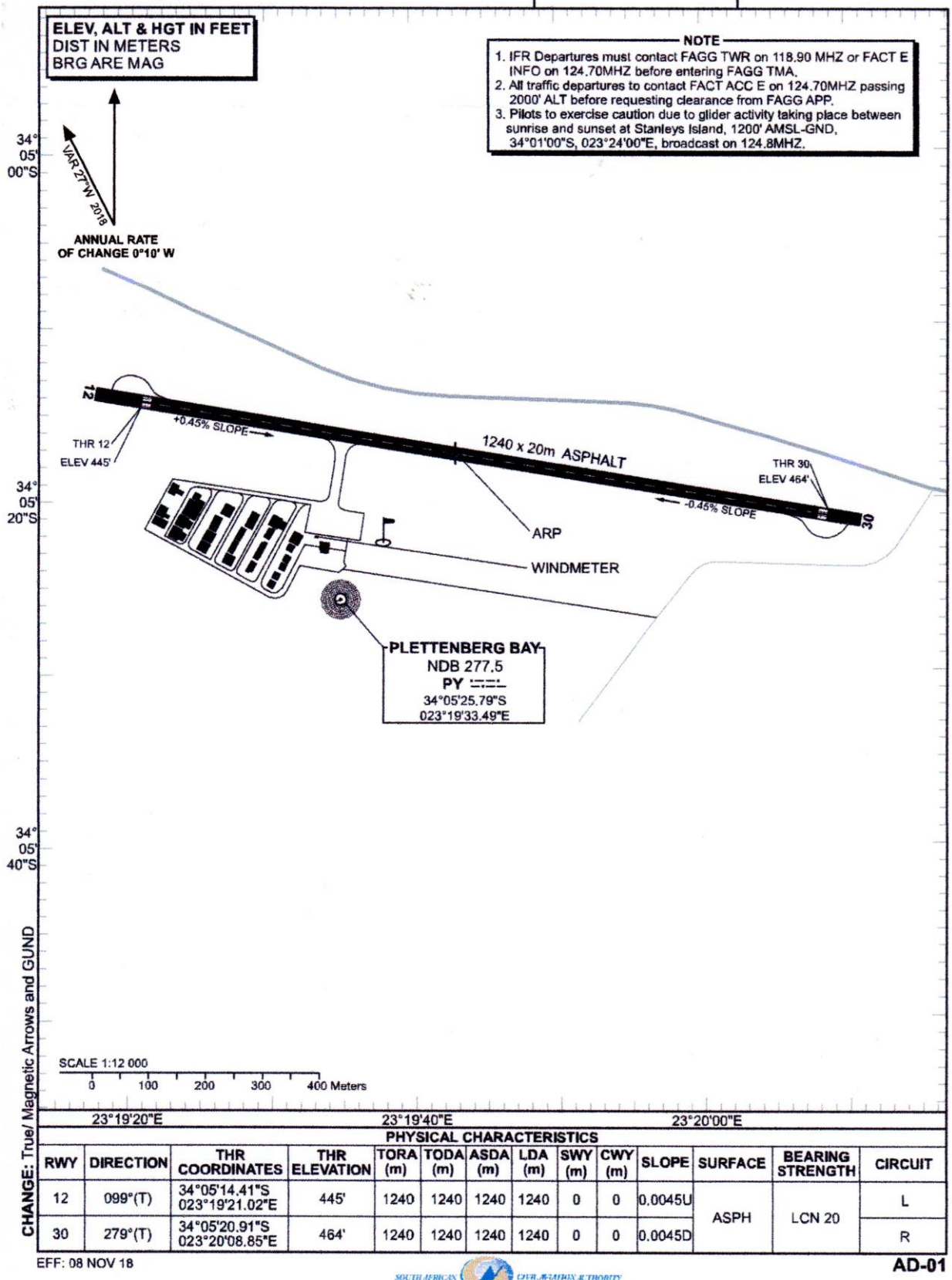
ELA1
Complex Type
Type
ID
Name
Manufacturer
Manufactured in
Production Certif...
Serial No.
Year of Constru
Airframe
8210
SF-25D FALKE
SCHEIBE FLUGZ...
Germany
4681 D
1982
Engine
4131
L2000
LIMBACH FLUG...
Propeller
13243
P.PROP

ANNEXURE B

AERODROME/ HELIPORT CHART - ICAO | 34°05'17.37"S 023°19'43.02"E | **ELEV 465'** **GUND 99.6'** | PLETTENBERG BAY TIBA 124.80 | **PLETTENBERG BAY** FAPG



PHYSICAL CHARACTERISTICS

RWY	DIRECTION	THR COORDINATES	THR ELEVATION	TORA (m)	TODA (m)	ASDA (m)	LDA (m)	SWY (m)	CWY (m)	SLOPE	SURFACE	BEARING STRENGTH	CIRCUIT
12	099°(T)	34°05'14.41"S 023°19'21.02"E	445'	1240	1240	1240	1240	0	0	0.0045U	ASPH	LCN 20	L
30	279°(T)	34°05'20.91"S 023°20'08.85"E	464'	1240	1240	1240	1240	0	0	0.0045D			R

EFF: 08 NOV 18

SOUTH AFRICAN CIVIL AVIATION AUTHORITY

AD-01