AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/8568		
Aircraft Registration	**ZS-NAB**	**Date of Accident**	23 October 2008		**Time of Accident**	1647Z	
Type of Aircraft	Beechcraft Baron 58		**Type of Operation**		Unknown		
Pilot-in-command Licence Type	Commercial		**Age**	42	**Licence Valid**	Yes	
Pilot-in-command Flying Experience	Total Flying Hours		1140.0		Hours on Type	15.0	
Last point of departure	Kruger Park Gateway Phalaborwa Aerodrome (FAPH) – Limpopo.						
Next point of intended landing	Lanseria Airport (FALA) – Gauteng.						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Phalaborwa – Silongo at location with GPS co-ordinates: S 23°54.354 E031°09.235.							
Meteorological Information	Surface Wind: 160° TN/ 07 kts, Temperature: 20°C, Visibility: 10 km, Cloud base: 3000 ft, Cloud cover: SCT at 2000 ft & Dew point: 11°C.						
Number of people on board	1 + 0	**No. of people injured**	0	**No. of people killed**	1		

Synopsis

The pilot, accompanied by four passengers, departed from Lanseria Aerodrome (FALA) at approximately 1430Z on a private flight under Instrument Flight Rules (IFR) to Kruger Gateway Phalaborwa Aerodrome (FAPH) as per the filed flight plan. The pilot landed on Runway 19 at FAPH, taxied to the apron and the passengers disembarked from the aircraft.

At approximately 1645Z, in night-time conditions, the pilot started the engines of the aircraft and taxied to the threshold of Runway 19 for the return flight back to FALA. The aircraft took off in a southerly direction and during the climb made a right turn and proceeded with a right-hand circuit. During the latter part of the downwind sector of the right-hand turn circuit, at an altitude of approximately 776 metres, the aircraft started to descend at a fairly high rate of descent (ROD). At an altitude of approximately 657 metres the aircraft entered into a right-hand turn and impacted with the ground in a nose-down attitude. The aircraft was destroyed on impact and by the post-impact fire that erupted. The pilot, who was the sole occupant on board, was fatally injured.

During the onsite investigation of the wreckage there was proof found indicating that the right side propeller was feathered. This was an indication that the right side engine had stopped “shut down” prior to the aircraft impacting the ground. The engine was investigated and there was no evidence of any mechanical failure found within the remains of the engine.

Probable Cause

The pilot lost situational awareness whilst positioning the aircraft to return for landing on runway 19 and the aircraft entered into a spiral dive from which a recovery could not be affected within the height remaining.

Contributory Factors

The pilot experienced an unknown emergency situation which influenced his decision to return to the aerodrome.
An improper circuit sequence was flown around the aerodrome.
The aircraft was cutting into the circuit towards the runway centre line in the downwind and tightened it into the base leg.
The base leg was too tight for the aircraft to line up into final approach.

IARC Date		Release Date	

AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : Gavil Air Services (Pty) Ltd.
Manufacturer : Raytheon Beechcraft
Model : Beechcraft Baron 58
Nationality : South African
Registration Marks : ZS-NAB
Place : Phalaborwa - Limpopo
Date : 23 October 2008
Time : 1647Z

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Purpose of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (1997) 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 establish legal liability****.*

Disclaimer:

This report is given without prejudice to the rights of the CAA, which are reserved.

ABBREVIATIONS IN THE REPORT:

ATC	: Air Traffic Controller
SACAA	: South African Civil Aviation Authority
CAR	: Civil Aviation Regulation
ANR	: Air Navigation Regulations
AIC	: Aeronautical Information Circular
AIP	: Aeronautical Information Publication
CVR	: Cockpit Voice Recorder
FDR	: Flight Data Recorder
IFR	: Instrument Flight Rule
AMO	: Aircraft Maintenance Organisation
MPI	: Mandatory Periodic Inspection
C of A	: Certificate of Airworthiness
C of R	: Certificate of Registration
CRS	: Certificate of Release to Service
CRMA	: Certificate Relating to Maintenance of an Aircraft
S/N	: Serial Number
TTSN	: Total Time Since New
TTSO	: Total Time Since Overhaul
ILS	: Instrument Landing System
VOR	: Very High Frequency Omnidirectional Radio Range
NDB	: Non-directional Radio Beacon
FALA	: Lanseria International Airport

FAPH	: Kruger Park Gateway Phalaborwa Airport
FAWB	: Wonderboom Airport
GPS	: Global Positioning System
RWY	: Runway
AGL	: Above Ground Level
AMSL	: Above Mean Sea Level
SAPS	: South African Police Services
SAR	: Search and Rescue
ft	: Feet
kts	: Knots
NM	: Nautical Miles
Ft/min	: Feet per minute
Km/h	: Kilometre per hour
Sec	: Seconds
MHz	: Megahertz
VHF	: Very High Frequency

1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1 On Thursday, 23 October 2008, a Beechcraft Baron 58 aircraft was flying from Lanseria Aerodrome (FALA) in Gauteng to Kruger Park Gateway Phalaborwa Aerodrome (FAPH) in Limpopo. The pilot was doing **"freelance,"** which was temporary piloting work for the owner of the aircraft on the day. The pilot and owner agreed that the pilot would fly four passengers (friends) of the owner to Phalaborwa. Before the aircraft could be flown by the pilot, it was refuelled to capacity and the owner first had to amend his insurance cover to include the personal details of the pilot. The process of amending the insurance took longer than was anticipated, and the aircraft departed from FALA later than the initial scheduled time. When all the insurance administrative issues were finally completed by the owner, the pilot, accompanied by the four passengers, departed from FALA at approximately 1430Z, under Instrument Flight Rules (IFR) by day to FAPH.

1.1.2 According to the initial (IFR) flight plan filed and information on the pilot's personal computer, the pilot departed from FALA en route to FAPH via Pinedene and Hoedspruit. The aircraft landed safely at FAPH after an uneventful flight of approximately 1.6 hours.

(See below attached the airspace map view of the track flown to FAPH.)

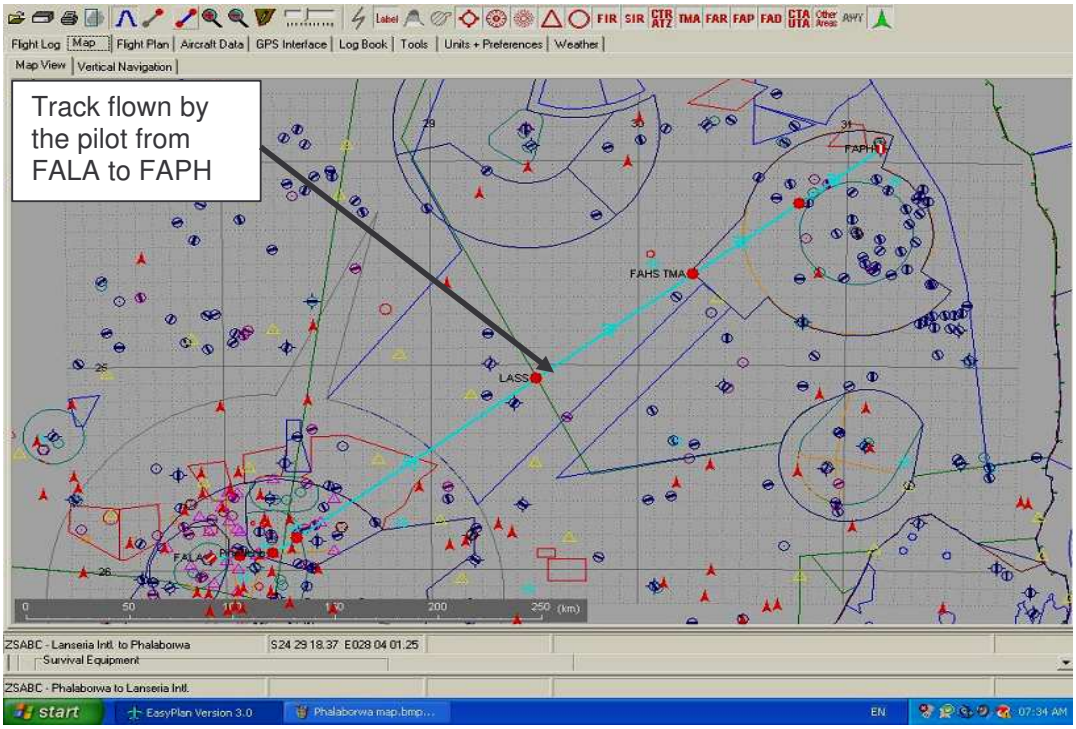


Figure 01, Flight Planning - showing flight information region/airspace map view from FALA to FAPH.

1.1.3 After a successful landing at the aerodrome, the pilot taxied the aircraft to the apron and shut down the engines. After the four passengers had disembarked from the aircraft, the pilot started to prepare the aircraft for the return flight to FALA. The aircraft still had sufficient fuel on board and no fuel was uplifted at FAPH.

1.1.4 According to the Airport Manager of FAPH, the arrival of the aircraft was not expected. Neither the pilot nor the owner of the aircraft had obtained prior landing approval from the aerodrome management as required in the prescribed time and days. As a result, no arrangements had been made to render services to the aircraft. The pilot was then required to pay a penalty (fine) before he was allowed to depart from FAPH.

1.1.5 According to the Global Positioning System (GPS) of the aircraft, as recovered on site, the pilot started the engines at 1641Z and taxied to the threshold of Runway 19. The pilot, who was the sole occupant of the aircraft, then took off in a southerly direction. The aircraft turned out to the right; and after take-off the pilot positioned the aircraft on a right-hand downwind, which suggested that his intention was to return to the aerodrome.

1.1.6 According to an eyewitness, during the downwind sector of the flight, the aircraft was positioned on the western side of the aerodrome, which was over the Central Business District (CBD) of Phalaborwa. A strange noise, which sounded like a “rough running engine” was heard coming from the aircraft. Whilst the aircraft was turning onto a right base leg, approximately 3 nautical miles (NM) from Runway 19, the aircraft entered into a right-hand turn which was in a slightly nose-down attitude. The aircraft then impacted with a tree, prior to impacting with the ground.

Location of Accident Site
GPS position: S23°54'20.48 E031°09'08.93
Elevation: 1532 feet
Distance from FAPB: 1.46 nm (2.73 km)

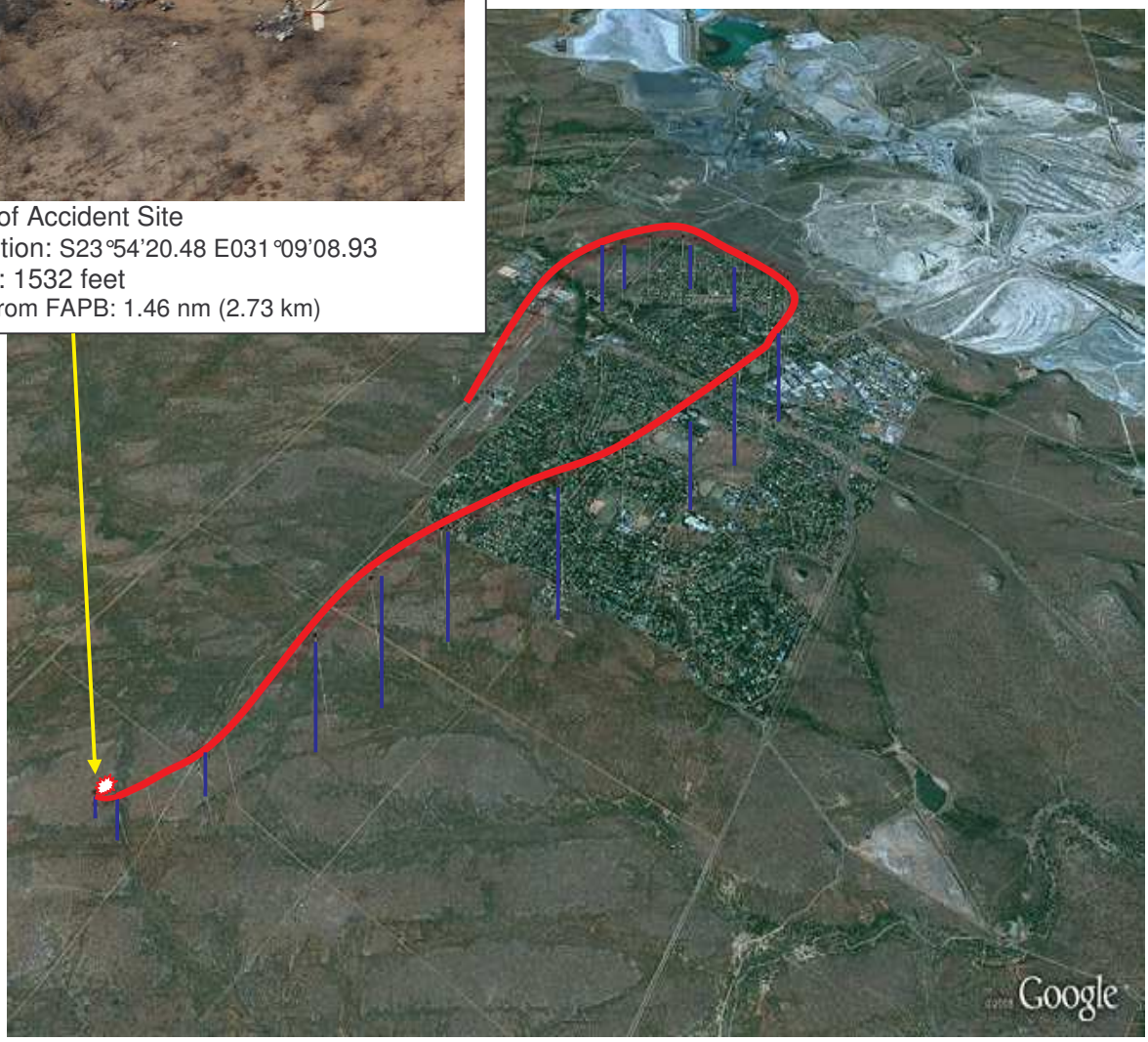


Figure 2 showing Flight Path Diagram.

1.1.7 Another eyewitness whom was standing at the aerodrome saw smoke rising from the northern side of the aerodrome. The airport manager had already left for home at the time, and a telephone call was made to inform him that there may have been an aircraft accident. A decision was made to initiate a ground and air search and rescue operation to the location of the smoke. The emergency services (fire-fighters) arrived at the scene and found the aircraft still burning. After the fire was extinguished, the emergency services started to search for the pilot inside and on the underside of the aircraft structures. It was already past sunset and the emergency personnel experienced some difficulty locating the pilot. Finally, when the body of the pilot was found in the aircraft wreckage, the search and rescue operation was stopped and the accident site was handed over to the South African Police Services (SAPS) to secure the wreckage for the investigation. The pilot had been fatally injured in the accident.

1.2 Injuries to Persons

Injuries	Pilot	Crew	Pass.	Other
Fatal	1	-	-	-
Serious	-	-	-	-
Minor	-	-	-	-
None	-	-	-	-

1.3 Damage to Aircraft

1.3.1 The aircraft was destroyed during the impact sequence and also by the post-impact fire that erupted.

Figure 3, showing the main wreckage.

1.4 Other Damage

1.4.1 There was minor fire damage to the vegetation (trees and grass).

1.5 Personnel Information

Nationality	South African	Gender	Male	Age	42
Licence Number	xxxxxxxxxxxx	Licence Type	Commercial		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Instructor Grade 2, Instrument & Night Rating				
Medical Expiry Date	31 July 2009				
Restrictions	None.				
Previous Accidents	None.				

Flying Experience:

Total Hours	1062.5
Total Past 90 Days	235.6
Total on Type Past 90 Days	1.3
Total on Type	1.3

1.5.1 The pilot's logbook was not located during the investigation. According to the available records (SACAA pilot file) the experience of the pilot was as reflected in above column.

Total Hours	1140.0
Total on Type	15.0
Total on Twin Aircraft	75.0

1.5.2 The flying hours reflected in the above column were received from the owner of the aircraft. According to the owner, the pilot provided him with the information about his flying hours, prior to the flight. The information was needed for the purpose of including his details on the insurance cover.

1.5.3 The pilot had completed a type conversion and the Beechcraft Baron 58 rating had been endorsed on his licence on 29 July 2008.

1.6 Aircraft Information

Airframe:

Type	Beechcraft Baron 58	
Serial Number	TH 1164	
Manufacturer	Raytheon Beechcraft	
Date of Manufacture	1980	
Total Airframe Hours (At time of Accident)	1923.15	
Last MPI (Date & Hours)	01 August 2008	1910.5
Hours since Last MPI	12.65	
C of A (Issue Date) (Expiry Date)	16 May 1991	15 May 2007
C of R (Issue Date) (Present owner)	16 March 1998 Gavil Air Services (Pty) Ltd.	
Operating Categories	Standard	

1.6.1 According to information found on the aircraft file, the aircraft was imported into the Republic of South Africa (RSA) from the United States of America (USA) on 17 April 1991 and entered on the South African Register. After a few years of operation, the aircraft was sold by its previous owner and a "change of ownership" application was submitted to the Regulator with subsequent registration in the name of the current owner. The current owner operated the aircraft privately in accordance with CAR, Part 91 in the General Aviation Sector (GA).

1.6.2 A requirement of CAR, Part 91 is that the owner of the aircraft must carry certain aircraft documentation on board the aircraft.. Due to the aircraft being destroyed by post-impact fire, it was not possible to do an inspection of the documents during the on-site investigation. When returning from the accident site, copies of the aircraft documentation were obtained from the Regulator and inspected to determine the validity. During the inspection process it was found that the Certificate of Airworthiness (C of A) had expired on 15 May 2007. According to the owner, there were consultations with the Regulator into the matter of the expired C of A, but before the problem could be finalised and the C of A reissued, the owner continued to operate the aircraft with the expired C of A.

1.6.3 The finding of the expired C of A resulted in an investigation into the responsibility of the owner to ensure that the aircraft is maintained and airworthy in accordance with the applicable regulations. The aircraft maintenance documentation (work packs) and logbooks (airframe, engines and propellers) were obtained from the Aircraft Maintenance Organisation (AMO) for inspection. During this inspection the following was identified:

(i) The aircraft was flown from FALA to Wonderboom Aerodrome (FAWB) on 28 July 2008, to the AMO for a Mandatory Periodic Inspection (MPI). The MPI was carried out over four days and a Certificate of Release to Service (CRS) was then issued on 01 August 2008.

(ii) According to the regulations, the aircraft is considered to be airworthy when it is serviceable and meets all the requirements prescribed for the issuing of a certificate of airworthiness, and when other requirements as have been prescribed for the continuing validity of such a certificate, have been complied with.

1.6.4 When the dates of the CRS issuance and expiry of the C of A were checked, it was found that the aircraft had been released to service during the time that the C of A had already expired. This scenario was in conflict with a statement contained in the CRS, which reads as follows: “The release to service validity is only current if the Certificate of Airworthiness has not expired”.

1.6.5 The compliance statement of the CRS was certified by the AMO, based on the fact that they were satisfied that the aircraft and all its equipment were in every way serviceable for flight and that all maintenance had been carried out in accordance with applicable regulations. To verify whether the AMO had complied with the regulations as indicated in the preceding sentence, other maintenance documentation such as the aircraft logbooks, were also inspected.

(i) It was found that after the MPI had been completed, entries were made in the logbooks to that effect. However, the entries had not been certified (signed out) by the AMO. The logbooks were not certified until approximately 60 days after the aircraft had been released to service. During this time, the logbooks were held by the AMO. The AMO explained that this was an omission and that it was the first time that something like this had happened.

(ii) Another factor regarding the logbooks was that they were still in the old format and referring to the Air Navigation Regulations (ANR). An Aeronautical Information Circular (AIC60.3) had been published wherein the Regulator informed the local aviation industry of the requirement to open new logbooks for their aircraft, using the new format logbooks.

1.6.6 More evidence was found of maintenance information (product removal and replacement record, modifications embodied and defect rectification record sections) and Certificates Relating to Maintenance of an Aircraft (CRMA) of which the entries were not entered or recorded in the logbooks. The non-inclusion of the identified information created an undesirable situation in that problems were encountered with the traceability of some of the parts and components fitted on the aircraft.

1.6.7 The modification of the aircraft by installing a STEC Autopilot System in the aircraft was an item which had not been entered in the airframe logbook. Incorporation of this modification only became known during an interview with the owner of the aircraft. During verification of this modification information, irregularities were found with the approval process and maintenance procedures that had been followed.

(i) According to the aircraft file, a modification application had been submitted to the Regulator for approval. The AMO did not wait for the approval to be granted and commenced with the autopilot installation. On completion of the installation, a CRMA was issued on 22 July 2008, certifying that the aircraft was in a serviceable condition. Throughout the process, there was no communication or an indication from the Regulator that the modification had been approved.

(ii) The owner had operated (flown) the aircraft until 30 September 2008 and had occasionally experienced problems with the autopilot. The relevant AMO had carried out additional maintenance on the autopilot of the aircraft and had issued CRMAs (dated 28 August 2008, 29 August 2008, 02 September 2008 and 13 October 2008) certifying that the problems had been rectified. Following the rectification of the autopilot, a “Post-Installation Test Flight Checklist” was completed to show that the aircraft had been tested. However, it was later found that the autopilot had been ground-tested only and considered to be serviceable (due to the FALA ILS being disabled).

(iii) According to the flight test checklist, the owner of the aircraft was identified as the pilot having conducted the test flight. However, the owner did not have a test pilot rating endorsed on his licence and was thus not authorized to conduct any test flying on the aircraft.

(iv) The Regulator only approved the autopilot modification on 14 October 2008.

1.6.8 The work pack of the aircraft was also inspected during the investigation. All the documentation and associated maintenance activities with which the AMO had to comply during the MPI were inspected. Maintenance performed and certified in the work pack, was not within the authorization as per the scope of work and privileges of the AMO Approval. It would appear that the aircraft had been released to service without the performance of an acceptance test flight.

1.6.9 According to the CARs, flight testing **"shall"** be carried out by the holder of an appropriate test pilot rating or a person whose experience is considered to be adequate for satisfactorily assessing the flight characteristics and performance of that particular aircraft. As indicated in the paragraphs above, there was no test flight carried out on the aircraft, implying that the flight characteristics and performance of the autopilot installation had not been assessed. The AMO still certified (signed out) the work pack, stating that they have complied with all relevant requirements specified in the CARs.

1.6.10 Fuel status:

According to available refuelling records, the aircraft was last refuelled at FALA on 23 October 2008. The fuel uplift was a total of 434 litres (114.65 US gallons) of Aviation Gasoline (Avgas) to fill the aircraft to capacity. The pilot did not uplift fuel at FAPH, as there was still sufficient fuel on board the aircraft on landing.

1.6.11 ngines

According to the aircraft file, the history of the engines' replacement is as follows:

When the aircraft was imported, it had engines with the following serial numbers (S/N) entered on the right-hand (R/H) side - S/N 571628 and left-hand (L/H) side - S/N 571645. Following a "wheels up" landing accident on 20 March 1996, engine: S/N 571628 had been removed and S/N 298711-R installed on 12 September 1997.

Engine: (Left-hand)

Type	Continental IO-520 CB
Serial Number	298711-R
Hours since New	1923.15
Hours since Overhaul	876.85

1.6.12 According to an Export Certificate of Airworthiness, dated 13 February 1996, the left-hand engine: S/N 298711-R was exported from the USA to RSA as a new product. After the engine had arrived in the country, it was installed on the aircraft on 12 September 1997. At the time of installation, the total time since new (TTSN) was identified as unknown. The implication was that the history of the engine from 13 February 1996 to 12 September 1997 (approximately 18 months) was not known or available.

(i) Due to the fact that the TTSN had been identified as unknown, the owner had obtained a letter, dated 23 September 1997, from the engine manufacturer which identified that the engine was a new product and that at the time of shipment it was considered to be airworthy. Subsequently, the information of the letter was then used as motivation to zero the time since overhaul (TSO).

1.6.13 It appears that during the last two MPIs (100 hour inspections) a recurring defect was reported with regard to an engine oil leak. The locations of the oil leak was from the engine crankshaft seal and rocker cover gaskets. The identified parts (seal and gaskets) were replaced with the aim to stop the oil from leaking.

1.6.14 Because the TTSN was unknown and the TSO zeroed, the engine had not reached the overhaul time interval in respect of the hours operated since overhaul and since new. According to the manufacturer, the engine is required to be overhauled either at 1700 hours or at 12 years interval. It appears the engine had been operated over the 12 years' interval without being overhauled, notwithstanding AIC 61.7 which states that; "Engines installed in aircraft for which a C of A was issued to operate in Category (f) (Private Operation Category), are exempted from mandatory engine overhauls, and shall be overhauled at such times as are found necessary, save that all Mandatory Service Bulletins and Airworthiness Directives shall be implemented as directed"; CARs do still require that owners should comply with the manufacturer's requirements.

Engine: (Right-hand)

Type	Continental IO-520 CB
Serial Number	571645
Hours since New	1923.15
Hours since Overhaul	1746.85

1.6.15 The right-hand engine: S/N 571645 was removed and taken to an Engine Maintenance Facility on 19 January 2006 for an overhaul and the accessory components of the engine were also removed for inspection. After the overhaul was completed, the engine was installed on the aircraft again on 12 June 2006. As indicated above, according to the engine service information, the model: IO-520 CB was required to be overhauled when it reached 1700 hours in operation. However, the engine was only overhauled at 1734.7 hours.

1.6.16 There was an issue raised about a strange noise from the aircraft, which sounded like **"rough running"** engine/s. In an effort to eliminate the probability of a mechanical failure experienced in flight, the engines and propellers were removed from the wreckage and recovered to an AMO for the purpose of conducting a teardown examination.

Propeller: (Left-hand)

Type	Hartzell PHC-J3YF-2UF
Serial Number	ED 2453
Hours since New	1923.15
Hours since Overhaul	117.3

Propeller: (Right-hand)

Type	Hartzell PHC-J3YF-2UF
Serial Number	ED 2452
Hours since New	1923.15
Hours since Overhaul	117.3

1.7 Meteorological Information

1.7.1 The meteorological information for the time and place was obtained from the South African Weather Service.

Wind direction	160° TN	Wind speed	07 kts	Visibility	10 km
Temperature	20°C	Cloud cover	SCT at 2000 ft	Cloud base	3000 ft
Dew point	11°C				

1.8 Aids to Navigation

1.8.1 The navigation and landing aids on Runway 19 at FAPH were as follows:

(i) Very high frequency omni-directional radio range (VOR), frequency 115.3 MHz.

(ii) Non-directional radio beacon (NDB) - PW: frequency 272 kHz.

(iii) Runway centrelines and identification markings.

(iv) The above identified navigation and landing aids were in a good condition and were serviceable.

1.8.2 According to the equipment list, the aircraft had standard navigation equipment installed as well as other additional navigation equipment as approved by the Regulator.

1.8.3 The Global Positioning System (Garmin GPS 296 Unit ID 3017080015) of the aircraft was recovered from the accident site. During the testing of the GPS, it was found that the unit had been set up with track logging in the Wrap mode, which was on the latest track, No 037. Using a MapSource program, it was possible to download and reproduce the track of the flight. (Refer to figure 4 below.)

1.8.4 The track was plotted on a picture showing the pattern of the circuit. According to the track log, the pilot took off from RWY 19 in a southerly direction and then entered a climbing turn when it reached the altitude 606 metres. Thereafter the aircraft turned to the right through less than 90 degrees into the crosswind leg, reaching 656 metres before starting to turn downwind. After turning into the downwind, the aircraft started losing altitude from 776 metres, with a slight change in direction towards the runway centre line and tightening the turn even further onto the base leg. The aircraft made very tight base leg turn with an increase in the rate

of descent and thereafter impacted with terrain.

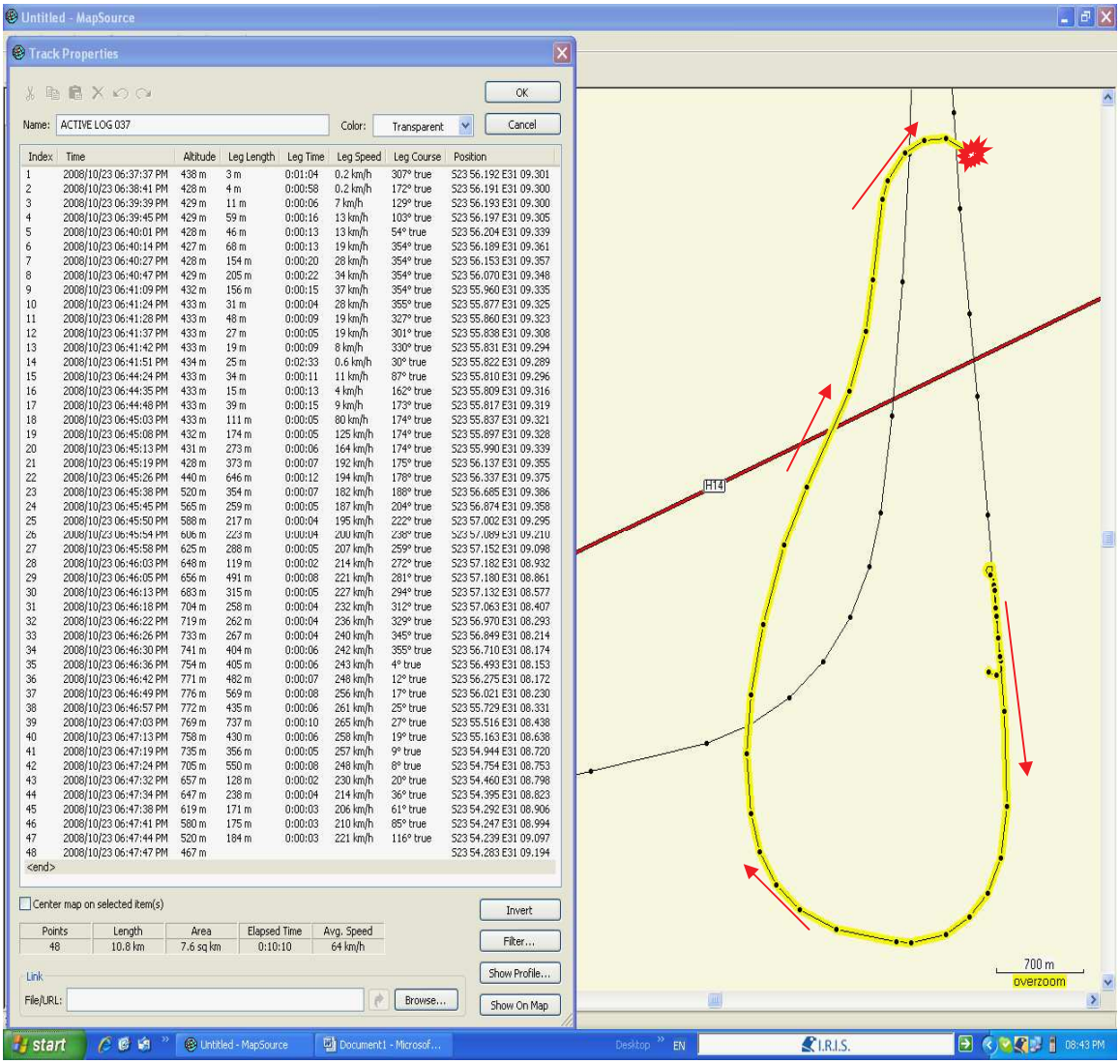


Figure 4, showing the track log of the right-hand circuit flown at FAPH.

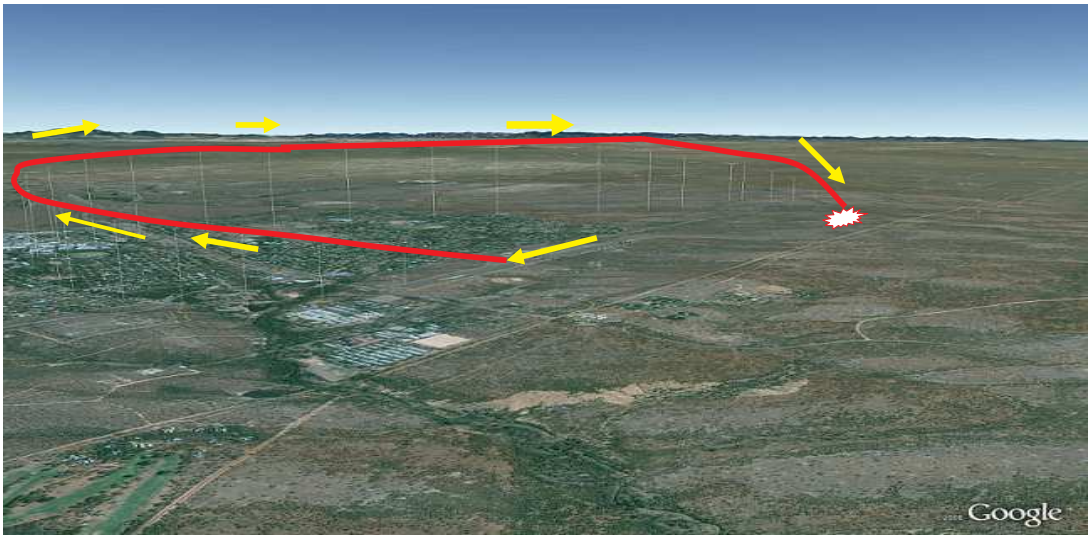


Figure 5, showing a different view and representation of the last track flown around the aerodrome.

1.8.5 The circuit flown by the pilot deviated significantly from that of a normally flown circuit, which is within a specific pattern around an aerodrome. A circuit normally consists of the following flight phases: Take-off, climbing turn, crosswind leg, downwind leg, base leg and final approach to the RWY for landing. During the take-off phase, the aircraft maintains the projected departure centreline heading and climbs up to the point when it starts turning into the crosswind leg. The crosswind shall be so that a 90 degree track is maintained with the runway until the turn into the downwind leg. The downwind leg is normally parallel to the runway but in the opposite direction to the take-off. At the end of the downwind leg, the aircraft turns into the base leg and final approach to the RWY.

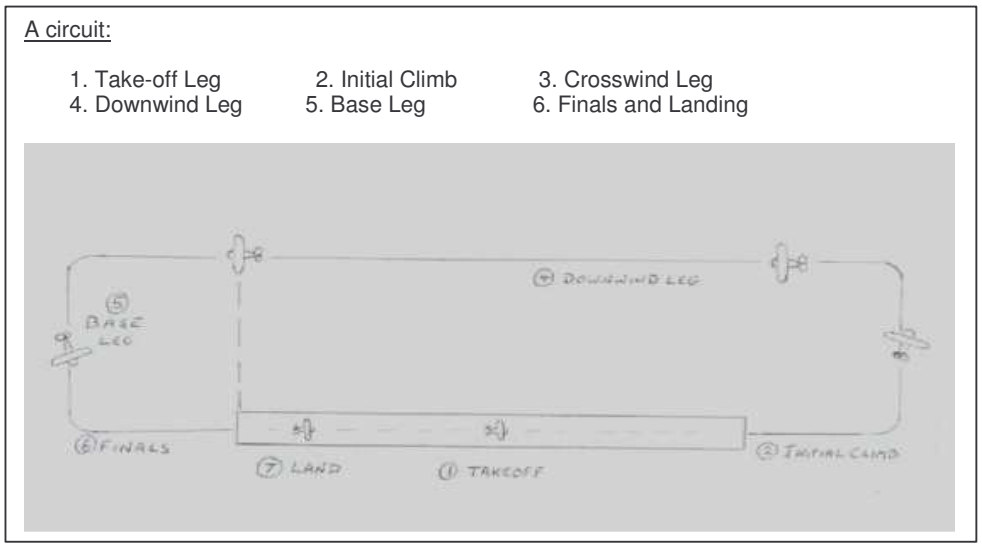


Fig 6. A normal circuit pattern.

The actual circuit flown by the pilot, indicating that the aircraft was flying in the downwind leg not parallel to the RWY, but cutting into the circuit towards the RWY centreline.

1.9 Communications

1.9.1 The Kruger Park Gateway Phalaborwa Aerodrome (FAPH) is an unmanned aerodrome. There is no Air Traffic Control (ATC) service available at the aerodrome. The only communication facility available was a radio on frequency 130.7 MHz, which belonged to an operator at the aerodrome. The radio is kept in the airport manager's office. The radio is used mainly for broadcasts between the airport manager, operators and their aircraft. The aerodrome management advises pilots to broadcast on 124.8 MHz and to comply with unmanned aerodrome procedures. All aircraft routing to and from FAPH (below 6000 ft) must contact Lowveld Flight Information Service (LASS FIS) on frequency 119.0 MHz at the start with flight details to arrange inbound clearance from FAHS Approach. When LASS FIS was contacted in the investigation, requesting if they had received any communication from the pilot, their response was that the pilot had not contacted the tower. There is also no record of communication between the pilot and regional control towers such as Kruger Mpumalanga International Airport (KMIA).

1.9.2 According to the equipment list, the aircraft was equipped with Collins 251 VHF radio equipment. There were no defects recorded against the radio equipment and it was considered to be in a serviceable condition.

1.9.3 According to the wife of the pilot, he had called her prior to the take-off from FAPH and left a voice message, informing her that he was returning home. The pilot did not mention anything about a defect or any problems that he had encountered with the aircraft during the flight.

1.10 Aerodrome Information

Aerodrome Location	Phalaborwa Aerodrome - FAPH	
Aerodrome Co-ordinates	S 23°5609.88 E 031°0918.34	
Aerodrome Elevation	1432 feet	
Runway Designations	01/19	
Runway Dimensions	1369 m x 18 m	
Runway Used	19	
Runway Surface	ASPHALT	
Approach Facilities	VOR & NDB	

1.10.1 The aerodrome is certified as a “private use aerodrome” and all visiting aircraft need to first submit an application, requesting permission to land from the airport manager. If an application is received, special arrangements will then be made for the arriving aircraft. According to the AIP, any visiting aircraft to FAPH must obtain landing approval at least 72 hours or 3 working days in advance before arrival. The aerodrome management was surprised to see the aircraft landing, as no application had been received nor given for the use of the aerodrome. As a result,no prior preparations had been made to render services to the aircraft. It is possible that the pilot thought that the owner would take care of the administrative issues regarding the flight. However, the result was that neither of the two had made the required arrangements. When the aircraft landed at FAPH, the Management of the aerodrome decided to act against the pilot and gave him a penalty (fine).

1.10.2 According to the Aeronautical Information Publication (AIP), the aerodrome does not have aircraft handling services or facilities available. The Rescue and Fire-Fighting Services are available only if a request is made. There was no record indicating that the pilot requested assistance from the Rescue and Fire-Fighting Services.

1.10.3 The official operating hours of the aerodrome are 0400Z to 1600Z daily. There was another aircraft coming in later that night on a scheduled flight. But at the specified time, the accident aircraft was the last to depart from the aerodrome. The aircraft took off at 1645Z; 45 minutes after the normal operating hours of the aerodrome. The employees of the aerodrome were ready to leave for home and they were waiting for the aircraft to take off.

1.10.4 According to the AIP, due to blasting at the open–cast mine south-west of the aerodrome, circuits are to be flown on the eastern side i.e. right-hand side of Runway 01 and left side for Runway 19. The circuit altitude at the aerodrome is 2500 feet. An aircraft departing from Runway 19 should proceed in a westerly direction and maintain runway heading for a minimum of 3 nautical miles (NM) before turning right. The pilot took off from Runway 19, however, before reaching the minimum of 3 nautical miles (NM), he entered a climbing turn to the right into the crosswind and downwind leg.

1.10.5 To determine the light conditions when the aircraft was flown, sunset was at 16:04Z and moonrise at 01:41on the day of the accident, according to information obtained from the weather services. Taking into account the time at which the aircraft took off, 1645Z, in relation to the time of sunset, the indication is that the pilot was operating the aircraft in night-time conditions. Due to this fact, the operation of the runway lights would have played a very significant role.

1.10.6 According to the AIP, the runway lighting at FAPH is available during the aerodrome operating hours and on request. There is no way to switch on the RWY lighting by remote. The only way to switch on the RWY lights was if someone from the aerodrome did it.

1.10.7 An eyewitness was interviewed and asked about the status (on or off) of the runway lights during the time that the aircraft took off. According to the eyewitness, the runway lights were switched off after the aircraft took off. Additionally, the Airports Manager was also asked about the lights and he stated that at the time when the aircraft was flying over FAPH, he called the aerodrome and gave instructions that the runway lights should be switched on. It is not known whether the runway lights were switched on fast enough to provide sufficient time for the pilot to have had visual reference to the runway.

1.11 Flight Recorders

1.11.1 The aircraft was not fitted with a Cockpit Voice Recorder (CVR) or a Flight Data Recorder (FDR) and neither was required by regulations to be fitted to this type of aircraft.

1.12 Wreckage and Impact Information

1.12.1 The location of the wreckage was at GPS reading S23°54.354 E031°09.235 which was in the veldt on the northern side of FAPH.

1.12.2 During the on-site investigation, the accident site and wreckage were examined to determine if there was any structural failure that could have attributed to the cause of the accident. According to the wreckage and ground impact marks, it is evident that the aircraft impacted with the ground in a nose pitched-down attitude and at a fairly high velocity. The degree of break-up and destruction of the wreckage gave a clear indication of the impact sequence. The impact information indicates that the aircraft rolled into what is believed to be the beginning of a spiral and ended up in an inverted position when it impacted with the ground. The aircraft bounced three times before coming to a stop. In the process of bouncing, there were parts and components separated from the aircraft.

1.12.3 Information of the wreckage was used to draw an impact sequence diagram. Attached below is a diagram (Figure 7) as a representation of the impact sequence of the aircraft.

(i) The diagram shows the attitude in which the aircraft collided with the tree. The indications are that the left-hand side engine was operating with the right-hand side engine feathered. At some point in the right-hand turn it appears as if the aircraft became inverted with a nose-down attitude.

1.12.4 The wreckage was spread out in a straight line over an area of approximately 100 metres.

Fuselage and Wings

(i) Prior to impact the aircraft entered into a banked turn towards the right, where the outer wing (left-hand) was raised higher than the inner wing (right-hand). The right-hand wing collided with a tree, which resulted in a portion (wingtip - approximately 1 metre long) separating from the wing. The aircraft impacted with the ground in a nose-down attitude with high velocity. The detached piece of wing structure remained entangled in the tree, which was approximately 4 metres above the ground.

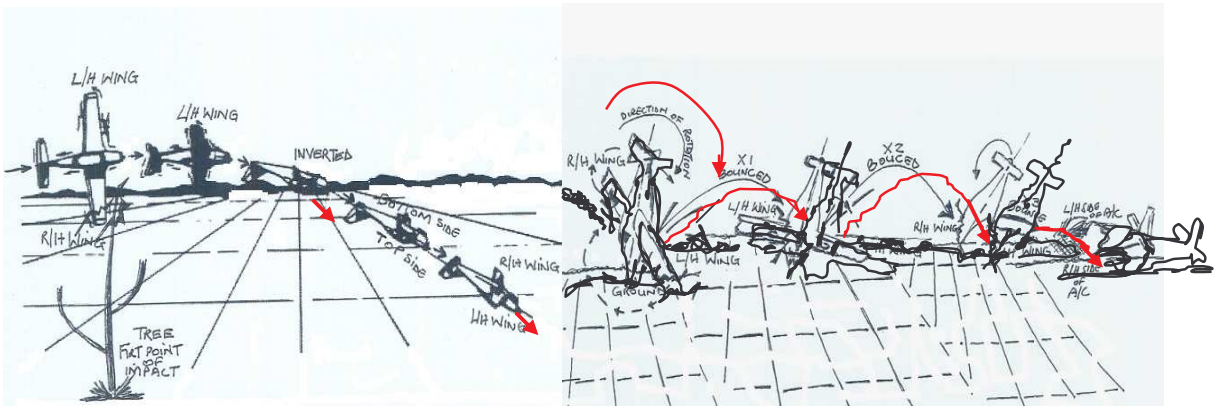


Figure 7 Impact sequence of the aircraft.

Figure 8, showing the location of first point of impact – right-hand (R/H) side wingtip.

Figure 9, showing the wreckage, destroyed by the impact and post-impact fire

(ii) After impacting with the tree, the aircraft continued forward for approximately 20 m and the nose section of the aircraft then impacted with the ground with major impact damage. The nose cone panels were destroyed and the navigation components located in the nose cone separated from the aircraft. The aircraft bounced approximately 17 m and the left-hand wing struck the ground and a portion of the left outer wing (approximately 1 m long) separated from the wing. The aircraft bounced a second time for approximately 15 m and the right-hand wing broke off. The aircraft bounced approximately 48 m for a third time and the main wreckage ended up facing in the opposite direction to RWY 19. The empennage and tail section of the aircraft did not sustain impact or fire damage. This implies that the tail section was pivoting around the nose of the aircraft.

Landing Gear

I. It is evident that the aircraft was as yet not in a landing configuration when it impacted with the ground as the landing gear assembly (struts) were found in the retracted and in a folded position in the wheel bays. The left-hand main wheel, however, separated from the rest of the gear assembly during the impact.

Engines

II. The two engines separated from the aircraft on impact. The left-hand engine was found approximately 40 metres from the main wreckage and in close proximity to the right-hand wing. The location of the right-hand engine was next to the main wreckage. Both engines sustained major impact and fire damage.

L/H Engine S/N 298711-R

R/H Engine S/N 571645

Propellers

III. The left-hand propeller separated from the engine and was located to the left side of the wreckage and approximately 30 metres away from the location of the right-hand wing. The left-hand propeller did not sustain fire damage, which is an indication that the propeller probably separated from the engine attachment before the fire started. The left-hand propeller was not feathered and sustained major impact damage.

IV. Stains of oil spillage on the hub and blades were evident on the left-hand propeller. When the propeller was examined to find the source of the oil leak, the propeller hub was found to be intact, which indicated that the oil was not leaking from the propeller. Further investigation revealed that the oil found on the propeller was from the left-hand engine. The possibility exists that the source of the oil was the result of a recurring defect of the crankshaft seal and/or rocker covers gaskets.

V. The right-hand propeller was still attached to the right-hand engine. The three blades of the propeller were examined during the on-site investigation. The blades sustained major bending and fire damage. The initial indication was that the blades were feathered at the time of impacted with the ground.

1.13 Medical and Pathological Information

1.13.1 The medico-legal post-mortem examination of the pilot was performed by Forensic Pathology Services on 27 October 2008. The result of the post-mortem report was that the cause of death was multiple injuries.

1.14 Fire

1.14.1 The aircraft was destroyed by the post-impact fire.

1.15 Survival Aspects

1.15.1 The pilot was fatally injured in the accident and the accident is categorized as not being survivable. The aircraft started to break up after it collided with the tree and during the subsequent ground impact. The cockpit and cabin area was completely destroyed by the impact and post-impact fire damage.

1.15.2 The exact location of the wreckage was not immediately known, therefore the Phalaborwa Municipal Fire Department made a request at approximately 1720Z for a helicopter to help in the search. The helicopter pilot located the wreckage at approximately 1725Z and circled above the accident site, whereafter all the rescue personnel responded to the identified location.

1.15.3 When the ground rescue team and emergency services arrived at the crash site at approximately 1740Z, the aircraft was still burning and the Fire Department started to extinguish the fire. At approximately 1742Z the fire was extinguished and they started with the search for the pilot. The aircraft had broken in pieces and its structures were destroyed. It was already dark and the search for the pilot was hampered. At 1744Z, the body of the pilot was found trapped inside the wreckage.

1.15.4 The Aeronautical Search and Rescue Centre (RCC) was not involved in the search and rescue operation. RCC only received information of the accident when the family enquired about the aircraft.

1.15.5 The pilot had submitted a flight plan to FALA ATC for the flights to and from FAPH. The pilot had filed the flight plan, knowing that he would be flying in controlled or advisory airspace and for the purpose of alerting search and rescue action, if required. This implies that search and rescue action would be instituted

automatically in the event of a missed position report while the aircraft is flying within controlled airspace or in the event of non-arrival at destination. According to the flight plan, for the flight to FAPH the pilot was required to cancel the search and rescue action within an hour after the estimated time of arrival at the destination. For the return flight to FALA, the flight plan indicated SAR Normal because the flight was bound for a licensed aerodrome with an operational ATC.

1.15.6 It would appear that the FALA ATC was not aware that the aircraft had been involved in an accident. There was proof found indicating that the flight plan filed before departure would not have been activated unless a time of departure had been received by the ATC. When departing from an aerodrome where an ATC is in operation, it may be assumed that the flight plan will be activated by that ACT. Conversely, when departing from an aerodrome where an ATC is not in operation, the pilot must ensure that the ATC at his intended destination receives the actual time of departure.

1.16 Tests and Research:

1.16.1 Propeller Teardown Investigation

On Wednesday, 06 November 2008, two propellers: Model PHC-J3YF-2UF/FC7663-2R with S/N ED 2452 and ED 2453 were recovered and taken to a South African approved Aircraft Maintenance Organisation (AMO) at Lanseria Aerodrome for examination. Both propellers were then disassembled and the following observations were noted.

1.16.1.1 Right-hand Propeller

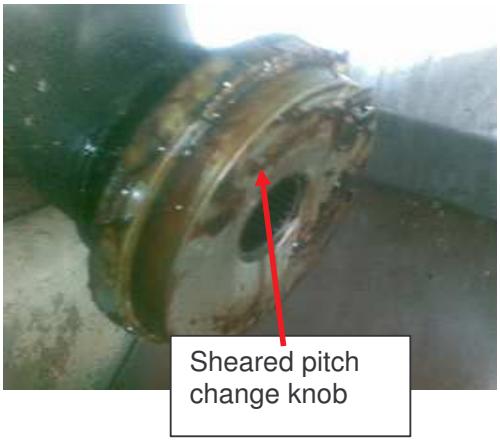
(i) The Propeller S/N ED 2452 (Blades S/N E 66154; E66108; E66092) ***fitted on the right-hand engine*** of the aircraft showed that two of the propeller blades were bent backwards towards the engine, and were stationary at the moment of impact with the ground. The start latches were engaged, suggesting that the engine had stopped "shut down" normally.

Right-hand propeller: S/N ED 2452

(ii) The examination of the right-hand propeller also indicated that as the affected engine slowed down, the propeller governor allowed oil

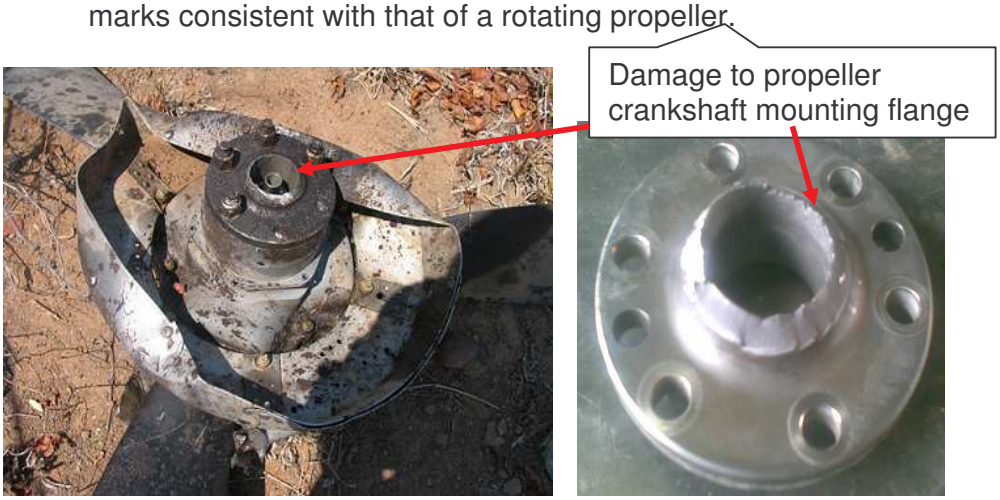
pressure into the propeller cylinder, thus pushing the piston to fine pitch position. This would have also caused the start latch sleeve to migrate past the spring loaded latches. As the prop speed decreased to below 800 r.p.m, the latch spring overcame the centrifugal force acting on the latches and allowed them to move to engage the latch sleeve.

(iii) The internal damage caused to the propeller hub unit was minimal, but two of the blades pitch change knobs were found to be sheared off.

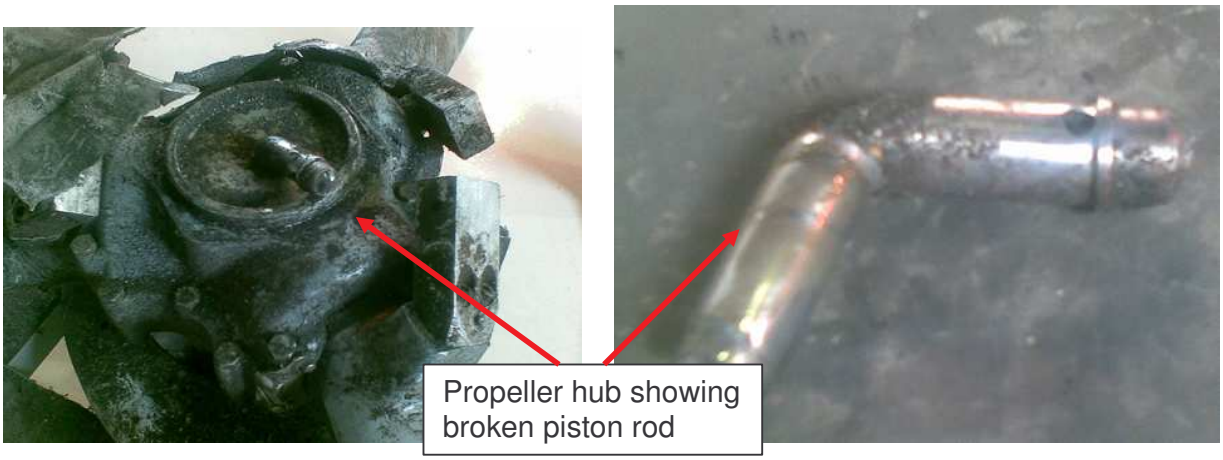


1.16.1.2 Left-hand Propeller

(i) The Propeller S/N ED 2453 (Blades S/N E 59373; E59871; E59578) that was ***fitted to the left-hand engine*** indicated a high level of energy output at the moment of impact. The propeller crankshaft's mounting flange had broken off and was still attached to the propeller. The cylinder and piston were missing. The piston rod had broken off just forward of the pitch change rod shoulder and bent almost ninety degrees and approximately 1.50 inches aft of the oil hole. The rear hub half was cracked on the leading edge side of a blade port, indicating that the particular blade had impacted with the ground at a high r.p.m and power setting. All three blades had transverse scratch marks consistent with that of a rotating propeller.



L/H Propeller: S/N ED 2453



1.16.2 Propeller blade S/N E 59871 was damaged and slightly curved at the 6 inch station in the plane of rotation. The pre-load shelves of the three blades ports on the rear hub were also damaged. This implied that the blades had impacted with the ground at a high r.p.m and/or power setting.

L/H propeller blade; Note scratches and slight curve in the plane of rotation, at the 6 inch station.

1.16.1.3 Conclusion of Propeller Investigation:

In conclusion, it appears that the right-hand propeller (S/N ED 2452) was stationary at the time of impact, as evidenced by the nature of the damage caused to the propeller whilst the left-hand propeller (S/N ED 2453) was at maximum power at the moment of impact.

1.16.2 Engine Teardown Investigation:

During the on-site investigation, indications were that the right-hand engine was not operating at full power when the aircraft impacted with the ground. To determine what may have caused this, the engines, Model IO-520-CB, S/N 571645 and 298711-R were recovered from the accident site and were taken to an AMO for an engine teardown and examination inspection.

1.16.2.1 Examination of Right-hand Engine:

(i) The engine accessories of the right-hand engine (S/N 571645) sustained major impact and fire damage. Due to the extent of the damage, it was not possible to conduct any further tests on these accessory components.

(ii) Prior to the disassembly of the engine, some mechanical problems were identified. The six cylinders were removed from the crankcase and all cylinders were intact, but damaged by the fire. During the disassembly of the pistons from the cylinders, the only difficulty experienced was with the removal of the #6 piston. It appeared as if the piston seized in the bore of the cylinder. The most appropriate method used to remove the #6 piston was by removing the big-end bearing cap and separating it from the crankshaft. The #5 piston showed melting of the piston skirt, but without any scoring, which normally accompanies seizure in operation.

(iii) Both engine fuel systems were reduced to ashes in the post-impact fire. It was also not possible to determine if any of the components in the engine fuel system had become defective or were not functioning correctly.

Photo showing damage caused to #5 piston.

Photo showing the crankshaft as examined.

(iv) The crankshaft and connecting rods were also examined and the damage caused to the crankshaft was determined to be the result of the fire. The crankshaft main bearing journals showed no signs of scoring or abnormal wear. There was oxidation of the surface of the #7 main bearing journal and minor scoring. The internal surface of both crankcase halves displayed evidence of oil.

(v) All eight crankcase thru bolts were still intact. During the disassembly it was found that several of the thru bolt nuts were not properly fastened or torqued and others were cracked open.

(vi) During the on-site investigation and later in the engine teardown examination, it was established that some of the engine crankcase thru bolts nuts had failed. The result was that the thru bolts had pulled to the opposite side of the crankcase.

(vii) The situation was brought to the attention of the engine manufacturer, with the objective of obtaining some clarity as to the cause of the thru bolts nut failures. The engine manufacturer was of the opinion that the nuts may have failed as a result of the heat of the fire. However, in an Airworthiness Bulletin (AWB 85-011) cases of engine thru-bolts and cylinder tie down nuts failures, following installation on engines, are quoted.

(viii) These failures typically happened after an overhaul, but could also occur in new engines received from the manufacturer. According to the AWB, in-flight failure of such items of hardware may well result in engine failure and a serious accident. In most cases, such a failure can be attributed to improper heat treatment during manufacture or following local re-plating processes.

(ix) In the process of eliminating relevant different scenarios, the engine overhaul facility was requested to provide records that would verify that the thru-bolts and nuts found on the engine were new parts and had not been subjected to an improper heat treatment process as referred to in the AWB. The engine overhaul facility provided documentation, but in the form of a purchase requisition and certificate of conformity. Indications were that the thru bolts and nuts purchased were all new items. However, the possibility does exist that these new parts (nuts) may not have been installed on this engine, but used on other engines.

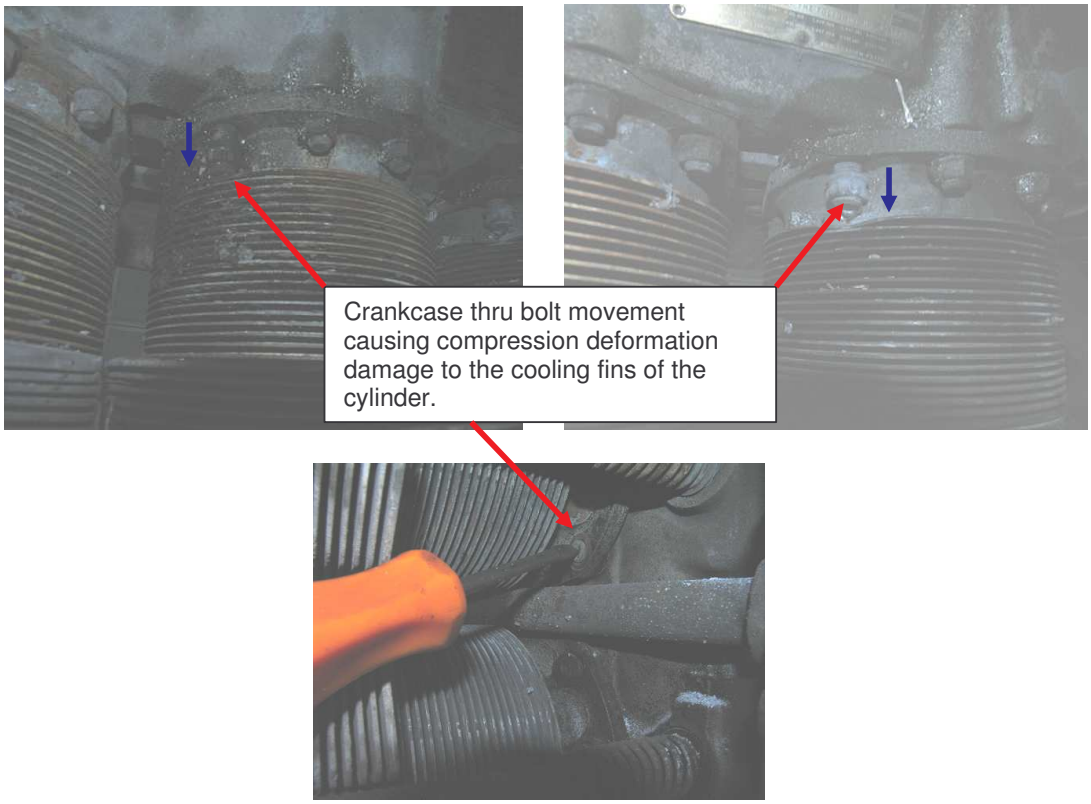


Fig 9 Pulled crankcase thru bolt.

(See below the photographic evidence of fractured thru-bolt nuts found in the investigation)

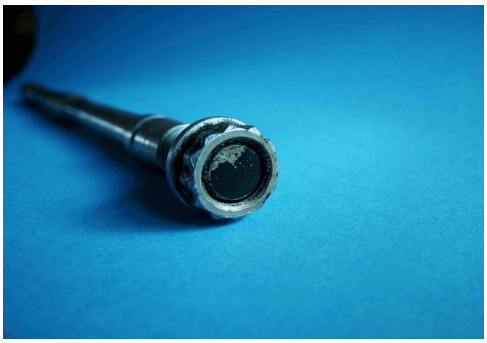


Photo showing positioning of nut on crankcase thru bolt during disassembly

Photo showing cracked Crankcase thru bolt nuts.

(x) Other bolts and nuts that were not properly fastened were also found on the engine. The relevant overhaul facility could not give an explanation as to these maintenance problems identified in the teardown inspection.

1.16.2.2 Examination of Left-hand Engine:

(i) The left-hand engine: S/N 298711 - R was also examined during the teardown inspection. Again, it was not possible to conduct tests on the accessory components, due to the extent of the fire damage. After the engine was disassembled, all the parts and components were examined for evidence of mechanical failure. None were identified.

(ii) The source of the oil leak onto the propeller was found to originate from the location of the crankshaft seal, which is where the propeller is mounted.

1.16. 3 Metallurgical Examination:

Metallurgical examinations were also conducted on the parts and components of the engines. The conclusion of the metallurgical report was the following:

No evidence of any mechanical failure could be found within the remains of the engine. However, a possible failure of the fuel system cannot be eliminated, since the components and parts were destroyed. A failure of the ignition system is considered most unlikely, since it would require the simultaneous failure of two independent systems, both of which are known to be robust and generally reliable.

1.17 Organisational and Management Information

1.17.1 Kruger Park Gateway (Phalaborwa) FAPH had a valid Aerodrome Licence.

1.17.2 The aircraft was maintained by a South African Approved AMO. The AMO had a valid AMO Approval Certificate. The aircraft and engine types were included on the AMO Approval Certificate.

1.17.3 It would appear as if the members of the AMO Management had acted in contravention of their own approved Manual of Procedure and related Civil Aviation Regulations when they certified the Release to Service (CRS) of the aircraft. This assertion is based on the following:

(i) The logbooks were in a poor state and important maintenance information was excluded. The status of the maintenance documentation was a cause for concern to the investigators.
(ii) The CRS was certified whilst the AMO was aware of the fact that the CoA had expired and this appeared to be a recurring event at the AMO.
(iii) The impression was that the AMO management was experiencing a problem in ensuring that proper and effective control measures were being implemented to prevent problems of this nature.

1.17.4 The aircraft was last physically inspected by the SACAA inspectors after it had been involved in a landing accident. Thereafter the SACAA based reissuance of the CoA on the documentation (Inspection Reports) which the AMO had submitted. The same applied as to the approval of the autopilot modification. However, it appears that after the SACAA had received the modification application, processing of the approval was delayed. By the time that the application was finally approved, the autopilot had been installed and the aircraft released to service. It would appear that the relevant department had not complied with their own internal procedures in processing the modification approval.

1.17.5 The aircraft was flown with an expired CoA. A copy of the CRS was forwarded to the SACAA after the MPI was carried out and this was accepted, filed and the aircraft continued flying, although the CRS had stamped on it a directive which proclaimed that it was invalid if the CoA had expired. The SACAA was aware of the situation, but the Authority did not stop the owner from flying the aircraft.

1.17.6 As the TTSN of the left-hand engine was unknown, the owner submitted a copy of a letter to the SACAA as proof that the engine was imported as new. The letter was then used as the basis for the owner to zero the TSO. The SACAA appears not to have a procedure available with the necessary guidance information to assist staff in assessing the validity thereof.

1.17.7 The right-hand engine had reached the 12-year overhaul inspection interval. But due to the TTNS being identified as unknown and subsequently TSO zeroed, the engine was not subjected to an overhaul inspection. According to an AIC published, the CCA exempted owners from complying with the manufacturer overhaul requirements.

1.18 Additional Information

1.18.1 The following GPS data information was used to determine the last or final leg of the flight (points 37 to 48):

Points	Speed between points		Altitude		Time between points	Course between points	Estimated Rate of Descent
	km/h	kts	m	ft	Sec.		Ft/min
37	256	138	776	2545	8	17° turn	97
38	261	141	772	2532	6	25° turn	60
39	265	143	769	2522	10	27° turn	216
40	258	139	758	2486	6	19° turn	740
41	257	139	735	2410	5	9° turn	2940
42	248	134	705	2312	8	8° turn	1178
43	230	124	657	2155	2	20° turn	990
44	214	116	647	2122	4	36° turn	1380
45	206	111	619	2030	3	64° turn	2560
46	218	113	580	1902	3	85° turn	3920
47	221	119	520	1902	3	116° turn	3488
48	0	0	467	1532	3		0

At point 37 the aircraft commenced with an increasing rate of descent from an altitude of approximately 2545 feet. The aircraft took only approximately 1 minute (60 seconds) from the start of this descent before it eventually impacted with the ground.

1.18.2 Multi-Engine Operation:

1.18.1.1 Banking of an aircraft in flight:

Both control and performance are critical during aircraft operations. If the pilot happens to experience an engine failure, a quick decision needs to be made in order to have a safe landing. It is sometimes hard to detect which engine has failed and this requires that the pilot maintains the blue line speed.

If any one of the two engines fails or stops, and if the pilot banks towards the engine which is still operating, the horizontal component of the lift vector will tend to oppose the yawing attitude of the aircraft into the dead engine. If the pilot decides to increase the bank angle into the engine that is operating, he will also increase the horizontal component of lift, thus reducing the need for rudder input. However, as the pilot banks the aircraft, the vertical component of lift decreases and the aircraft will descend. However, excessive banking will degrade the performance of the aircraft, which usually contributes in a situation where the pilot is having control problems. In the case of the Beechcraft Baron, failure of the left engine would present the most critical situation.

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2. ANALYSIS

2.1 The owner of the aircraft approached the pilot with a proposal to fly his aircraft with four of his friends on his behalf from FALA to FAPH. This was to be on what is generally known as a “freelance” temporary piloting arrangement. However, before the pilot could fly the aircraft, the owner first had to notify his insurance of the situation and ensure that the personal details of the pilot on the insurance were included in the insurance policy. After amendment of the insurance policy, the pilot departed from FALA to FAPH per his filed flight plan. According to the owner of the aircraft, the pilot and passengers were engaged on a private flight. This kind of flight is normally considered not to be for commercial purposes, and there is no requirement for the issuance of any tickets.

2.2 The pilot had started his aviation career by flying light aircraft in the General Aviation (GA) Sector. The pilot held a valid commercial pilot’s licence (CPL) and medical certificate with no waivers. He was successful in completing his theoretical, technical and pilot training. There were different aircraft types endorsed on his licence, including the Beechcraft Baron 58. The pilot did not have extensive flying experience on twin engine aircraft or on type.

2.3 The flight was considered to be uneventful and no defect, system malfunctioning or emergencies were reported by the pilot during the flight. The passengers disembarked from the aircraft after landing on runway 19 at FAPH and left the aerodrome. However, the pilot had to pay a fine for landing at FAPH without prior permission.

2.3 When ready to depart again, the pilot conducted a between-flight inspection and prepared the aircraft for the return flight to FALA. The pilot completed the inspection and did not report anything in respect of any problems to the people at the aerodrome. When ready for departure, the pilot taxied to the threshold of Runway 19 for the takeoff. A witness (employee) at the aerodrome saw the aircraft taking off and turning to the right during the climb out. This he found unusual, as most aircraft will usually climb out for a much longer period before turning to the right.

2.4 The GPS recovered data indicated that shortly after takeoff, the pilot positioned the aircraft on a right-hand circuit on the western (right) side of the aerodrome, which was a clear deviation from what would be expected. The aircraft should have continued maintaining the runway heading for at least 3 nm and only thereafter have altered the heading in a south-westerly direction for direct routing to FALA. It appeared that the pilot intended to fly a right-hand circuit and land back on runway 19. However, after approximately 1.46 nautical miles on the downwind sector, the aircraft turned right onto base leg. During the base leg sector of the flight, the aircraft impacted with terrain.

2.5 According to the AIP, this was not the correct thing to do. Aircraft operators are advised to do circuits on the left side of Runway 19.There must have been a reason for the pilot to return back to the aerodrome. It is possible that the pilot found it necessary to deviate from compliance with the 3nm runway heading requirement due to an emergency occurring with the aircraft and that he elected to return to the aerodrome. However, as FAPH is unmanned there was no ATC that any problems could be reported to; if he had in fact made any blind transmissions, such were not heard or recorded by any other aircraft or ATC providers.

2.6 If any problems had occurred during the takeoff, the pilot could have aborted the takeoff, but as the takeoff was continued, it is an indication that he was probably still satisfied with the aircraft's performance at that time.

2.7 A witness raised an issue about a strange noise coming from the aircraft in flight. The strange noise was associated with the operation of the engine/s. Due to the break-up and post-impact fire, the airframe could not give clues to show the origin of the strange noise.

2.8 During the on-site investigation, it was determined that the left-hand engine and propeller were rotating when the aircraft impacted with the ground. The right- hand propeller, however, was found feathered prior to the impact. The conclusion was that the right-hand propeller S/N ED 2452 was stationary at the time of impact, as evidenced by the nature of the damage caused to the propeller and that the left-hand propeller S/N ED 2453 was at maximum power at the moment of impact.

2.9 No evidence of suspect internal mechanical failure could be found within the remains of the engines. However, after a metallurgical examination was performed on the engines, indications were that the right-hand engine probably stopped due to cut-off of the fuel supply.

2.10 Entries made in the logbook indicated that the left-hand engine had a recurring problem with an oil leak from the crankshaft seal and rocker covers gaskets. As this engine was delivering power on impact, it is not considered to have been the source of the emergency.

2.11 Indications were that on the right-hand engine some of the engine crankcase thru-bolts nuts had failed, with the result that the thru-bolts, on the one side of the crankcase where the nuts had failed, had pulled to the opposite side of the crankcase. The opinion of the engine manufacturer is that the thru-bolt nuts may have failed as a result of the heat exposure from the post-impact fire. However, it is a known fact that engine thru-bolts and cylinder tie down nuts had previously failed following installation on an engine and prompted the issuance of an AWB. These failures typically happened after an engine overhaul, but had also occurred on newly manufactured engines. According to the AWB, in-flight failure of such items of hardware may well result in engine failure and a serious accident. Failure of the nuts may therefore not have been the reason for the pilot to shut down the engine and feather the propeller.

2.12 No obvious reason could therefore be found as to why the pilot found it necessary to feather the propeller on the right-hand engine. The engine would be shut down by reducing power and cutting the fuel supply to the engine. However, as the aircraft had sufficient fuel on board, fuel starvation or exhaustion is not considered to have been a factor.

2.13 It would appear that due to an unknown problem with the right-hand engine after takeoff, the pilot decided to shut down the engine and feather the propeller and he decided to fly the circuit and return back to the aerodrome. During the downwind leg, the pilot was tightening the circuit towards the runway centre line. This would have resulted in a need to execute a steep turn on base leg to line up with the runway for landing. As it was already dark and the horizon may not have been visual any longer, the pilot may have opted to turn right over the lighted town and then tightened the circuit to maintain visual contact with the runway. It is not known if the runway lights had by that time already been switched off. Asymmetric flight under these conditions would have increased the workload in the cockpit considerably, which could have adversely affected the pilot's situational awareness. It would appear that in executing the steep turn onto finals, the pilot may have lost visual reference and entered a spiral dive to the right and became inverted. The rate of descent (ROD) at the time was calculated to be approximately between 2560 ft/min and 3488 ft/min, turning coming closer to the ground. The aircraft impacted with the terrain thereafter.

2.14 The owner only became aware of certain issues about the maintenance of the aircraft after the accident had occurred and it was clear that the owner relied on the AMO to ensure that everything was done properly. However, the owner was the responsible person for ensuring the airworthiness of his aircraft. He had to ensure compliance to the applicable regulations and by implication the situation of the CoA expiring, the autopilot modification, maintenance documentation and work performed on the aircraft were his responsibility.

2.15 As an instructor, the pilot had vast knowledge regarding cross-country, emergency and forced landing drills, including doing circuits and landings. With this experience

he was probably in a better position to make informed decisions about situations that presented themselves in flight. However, the pilot omitted to ensure compliance with some requirements which could easily have been averted, such as:

(i) As the pilot-in-command of the aircraft, it was his responsibility to ensure that the documentation carried on board the aircraft, especially the CoA, was valid prior to flight.
(ii) No prior landing arrangements with the appropriate authorities were made as were supposed to be done. This could have led to a potentially unsafe situation.

2.16 FAPH is an unmanned aerodrome. According to the AIP, the pilot was required to comply with unmanned aerodrome procedures when entering the airspace of FAPH and to broadcast his intentions on frequency 124.8 MHz. Based on the fact that the aircraft was arriving unexpectedly with no prior approval for use, the pilot could have easily endangered himself, the safety of the passengers and the aircraft.

3. CONCLUSION

3.1 Findings

3.1.1 The pilot was doing “freelance” piloting work for the owner at the time of the accident.

3.1.2 The pilot had a valid commercial pilot’s Licence (CPL) and medical certificate with no waivers. The accident aircraft type rating was endorsed on the licence.

3.1.3 The pilot, accompanied by four passengers, was engaged on a private flight from FALA under Instrument Flight Rules (IFR) by day to FAPH. The flight was uneventful, without experiencing any sort of emergency and landed safely at FAPH on runway 19.

3.1.4 The pilot had filed appropriate flight plans with FALA - ATC for the flights between FALA and FAPH.

3.1.5 The aircraft was not expected at FAPH, because the pilot and/or owner had not obtained landing approval in the specified time interval. The result was that no preparations were made to give services to the aircraft. Consequently, the pilot was given a penalty (fine) to pay before being allowed to leave the aerodrome.

3.1.6 No fuel was uplifted at FAPH as there was sufficient fuel on board the aircraft for the return flight to FALA.

3.1.7 The pilot, the sole occupant of the aircraft, took off at 1644Z from RWY 19 in a southerly direction for the return flight to FALA.

3.1.8 According to an eyewitness, the aircraft was observed entering an unusual right-hand circuit.

3.1.9 Smoke was thereafter observed on the northern side of the aerodrome, which was determined to be the smoke coming from the aircraft accident site.

3.1.10 The location of the accident site was at GPS reading: S23°54.354 E031°09.235 which was approximately 1.46 nautical miles (NM) from the threshold of RWY 19.

3.1.11 A ground and air search and rescue operation was initiated after the accident had been reported. Emergency services were alerted and responded to the location of the accident site.

3.1.12 On arrival at the accident site, emergency services (fire–fighters) found the aircraft still burning and first had to extinguish the fire before starting the search for the body of the pilot.

3.1.13 The aircraft was destroyed by the impact and the post-impact fire.

3.1.14 The pilot was fatally injured in the accident.

3.1.15 Data downloaded from the recovered Garmin 296 GPS (Unit) was used to reproduce the track over the ground and a height profile of the flight.

3.1.16 During the on-site investigation it was evident that the right-hand wing had collided with a tree, resulting in a portion of the wingtip separating from the wing and remaining entangled in the tree. Following the collision of the wing with the tree,it ended up in an inverted position. Furthermore, following the initial impact, the aircraft bounced and broke up.

3.1.17 The landing gear was not extended, confirming that the aircraft was not yet configured for landing at the time of impact.

3.1.18 The left-hand propeller was rotating on impact and separated from the left-hand engine. The right-hand propeller was still attached to the right-hand engine. Based on the position of the blades, the conclusion was that the propeller had been feathered prior to impact.

3.1.19 Both engines separated from the aircraft on impact and sustained major impact and post-impact fire damage. The engines were disassembled and all parts and components visually examined. No internal mechanical failures were identified.

3.1.20 The only anomaly identified was with the right-hand engine (S/N 571645), where some bolts and nuts were not found properly fastened or torqued and some of the thru bolts nuts were fractured.

3.1.21 The left-hand engine (S/N 298711-R) was in a better condition. Apart from the crankshaft which broke when the propeller separated, there were no other anomalies identified.

3.1.22 Due to the possibility of the right-hand engine bolts and nuts not being properly fastened or torqued and some of the thru bolts nuts fractured, the engine was subjected to a metallurgical inspection to determine

whether these factors had contributed to the propeller feathering. The metallurgical report indicated that seizure of the engine through either lubrication failure or lack of lubrication was unlikely. The seizure of the #6 piston and melting of the skirt of the #5 piston were considered to be most likely as a result of excessive heating during the fire. The fracture of the thru bolt nuts could also not be attributed to either over-tightening or service conditions. No other evidence of any mechanical failure could be found on this engine.

3.1.23 The CoA validity of the aircraft had expired.

3.1.24 The Certificate of Release to Service (CRS) of the aircraft was considered to be invalid, due to the prescription that the CRS is only valid if the CoA is valid.

3.1.25 The pilot had not adhered to the instructions of the AIP.

3.1.26 During a discussion with the relevant department of the SACAA with regard to the expired CoA and anomalies identified with the autopilot modification approval process and maintenance documentation, the response was that they are implementing resources to improve their oversight activities.

3.2 Probable Cause/s

3.2.1 The pilot lost situational awareness whilst positioning the aircraft to return for landing on runway 19 and the aircraft entered a spiral dive from which a recovery could not be affected within the height remaining.

Contributory Factors

3.3.1 The pilot experienced an unknown emergency situation which influenced his decision to return to the aerodrome.
3.2.2 Improper circuit sequence flown around the aerodrome.
3.2.3 The aircraft was cutting into the circuit towards the runway centre line in the down-wind and tightened it into the base leg.
3.2.4 The base leg was too tight for the aircraft to line up into final approach.

4. SAFETY RECOMMENDATIONS

It is recommended that the Commissioner for Civil Aviation (CCA) should, through the relevant SACAA department:

4.1 Ensure that the Certificate of Airworthiness Register is monitored to verify that each aircraft registered and operating in South Africa is in possession of a valid Certificate of Airworthiness.

4.2 Use appropriate publications to remind flight crew who intend to operate from unmanned aerodromes, of the importance to familiarise themselves with the information in the Aeronautical Information Publications (AIP) and relevant operations instructions of use at the aerodrome.

4.3 Ensure that modifications are approved as required by applicable regulations and internal procedures.

5. APPENDICES

5.1 None.

Report reviewed and amended by the Advisory Safety Panel on 16 February 2010

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