AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:		CA18/2/3/10007	
Aircraft Registration	ZU-FXE	**Date of Accident**		26 May 2021	**Time of Accident**	1451Z	
Type of Aircraft	Bushbaby Explorer			**Type of Operation**	Private (Part 94)		
Pilot-in-command Licence Type	National Pilot Licence (NPL)			**Age**	69	**Licence Valid**	Yes
Pilot-in-command Flying Experience	**Total Flying Hours**		63.6	**Hours on Type**	31.2		
Last Point of Departure	Polokwane Civil Aerodrome (FAPI), Limpopo Province						
Next Point of Intended Landing	Polokwane Civil Aerodrome (FAPI), Limpopo Province						
Damage to Aircraft	Destroyed						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Approximately 200m from Polokwane Civil Aerodrome perimeter fence at GPS: S 23°55'54.19" E 029°28'40.86" and at a field elevation of 4250 feet (ft)							
Meteorological Information	Wind direction and velocity: 120° at 1 knot; Visibility: CAVOK; Temperature: 22°C; Dew Point: 00°C; QNH: 1023 hPa						
Number of People On-board	1 + 0	**Number of People Injured**	0	**Number of People Killed**	1	**Other (On Ground)**	0

Synopsis

On 26 May 2021, a pilot on-board a Bushbaby Explorer with registration ZU-FXE was engaged in circuit exercises on Runway 08 (RWY08) at Polokwane Civil Aerodrome (FAPI). The pilot was in contact with Polokwane International Aerodrome (FAPP) air traffic control (ATC) on frequency 114.50-Megahertz (MHz). During the fourth circuit whilst on downwind, the pilot reported an engine failure to FAPP ATC, and further stated his intention to execute a forced landing at FAPI. On final approach for landing, the aircraft collided with a tree, approximately 200 metres (m) from the aerodrome's perimeter fence. This caused the aircraft to swing about 180 degrees before it came to rest facing south. A post-impact fire erupted whilst the pilot was still inside the aircraft; however, he managed to escape but had already sustained serious burn wounds. He was treated by emergency personnel at the scene before being transported to the hospital. He later succumbed to his burn injuries the following day.

After the accident, the engine was recovered from the crash site and was subjected to a compression test; no anomalies were found with the engine components. The timing gears and chain were intact, lubricated and still rotating. The crankshaft was turning with no restrictions and all internal components were intact and in good condition. Other components relating to fuel and electrical systems could not be tested due to fire damage. Therefore, it could not be determined what could have caused the engine to stop operating.

Probable Cause

An undetermined engine stoppage in-flight, followed by an unsuccessful forced landing as the aircraft collided with a tree approximately 200m from the aerodrome's perimeter fence. The aircraft swung about 180 degrees before it came to rest facing south. A post-impact fire erupted and consumed the aircraft.

SRP Date	16 August 2022	Publication Date	18 August 2022

Occurrence Details

Reference Number	**:** CA18/2/3/10007
Occurrence Category	**:** Category 1
Type of Operation	**:** Private (Part 94) Experimental
Name of Operator	**:** Fire Creek Investments 59 CC
Aircraft Registration	**:** ZU-FXE
Aircraft Make and Model	**:** Bushbaby Explorer
Nationality	**:** South African
Registration	**:** South African
Place	**:** Polokwane Civil Aerodrome (FAPI), Limpopo Province
Date and Time	**:** 26 May 2021 at 1451Z
Injuries	**:** Fatal
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 occurrence on 26 May 2021 at 1535Z. Investigators dispatched to the accident site to conduct a full scope investigation. The occurrence was classified as an accident according to Part 12 of the CAR 2011 and ICAO STD Annex 13 definitions. Notifications were sent to the State of Registry/Operator/ Design/Manufacture in accordance with Part 12 of the CAR 2011 and ICAO Annex 13 Chapter 4. The State of Manufacture (engine) appointed an accredited representative and advisor.

Notes:

1. *Whenever the following words are mentioned in this report, they shall mean the following:*
   Accident — this investigated accident
   Aircraft — the Bushbaby Explorer 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

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Abbreviation	Description
°	Degrees
°C	Degrees Celsius
AIID	Accident and Incident Investigations Division
AP	Approved Person
ASTM	American Society for Testing and Materials
ATC	Air Traffic Control
CAR	Civil Aviation Regulation
C of R	Certificate of Registration
CRS	Certificate of Release to Service
FAPI	Polokwane Civil Aerodrome
FAPP	Polokwane International Airport
ft	Feet
hPa	Hectopascal
kt	Knots
LSA	Light Sport Aircraft
m	Metres
METAR	Meteorological Aerodrome Report
MHz	Megahertz
NTCA	Non-Type Certified Aircraft
PFATF	Proofing Flight Authority to Fly
SACAA	South African Civil Aviation Authority
SA-CATS	South African Technical Standards
SAWS	South African Weather Service
QNH	Altitude Above Mean Sea Level
VMC	Visual Meteorological Conditions
Z	Zulu (Term for Universal Co-ordinated Time – Zero Hours Greenwich)

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1 On 26 May 2021 at approximately 1425Z, a pilot flying solo on-board an amateur-built Bushbaby Explorer aircraft with registration ZU-FXE took off from Runway 08 (RWY 08) at Polokwane Civil Aerodrome (FAPI) to conduct circuits consisting of touch-and-go exercises as part of his proving flight. The pilot was also the builder and owner of the aircraft. The flight was conducted in visual flight rules (VFR) by day and under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended. The pilot was in contact with Polokwane International Airport (FAPP) air traffic control (ATC) on frequency 114.50-Megahertz (MHz). FAPP is located 5.5 nautical miles (nm) north-east of FAPI.

1.1.2 The pilot completed three circuits successfully. During the fourth circuit after take-off and whilst the aircraft was in a right turn on downwind, the pilot reported an engine failure to the FAPP ATC, as well as advised that he intended to execute a forced landing at FAPI. During a right turn to route towards FAPI, the aircraft lost significant height and eventually collided with a tree before it impacted the ground. A post-impact fire erupted shortly thereafter.

1.1.3 According to the eyewitness who was on guard at Polokwane Municipal Fire Station, he was positioned approximately 120 metres (m) from the accident site; and the aircraft, which approached from the south-easterly direction, made the initially contact with the treetop, approximately 600m away from the accident site. The aircraft continued on its glide path whilst losing height rapidly before it disappeared behind a thick bush which was about 120m away from his (guard) position. Thereafter, he heard a loud bang coming from the direction in which the aircraft had disappeared; this was followed by a dark cloud of smoke. Upon seeing the smoke, the eyewitness alerted the Polokwane Municipal Fire-fighting personnel who dispatched to the accident scene within five minutes of the call.

1.1.4 The pilot sustained serious burn wounds; however, he was able to escape from the burning wreckage. The Polokwane Municipal Fire-fighting personnel extinguished the fire, as well as attended to the pilot's medical needs at the scene. The pilot was later transported in an ambulance to Polokwane Provincial Hospital. The fire-fighting team was able to contain the fire which was, at the time, spreading to the field. The aircraft was destroyed by the fire. The fire-fighting personnel further monitored and guarded the wreckage whilst waiting for the South African Police Service (SAPS) to arrive at the scene. The pilot succumbed to his burn injuries in hospital the following day.

1.1.5 Observation by the investigation team at the accident site determined that during the accident sequence, the aircraft's nose section and the left wing inner leading edge collided with a tree whilst flying at a height of approximately 1.7m. The aircraft then swung to the right before impacting the ground hard with its left main gear outer side tyre, which caused the landing gear strut to bend and fold towards the right-side. The aircraft came to an abrupt stop facing south. A post-impact fire erupted and consumed the entire fuselage composite and sheet materials. The aircraft's engine was recovered from the accident site for further investigation.

1.1.6 The accident occurred during daylight on a bushy terrain near FAPI at Global Positioning System (GPS) co-ordinates determined to be: S 23°55'54.19" E 029°28'40.86" at a field elevation of 4250 feet (ft).

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

1.2. Injuries to Persons

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

Note: Other means people on the ground.

1.2.1. The pilot was able to escape from the burning wreckage but had sustained serious burn wounds. He was treated by fire-fighting personnel at the scene before being transported to the hospital. He succumbed to his injuries the following day.

1.3. Damage to Aircraft

1.3.1. The aircraft was destroyed by ground impact force and the post-impact fire.

Figure 2: The wreckage after the fire was extinguished at the accident site.

1.4. Other Damage

1.4.1. None.

1.5. Personnel Information

Nationality	South African	Gender	Male	Age	69
Licence Type	National Pilot Licence				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	8 November 2022				
Restrictions	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	63.6
Total Past 24 Hours	1.4
Total Past 7 Days	15.0
Total Past 90 Days	31.2
Total on Type Past 90 Days	31.2
Total on Type	31.2

1.5.1 The pilot was initially issued a National Pilot Licence on 14 September 2011. The licence was revalidated and reissued on 9 November 2020 with an expiry date of 8 November 2022. The pilot's Class II medical certificate was issued on 12 July 2019 with an expiry date of 12 July 2021.

Nationality	South African	Gender	Male	Age	69
Licence Type	Approved Person Certificate				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	8 November 2022				

1.6. Aircraft Information

Airframe:

Manufacturer/Model	Kitplanes for Africa/Bushbaby Explorer	
Serial Number	154-06-11 EXP	
Year of Manufacture	2011	
Total Airframe Hours (At Time of Accident)	56.3	
Last Inspection (Date & Hours)	4 June 2020	52.3
Airframe Hours Since Last Inspection	13	
ATF (Issue Date & Expiry Date)	13 October 2020	12 October 2021
C of R (Issue Date) (Present Owner)	21 January 2013	
Operating Category	Normal	
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.

Engine:

Manufacturer/Model	BMW 1200 GS
Serial Number	122EF17087229
Hours Since New	1987.3
Hours Since Overhaul	TBO not determined

Propeller:

Manufacturer/Model	IVO
Serial Number	DL/74/3313
Hours Since New	20.8
Hours Since Overhaul	TBO not reached

1.6.1. The Bushbaby is a side-by-side, two-seater single engine high-wing aircraft with composite tanks and a fixed undercarriage. It is composed of a welded steel tube and polyfibre fabric. The foldable wings are constructed from tubular aluminium spar with plywood ribs. Its landing gear configuration is complemented by a tail dragger. The aircraft kit is offered with the aviation-approved engine range series of Rotax 582 and Rotax 912, as well as other varieties

of BMW 1100, 1150 and 1200 boxer engines under the American Society for Testing and Materials (ASTM) F2245-10 LSA design criteria. The operator purchased the aircraft in a kit format from the manufacturer. It was equipped with a Rotax 912 ULS engine type, and was assembled at the operator's (owner's) hangar. The aircraft was built by the accident pilot and was signed out by an approved person (AP) in accordance with the South African Civil Aviation Technical Standards (SA-CATS) 66.04.14. All modifications were carried out by the pilot and a licensed AP. The aircraft operated for approximately 30.5 airframe hours with the originally fitted Rotax 912 ULS engine. The tail dragger aircraft was later fitted with a modified motorcycle BMW 1200 GS engine type. According to the engine manufacturer, the engine is specifically designed for motorcycle use.

1.6.2. The aircraft records, including the maintenance documents such as logbooks, airframe, engine and propeller maintenance records, were reviewed. It was found that the aircraft's engine type change modification application was approved by the Regulator. The aircraft was registered as a Non-Type Certified Aircraft (NTCA) amateur-built on 21 January 2013. According to the aircraft records, it was initially issued a Proving Flight Authority to Fly (PFATF) by the Regulator in terms of the South African Civil Aviation Technical Standards (SA-CATS) 24.02.3 and Part 24 of CAR as amended on 7 July 2015, with an expiry date of 26 November 2015 or at 45 airframe hours. The aircraft operated for 9 airframe hours before the PFATF expired on 26 November 2015. An application for the renewal of the PFATF certificate was approved and issued by the Regulator on 13 October 2020 with an expiry date of 12 October 2021. The proving flights were expected to be conducted for at least a minimum of 31 airframe hours, which is in accordance with the requirements of Part 24 and Part 94 of the CAR 2011. The aircraft was required to be serviceable before undertaking each flight and correctly certified in the applicable airframe logbook.

1.6.3 The AP who carried out the maintenance of the aircraft had a valid AP certificate issued by the Regulator on 2 August 2019 with an expiry date of 1 August 2021. The AP was licensed by the Aeroclub of South Africa. The aircraft was issued a Certificate of Release to Service on 4 June 2020 at 39.5 airframe hours with an expiry date of 4 November 2020 or at 56.43 airframe hours, whichever comes first.

1.7. Meteorological Information

1.7.1. The weather information below was obtained from the Meteorological Aerodrome Report (METAR) that was issued by the South African Weather Service (SAWS), recorded on 26 May 2021 at 1500Z at FAPP, which is located 6nm from the accident site.

Wind Direction	120°	Wind Speed	01kt	Visibility	≥10000m
Temperature	22°C	Cloud Cover	CAVOK	Cloud Base	CAVOK
Dew Point	00°C	QNH	1023hPa		

1.8. Aids to Navigation

1.8.1. The aircraft was equipped with standard navigational equipment as approved by the Regulator. There were no records indicating that the navigation system was unserviceable 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. The pilot was in contact with FAPP ATC on frequency 114.50 MHz.

1.10. Aerodrome Information

Aerodrome Location	Polokwane Civil, Limpopo Province
Aerodrome Status	Licensed
Aerodrome GPS coordinates	23°55.56' South, 029°29.06' East
Aerodrome Elevation	4354 ft
Runway Headings	08/26
Dimensions of Runway Used	2200 X 25 metres
Heading of Runway Used	RWY 08
Surface of Runway Used	Asphalt
Approach Facilities	None
Radio Frequency	114.50 MHz

1.10.1. The aircraft accident occurred 30 metres (m) from FAPI's perimeter fence, on the eastern side.

1.11. Flight Recorders

1.11.1. The aircraft was neither 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

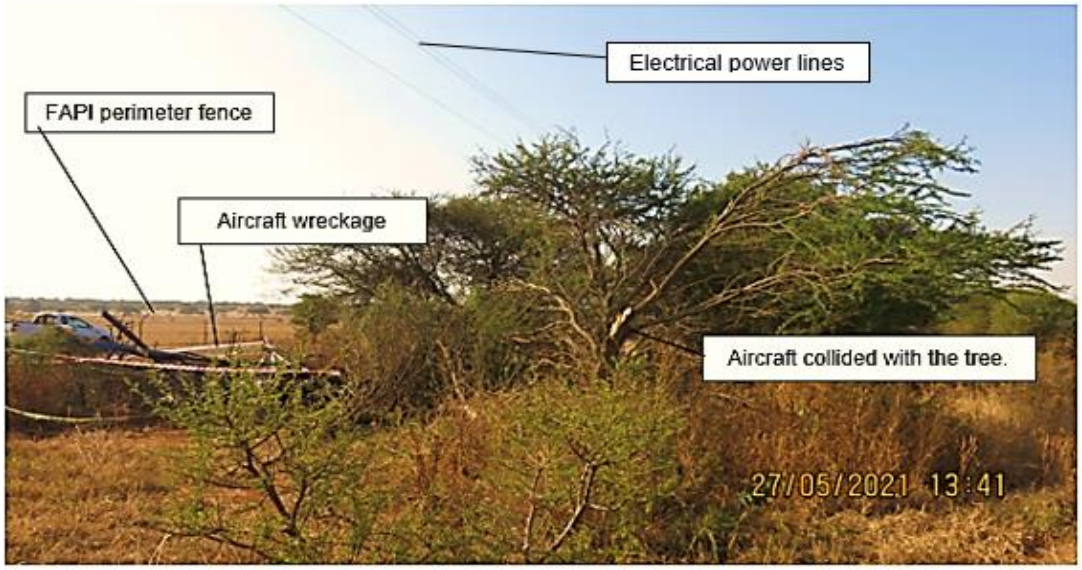

Figure 3: The accident site and obstacles in the area.

1.12.1 The aircraft crashed on a bushy terrain, close to the electrical power lines. The aircraft collided with a tree and swung around approximately 180 degrees to face the opposite direction of the approach path before coming to a stop; thereafter, a post-impact fire ensued.

Figure 4: The main landing gear wheels were found on the right-side of the wreckage.

1.12.2 The left-side main gear was observed near the right-side main landing gear; whilst the left-side landing gear strut was bent towards the right-side main landing gear.

Figure 5: The damage on the propeller blades.

1.12.3 The aircraft was equipped with a three-bladed propeller, and two of the propeller blades were damaged by post-impact fire. One of the propeller blades was found with no damage. The damage to the composite propeller blades was indicative of an engine that was not turning during collision with the tree.

1.12.4 All aircraft control surfaces and cabling were still attached to their mounting positions, although they had fire damage. The fuselage skin cover was destroyed and consumed by the post-impact fire. The cockpit panel, including the pilot's personal vehicle keys, were destroyed in the fire.

1.13. Medical and Pathological Information

1.13.1. The medical and pathological reports were still outstanding at the time of compiling this report. The cause of death has not yet been determined. However, should any of the results have a bearing on the circumstances leading to this accident, they will be treated as new evidence which will necessitate the re-opening of this investigation.

1.14. Fire

1.14.1. There was evidence of post-impact fire which engulfed the aircraft. Moreover, fuel on-board the aircraft further fed the fire.

1.15. Survival Aspects

1.15.1. The accident was considered not survivable. Although the cockpit structure was intact and the pilot managed to exit the aircraft, survivability was diminished because of the post-impact fire, as well as the fuel from the tanks that fed the fire.

1.16. Tests and Research

1.16.1. The aircraft's engine was recovered from the crash site for further inspection, but no mechanical anomalies were identified when the engine was disassembled.

1.16.2. The engine was initially taken to the manufacturer, BMW, for further examination. The initial teardown inspection was conducted with compression tests, and no anomalies were detected. The engine manufacturer declined to complete the analysis of the engine. They could not associate with an aviation-related investigation in which their engine, which was specifically designed for a motorcycle, was used.

1.16.3. The engine was then taken back to the investigators' recovery room where a further teardown inspection was conducted by the investigators, and no anomalies were found with the engine components. The timing gears and chain were intact with no rotational restrictions and still well lubricated. The crankshaft also turned with no restrictions, and all internal components were intact and in good condition.

1.16.4. Other components related to fuel and electrical systems could not be tested due to damage caused by impact and the post-impact fire. As such, it could not be determined what could have cause the engine to stop operating.

1.17. Organisational and Management Information

1.17.1. The aircraft was operated privately under the provisions of Part 94 of the CAR 2011 as amended. The aircraft had a valid Proving Flight Authority to Fly certificate with the BMW GS1200 engine, issued by the Regulator on 13 October 2020 with an expiry date of 12 October 2021. The certificate was issued in terms of the SA-CATS 24.02.3 and the Civil Aviation Regulations (CAR) 2011 as amended.

1.17.2. The aircraft was built by the owner and was signed out by the AP responsible for the aircraft maintenance. The kit, which was an NTCA amateur-built aircraft, was originally equipped with an aviation-approved four-cylinder Rotax 912 ULS engine. The owner removed the original Rotax 912 ULS engine and replaced it with a BMW GS1200 two-cylinder motorcycle engine at 30.5 airframe hours. The investigation team could not establish the history and condition of the replacement engine (BMW GS1200) and the hours it had accumulated before it was installed on the aircraft in place of the Rotax 912 ULS engine. The PFAFT was issued with a stipulation of 45 airframe proving flight hours. The aircraft was undergoing a proving flight within a radius of 100 kilometres (km) from FAPI as required by regulation at the time of the accident.

1.17.3. According to SACAA, an erroneous entry was made during the aircraft registration process in which it was stated (captured) that the aircraft builder (constructor) was the manufacturer, instead of the owner (who bought the aircraft kit and assembled it in his hangar). As such, the aircraft was regarded and registered as an amateur-built and was issued a PFAFT certificate with a limit of 40 airframe flying hours. The builder of the aircraft is not required to seek advice and modification approval for non-aviation approved engine. The aircraft was subjected to the following approval conditions, which are also reflected on the PFATF description:

SACAA's CAR and SA-CATS applicable approval procedures for the amateur-built aircraft type:
CAR 24.02.3(6) Proving flight authority

(6) A proving flight authority show the base from which the flights are to be carried out.
(7) A proving flight authority may be extended for further periods at the discretion of the Director, or if applicable , the organisation designated for the purpose in the case may be, on the submission of an inspection report equivalent to an annual inspection.
(8) The constructor, as required , may effect modifications and repairs during the periods validity of the proving flight authority. However, should a major modification or the organisation designated in terms of Part 149 of these regulations, may require that the proving flights be commenced anew.

(9) Proving flight shall be carried out as prescribed in document SA-CATS 24.
(10) Flights conducted in terms of a proving flight authority:-

a) are limited to an area not exceeding 100km radius from the specified base from which such flights are to be undertaken, unless stated otherwise on the proving flight authority.

b) may only be conducted under VMC by day.
c)) are forbidden over open-air assemblies of persons; and
d) are forbidden over built-up areas, except where necessary for take-off and landing.

(11) Only essential crew members, including those persons assigned to carry out in-flight inspections, may be carried on board the aircraft during flights conducted in terms of a proving flight authority.

(12) Where a proving flight authority is issued in respect of an aircraft of a new design, or of which the originally approved design has undergone major modification, the first flight or flights shall be conducted by a pilot with the appropriate test flight rating.

(13) With the approval of the Director, the flight or flights referred to in sub-regulation (12), the owner of the aircraft, if suitably qualified, may carry out additional proving flights. For the purpose of this sub-regulation, where the 'owner' consists of more than one natural person, one of these persons shall be designated by the test pilot to carry out the proving flights.

(14) The owner, referred to in sub-regulation (13), shall be a licensed pilot, holding the appropriate category and class rating, and having been converted on type by an appropriately rated flight instructor.

(15) Apart from any conversion training, which may be required in terms of sub-regulation (14), no flight training may be conducted on an aircraft, operated in terms of a proving flight authority.

(16) Where the limitations for flight still have to be established, such proving flight or flights shall be carried out by a pilot with the appropriate test flight rating.

(17) The final proving flight for the issue of an authority to fly shall be carried out by a pilot with the appropriate test flight rating who, if applicable, shall be the pilot who carried out the proving flights, referred to in sub-regulation (16).

SA-CATS 24.01.2(1.8)(4): Amateur-built aircraft.

The aircraft is an amateur built and is subjected to the below conditions as extracted:

WARNING
AMATEUR-BUILT AIRCRAFT: THIS AIRCRAFT IS NOT REQUIRED TO COMPLY WITH ALL THE REGULATIONS FOR TYPE CERTIFICATED AIRCRAFT TO BE OPERATED FOR SPORT OR RECREATIONAL PURPOSES ONLY.

YOU FLY IN THIS AIRCRAFT AT YOUR OWN RISK

SACATS: 24.01.2 (1.6)
(4) During the course of proving flights, the following flight experience shall be gained in respect of the aircraft:
(a) a minimum of 25 hours of flight time when an approved or type-certificated aircraft engine is installed; or
(b) a minimum of 40 hours of flight time when any other engine is installed; or
(c) in the case of the first importation of a production-built aircraft, a minimum of 20 hours, or more at the discretion of the Director; and
(d) such other tests or flight experience as the Director considers necessary.

1.18. Additional Information

1.18.1. None.

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 organisation or individual.

2.2. Analysis

2.2.1 The pilot was initially issued a National Pilot Licence (NPL) on 14 September 2011. The licence revalidation was issued on 9 November 2020 with an expiry date of 8 November 2022. The pilot's Class II medical certificate was issued on 12 July 2019 with an expiry date of 12 July 2021.

2.2.2 The flight was conducted in visual flight rules (VFR) by day and under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended; this is one of the proving flight requirements. The weather conditions were suitable for the flight and did not contribute to this accident.

2.2.3 The aircraft kit was purchased and built by the owner. This rendered the aircraft as a NTCA and was registered as an amateur-built type. The aircraft was issued a Certificate of Registration on 21 January 2013. The pilot, following construction and operation, removed the Rotax 912 ULS engine from the aircraft and fitted a motorcycle engine instead; thereafter, made a submission to the Regulator, which was approved. Operators of amateur aircraft types are not required to seek approval for any modification on the aircraft other than to comply with the stipulations of the Proving Flight Authority to Fly requirements. They are also not required to seek further advice and modification approval from non-aviation approved engine manufacturers. As such, the aircraft operations are conducted at the operator's discretion and own risk.

2.2.4 The aircraft was maintained by an AP, licensed by the Aeroclub of South Africa. The AP's licence was issued on 2 August 2019 with an expiry date of 1 August 2021. The manufacturer had prescribed several engine options for the kit, and the pilot elected to replace the Rotax 912 ULS engine with a BMW GS1200, which was approved by the Regulator. The last annual inspection was carried out on 4 June 2020 at 39.5 airframe hours, 52.3 engine hours and 2.0 propeller hours. The aircraft had flown a further 26.9 hours after the annual inspection. An application for extension of the Proving Flight Authority to Fly (PFATF) was issued on 4 June 2020 with an expiry date of 4 November 2020 or at 56.43 airframe hours, whichever occurs first. The aircraft was then issued a PFATF on 13 October 2020 with an expiry date of 12 October 2021.

2.2.5 The pilot reported to FAPP ATC that his aircraft had experienced an engine failure and that he intended to execute a forced landing at FAPI. On the final glide path to a forced landing at FAPI, the aircraft collided with a tree, approximately 200m from the aerodrome's perimeter fence. The aircraft swung around about 180 degrees and came to rest facing south. A post-impact fire erupted thereafter. The pilot managed to escape from the burning wreckage with 95% burn wounds. He was treated by emergency personnel at the accident scene, however, he succumbed to his burn injuries in hospital the following day.

2.2.6 Post-accident, the engine was recovered from the crash site for teardown inspection. A compression test revealed no anomalies with the engine components. The timing gears and chain were intact with no rotational restrictions and still well-lubricated. The crankshaft also turned with no restrictions and all internal components were intact and in good condition. Other components relating to fuel system could not be tested due to post-impact fire damage. Therefore, it could not be determined what could have cause the engine to stop operating. Based on the tests and the engine teardown, which showed no anomalies on any of the engine components and the insufficient evidence for testing of other engine systems, the cause of engine stoppage could not be determined.

2.2.7 There was sufficient fuel on-board the aircraft at the time of the flight. Also, there was evidence of fuel-fed fire post-accident.

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

3.2.1. The pilot had a valid National Pilot Licence issued on 9 November 2020 with an expiry date of 8 November 2022. The pilot had a Class II medical certificate issued on 12 July 2019 with an expiry date of 12 July 2021.

3.2.2. The flight was conducted in visual flight rules (VFR) by day and under the provisions of Part 94 of the CAR 2011 as amended. The weather conditions did not contribute to the accident.

3.2.3. The last annual maintenance inspection was carried out on 4 June 2020 at 39.5 airframe hours, 52.3 engine hours and 2.0 propeller hours. An application for extension of the PFATF was issued on 4 June 2020 with an expiry date of 4 November 2020 or at 56.43 airframe hours. The aircraft was flown a further 26.9 hours after the said inspection.

3.2.4. The AP who inspected the aircraft was issued an AP certificate on 2 August 2019 with an expiry date of 1 August 2021, in terms of the SA-CATS 66.04.14. The aircraft was initially fitted with a Rotax 912 ULS engine which was later replaced with a BMW GS1200 motorcycle engine. The Proving Flight Certificate and approval was issued by the Regulator on 13 October 2020 with an expiry date of 12 October 2021.

3.2.5. The aircraft collided with a tree and swung around approximately 180 degrees to face the opposite direction of approach; a post-impact fire ensued thereafter. The pilot managed to escape from the burning wreckage but had already sustained 95% burn wounds. He was treated by fire-fighting personnel at the accident scene before he was transported to the hospital. He succumbed to his burn injuries in hospital the following day.

3.2.6 The engine stoppage could not be determined, and the engine manufacturer did not want to investigate an aviation-related engine failure. The engine was designed for motorcycle specifications and use. No anomalies on any of the engine components were observed.

3.2.7 There was sufficient fuel on-board the aircraft at the time of the flight. Also, there was evidence of fuel-fed fire which erupted post-accident.

3.3. Probable Cause

3.3.1. An undetermined engine failure in-flight followed by an unsuccessful forced landing as a result of the aircraft colliding with a tree approximately 200m from the aerodrome's perimeter fence. The aircraft swung around about 180 degrees before it came to a stop facing south. A post-impact fire erupted which consumed the aircraft.

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