AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

		Reference:		**CA18/2/3/9920**	
Aircraft Registration	**ZU-EPK**	**Date of Accident**	24 October 2020	**Time of Accident**	1030Z
Type of Aircraft	Bushbaby		**Type of Operation**	Private (Part 94)	
Pilot-in-command Licence Type	National Pilot Licence (NPL)		**Age** 58	**Licence Valid**	Yes
Pilot-in-command Flying Experience	**Total Flying Hours**		63.1	**Hours on Type**	59.7

Last Point of Departure	Eva's Field, KwaZulu-Natal Province
Next Point of Intended Landing	Light Flight Airstrip, KwaZulu-Natal Province
Damage to Aircraft	Destroyed

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

The accident occurred on the embankment next to the Eva's Field runway at Global Positioning System (GPS) co-ordinates: 29° 29' 23.1" S 30° 16' 11.6" E at an elevation 3356 feet (ft)

Meteorological Information	Wind direction: 035º; Wind speed: 13kts, Temperature: 36ºC; Dew Point: 8ºC; Cloud cover: Nil; Cloud base Nil; QNH: 1014hPA						
Number of People On-board	1+1	**Number of People Injured**	0	**Number of People Killed**	2	**Other (On Ground)**	0

Synopsis

On Saturday morning, 24 October 2020 at approximately 0615Z, a pilot (co-owner of the aircraft) and a passenger on-board a Bushbaby aircraft with registration ZU-EPK took off from KwaZulu-Natal's Light Flight Airstrip to Eva's Field, also in KwaZulu-Natal. The intention for this flight was for the other co-owner of the aircraft, who is also a pilot and an Approved Person (AP), to carry out an annual inspection on the day. The flight was uneventful. The flight was conducted under visual meteorological conditions (VMC) by day and under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended. After the annual inspection was completed, the pilot and his passenger prepared to depart Eva's Field back to the Light Flight Airstrip. The initial start-up of the engine sounded rough, and the pilot decided to shut down the engine. The AP then opened the cowlings and removed the spark plugs for cleaning and re-gapping. The aircraft was started up again, and it sounded well. The aircraft was then taxied close to the threshold of Runway 18 (RWY 18) for take-off. Once airborne, the pilot made a sharp left turn. During this sequence, an eyewitness stated that he heard the engine misfire and moments later, the left wing dropped; the pilot seemed unable to correct the aircraft (recover), and the aircraft continued in the left roll whilst losing height in what seemed like a teardrop turn to return to the airstrip.

The pilot and the passenger were fatally injured, and the aircraft was destroyed in the accident sequence.

Probable Cause and Contributory Factors			
It is probable that the engine stopped due to fuel exhaustion after the initial climb and the pilot lost control of the aircraft after making a sharp left turn; he failed to recover the aircraft and, subsequently, impacted the ground in the valley. **Contributing factor** Fuel mismanagement.			
SRP Date	12 April 2022	Publication Date	19 April 2022

INTRODUCTION

Reference Number	**:** CA18/2/3/9920
Name of Owner/Operator	**:** Mr Stephen O'Hara
Manufacturer	**:** Kitplanes for Africa
Model	**:** Bushbaby
Nationality	**:** South African
Registration Marks	**:** ZU-EPK
Place	**:** Eva's Field, Hilton KwaZulu-Natal Province
Date	**:** 24 October 2020
Time	**:** 1030Z

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 was notified to the Accident and Incident Investigations Division (AIID) on 24 October 2020. The investigator/s dispatched to the site on 24 October 2020. The investigator/s co-ordinated with all authorities on site by initiating the accident investigation process according to CAR Part 12 and investigation procedures. The AIID is leading the investigation as the Republic of South Africa 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 — Bushbaby 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 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:

TABLE OF CONTENTS

ABBREVIATION	DESCRIPTION
AC	Alternating Current
AIID	Accident and Incident Investigations Division
AMO	Aircraft Maintenance Organisation
AOA	Angle of Attack
AP	Approved Person
CAR	Civil Aviation Regulations
CVR	Cockpit Voice Recorder
C of R	Certificate of Registration
CRS	Certificate of Release to Service
FDR	Flight Data Recorder
FT	Feet
GPS	Global Positioning System
Kt	Knot
M	Metre
METAR	Meteorological Routine Aerodrome Report
MHz	Megahertz
Mph	Miles Per Hour
MPI	Mandatory Periodic Inspection
QNH	Query Nautical Height
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
Z	Zulu (Term for Universal Time- Zero Hours Greenwich)

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1 On Saturday morning, 24 October 2020 at approximately 0615Z, the pilot and the passenger on-board a Bushbaby aircraft with registration ZU-EPK took off on a local ferry flight from Light Flight Airstrip in Cato Ridge, situated in KwaZulu-Natal, to Eva's Field, also in Kwa-Zulu-Natal. The pilot was one of the co-owners of the aircraft. The intention for this flight was for the pilot to bring the aircraft to the Approved Person (AP), who is the other co-owner of the aircraft and also a pilot, to carry out a 100-hour annual inspection on the day at Eva's Field. The aircraft was last flown by the AP/pilot on 30 June 2019. The aircraft landed uneventfully at Eva's Field at approximately 0710Z. The flight was conducted under visual meteorological conditions (VMC) during the day and under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.1.2 After the 100-hour annual inspection was completed, the pilot and his passenger prepared for departure at Eva's Field. The pilot stated that the initial start-up of the engine sounded rough, and he decided to switch the master off. The AP/pilot suspected that the spark plugs might be the problem; he then opened the cowlings and removed them for cleaning and re-gapping. After the spark plugs were fitted back to the engine, the pilot started the engine again and it ran without fault. The aircraft was then taxied close to the threshold of Runway (RWY) 18 at Eva's Field in preparation for take-off.

1.1.3 An eyewitness reported that the pilot did not taxi to the beginning of the runway as he would normally do because there were workmen who were doing maintenance on the fence; they were attaching cautionary plates on the runway perimeter fence (Figure 6). The pilot then proceeded to take-off approximately 3 metres (m) from the runway threshold and, on the initial climb, the aircraft made a steep left turn after gaining height.

1.1.4 During this sequence, the eyewitness stated that he heard the engine misfire and, moments later, the left wing dropped. Figures 1, 2, 3 and 4 are the snapshots of the security footage given to the investigation team by the airfield owner. The snapshots show the aircraft moments before it impacts the ground. *Moments after getting airborne, the aircraft makes a steep left turn (Figure 1); thereafter, the left wing drops further and the pilot seems to be unable to correct (recover) the aircraft; the aircraft continues in the left roll whilst losing height in what seems like a teardrop turn to return to Eva's Field (Figure 2).*

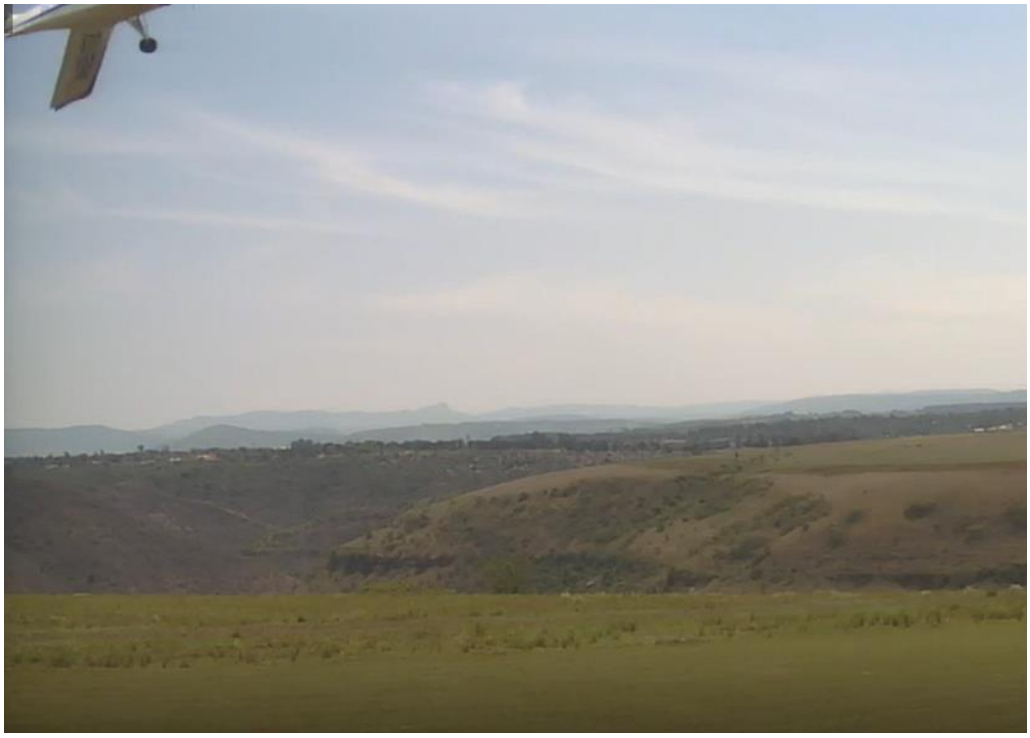

Figure 1: Steep bank after take-off. (Source: Security video)

The aircraft continues to lose height and finally disappears at the end of the runway/beginning of the valley. The pilot was unable to recover the aircraft and he crashed down the embankment facing a northerly direction at 1030Z (Figures 3 and 4). The pilot and the passenger were fatally injured in the accident and the aircraft was destroyed.

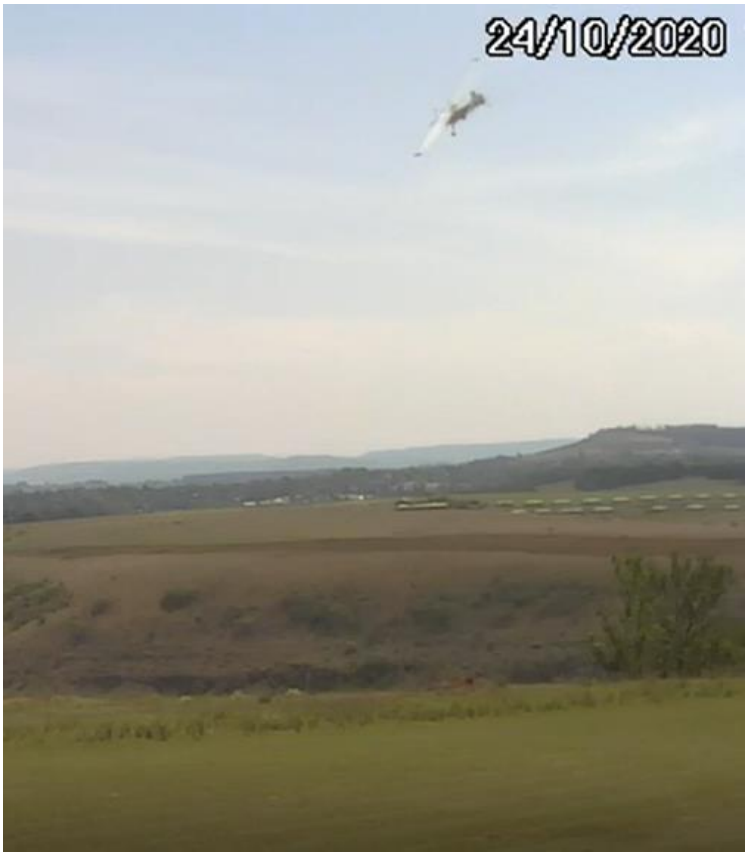

Figure 2: The aircraft making a turn. (Source: Security video)

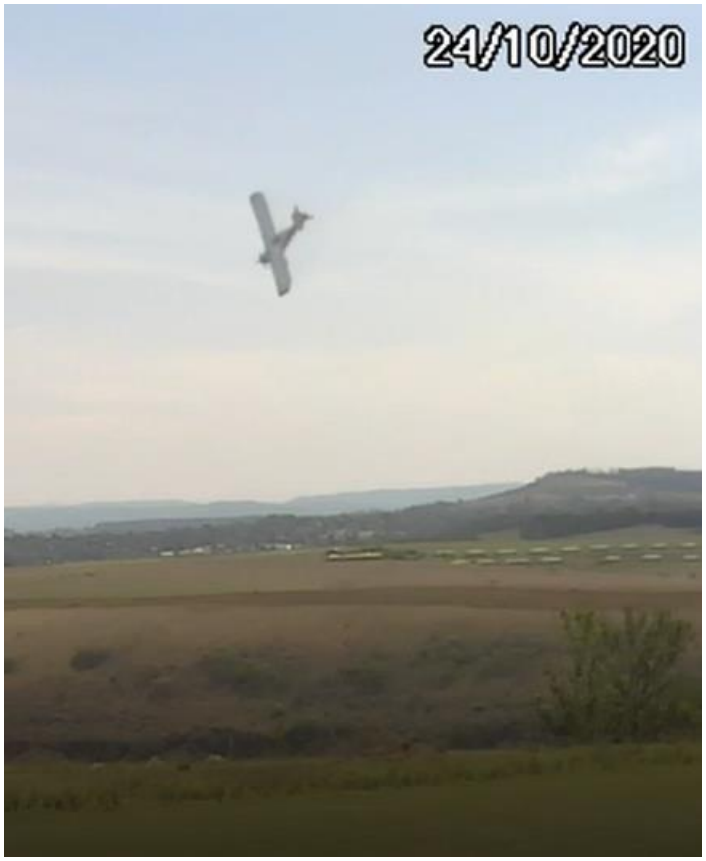

Figure 3: The aircraft almost inverted in a dive position. (Source: Security video)

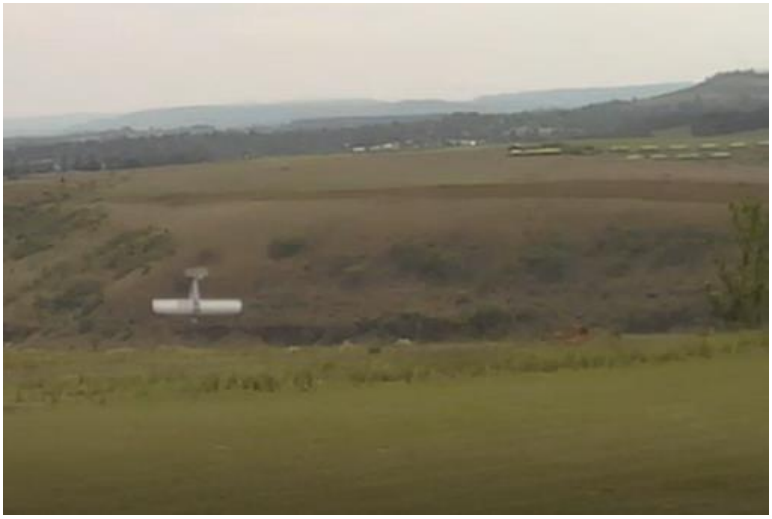

Figure 4: The aircraft just before it disappears in the valley. (Source: Security video)

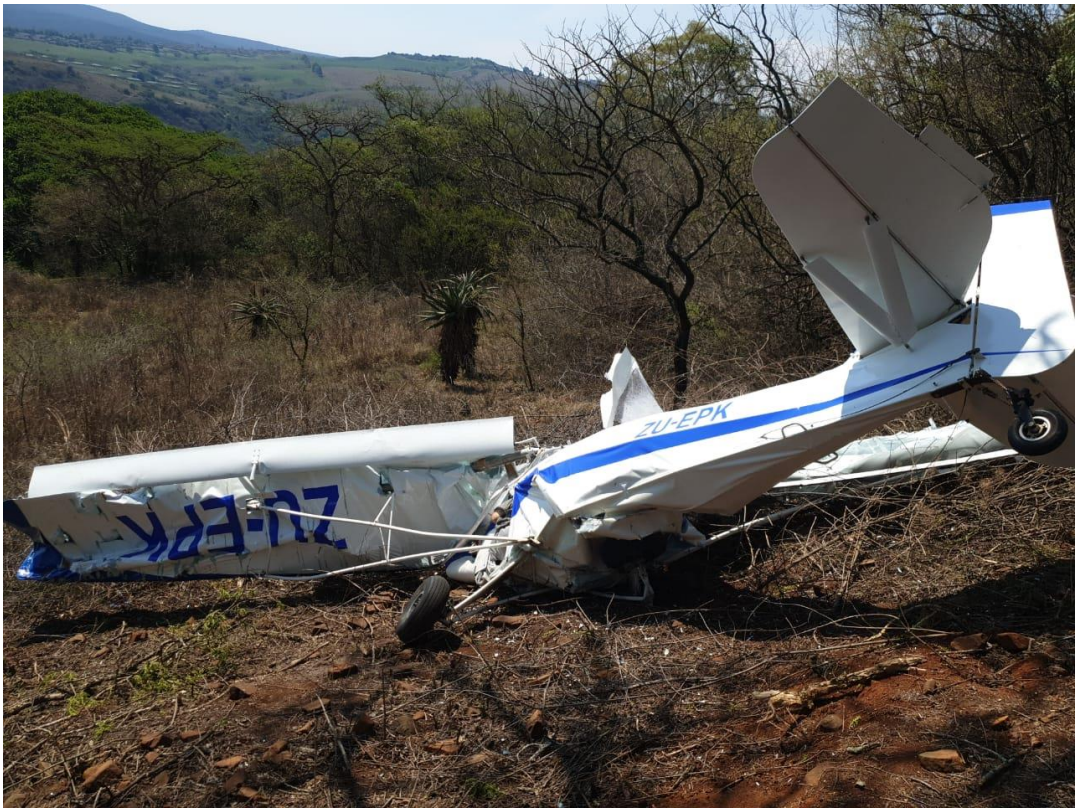

Figure 5: The aircraft post-accident.

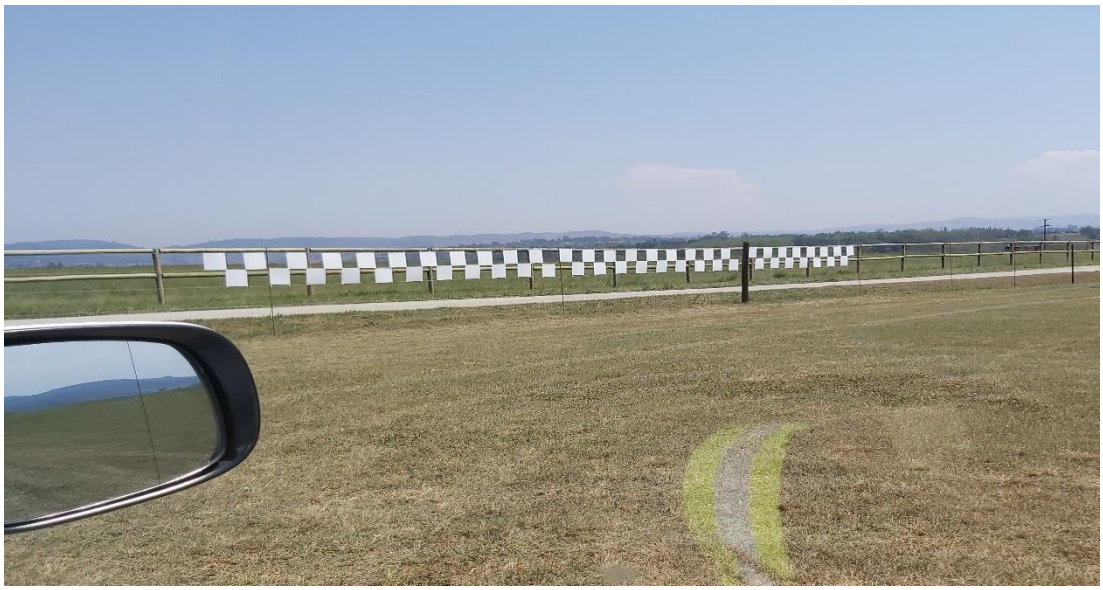

Figure 6: The fence at the end of the Runway 18 with plates installed.

1.1.5 The accident occurred in day light in the valley, at the end of RWY 18 at Eva's Field in Hilton, KwaZulu-Natal, at Global Positioning System (GPS) co-ordinates determined to be 29° 29' 23.1" S 30° 16' 11.6" E at an elevation of 3356 feet (ft).

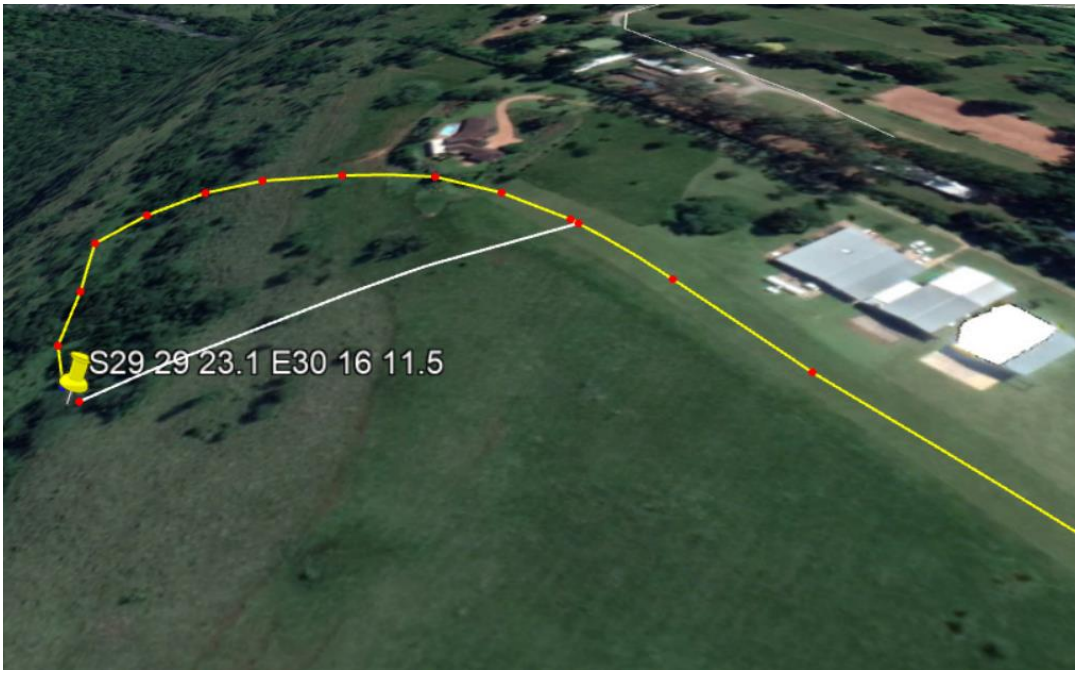

Figure 7: The airstrip elevation is 3453ft and the accident site elevation is 3356ft. The white line shows a distance of 130.83m from the crash site to the runway threshold.

1.2. Injuries to Persons

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

Note: Other means people on ground.

1.3. Damage to Aircraft

1.3.1 The aircraft was destroyed during the accident sequence. The aircraft was cut open to gain access to the occupants so as to remove them.

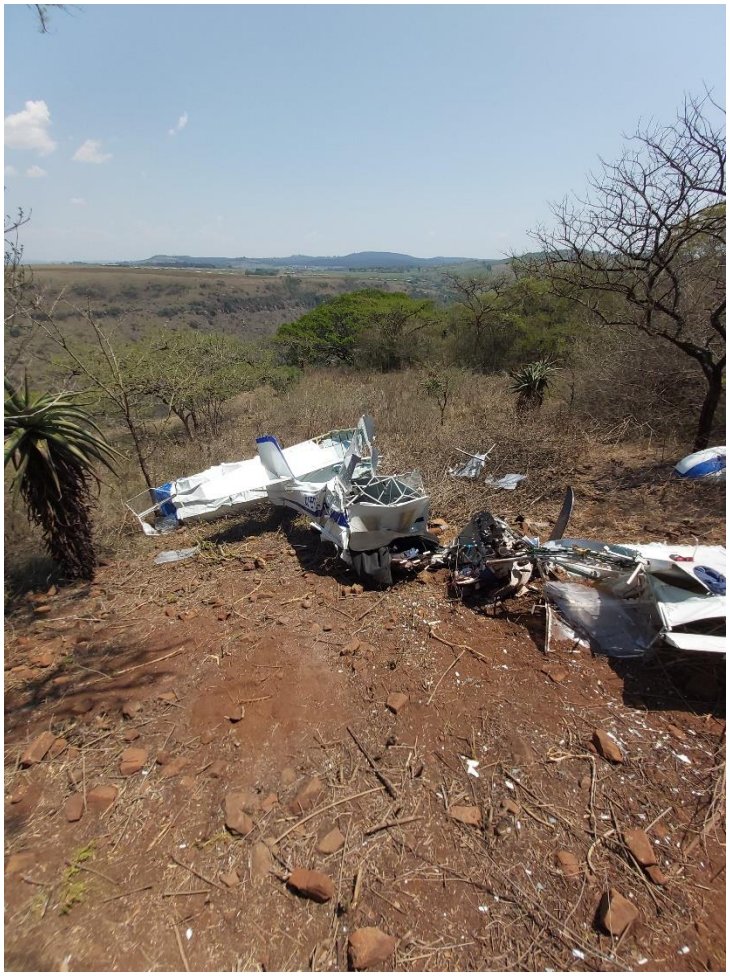

Figure 8: The aircraft at the accident site.

1.4. Other Damage

1.4.1. None.

1.5. Personnel Information: Pilot

Nationality	South African	Gender	Male	Age	58
Licence Number	0271010886	Licence Type	National Pilot Licence		
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	27 February 2023				
Restrictions	Yes, corrective lenses.				
Previous Accidents	None				

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

Flying Experience:

Total Hours	63.1
Total Past 24 Hours	0.9
Total Past 7 Days	0.9
Total Past 90 Days	5.5
Total on Type Past 90 Days	5.5
Total on Type	59.7

1.5.1 The pilot started training towards his Private Pilot Licence (PPL) on 29 June 2000 and accumulated 31.3 hours dual and 3.4 hours solo; he stopped flying on 15 July 2004. He then commenced training again, but this time towards his National Pilot Licence (NPL) on 9 February 2014. He qualified for his NPL on 20 May 2016 with 21.9 hours dual and 15.1 hours solo, and a grand total of 63.1 hours.

Approved Person (AP) experience

Nationality	South African	Gender	Male	Age	59
Licence Type	Approved Person				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	APC 2 Aeroplanes A and C Repair and maintenance certificate				
Restrictions	None				
Previous Accidents	None				

1.5.2 The aircraft was maintained by the co-owner, who is an AP. After completing each service maintenance, the aircraft would then be signed out by another AP in the flight folio because he was unable to sign out the aircraft himself (as he was the co-owner). *CARS Part 44.01.04 (1) No person may carry out maintenance on an amateur built aircraft or a production-built non-type certificated aircraft, or any component thereof, unless such person—*

(c) is the owner of the aircraft provided that an appropriately rated approved AMO, AME or Approved Person, rated in accordance with subpart 4 of part 66, performs a dual check on the maintenance which was carried out;

1.6. Aircraft Information (Source: Rotax 912 S Operators Manual)

Airframe:

Manufacturer/Model	Kitplanes for Africa	
Serial Number	014	
Year of Manufacture	2009	
Total Airframe Hours (At Time of Accident)	175.1	
Last MPI (Date & Hours)	18 December 2019	165.1
Hours Since Last MPI	10	
Authority to Fly (Issue Date)	24 November 2019	
Authority to fly (Expiry Date)	30 November 2020	
C of R (Issue Date) (Present Owner)	19 June 2015	
Operating Categories	Part 94	
Type of Fuel Used	MOGAS	
Previous Accidents	None	

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

1.6.1 *The aircraft was fitted with a Rotax 912S engine which is a four stroke, with four cylinders which are horizontally opposed, spark ignition engine, single central camshaft with hydraulic tappets. It has liquid cooled cylinder heads with ram air cooled cylinders. It has a dry sump forced lubrication system. This engine has dual ignition of breakerless, capacitor discharge design with two constant depression carburettors. It is fitted with a mechanical fuel pump. It has an electric starter, and it is fitted with an integrated alternating current (AC) generator with external rectifier regulator. The propeller drive is integrated via a gearbox with mechanical shock absorber, and overload clutch.*

1.6.2 The last annual inspection of the aircraft was carried out on 24 October 2020 with an expiry date of 24 October 2021, and the flight folio was stamped with the AP's (co-owner's) stamp, but without a signature. However, no entries were made in the airframe logbook. The administration person from Eva's Field issued a statement to the Accident and Incident Investigations Division (AIID) stating that the flight folio was stamped in error by the administrator at Eva's Field.

1.6.3 According to the flight folio (pages serial numbers 196801 and 196802), the aircraft was refuelled with a total of 170 litres of Mogas starting from 11 February 2020 (25 litres); 15 February 2020 (25 litres); 14 March 2020 (20 litres); 5 July 2020 (20 litres); 18 July 2020 (10 litres); 23 August 2020 (10 litres); 19 September 2020 (30 litres) and 24 September 2020 (30 litres), with the total hours flown (based on the calculation of the two flight folio pages) being 17.3 hours. The aircraft would have needed 294.1 litres of fuel for a return flight to Light Flight Airstrip based on fuel consumption of 17 litres/hour. With the fuel uplift of 170 litres, it would mean that 124.1 litres of fuel is unaccounted for.

Engine:

Manufacturer/Model	Bombardier Rotax 912 S
Serial Number	4923329
Part Number	912 S
Hours Since New	175
Hours Since Overhaul	TBO not reached

Propeller:

Manufacturer/Model	Maglin SR 107
Serial Number	V 2700
Hours Since New	50.3
Hours Since Overhaul	TBO not reached

1.7. Meteorological Information

1.7.1 The weather information below was obtained from the South African Weather Service (SAWS) for Eva's Field on 24 October 2020 at 1000Z, which is a true reflection for the area around the airfield, but not true for Eva's Field. On the video, the 15-knot windsock could be

seen blowing parallel to the ground, which suggests that the wind was almost 15 knots, making it slightly higher than in the SAWS report.

Wind Direction	035º	Wind Speed	13kts	Visibility	9999m
Temperature	36ºC	Cloud Cover	CAVOK	Cloud Base	CAVOK
Dew Point	8ºC	QNH	1014hPa		

1.8. Aids to Navigation

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 flight.

1.9. Communication

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

1.10. Aerodrome Information

Aerodrome Location	Eva's Field (Hilton, KwaZulu-Natal)
Aerodrome Status	Not licensed
Aerodrome Co-ordinates	S29°29'23.69" E30°16'17.18"
Aerodrome Altitude	1045ft AMSL
Runway Headings	18/36
Runway Dimensions	687.91m x 10.33m
Runway Used	18
Runway Surface	Grass
Approach Facilities	None
Radio Frequency	124.800 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 this aircraft type.

1.12 Wreckage and Impact Information

1.12.1 The aircraft crashed in the valley just below Eva's Field in a northerly direction. The wreckage distribution was limited to one area. The wings main spar was intact but the front spar of both wings was broken at four points (Figure 8). The damage on the wings indicated the high impact force.

1.12.2 The fuel tanks on both wings ruptured on impact and the remaining fuel leaked out. A light fuel smell was still hanging in the air when the investigators arrived at the scene. The cockpit was compressed due to the engine pushing towards the fuselage during impact. The wrinkles on the fuselage showed excessive force involved as it had compressed (Figure 10). The jaws of life were used to cut open the aircraft to remove the occupants trapped inside the cockpit. The left main landing gear had broken off and the right landing gear had bent under the aircraft during the accident. Two of the three propeller blades were not damaged, except for the one that impacted the ground and broke off completely (Figure 11). Evidence of the propeller blades indicated that the engine was not operational at the time of impact (Figure 11). The airframe fuel filter was found empty with no sign of fuel in the system (Figure 12).

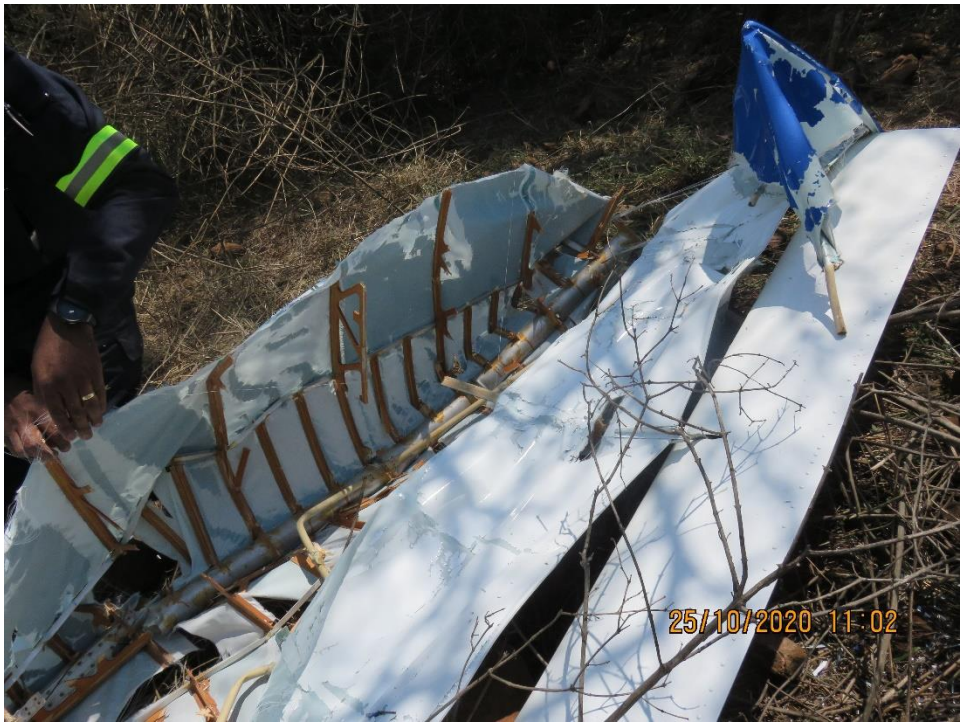

Figure 9: The damaged main left-wing spar.

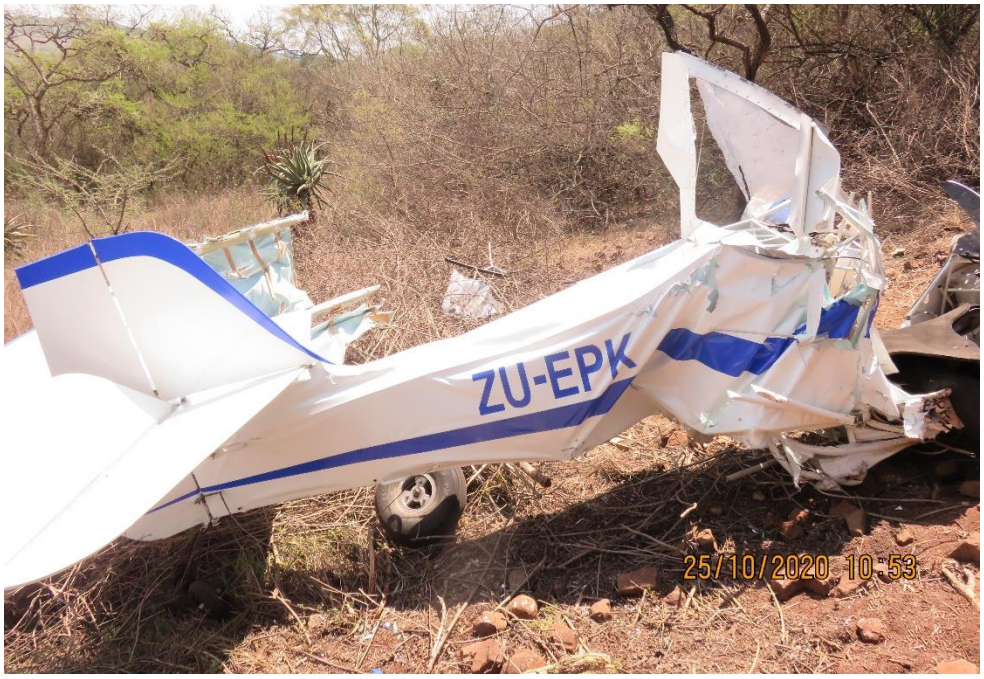

Figure 10: Wrinkles on the fuselage due to impact forces.

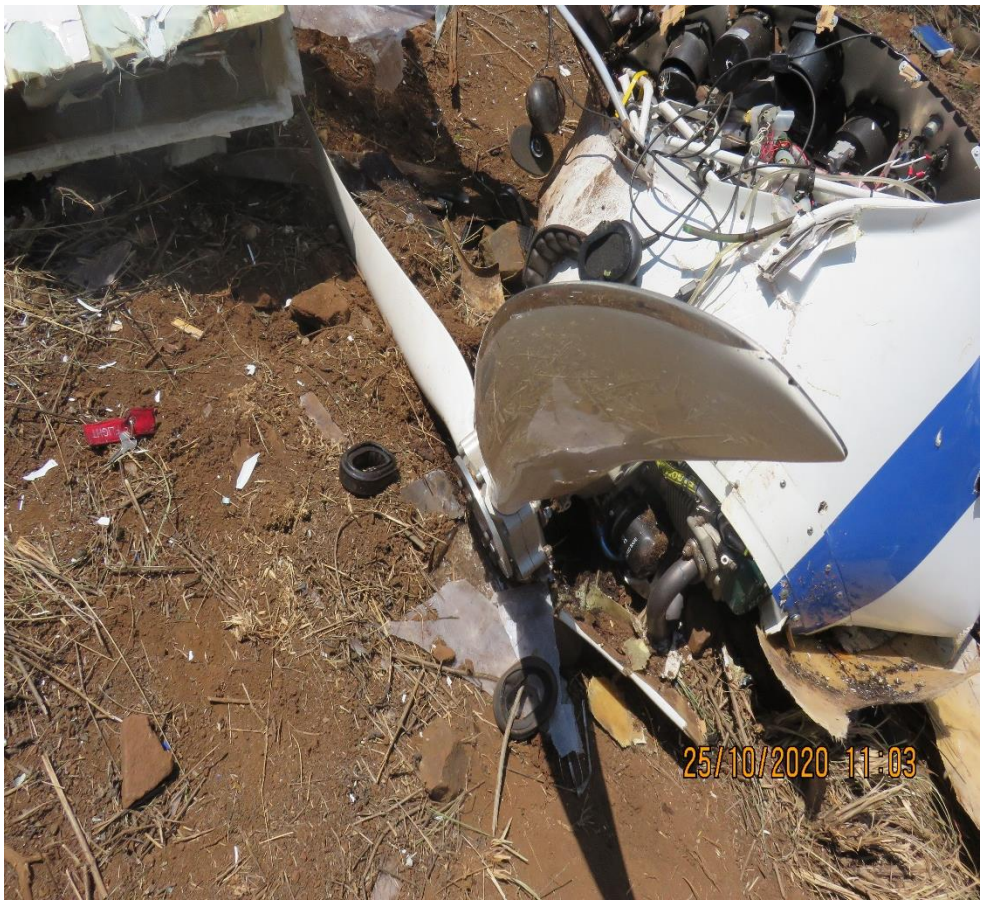

Figure 11: Two of the three propeller blades were still intact.

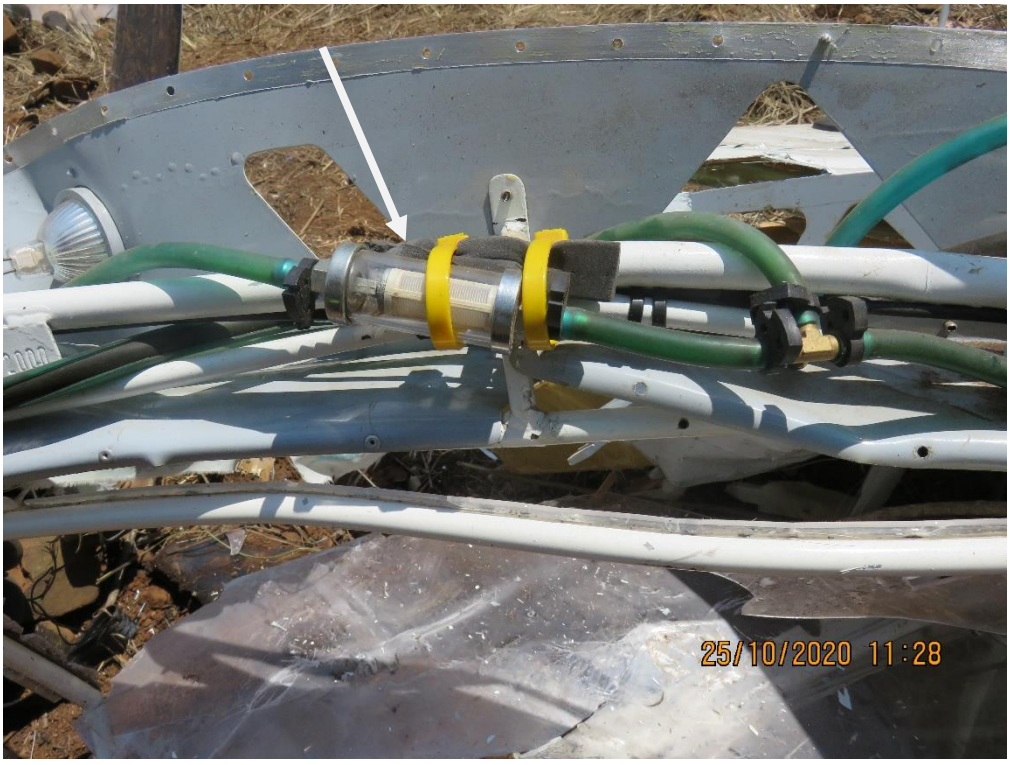

Figure 12: Arrow showing an empty or dry airframe fuel filter.

1.13 Medical and Pathological Information

1.13.1 The pilot's medical records reviewed from the SACAA showed that the pilot had no medical conditions that could have contributed to the accident.

1.13.2 Both occupants' post-mortem reports were not available at the time of issuing this final 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 the structural integrity of the cabin area was compromised. Both occupants had made use of the aircraft's safety harnesses which had failed during impact. Both occupants were still inside the wreckage after the accident sequence and had to be removed using the jaws of life.

1.16 Tests and Research

1.16.1 The aircraft was recovered to Eva's Field hangar two days after the accident. After the aircraft was recovered, the spark plugs were removed and tested; they were found to be functioning normally even though two of them were damaged due to impact forces during the accident sequence.

1.17 Organisational and Management Information

1.17.1 The flight was conducted in accordance with the provisions of Part 94 of the CAR 2011 as amended.

1.17.2 The AP who had signed out the last maintenance inspection on the aircraft prior to the accident flight was issued an approval certificate by the SACAA on 31 September 2020 with an expiry date of 31 September 2022.

1.17.3 The AP (co-owner) who carried out the inspection on the aircraft on the day of the accident was issued an approval certificate by the SACAA on 7 January 2019 with an expiry date of 31 January 2021.

1.18 Additional Information

1.18.1 This information was extracted from the Airplanes Flight Manual.

Engine failure on initial climb-out

In the event of an engine failure on initial climb-out, the pilot's first responsibility is to maintain aircraft control. At a climb pitch attitude without power, the airplane is at or near a stalling AOA. At the same time, the pilot may still be holding right rudder. The pilot must immediately lower the nose to prevent a stall while moving the rudder to ensure coordinated flight. Attempting to turn back to the take-off runway should not be attempted. The pilot should establish a controlled glide toward a plausible landing area, preferably straight ahead.

Limitations

The manufacturer acknowledges the design limitations of this engine, warning pilots:

"This engine, by its design, is subject to sudden stoppage. Engine stoppage can result in crash landings, forced landings or no power landings. Such crash landings can lead to serious bodily injury or death...This is not a certificated aircraft engine. It has not received any safety or durability testing and conforms to no aircraft standards. It is for use in experimental, uncertificated aircraft and vehicles only in which an engine failure will not compromise safety. User assumes all risk of use and acknowledges by his use that he knows this engine is subject to sudden stoppage...Never fly the aircraft equipped with this engine at locations, airspeeds, altitudes, or other circumstances from which a successful no-power landing cannot be made, after sudden engine stoppage. Aircraft equipped with this engine must only fly in DAYLIGHT VFR conditions."

1.18.2 Fuel record

91.03.6

(1) The owner of 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 those trends for oil consumption are such that an aircraft has sufficient oil to complete each flight

91.07.12

(1) A pilot-in-command of an aircraft shall not commence a flight unless he or she is satisfied that the aircraft is carrying sufficient amount of usable fuel and sufficient oil to complete the planned flight safely and to allow for deviations from the planned operation.

(2) The pilot-in-command shall ensure that the amount of useable fuel to be carried shall, as a minimum, be based on—

(a) the following data—

(i) current aircraft-specific data derived from a fuel consumption monitoring system, if available; or

(ii) if current aircraft-specific data is not available, data provided by the aeroplane manufacturer; and

(b) the operator conditions for the planned flight including—

(i) anticipated aeroplane mass;

(ii) notices to Airmen;

(iii) current meteorological reports or a combination of current reports and forecasts;

(iv) air traffic services procedures, restrictions and anticipated delays; and

(v) the effects of deferred maintenance items and/or configuration deviations.

(3) The pre-flight calculation of usable fuel required shall include—

(a) Taxi fuel, which shall be the amount of fuel expected to be consumed before take-off; taking into account local conditions at the departure aerodrome and auxiliary power unit (APU) fuel consumption;

(b)Trip fuel, Which shall be the amount of fuel required to enable the aeroplane to fly from take-off or the point of in-flight re-planning until landing at the destination aerodrome taking into account the operating conditions of paragraph (b) of sub-regulation 91.07.12 (2);

(c) Contingency fuel, which shall be the amount of fuel required to compensate for unforeseen factors. It shall be 5 per cent of the planned trip fuel or of the fuel required from the point of in-flight re-planning based on the consumption rate used to plan the trip fuel but in any case shall, in the case of aeroplanes, shall not be lower than the amount required to

fly for 5 minutes at holding speed at 1 500 ft above the destination aerodrome in standard conditions;

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

(d) Destination alternate fuel, which shall be—

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

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

(bb) climb to the expected cruising altitude;

(cc) fly the expected routing;

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

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

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

(iii) where a flight is operated without a destination alternate aerodrome, the amount of fuel required to enable the aeroplane to fly for 15 minutes at holding speed at 1 500 ft above the destination aerodrome elevation in standard conditions; or

(iv) Where the aerodrome of intended landing is an isolated aerodrome—

(aa) for a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes plus 15 percent of the flight time planned to be spent at cruising level, including final reserve fuel, or two hours, whichever is less; or

(bb) for a turbine engine aeroplane, the amount of fuel required to fly for two hours at normal cruise consumption above the destination aerodrome, including final reserve fuel;

(e) Final reserve fuel, which shall be the amount of fuel calculated using the estimated mass on arrival at the destination alternate aerodrome or the destination aerodrome, when no destination alternate aerodrome is required—

(i) for a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes, under speed and altitude conditions specified by the Director;

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

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

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

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

(bb) Make an approach and landing;

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

(iii) meet additional requirements not covered above;

(g)Discretionary fuel, which shall be the extra amount of fuel to be carried at the discretion of the pilot-in-command.

(4) Operators shall determine one final reserve fuel value for each aeroplane type and variant owned or operated rounded up to an easily recalled figure.

(5) An aeroplane shall not take off or continue from the point of in-flight re-planning unless the usable fuel on board meets the requirements prescribed in paragraphs (b), (d), (e) or (f) of sub-regulation 91.07.12 (3), if applicable.

(6) The pilot-in-command shall continually ensure that the amount of usable fuel remaining on board is not less than the fuel required to proceed to an aerodrome where a safe landing can be made with the planned final reserve fuel remaining upon landing.

(6A) The use of fuel after flight commencement for purposes other than originally intended during pre-flight planning shall require a re-analysis and, if applicable, adjustment of the planned operation.

***Note**. Guidance on procedures for in-flight fuel management including re-analysis, adjustment and/or re-planning considerations when a flight begins to consume contingency fuel before take-off is contained in the In-Flight Fuel Management TGM on the CAA website.*

(7) The pilot-in-command shall request delay information from ATC when unanticipated circumstances may result in landing at the destination aerodrome with less than the final reserve fuel plus any fuel required to proceed to an alternate aerodrome or the fuel required to operate to an isolated aerodrome.

(8) The pilot-in-command shall advise ATC of a minimum fuel state by declaring MINIMUM FUEL when, having committed to land at a specific aerodrome, the pilot calculates that any

change to the existing clearance to that aerodrome may result in landing with less than planned final reserve fuel.

***Note**. The declaration of MINIMUM FUEL informs ATC that all planned aerodrome options have been reduced to a specific aerodrome of intended landing and any change to the existing clearance may result in landing with less than the planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible should any additional delay occur.*

(9) The pilot-in-command shall declare a situation of fuel emergency by broadcasting MAYDAY FUEL, when the calculated usable fuel predicted to be available upon landing at the nearest aerodrome where a safe landing can be made is less than the planned final reserve fuel.

(10) Notwithstanding the provisions in paragraphs (a), (b), (c), (d), and (f) of sub-regulation 91.07.12(3), the Director may, based on the results of a specific safety risk assessment conducted by the operator which demonstrates how an equivalent level of safety will be maintained, approve variations to the pre-flight fuel calculation of taxi fuel, trip fuel, contingency fuel, destination alternate fuel, and additional fuel. The specific safety risk assessment shall include at least the—

(a) flight fuel calculations;

(b) capabilities of the operator include—

(aa) a data-driven method that includes a fuel consumption monitoring programme; and/or

(bb) The advanced use of alternate aerodromes; and

(c) specific mitigation measures.

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

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 particular organisation or individual.

2.2. Analysis

2.2.1 The pilot started training towards his Private Pilot Licence (PPL) on 29 June 2000 and stopped on 15 July 2004. The pilot resumed training on 9 February 2014, this time towards his National

Pilot Licence (NPL), and was later issued a NPL on 30 May 2016; his licence was reissued on 27 April 2019 with an expiry date of 26 April 2021.

2.2.2 The pilot was in possession of a Class 4 medical certificate issued on 27 February 2020 with an expiry date of 27 February 2023.

2.2.3 The aircraft was built on 3 June 2011 by the pilot and his co-owner (AP). The AP/co-owner was the one conducting the annual inspection on the aircraft on the day of the accident, which was later supposed to be signed out by another AP. The aircraft was issued an Authority to Fly on 24 November 2019 with an expiry date of 30 November 2020. The aircraft was issued a Certificate of Registration on 19 June 2015.

2.2.4 The last annual inspection of the aircraft was carried out on 24 October 2020 with an expiry date of 24 October 2021, and the flight folio was stamped with the AP's (co-owner's) stamp, but without a signature. However, no entries were made in the airframe logbook. The administration person at Eva's Field issued a statement to the Accident and Incident Investigations Division (AIID) stating that the flight folio was stamped in error.

2.2.5 According to the flight folio (pages 196801 and 196802), the aircraft was last refuelled with 170 litres of Mogas (between 11 February 2020 and 24 September 2020) with the total hours flown (based on the calculation of the two flight folio pages) being 17.3 hours. The aircraft would have needed 294.1 litres of fuel for a safe return flight to Light Flight Airstrip based on fuel consumption of 17 litres/hour. With the fuel uplift of 170 litres, it would mean that 124.1 litres of fuel is unaccounted for.

2.2.6 The aircraft was recovered to Eva's Field hangar two days after the accident date. After the aircraft was recovered, the spark plugs were removed and tested; however, they were found to be functioning normally even though two of them were damaged due to impact forces during the accident sequence.

2.2.7 Two of the propellers on the aircraft were found intact except for the third propeller that made contact with the ground at the time of the accident. On the airframe, the fuel filter was dry, showing that there was no fuel in the system.

2.2.8 The Airplanes Flight Manual indicates that "*in case of engine failure on initial climb-out, the pilot's first responsibility is to maintain aircraft's control. At a climb pitch attitude without power, the airplane is at or near a stalling AOA. At the same time, the pilot may still be holding right rudder. The pilot must immediately lower the nose to prevent a stall while moving the rudder to ensure co-ordinated flight. Attempting to turn back to the take-off runway should not be attempted*."

2.2.9 A security video supplied by the airfield owner revealed how the aircraft lost control after the initial climb. The pilot made a steep left turn and was unable to recover the aircraft from that left turn, it continued losing height until it disappeared at the end of the runway and into the valley. The aircraft crashed on an embankment with the aircraft's final resting position facing north. The pilot and the passenger were fatally injured, and the aircraft was destroyed.

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 particular 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

3.2.1 The pilot started training towards his Private Pilot Licence (PPL) on 29 June 2000 and stopped on 15 July 2004. The pilot resumed training on 9 February 2014, this time towards his National Pilot Licence (NPL), and was later issued a NPL on 30 May 2016; his licence was reissued on 27 April 2019 with an expiry date of 26 April 2021.

3.2.2 The pilot was in possession of a Class 4 medical certificate issued on 27 February 2020 with an expiry date of 27 February 2023.

3.2.3 The weather did not contribute to this accident; the wind was within the aircraft's limits and visibility was greater than 10km.

3.2.4 The aircraft was issued an Authority to Fly on 24 November 2019 with an expiry date of 30 November 2020. The aircraft was issued a Certificate of Registration on 19 June 2015.

3.2.5 The aircraft was built on 3 June 2011 by the pilot and his co-owner. The AP/co-owner was the one conducting the annual inspection on the aircraft on the day of the accident, which was later to be signed out by another AP.

3.2.6 The last annual inspection of the aircraft was carried out on 24 October 2020 with an expiry date of 24 October 2021, and the flight folio was stamped with the AP's (co-owner's) stamp, but without a signature. However, no entries were made in the airframe logbook. The administration person from Eva's Field issued a statement to the Accident and Incident Investigations Division (AIID) stating that the flight folio was stamped in error.

3.2.7 According to the flight folio (pages 196801 and 196802), the aircraft was last refuelled with 170 litres of Mogas. The aircraft would have needed 294.1 litres of fuel for a safe flight to Light Flight Airstrip based on fuel consumption of 17 litres/hour. With fuel uplift of 170 litres, it would mean that 124.1 litres of fuel is unaccounted for.

3.2.8 A witness mentioned that the pilot did not use the full length of the runway during his take-off on the day of the accident because the end of the runway was occupied by workmen.

3.2.9 The spark plugs were removed and tested after the accident; however, they were found to be functioning normally even though two of them were damaged due to impact forces during the accident sequence.

3.2.10 The Airplanes Flight Manual indicates that "*in case of the engine failure on initial climb-out, the pilot's first responsibility is to maintain aircraft's control. At a climb pitch attitude without power, the airplane is at or near a stalling AOA. At the same time, the pilot may still be holding right rudder. The pilot must immediately lower the nose to prevent a stall while moving the rudder to ensure co-ordinated flight. Attempting to turn back to the take-off runway should not be attempted*."

3.2.11 A security video supplied by the airfield owner revealed how the aircraft lost control after it was airborne. The pilot made a steep left turn and he was unable to recover the aircraft from that left turn; the aircraft continued losing height until it disappeared at the end of runway and into the valley. The aircraft crashed on an embankment with the aircraft's final rest position facing north.

3.2.12 Two of the propellers on the aircraft were intact except for the third propeller that made contact with the ground when the aircraft impacted the ground, indicating that the engine was not under power. On the airframe, the fuel filter was dry showing that there was no fuel in the system.

3.3. Probable Cause/s

3.3.1 It is probable that the engine stopped due to fuel exhaustion after the initial climb and the pilot lost control of the aircraft after making a sharp left turn; he failed to recover the aircraft and, subsequently, impacted the ground in the valley.

3.4 Contributing Factor

3.4.1 Fuel mismanagement.

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 Recommendation/s

4.2.1 None.

5. APPENDICES

5.1 None.

This report is issued by:

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