

**AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY**

				<b>Reference:</b>		CA18/2/3/10258	
<b>Aircraft Registration</b>	ZS-IBX	<b>Date of Accident</b>	30 January 2023		<b>Time of Accident</b>	1313Z	
<b>Type of Aircraft</b>	Beechcraft E33 Bonanza			<b>Type of Operation</b>	Private (Part 91)		
<b>Pilot-in-command Licence Type</b>	Private Pilot Licence (PPL)		<b>Age</b>	43	<b>Licence Valid</b>	Yes	
<b>Pilot-in-command Flying Experience</b>	<b>Total Flying Hours</b>		92.6		<b>Hours on Type</b>	30.1	
<b>Last Point of Departure</b>	Private Farm in Steelpoort, Mpumalanga Province						
<b>Next Point of Intended Landing</b>	Nelspruit Aerodrome (FANS), Mpumalanga Province						
<b>Damage to Aircraft</b>	Destroyed						
<b>Location of the accident site with reference to easily defined geographical points (GPS readings if possible)</b>							
Portion 2 Hermannsburg 450 JJ (GPS position: 25°29'55.5" South 030°52'42.5" East), at an elevation of 3510 feet (ft)							
<b>Meteorological Information</b>	Surface wind: 210°/07 kts; Temperature: 19.2°C; Dew point: 0.8°C; Visibility: CAVOK						
<b>Number of People On-board</b>	1 + 0	<b>Number of People Injured</b>	0	<b>Number of People Killed</b>	1	<b>Other (On Ground)</b>	0
<b>Synopsis</b>							
<p>On Monday, 30 January 2023 at 1230Z, a pilot on-board a Beechcraft E33 Bonanza with registration ZS-IBX took off from Steelpoort Farm in Mpumalanga province with the intention to land at Nelspruit Aerodrome (FANS), also in Mpumalanga province. A flight plan was not filed for this flight. The flight was conducted under visual flight rules (VFR) by day and under visual meteorological conditions (VMC) by day.</p> <p>After take-off, the pilot routed south-east towards FANS and requested entry to the Kruger Mpumalanga airspace as well as stated his intention to route to FANS. Kruger Mpumalanga International Airport (FAKN) granted the pilot entry, joining at 9500 feet (ft) above mean sea level (AMSL). FAKN air traffic control officer (ATCO) lost communication with the pilot before the aircraft reached its intended reporting point. A pilot flying ZS-EPO who was in the vicinity of FANS was requested to look for ZS-IBX, and at 13:16:00Z, ZS-EPO reported to ATCO that ZS-IBX had crashed 1.79 nautical miles (nm) north-west of FANS. The FAKN ATCO reported the accident to the Aeronautical Rescue Coordination Centre (ARCC) after being informed.</p> <p>The pilot was found fatally injured at the accident site, and the aircraft was destroyed. Investigation revealed that the aircraft flew into conditions that required instrument flight rules (IFR), and the pilot became disorientated due to loss of visual reference.</p>							

**Probable Cause**

The aircraft was flown from VMC to Instrument Meteorological Conditions (IMC) and the pilot became disorientated, which led to the crash in the mountainous terrain.

**Contributing factor:**

- Proceeding with flight into IMC.
- Not instrument flight rated.
- Poor weather conditions (mist / low laying clouds).

SRP date

16 January 2024

Publication date

8 February 2024

## Occurrence Details

**Reference Number** : CA18/2/3/10258  
**Occurrence Category** : Accident (Category 1)  
**Type of Operation** : Private (Part 91)  
**Name of Operator** : Mashishing Building Material (PTY) LTD  
**Aircraft Registration** : ZS-IBX  
**Aircraft Make and Model** : Beechcraft E33 Bonanza  
**Nationality** : South African  
**Place** : Portion 2 of Hermannsburg 450 JJ, Mpumalanga Province  
**Date and Time** : 30 January 2023 at 1313Z  
**Injuries** : Fatal (one)  
**Damage** : Destroyed

## 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.*

*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.*

## Investigation Process

The Accident and Incident Investigations Division (AIID) of the South African Civil Aviation Authority (SACAA) was notified of the accident on 30 January 2023 at 1335Z. The occurrence was classified as an accident according to the CAR 2011 Part 12 and the International Civil Aviation Organisation (ICAO) STD Annex 13 definitions. Notifications were sent to the State of Design and Manufacturer in accordance with CAR 2011 Part 12 and ICAO Annex 13 Chapter 4. The AIID is leading the investigation as the Republic of South Africa is the State of Occurrence. The investigators had dispatched to the accident site for this occurrence.

### Notes:

- Whenever the following words are mentioned in this report, they shall mean the following:  
Accident — this investigated accident  
Aircraft — the Beechcraft Bonanza E33 involved in this accident  
Investigation — the investigation into the circumstances of this accident  
Pilot — the pilot involved in this accident  
Report — this accident report*
- Photos and figures used in this report were taken from different sources and may have been adjusted from the original for the sole purpose of improving clarity of the report. Modifications to images used in this report were limited to cropping, magnification, file compression; or enhancement of colour, brightness, contrast; or addition of text boxes, arrows, or lines.*

## Disclaimer

*This report is produced without prejudice to the rights of the SACAA, which are reserved.*

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<b>Abbreviation</b>	<b>Description</b>
°	Degrees
°C	Degrees Celsius
ACCID	Accident
AIID	Accident and Incident Investigations Division
AME	Aircraft Maintenance Engineer
AMO	Aircraft Maintenance Organisation
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
CAR	Civil Aviation Regulations
CSU	Constant Speed Unit
CAVOK	Cloud and Visibility OK
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CVR	Cockpit Voice Recorder
CRS	Certificate of Release to Service
DNC	Day Natural Colour
FDR	Flight Data Recorder
FAKN	Kruger Mpumalanga International Airport
FANS	Nelspruit Aerodrome
ft	feet
GPS	Global Positioning System
GFA	General Flying Area
kt	Knots
hPa	Hectopascal
m	metre(s)
METAR	Meteorological Aerodrome Report
MHz	Megahertz
MPI	Mandatory Periodic Inspection
PIC	Pilot-in-command
POH	Pilot's Operating Handbook
QNH	Barometric Pressure Adjusted to Sea Level
RWY	Runway
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
TBO	Time Between Overhaul
UTC	Co-ordinated Universal Time
VFR	Visual Flight Rules
VMC	Visual Metrological Conditions
Z	Zulu (Term for Universal Co-ordinated Time - Zero Hours Greenwich)

## 1. FACTUAL INFORMATION

### 1.1. History of Flight

- 1.1.1. On Monday, 30 January 2023 at 1230Z, a pilot on-board a Beechcraft E33 Bonanza with registration ZS-IBX took off from his farm in Steelpoort, Mpumalanga province, with the intention to land at Nelspruit Aerodrome (FANS), also in Mpumalanga province. A flight plan was not filed for this flight. The flight was conducted under visual flight rules (VFR) by day and in visual meteorological conditions (VMC) by day. The provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended were followed.
- 1.1.2. According to the flight instructor who was based at FANS, at approximately 1211Z, the pilot of ZS-IBX phoned him via his cellular phone to enquire about the weather conditions at FANS, to which he responded that the weather was overcast but the clouds were high enough to conduct circuits at the aerodrome. He also told him that it was overcast in the direction in which he (the pilot) would be approaching the aerodrome.
- 1.1.3. A person who was tasked with assisting the pilot with refuelling the aircraft at his farm stated that the aircraft took off at approximately 1230Z and routed south-east towards FANS. The wife of the pilot stated that at approximately 1233Z, the pilot attempted to make a video call to her to show her how 'bad' the weather was; she could only see the clouds as he showed her, however, the call lasted a short time because of poor connection. The pilot kept attempting to make another video call to her for approximately 21 seconds but could not connect. At 1258Z, the flight instructor received another phone call from the pilot, but there was about 12 seconds of silence before the instructor could hear him.
- 1.1.4. According to the air traffic control (ATC) recordings, the pilot requested entry into Kruger Mpumalanga airspace. The pilot contacted the air traffic control officer (ATCO) on frequency 119.20-Megahertz (MHz) at approximately 12:49:47Z whilst at 9 500 feet (ft) and requested to route to FANS. The ATCO at FAKN cleared him inbound, routing visual flight rules (VFR) at 9 500ft. The ATCO asked the pilot to report his distance from FAKN, and the pilot stated that he was 24 nautical miles (nm) out. The ATCO then asked the pilot to report "ready for descent". The pilot read back correctly and continued with the flight to FANS.
- 1.1.5. At 1250Z, the pilot attempted to make another video call to his wife once again, but still could not connect. At approximately 12:56:57Z, the pilot requested the weather status for FANS and a VFR descent. The ATCO cleared him to descend VFR and to report below the FAKN terminal control area (TMA). The pilot readback the instructions and this was his last transmission to FAKN. The ZS-IBX did not call when below the FAKN TMA as agreed in his last transmission. Generally, it would have taken approximately (five) 5 minutes to clear

FAKN airspace. The airport manager who was on radio watch at FANS overheard the pilot reporting his intention to land on Runway 22 at FANS.

- 1.1.6. The FAKN ATCO tried to call ZS-IBX on frequency 119.20 MHz but there was no response. The ATCO telephoned FANS to find out if ZS-IBX had landed; she was informed that the aircraft had not landed yet. The ATCO tried to call ZS-IBX pilot again on the same frequency (119.20MHz) but there was still no response. The ATCO checked for ZS-IBX on special rules frequency 130.35 MHz, and the pilot of ZS-EPO who was flying in the FANS area was requested to look for ZS-IBX aircraft. At 13:16:00Z the pilot of ZS-EPO reported to ATCO that ZS-IBX had crashed 1.79 nautical miles (nm) north-west of FANS.
- 1.1.7. Two witnesses, one of whom was a FANS employee, were positioned just outside the aerodrome perimeter fence when they saw the aircraft (from a distance) moments before it disappeared on the side of the mountain. The FANS employee alerted the airport manager who then called and requested ZS-EPO pilot to check on the ZS-IBX aircraft. Later, the ZS-EPO pilot confirmed that the ZS-IBX had crashed. The airport manager informed emergency services who responded to the accident site. One of the two witnesses called the owner of the farm on which ZS-IBX had crashed to request that he shows the first responders how to get to the accident site by road. An emergency helicopter was dispatched to the accident site. The aircraft was found crashed on rising terrain (Figure 2) and the pilot was fatally injured.
- 1.1.8. The accident occurred during daylight at Global Positioning System (GPS) co-ordinates determined to be 25°29'55.5" South 030°52'42.5" East, at an elevation of 3 510 feet (ft).



**Figure 1:** An aerial view of the crash site. (Source: Google Earth)

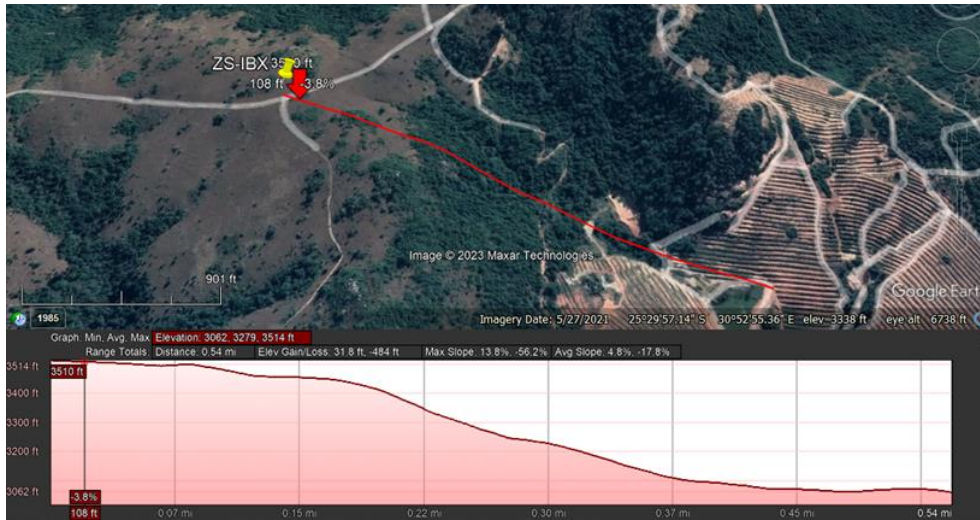


Figure 2: Image showing rising terrain at the crash site. (Source: Google Earth)

## 1.2. Injuries to Persons

Injuries	Pilot	Crew	Pass.	Total On-board	Other
Fatal	1	-	-	1	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	-	-	-	-	-
<b>Total</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>-</b>

Note: Other means people on the ground.

## 1.3. Damage to Aircraft

1.3.1. The aircraft was destroyed.





**Figure 3:** The wreckage post-accident.

#### 1.4. Other Damage

1.4.1. None.

#### 1.5 Personnel Information

##### 1.5.1 Pilot in command (PIC)

Nationality	South African		Gender	Male	Age	43
Licence Type	Private Pilot Licence (PPL)					
Licence Valid	Yes		Type Endorsed	Yes		
Ratings	None					
Medical Expiry Date	29 November 2023					
Restrictions	None					
Previous Accidents	None					

Note: Previous accidents refer to past accidents the pilot was involved in, when relevant to this accident.

1.5.2 The pilot was initially issued a Private Pilot Licence (PPL) on 20 October 2022 in accordance with Part 61 of the South African CAR 2011. The PPL had an expiry date of 31 October 2023. The pilot had flown a total of 92.6 hours of which 25.9 were on the aircraft type. The pilot was issued a Class 2 aviation medical certificate on 7 December 2021 with an expiry date of 29 November 2023.

### 61.03.5 Privileges and limitations of a PPL(A)

- (1) The holder of a PPL(A) may not exercise the privileges of that licence unless he or she—
- (a) is in possession of a valid medical certificate, issued to him or her in terms of Part 67;
  - (b) has submitted a copy of the medical certificate to the licensing authority, as required in regulation 61.01.6 (6) in the event that the aviation medical examiner is unable to submit electronic data to the Director; and
  - (c) complies with the Maintenance of Competency requirements.
- (2) The holder of a valid PPL(A) may, in VMC, act as PIC or co-pilot in any aeroplane for which he or she holds the appropriate valid class rating or type rating.
- (3) To provide for special VFR, the holder of a PPL(A) may fly in IMC, in sight of the surface and clear of cloud, fog or mist within a control zone, after being authorised to do so by the responsible air traffic services controller.
- (4) If the holder of a PPL(A) has the appropriate valid rating, he or she may furthermore exercise the privileges of the licence for any of the special purposes referred to in regulation

#### Flying Experience:

Total Hours	92.6
Total Past 24 Hours	0
Total Past 7 Days	1.8
Total Past 90 Days	25.9
Total on Type Past 90 Days	25.9
Total on Type	25.9

#### Aircraft Maintenance Engineer (AME) experience:

Nationality	South African	Gender	Male	Age	67
Licence Type	Aircraft Maintenance Engineer				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Group 3 and 4				
Restrictions	None				
Previous Accidents	None				

- 1.5.3 The aircraft maintenance engineer (AME) who released the aircraft to service was initially issued an AME Licence on 21 July 1999. The licence was reissued on 21 January 2023 with an expiry date of 2 February 2025.

## 1.6 Aircraft Information

### 1.6.1 Beechcraft Bonanza E33

(Source: <https://www.bonanza.org/aircraft-index/browse-by-type/bonanza/bonanza-e33/>)

*The Beechcraft bonanza e33 has a conventional “straight” tail with a “Speed sweep” windscreen with no centre post. The aircraft are fitted with a large third window. It has a large vertical stabilizer dorsal fin. The aircraft can be fitted with long range fuel tanks (80 gal. total). It has vernier engine and mixture controls an electric auxiliary fuel pump and a gear handle on right, flap on left with a landing light on nose cowling.*

#### Airframe:

Manufacturer/Model	Beechcraft Aircraft Company/Bonanza E33	
Serial Number	CD-1172	
Year of Manufacture	1968	
Total Airframe Hours (At Time of Accident)	3 185.93 (Tachometer)	
Last Inspection (Date & Hours)	25 January 2023	3 181.3
Airframe Hours Since Last Inspection	4.63	
CRS Issue Date	25 January 2023	
C of A (Issue Date & Expiry Date)	16 April 2019	30 April 2023
C of R (Issue Date) (Present Owner)	2 December 2021	
Operating Category	Private (Part 91)	
Type of Fuel Used	Avgas 100LL	
Previous Accidents	None	

Note: Previous accidents refer to past accidents the aircraft was involved in, when relevant to this accident.

#### Engine:

Manufacturer/Model	Continental IO-520-BA
Serial Number	122043-8-B
Hours Since New	4 293.79
Hours Since Overhaul	407.49

#### Propellor:

Manufacturer/Model	Hartzell PHC-L3YF-1RF
Serial Number	FD78A
Hours Since New	1 948.99
Hours Since Overhaul	444.69

1.6.2 According to available information, the aircraft was first registered to the present owner on 2 December 2021. The Certificate of Release to Service (CRS) was reissued on 25 January 2023 with an expiry date of 24 January 2024 or at 3281.39 hours, whichever occurs first.

1.6.3 The aircraft's Certificate of Airworthiness (C of A) was issued on 16 April 2019 with an expiry date of 30 April 2023.

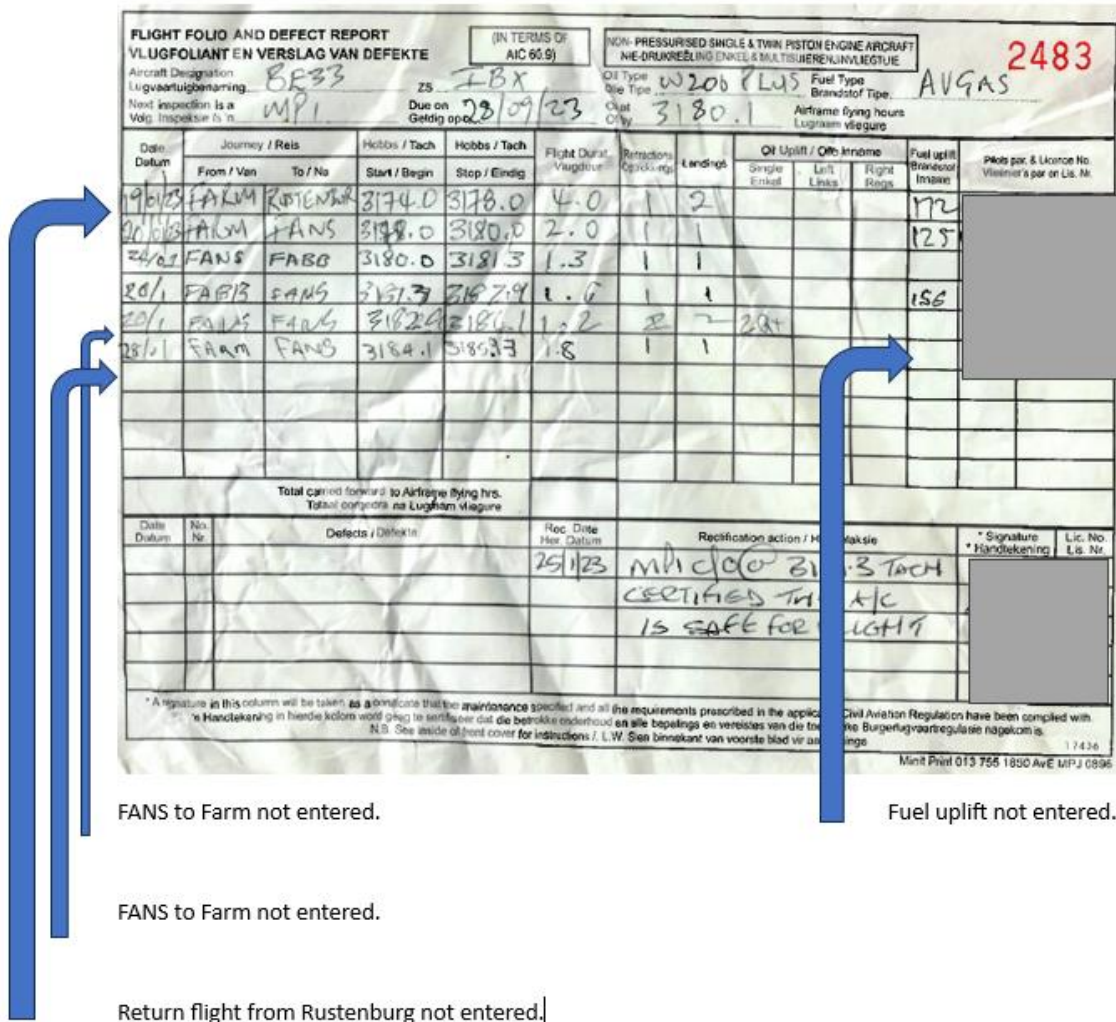


Figure 4: The flight folio with arrows indicating areas where information was not entered.

1.6.4 There were inconsistencies with the recordings in the flight folio. The flight from FANS to the farm was not entered, of which the date of departure (for the first trip) could not be determined. The fuel uplift was not entered. The flight from FANS to the farm on 28 January 2023 was also not recorded; it was confirmed that the pilot departed on 28 January 2023 after refuelling the aircraft.

## **Flight folio**

**91.03.5** (1) *The owner or operator of a South African registered aircraft shall ensure that the aircraft carries a flight folio or any other similar document which meets the requirements of and contains the information as prescribed in Document SA-CATS 91, at all times.*

(2) *The flight folio shall be kept up-to-date and maintained in a legible manner by the PIC.*

(3) *All entries shall be made immediately upon completion of the occurrence to which they refer.*

(4) *In the case of maintenance being undertaken on the aircraft, the entry shall be certified by the person taking responsibility for the maintenance performed.*

(5) *The owner or operator shall retain the flight folio for a period of 5 years calculated from the date of the last entry therein.*

## **Fuel record**

**91.03.6** (1) *The owner or operator shall maintain fuel records to enable the Director to ascertain that, for each flight under his or her control, the requirements of regulation 91.07.12 are complied with.*

(2) *The PIC of the aircraft shall enter the fuel and oil records referred to in sub regulation (1) in the flight folio.*

(3) *The owner or operator shall maintain oil records to enable the Director to ascertain that trends for oil consumption are such that an aircraft has sufficient oil to complete each flight.*

## **FLIGHT FOLIO**

### **1. Information to be contained in a flight folio**

(1) *An owner or operator must retain the following information for each flight in the form of a flight folio –*

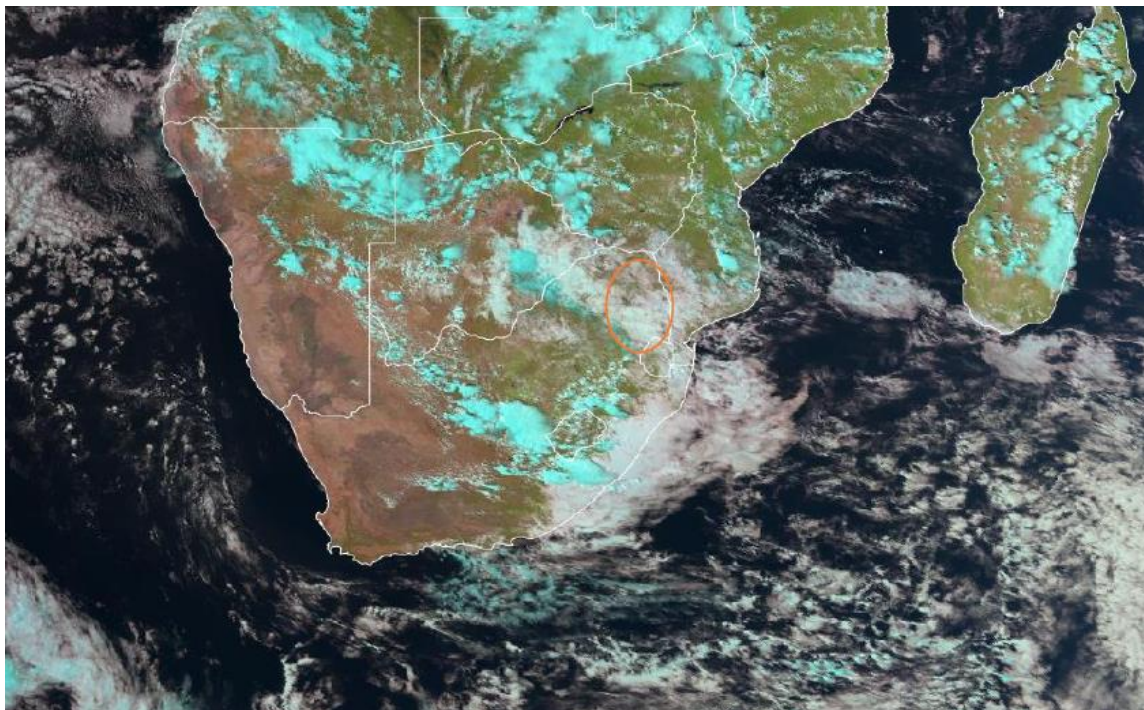
- (a) *aircraft registration;*
- (b) *date;*
- (c) *name(s) of flight crew member(s);*
- (d) *duty assignment of flight crew member(s);*
- (e) *place of departure;*
- (f) *place of arrival;*
- (g) *time of departure (off-block time);*
- (h) *time of arrival (on-block time);*
- (i) *hours of flight;*
- (j) *nature of flight;*
- (k) *incidents, observations (if any);*

- (l) signature of pilot-in-command;
  - (m) the current maintenance statement giving the aircraft maintenance status of what maintenance, scheduled or out of phase, is next due;
  - (n) all outstanding deferred defects which affect the operation of the aircraft;
  - (o) fuel and oil used; and
  - (p) fuel and oil uplift.
- (2) The owner or operator need not keep a flight folio or parts thereof, if the relevant information is available in other documentation.
- (3) The owner or operator must ensure that all entries are made concurrently and that they are made in ink or other permanent marking.

## 1.7 Meteorological Information

1.7.1 The weather information entered in the table below was obtained from the South African Weather Service (SAWS) report for FAKN on 30 January 2023 at 1300Z. FAKN is located 14nm from the accident site.

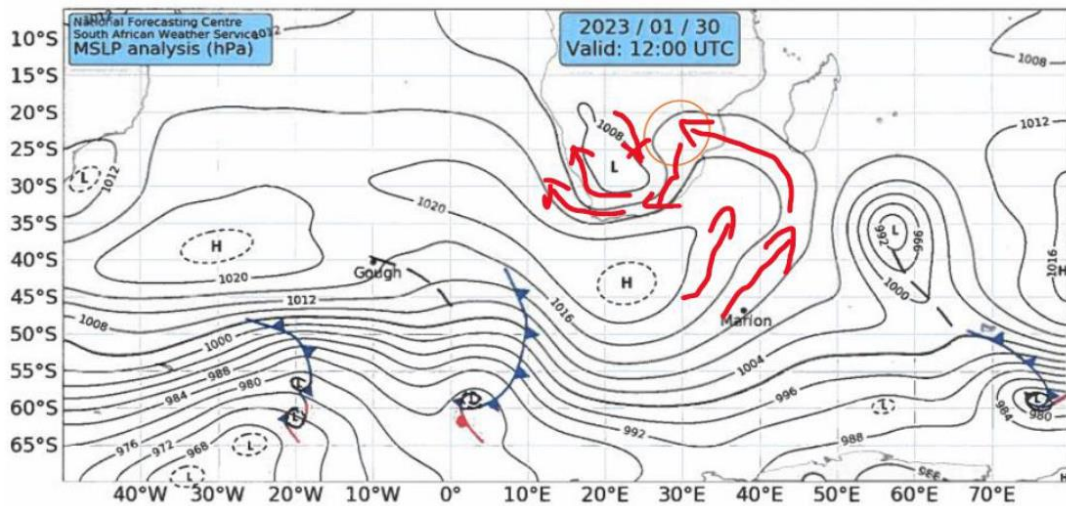
Wind Direction	27°	Wind Speed	1.7kts	Visibility	5km
Temperature	20.3°C	Cloud Cover	Scattered	Cloud Base	1300 ft
Dew Point	16°C	QNH	1021hPa		



**Figure 5:** The Day Natural Colour (DNC) satellite image valid for 30 January 2023 at 1300Z. The circle depicts the accident area. (Source: SAWS)

### 1.7.2 Satellite Image:

The Day Natural Colour (DNC) Red Green Blue (RGB) satellite images of the MeteoSat Second Generation (MSG) above show the presence of low-level clouds over the north-eastern escarpment of South Africa. These low-level clouds were present in the circled area where the accident occurred. There were cumulus clouds embedded by low-level clouds to the west of the accident site. The low-level clouds were extensively covering the accident site as depicted in the satellite image above.



**Figure 6:** Synoptic Chart valid for 1200Z. (Source: SAWS)

1.7.3 The Synoptic Chart at 1200Z above shows a ridging high pressure system supplying moisture over the north-eastern escarpment from the warm Indian Ocean. The anticyclonic circulation result in the cloud cover (low-level clouds) as observed over the south-east coast and its adjacent interior, as well as the north-east escarpment of the country (also observed in Figure 5 satellite images). The geostrophic wind circulation (red arrows) draws moisture from the ocean into the interior (accident area). A surface trough over the western interior of the country favours convective cloud development in the east of the surface trough.

The chart corresponds with cumulus clouds over central to north-eastern escarpment as observed in the satellite image in Figure 5.

## 1.8 Aids to Navigation

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

## 1.9 Communication

1.9.1 The aircraft was equipped with a standard communication system as approved by the Regulator. There were no recorded defects with the communication system prior to the accident.

1.9.2 The pilot was in radio communication with FAKN tower.

## 1.10 Aerodrome Information

1.10.1 FANS is an unmanned, licensed airport with a single runway oriented 04/22.

Aerodrome Location	Nelspruit, Mpumalanga Province
Aerodrome Status	Licensed
Aerodrome GPS coordinates	25°30'04.58" South 030°54'47.45" East
Aerodrome Elevation	2901 ft
Runway Headings	04/22
Dimensions of Runway Used	3419 X 18
Heading of Runway Used	N/A
Surface of Runway Used	Asphalt
Approach Facilities	PAPI Lights
Radio Frequency	119.2 MHz

## 1.11 Flight Recorders

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

## 1.12 Wreckage and Impact Information

1.12.1 The aircraft impacted the rising terrain and the wreckage dispersed in a radius of 220 metres (m). The aircraft first impacted the ground with the right-wing tip. The propeller grazed the ground for approximately 800 centimetres (cm) before it was embedded 93 centimetres into the ground with the engine.

1.12.2 The engine separated from the fuselage and continued to roll in the direction at which the aircraft had impacted the ground. The wings and the horizontal stabiliser separated from the fuselage; they were damaged by impact forces. Other small parts of the aircraft separated



and scattered in different directions. The propellers that dug into the ground did not show any signs that the engine was under power. There were no rotational scars on the blades.



**Figure 7:** The arrow shows the direction of impact.



**Figure 8:** Peg number 1 shows the first point of impact.



**Figure 9:** The engine after it was pulled out of the ground.



**Figure 10:** Damage to the propellor blades.

### **1.13 Medical and Pathological Information**

1.13.1 The pathology report had not been released at the time of completion of this report. The investigation will be reopened should the pathology report, at the time of its release, reveal evidence that will cause change to the outcomes of this report.

### **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 considered not survivable because of the angle at which the aircraft had impacted the ground, as well as the high impact forces that destroyed the aircraft's cabin area.

## 1.16 Tests and Research

1.16.1 When the first responders arrived at the accident site, they did not find evidence of fuel in the main tanks of the aircraft. The fuel bays were ruptured, and the fuel bladders were strewn on the accident site.

1.16.2 According to the flight folio (page 2483), the aircraft was refuelled with 172 litres of fuel on 19 January 2023, 125 litres on 20 January 2023, and 156 litres on 26 January 2023. According to FANS records of fuel sold, the aircraft was refuelled on 28 January 2023 with 78 litres; this record was not entered in the flight folio. The irregularity in the completion of the flight folio regarding fuel uplifts made it impossible to calculate fuel consumption.

Period	Total hours flown	Total fuel uplifted	Total fuel that should have been used	Fuel outstanding
19 January 2023 to 30 January 2023	12.5	531 Lt	760 Lt	229 Lt

1.16.3 **Get-there mindset** (Source: <https://www.southernwings.co.nz/how-to-avoid-get-there-itis-in-aviation/>)

*Rushing to get in the air, make your destination on time or beat the limits of daylight hours can be a deadly mix for pilots of any age or level of experience. This determination to continue with the original plan in spite of a change in circumstances, constraints or flying conditions is what is commonly referred to as ‘Get There’ or ‘Plan Continuation Bias’.*

*Essentially the influence of situational pressure-based circumstances causes the human brain to make more intuitive decisions influenced by cognitive biases, such as Plan Continuation Bias. This means the brain completely disregards the more reliable analytical decision-making process based on rational and logical reasoning that forms the very basis of any pilot training.*

*While the human brain is capable of some very impressive calculations in order for us to function and carry out tasks such as flying a plane, the limitations of our accessible memory can cause it to cut a few corners when it comes to decision making under pressure. These pressure filled situations can lead to what is known as ‘Cognitive Bias’.*

*The term cognitive bias is used to describe the brain's distortion of perception where it blocks or filters the true nature of the situation. This distortion can lead to the brain making illogical interpretations and inaccurate judgments when under pressure, particularly when faced with difficult time constraints. This unconscious cognitive bias is a factor in many aircraft crashes around the world and as a result, the loss of lots of lives each year.*

#### **4 Common Factors That Lead To Cognitive Bias In Flight**

- *Time Constraints*
- *Unexpected Weather Deterioration*
- *Fuel Management/Calculation Errors*
- *Reduced Situational Awareness*
- *Time Constraints*
- *Unexpected Weather Deterioration*
- *Fuel Management/Calculation Errors*
- *Reduced Situational Awareness*

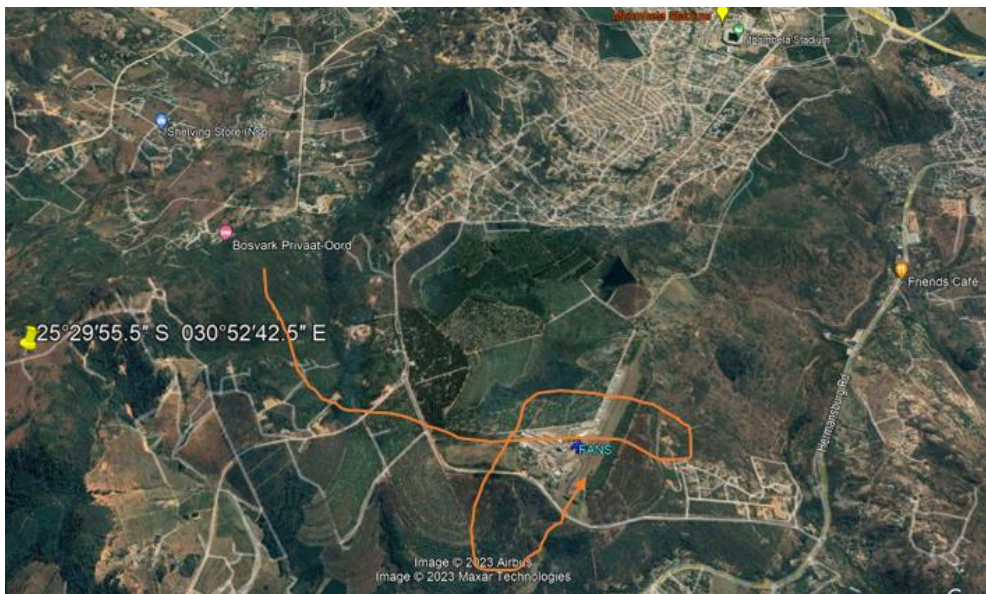
#### **8 tips of overcoming Get-there mind set**

1. **Be Aware.** *Take note of your behaviour and look out for signs that you are too fixated on getting to your destination no matter what. Understand that plan continuation bias gets stronger the closer you are to your destination.*
2. **Always Have A Backup Plan.** *Mentally prepare for having to abort/divert the flight. Having a number of other already established alternative options takes the pressure off the need to stick to the original plan.*
3. **Respect The Weather.** *Every pilot knows that weather forecasts are only a guide, when you are in the air it is up to you to constantly assess weather conditions. You cannot fly under IFR conditions if you are only VFR rated.*
4. **Think Ahead.** *Be sure to evaluate potential negative outcomes when making your decisions. What are the worst possible things that can happen if you continue on? Consider loved ones, passengers and your career – sometimes a bit of a reality check can help overcome the reluctance to turn back or divert.*
5. **Avoid Procrastination.** *Make up your mind to divert, go-around or change course earlier rather than later.*
6. **Take Command.** *As the pilot you are in charge, not some pushy passenger who insists they have paid you to do the job, or even an instructor who tells you “she’ll be right” – stand up for yourself and make sure safety is your number one priority.*
7. **Understand Your Limitations.** *Are you being asked to do something out of your comfort zone? Be sure your skills are up to the task; over-promising is not going to be good for*

anyone. Making sure passengers are aware of the limitations of the aircraft and weather restrictions is also a good idea to avoid extra pressure.

8. **Take Your Time.** Spend extra time reviewing your route, all possible approaches and potential factors that may affect the flight along the way. Do not forget to include the return trip in this – it is not all about getting there, you need to get home again too.

The struggle between intuitive and analytical cognitive thought processes is ongoing, not only for pilots during flight. Learning how to recognise these cognitive biases and manage them allows us to establish a clearer understanding of what is actually occurring leading to safer decision making all round.



**Figure 11.** Normal flight path for landing on Runway 04. (Source: Google Earth)



**Figure 12.** Cloud overlay at the accident site and FAKN. (Source: Google Earth)

1.16.4 The engine and the propeller were sent to the University of Pretoria for analysis and these were the results:

The teardown of the engine assembly was performed by a Continental Motors approved aircraft maintenance organisation (AMO). **External Inspection Results:**

*The visual inspection revealed indications supporting an impact direction from forward to aft/lower left to upper right (direction of flight).*

*The crankshaft driveshaft failed under a torsion load Figure 11 and Figure 12. supporting a hypothesis of an operational engine on impact.*

*The engine crankcase revealed several fractures while the oil sump section has been partially severed by the impact Figure 13. No clear pre-existing fractures were noted.*

*Selected cylinders revealed impact damages corresponding with the impact direction. No clear pre-existing fractures were noted. The cylinder head assemblies revealed no clear discrepancies or fractures related to the valve- and rocker assemblies.*

*Damages to the governor drive bevel gear and pinion suggest exposure to a severe impact load for a short time.*



A1



**Figure 12:** Enlarged view of the crankshaft driveshaft that failed under a torsion load depicted by the blue square. (Source: Impact Analysis Report: Engine & Propeller Assy., Beechcraft E33 Aircraft No ZS-IBX)





**Figure 13:** Crankcase showing several fractures and the oil sump section partially severed by the impact. (Source: Impact Analysis Report: Engine & Propeller Assy., Beechcraft E33 Aircraft No ZS-IBX)



**Figure 14:** Damage to the governor drive bevel gear and pinion depicted by red square. (Source: Impact Analysis Report: Engine & Propeller Assy., Beechcraft E33 Aircraft No ZS-IBX)

**Internal Inspection Results:**

*The head and barrel sections of the cylinder assemblies revealed no clear indications of corrosion, discoloration (temperature), seepage, scoring glazing and/or roughening.*

*All piston and ring assemblies proved to be intact with no clear indications of fractures or other discrepancies.*

*The valve guides and seats revealed no clear indications of scoring, roughening of flaring damages.*

*No through cracks were noted within the cooling fins. The base flange revealed no indications of looseness or fretting. All through-bolts in place with no fractures.*

*The pushrod housing- and stems revealed impact damages but no other clear discrepancies*  
*Figure 15.*

*All 6 connecting rods were found intact and connected at both the big- and small ends.*

*The plain (sleeve) bearing sets (main and big end) revealed no indications of temperature exposure (seizure), scoring and/or excessive wear. The lack of metal impregnation supports the notion of a sudden stoppage on impact.*

*The crankshaft gear revealed impact damages but with no clear indications of pre-impact fractures. The crankshaft revealed no clear discrepancies surrounding the crank pins, oil seal race, screw holes while no obstructions were evident at the oil feed holes.*

*The oil feed system including the oil pickup, screens, bypass valves and the remainder revealed no clear indications of malfunction and/or blockages. The oil pump revealed no clear indications of fracture or excessive wear that would suggest the circulation of metallic particles prior to impact.*

*Both oil coolers were separated on impact. Only a single magneto was supplied but not tested.*

*The starter- and alternator assemblies were not recovered and/or severely damaged on impact.*



**Figure 15:** Pushrod housing and stems. (Source: Impact analysis report: engine & propeller assy., Beechcraft e33 aircraft No ZS-IBX)

## Hartzell Propeller Assembly (Model No. PHC-L3YF-1RF)

### **Visual Inspection Results:**

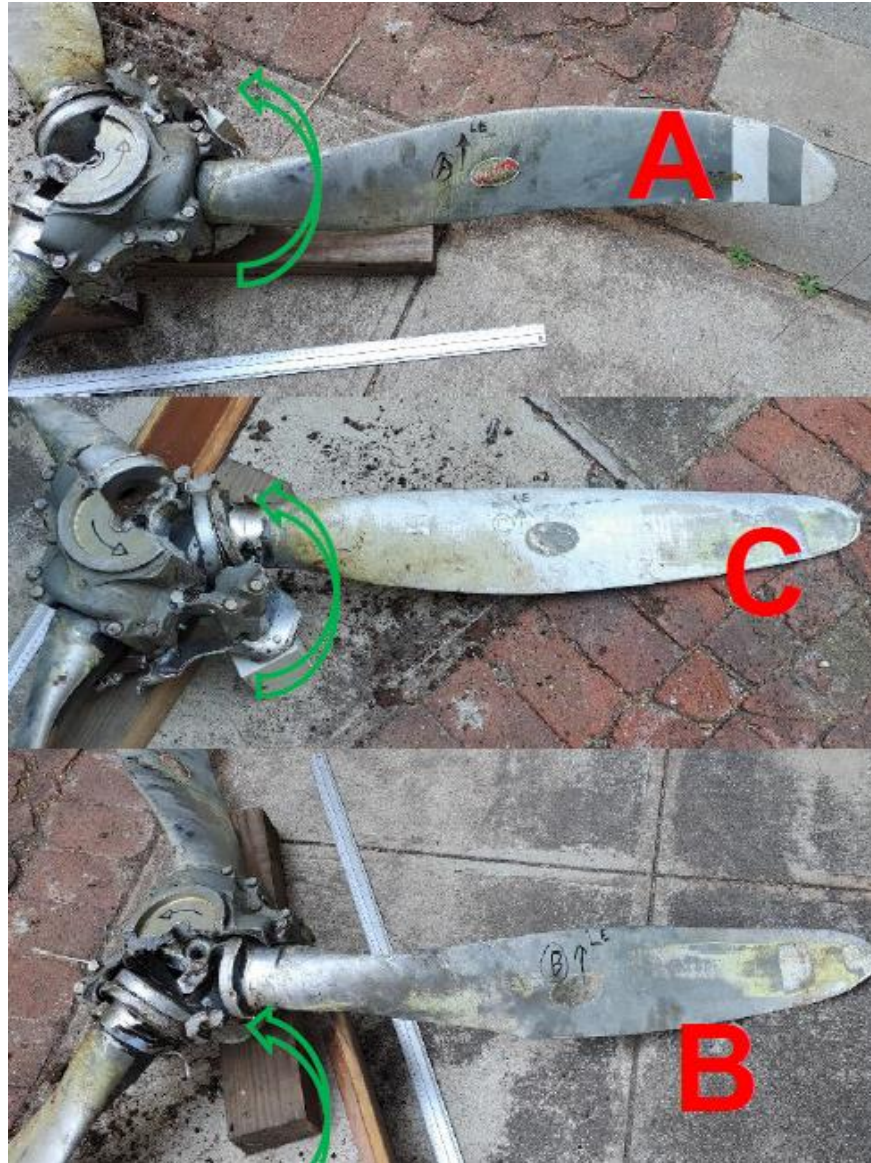
*The visual inspection revealed a fractured hub assembly with 2 forged aluminium blades separated on impact. The damages at the blade butt/propeller hub interfaces suggest rotation under power at the moment of impact.*

*Considering the variation in damages between the 3 blades and the extent thereof, it can be presumed that **blade C** most probable impacted first in the sequence. Therefore, the internal hub impact marks related to **blade C** were used as reference.*

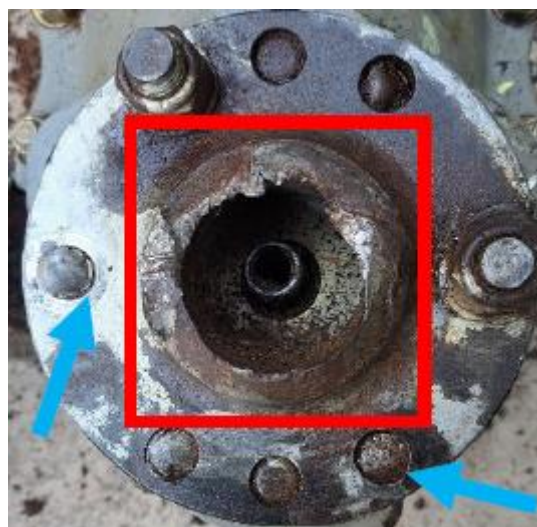
*The degree of damages suggest that the propeller assembly was rotating at the time of impact. However, considering the short impact time, it proved to be impossible to determine from the damages alone if the propeller assembly was indeed under power from the engine at the moment of impact.*

*Based on the relative internal hub impact locations it could be derived that at the moment of impact **blade C** pitch was closer to 'fine' than 'course'. This must be assessed in correlation with the perceived impact ground speed, angle of impact, aircraft attitude and vertical speed impact parameters. Under normal operating conditions, fine pitch will correspond with oil pressure within the constant speed unit (CSU) provided by an operating engine.*

*The fracture at the propeller driveshaft Figure 17 corresponds with that of the engine inspection results Figure 12. The fracture geometries of the driveshaft and the attachment bolts depicted by blue arrows in Figure 17 support the notion towards operation under engine power at the moment of impact.*



**Figure 16:** Forged aluminium blades. (Source: Impact Analysis Report: Engine & Propeller Assy., Beechcraft E33 Aircraft No ZS-IBX)



**Figure 17:** Propeller driveshaft. (Source: Impact Analysis Report: Engine & Propeller Assy., Beechcraft E33 Aircraft No ZS-IBX)

## **DISCUSSION AND CONCLUSION**

### **Engine Assembly**

The engine inspection in conjunction with the approved AMO revealed no clear indications of malfunction.

### **Propeller Assembly**

The propeller inspection revealed clear indications of rotation under an undetermined but notable level of engine power.

This investigation, based on the supplied assemblies only, did not bring to light any concrete evidence that would support a hypothesis of engine malfunction as a primary contributing factor to this accident.

Engine teardown revealed no anomalies that would suggest engine failure as part of the sequence of events. The propeller blade damage suggested rotation that was under power. The pitch indication of the first blade on impact corresponded with a notable engine oil pressure level, thus, supporting an operational engine at the time of impact.

## **1.17 Organisational and Management Information**

1.17.1 The flight was conducted in accordance with the provisions of Part 91 (General Aviation) of the CAR 2011 as amended.

1.17.2 The AMO that conducted the last maintenance inspection prior to the accident flight had an approved AMO certificate that was issued by the Regulator on 1 September 2022 with an expiry date of 31 September 2023.

## **1.18 Additional Information**

1.18.1 None.

## **1.19 Useful or Effective Investigation Techniques**

1.19.1 (a) The apparatus employed for this investigation included Stereo and Electron Microscopes (with EDS) and Digital Camera.

(b) The methodology included a visual examination of supplied parts, sectioning for sample preparation purposes, followed by a Light and Scanning Electron Microscope investigation.

## 2. ANALYSIS

### 2.1. General

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

### 2.2. Analysis

#### Pilot

- 2.2.1. The pilot was issued a Private Pilot Licence (PPL) on 20 October 2022 in accordance with Part 61 of the South African CAR 2011, with an expiry date of 31 October 2023. The pilot was issued a Class 2 medical certificate on 7 December 2021 in terms of Part 67, with an expiry date of 29 November 2023.

Upon examination of the flight folio, the flight from FANS to the farm was not recorded, of which the date of departure could not be determined. The flight from FANS to the farm on 28 January 2023 was also not recorded; it was confirmed that the pilot departed on 28 January 2023 after refuelling. This was not recorded in the flight folio according to the CAR Part 91.03.5 subpart (1). The pilot last updated the flight folio on 28 January 2023.

The pilot commenced the flight in VMC. However, towards reaching his destination, the weather had changed to IMC which he inadvertently found himself in. It is likely that he had the “get-there” mindset and was not IFR rated; thus, and found himself in IMC. The pilot flew against the privileges and limitations of a PPL(A) 61.03.5 and flew into rising terrain.

#### Aircraft

- 2.2.2 The AMO that conducted the last maintenance inspection prior to the flight had an approved AMO certificate that was issued by the Regulator on 1 September 2022 with an expiry date of 31 September 2023. The last annual inspection was conducted on 25 January 2023 at 3 181.3 airframe hours. The aircraft was issued a Certificate of Release to Service (CRS) on 25 January 2023 with an expiry date of 24 January 2024 or at 3 281.39 hours, whichever occurs first. The AME who released the aircraft to service was initially issued an AME Licence on 21 July 1999. The AME was reissued a licence on 21 January 2023 with an expiry date of 2 February 2025.

According to the FANS’s records of fuel sold, the aircraft was refuelled on 28 January 2023 with 78 litres; this was not recorded in the flight folio. This was not in line with the provisions of the CAR Part 91.03.5 subpart (1). The inconsistent recording of the flight folio regarding fuel uplifts made it impossible to calculate fuel consumption.

## Environment

2.2.3 Cumulus clouds embedded by low-level clouds were present to the west of the accident site. The low-level clouds were extensively covering the accident site at the time leading to the accident. At approximately 12:56:57Z, the pilot requested the weather status for FANS and a VFR descent. The pilot was cleared to descend VFR at his own discretion and to report below the TMA. The pilot read back the instructions correctly. This was the pilot's last transmission to FAKN. The ZS-IBX pilot did not report below the TMA as agreed on his last transmission. Generally, it would take approximately 5 minutes to descend out of FAKN airspace. The ATCO called the ZS-IBX pilot on frequency 119.2 MHz but received no response.

## Conclusion

2.2.4 The ATCO reported that they lost communication with the aircraft before it reached its intended destination. A witness who was at FANS reported that he saw the aircraft crash in Hermansburg, 1.79 nautical miles north-west of FANS. The pilot was not instrument rated and found himself flying in low visibility conditions near the mountainous terrain whilst likely being pressured by the get-there mindset. The pilot neither recorded two flights from FANS to his farm in the flight folio nor was the fuel that was uplifted on 28 January 2023 entered in the flight folio. The inconsistent recording of the flight folio regarding fuel uplifts made it impossible to calculate fuel consumption. The propeller hub inspection revealed indications of rotation under an undetermined level of engine power.

## 3. CONCLUSION

### 3.1. General

From the available evidence, 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 conclusion heading:

- **Findings** — are 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** — are actions, omissions, events, conditions, or a combination thereof, which led to this accident.
- **Contributing factors** — are actions, omissions, events, conditions or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the accident

occurring, or would have 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 issued a Private Pilot Licence (PPL) on 20 October 2022 in accordance with Part 61 of the South African CAR 2011. His pilot's licence had a validity date of 31 October 2023.
- 3.2.2. The pilot was issued a Class 2 medical certificate on 7 December 2021 in terms of Part 67, with an expiry date of 29 November 2023.
- 3.2.3. The pilot did not record two flights from FANS to his farm in the flight folio. This was not in line with the provisions of the CAR Part 91.03.5 subpart (1).
- 3.2.4. The pilot last updated the flight folio on 28 January 2023.
- 3.2.5. The pilot was not instrument rated and entered instrument meteorological conditions, and thus, flew into rising terrain.
- 3.2.6. The pilot was likely under self-pressure of the "get-there" mindset because he needed to get to his destination.

#### Aircraft

- 3.2.7 The AMO that conducted the last maintenance inspection prior to the accident flight had an approved AMO certificate that was issued by the Regulator on 1 September 2022 with an expiry date of 31 September 2023.
- 3.2.8 The last annual inspection on the aircraft was conducted on 25 January 2023 at 3 181.3 airframe hours. The aircraft was issued a Certificate of Release to Service (CRS) on 25 January 2023 with an expiry date of 24 January 2024 or at 3 281.39 hours, whichever occurs first.
- 3.2.9 The flight folio was not recorded with fuel uplift on 28 January 2023 at FANS which was 78 litres. According to Part 91.03.5 subpart (1), it is required that the flight folio be completed.
- 3.2.10 The AME who released the aircraft to service was initially issued an AME Licence on 21 July 1999. The licence was reissued on 21 January 2023 with an expiry date of 2 February 2025.



3.2.11 The inconsistent completion of the flight folio regarding fuel uplifts made it impossible to calculate fuel consumption.

3.2.12 The propeller hub inspection revealed indications of rotation under an undetermined level of engine power.

### Environment

3.2.13 Cumulus clouds embedded by low-level clouds were present to the west of the accident site. The low-level clouds were extensively covering the accident site.

3.2.14 At approximately 12:56:57Z, the pilot requested the weather status for FANS and a VFR descent. The pilot was cleared to descend VFR at his own discretion and to report below the TMA. The pilot read back the instructions correctly. This was the pilot's last transmission with ATC at FAKN. The ATCO called the ZS-IBX pilot on frequency 119.20 MHz but there was no response.

3.2.15 The ATCO reported that they lost communication with the aircraft before it reached its intended destination.

3.2.16 A witness who was at FANS reported that he saw the aircraft crash in Hermannsburg, 1.79 nautical miles north-west of FANS. He further reported that the area where the aircraft crashed was mountainous with low clouds at the time.

### **3.3. Probable Cause**

3.3.1 The pilot became spatially disorientated when he entered IMC conditions, which resulted in an uncontrolled flight into terrain.

### **3.4. Contributory Factor**

3.4.1 Proceeding with flight into IMC.

3.4.2 Not instrument flight (IMC) rated.

3.4.3 Poor weather conditions (mist / low laying clouds).

## **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 Message**

4.2.1 Pilots to ensure that they obtain weather information of their destinations and plan accordingly.

4.2.2 Pilots should avoid conditions that they have not been trained for and conditions not endorsed on their licences.

## **5. APPENDICES**

5.1. None.

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