

<b>AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY</b>
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				Reference:	CA18/2/3/9089	
Aircraft Registration	ZS-KFT	Date of Accident	8 October 2012		Time of Accident	1146Z
Type of Aircraft	Piper-34-200T		Type of Operation		Private (Part 91)	
Pilot-in-command Licence Type		Commercial	Age	20	Licence Valid	Yes
Pilot-in-command Flying Experience		Total Flying Hours	531,0		Hours on Type	66,9
Last point of departure		Runway 12 at Bethlehem Aerodrome (FABM), Free State province				
Next point of intended landing		Lanseria International Airport (FALA), Gauteng				
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)						
Panorama residential area, Bethlehem at coordinates S28° 14' 55" E028° 20' 10" an elevation of 5 561ft AMSL.						
Meteorological Information		Wind: 090°/11kt; Visibility: 10 km; Temperature: 23 °C; 1/8 Cloud cover				
Number of people on board		1 + 0	No. of people injured	0	No. of people killed	0
<b>Synopsis</b>						
<p>On 08 October 2012 at approximately 1143Z, the commercial pilot who was the sole occupant on board the Piper PA34-200T aircraft, stated that he took off from Runway 12 at Bethlehem aerodrome (FABM) with the flaps selected to 10° on a ferry flight bound for (FALA)Lanseria International Airport. The aircraft climbed to approximately 250 ft above ground level (AGL) when the left hand engine RPM suddenly decreased from 2450 rpm to 1500 rpm. The pilot reported that he then advanced both engine power levers to increase the engine power, but the left-hand engine failed completely whereafter he executed a left turn in order to turn back towards the runway and executed a forced landing.</p> <p>During the forced landing, the aircraft touched down on the field but as the selected area was too narrow, the aircraft left hand engine propeller impacted a street light pole at a residential area before the aircraft came to rest on the street. The main landing gear and the nose landing gear were substantially damaged during the forced landing. The left hand engine propeller sustained substantial damage on impact with the street light pole and the right-hand propeller during contact with the road. The pilot was not injured.</p> <p>The investigation revealed that both the fuel selectors were found in the cross-feed position, which suggested that the pilot omitted to select the fuel selectors from the cross-feed to the "on" position and took off with the fuel selected in this configuration that was prohibited in accordance with the flight manual. This according to POH resulted in a vapour lock in the left hand engine.</p> <p>The investigation revealed that the pilot took off with both fuel selectors on a crossfeed which resulted in an engine powerloss. It was further determined that the pilot did not feather the engine following engine powerloss as required by PHO. The report does not emphasize that the pilot did not feather the engine. Include in the probable cause as well. During touch down on the selected area it was found that it was too narrow resulting in the aircraft left hand engine propeller impacting a street light pole at a residential area before the aircraft came to rest on the street.</p>						
<b>Probable Cause</b>						
<p>Unsuccessful forced landing as a result of engine power loss with failure to feather the engine Contributory factor: Fuel mismanagement</p>						
SRP Date		14 Nov 2017		Release Date		20 February 2018
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of the selected field through a ditch. The aircraft came to rest facing in a westerly direction on the road in the Panorama residential area. The left hand engine propeller subsequently impacted a street light pole at a residential area before the aircraft came to rest in the street. The propeller subsequently separated from the engine during the impact sequence.

1.1.3 The pilot was not injured in the accident sequence. The main landing gear and the nose landing gear were substantially damaged during the forced landing. The left hand engine propeller was substantially damaged during the impact with the street light pole

1.1.4 The accident occurred during daylight conditions at a geographical GPS position of S28° 14 '55" E028° 20 '10" at an elevation of 5 561ft AMSL.

**1.2 Injuries to Persons**

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

**1.3 Damage to Aircraft**

1.3.1 The aircraft was substantially damaged in the accident sequence.



FIGURE 1: ZS-KFT ON ROAD WITH L/H ENGINE PROP FAILED ON IMPACT WITH STREET POLE LIGHT

**1.4 Other Damage**

1.4.1 The wire fence next to the residential area and the streetlight pole were damaged in the accident.

## 1.5 Personnel Information

Nationality	South African	Gender	Male	Age	20
Licence Number	0272316712	Licence Type	Commercial		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Night, Multi-piston engine and Instrument ratings				
Medical Expiry Date	31 October 2012				
Restrictions	None				
Previous Accidents	None				

### Flying Experience

Total Hours	531,0
Total Past 90 Days	74,9
Total on Type Past 90 Days	39,9
Total on Type	66,9

## 1.6 Aircraft Information

### 1.6.1 Airframe

Type	Piper-34-200T	
Serial Number	34-7970025	
Manufacturer	Piper Aircraft Corporation	
Year of Manufacture	1978	
Total Airframe Hours (At time of Accident)	4 511,41	
Last MPI (Date & Hours)	14 July 2012	4 428,61
Hours since Last MPI	82,8	
C of A (Expiry Date)	11 February 2013	
C of R (Issue Date) (Present owner)	3 February 2012	
Operating Categories	Standard Part 135	

### Left-hand Engine

Type	Continental TSIO-360-EB
Serial Number	818287R
Hours since New	1 261,31
Hours since Overhaul	TBO not reached

### Right-hand Engine

Type	Continental TSIO-360-EB
Serial Number	306677
Hours since New	959.31
Hours since Overhaul	TBO not reached

## Left-hand Propeller

Type	Hartzell PHC-C3YF-2KUF
Serial Number	EB3928A
Hours since New	1 385,12
Hours since Overhaul	272,8

## Right-hand Propeller:

Type	Hartzell PHC-C3YF-2KUF
Serial Number	EB5093A
Hours since New	1 460,81
Hours since Overhaul	205,2

## 1.6.2 Weight and Balance

Item	Weight (lbs)
Aircraft Basic Empty Weight	2 823
Pilot	185
Fuel on board	416
Take-off weight	3 424

**Note:** The maximum takeoff weight for this aircraft was 4 570 lb. The aircraft was well below the maximum takeoff weight limitations.

1.6.3 According to available records, the aircraft was refuelled with 53.9 US gallons of avgas 2.0 hours prior to the flight. Each tank had approximately 33.5 Gallons of usable fuel on board, that was sufficient for the intended flight. The fuel was tested and found to be free from any contamination.

## 1.7 Meteorological Information

1.7.1 The following weather conditions at the time and place of the incident were obtained from the pilot's questionnaire:

Wind direction	090°	Wind speed	11 kt	Visibility	+ 10 km
Temperature	23 °C	Cloud cover	Few (1/8)	Cloud base	9 000 ft
Dew point	09				

1.7.2 The density altitude was calculated to be 7 573 ft on the day of the accident. This was not considered a factor in the accident.

## 1.8 Aids to Navigation

1.8.1 The aircraft was equipped with standard navigation equipment as per the equipment list approved by the Regulator for the aircraft type. No defects were reported prior to the flight.

## 1.9 Communications

- 1.9.1 The aircraft was equipped with standard communications equipment as per the equipment list approved by the Regulator for the aircraft type. No communication defects were reported at the time of the accident.
- 1.9.2 The VHF radio on board was tuned to the Bethlehem traffic frequency – 124,8 MHz.

## 1.10 Aerodrome Information

- 1.10.1 The aircraft took off from Runway 12 at Bethlehem aerodrome (FABM) when the pilot experienced an engine failure on the left-hand engine. The pilot executed a forced landing approximately 0,8 nm west just outside the boundary fence of Bethlehem aerodrome in the suburb of Panorama.

Aerodrome Location	Bethlehem (FABM)	
Aerodrome Co-ordinates	S28 14' 55" E028 20' 10"	
Aerodrome Elevation	5 561 ft	
Runway Designations	12/30	13/31
Runway Dimensions	1 175 m x 15 m	1 311m x 46m
Runway Used	12/30	
Runway Surface	Asphalt	
Approach Facilities	NDB	

## 1.11 Flight Recorders

- 11.1 The aircraft was not fitted with a cockpit voice recorder or flight data recorder. Neither were required by the regulations.

## 1.12 Wreckage and Impact Information

- 1.12.1 The aircraft touched down on an open field, west of the aerodrome and rolled for approximately 400 metres during the forced landing when it rolled through a ditch and collided with the fence and a street light pole. The aircraft came to rest facing in a westerly direction on the road in the Panorama residential area.
- 1.12.2 The left wing and the left hand engine propeller sustained damage when it collided with the streetlight. The propeller fitted to the left hand engine separated from the engine during the impact sequence and was located 4 m in front of the main wreckage. (see Figure 2).





**Figure 2:** Shows the aircraft after it came to rest on the street

1.12.3 The right-hand propeller damage was consistent with a low power setting from the operative engine as shown below:



**Figure 3:** Damage to the left and right hand propellers

1.12.4 The nosegear broke-off and the main gear collapsed during the forced landing



**Figure 4: left main landing gear & nose landing gear damage**

1.12.5 During the on-site inspection of the cockpit, the propeller pitch levers were found to be full forward. This is inconsistent with the settings of a feathered propeller. It was therefore concluded that the left propeller had not been feathered during the single-engine operation and the pilot could not explain why it was so. (See Figure 5 and refer to the emergency checklist, Appendix A: 'The feathering procedure'.)



**Figure 5: Propeller pitch levers on full forward**

1.12.6 Both fuel selectors were found in the cross-feed position as shown in Figure 6.



**Figure 6: shows both fuel selectors on the cross-feed position**



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

1.13.1 The pilot did not sustain any injuries in the accident.

### **1.14 Fire**

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

### **1.15 Survival Aspects**

1.15.1 The accident was considered survivable due to the low kinetic energy associated with the impact. There was no damage to the cockpit or cabin area, and all the seats remained secured.

1.15.2 The pilot was properly restrained during the accident and exited the aircraft without any injuries.

### **1.16 Tests and Research**

1.16.1 The left Continental TSIO-360-EB, engine serial number 818287-R, was removed from the wreckage and transported to an approved engine maintenance facility. It was not possible to subject the engine to a bench-test procedure, due to the impact damage. An engine teardown inspection was carried out. No anomalies were found that could have prevented the engine or its accessories from operating normally.

1.16.2 The fuel system components were bench-tested. They were found to meet all the operating requirement limitations as contained in the manufacturer's maintenance manual and was found operating satisfactorily.

1.16.3 An inquiry was made to the manufacturer of the aircraft type regarding the effect of taking off with both fuel selectors on cross-feed . The manufacturer confirmed that taking off in the cross-feed position was prohibited and the requirement was established during the original certification of the PA-34 Seneca aircraft. However, when they reviewed their previous certification data for the Seneca, they could not find documentation explaining the reason for this requirement nor any documentation of the results from testing that may have been performed.

1.16.4 According to the Piper Seneca Pilot Operating Handbook (POH), both fuel selectors must be selected and checked on the cross-feed position during taxi and switched to the "on" position during takeoff. It further prohibits taking-off with both selectors on "crossfeed". The manual concluded that fuel and vapour returns to the tank on the same side as the operating engine.

### **1.17 Organisational and Management Information**

1.17.1 The Commercial pilot was appropriately licenced for the flight.

1.17.2 The aircraft maintenance organisation (AMO) responsible for the maintenance of the aircraft had a valid AMO approval certificate at the time the last maintenance service was certified on the aircraft prior to the accident flight.

1.17.3 The aircraft was properly registered in the name of the Owner/Operator.

## **1.18 Additional Information**

1.18.1 None

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

1.19.1 None

## **2. ANALYSIS**

### **2.1 Environment**

The prevailing weather conditions at the time of accident were reported to be fine with the surface wind:090°/11kt with the visibility :10km and the temperature 23°C.

### **2.2 Machine**

It is the norm that when an engine fails in a multi-engine piston aircraft with a loss of thrust and increased drag from the windmilling propeller which would cause the aircraft to yaw toward the failed engine as in this case when the left-hand engine failed. Due to the loss of lift produced by the left wing after the the left-hand engine failed, the accident aircraft would have rolled towards the failed engine with the serviceable engine producing full power, resulting in a rapid loss of height if not correctly counteracted by the pilot's manipulating the rudder control.

No major defects or concerns regarding the aircraft or the engine were reported during the last inspection. The left-hand engine teardown also revealed no anomalies whatsoever.

The possibility of a power loss due to fuel selector mismanagement is considered. The fact that the fuel selectors were found in the cross-feed position, suggested that the pilot omitted to select the fuel selectors from the cross-feed to the "on" position and took off with the fuel selected in this configuration that was prohibited in accordance with the flight manual. This could also have resulted in a vapour lock in the left hand engine.

Irrespective of the reason for the left hand engine power loss, the aircraft could still have been flown safely as certified for single-engine operations by the manufacturer if the pilot feathered the left-hand engine and manipulated the right hand engine and rudder input as required..

### **2.3 Man**

The pilot was licensed and current in accordance with existing regulations and had accumulated 39,9 hours on the aircraft within 90 days. He obtained a multi-piston engine rating on 25 February 2012 at total flying hours of 131,3 on the Piper Seneca and that would have been the last time that he had completed emergency drills on this specific aircraft

The pilot failed to employ a proper technique to maximise the performance of the aircraft during single-engine operation by not feathering the left-hand propeller as stipulated in the pilot's operating handbook. Feathering the left propeller would have allowed the aircraft to maintain altitude with less drag and the pilot would eventually have been able to land back on the runway as he had intended doing.

The pilot did not comply with the emergency procedures for an engine failure during takeoff as stipulated in the pilot's handbook. However, it cannot be ignored from a human factor's point of view that due to the aircraft's height and the inoperative engine, the pilot's workload had increased substantially, leaving him with no other option than to execute a forced landing.

### **3. CONCLUSION**

#### **3.1 Findings**

- 3.1 The pilot held a valid pilot's licence and a valid aviation medical certificate issued by a CAA-approved medical examiner.
- 3.2 CAVOK weather conditions prevailed at the time of the occurrence, and were not considered to be a factor in this accident.
- 3.4 The aircraft was maintained by an approved AMO, which was in possession of a valid AMO approval certificate at the time of the accident.
- 3.5 The aircraft was well within the takeoff weight limitation.
- 3.6 The left propeller was not feathered when the left engine failed.
- 3.7 The pilot executed an unsuccessful forced landing, resulting in substantial damage to the aircraft.

#### **3.2 Probable Cause/s**

- 3.2.1 Unsuccessful forced landing as a result of engine power loss with failure to feather the engine.

#### **3.3 Contributing Factor:**

- 3.3.1 Fuel mismanagement

### **4. SAFETY RECOMMENDATIONS**

- 4.1 Following fuel related occurrences AIID has since issued safety article:

<http://www.caa.co.za/Accidents%20and%20Incidents%20Research%20Articles/Fuel%20Exhaustion%20Management.PDF>

### **5. APPENDICES**

- 5.1 Appendix A: Engine failure procedures and the aircraft's fuel system.

# Appendix A

Engine failure and fuel system information as extracted from the Piper Seneca pilot's operating handbook

## **Engine Inoperative Procedures**

### **Engine failure during take-off (85 KIAS or above)**

*If engine failure occurs during take-off ground roll or after lift-off with gear still down and 86 KIAS has been attained:*

*If adequate runway remains CLOSE both throttles immediately, land if airborne and stop straight ahead.*

*If runway remaining is inadequate for stopping, decide whether to abort or continue. If decision to is made to continue, maintain heading and airspeed, retract landing gear when climb is established and feather inoperative engine prop (See Engine Securing Procedure).*

### **Detecting dead engine**

*Loss of thrust*

*Nose of aircraft will yaw in direction of dead engine (with co-ordinated controls).*

### **Engine Securing Procedure (Feathering Procedure)**

*To attempt to restore power prior to feathering:*

*Mixtures..... as required*

*Fuel selector..... cross feed*

*Magnetos..... left or right only*

*Alternate air..... ON*

*Auxiliary fuel pump..... unlatch, on HI, if power is not immediately restored, OFF*

*Feather before RPM drops below 800*

*Minimum control speed.....66 KIAS*

*Best S.E. R/C.....89 KIAS*

*Maintain direction and airspeed above 76 KIAS*

*Mixture controls..... forward*

*Propeller controls..... forward*

*Throttle controls..... forward (40 in Hg max.)*



Flaps..... retract  
 Gear..... retract  
 Identify inoperative engine  
 Throttle of inop. engine..... retard to verify  
 Mixture of inop.engine..... idle cut-off

Prop control of inop. engine.....feather  
 Trim.....as required  
 Auxiliary fuel pumps.....OFF (except in case of engine driven-pump failure)

Magnetos of inop. engine.....OFF  
 Cowl flaps.....close on inop. engine, as required on operative engine  
 Alternator of inop. engine.....OFF  
 Electrical load.....reduce  
 Fuel management.....OFF inop. engine, consider crossfeed.

**Fuel system**

*Fuel management controls are located on the console between the front seats. There is a control lever for each of the engines, and each is placarded ON – OFF – X FEED. During normal operation, the levers are in the ON position, and each engine draws fuel from the tanks on the same side as the engine. The two fuel systems are interconnected by crossfeed lines. When the X FEED position is selected, the engine will draw fuel from the tanks on the opposite side in order to extend range and keep fuel weight balanced during single-engine operation. The OFF position shuts off the fuel flow from a side.*

*NOTE: when one engine is inoperative and the fuel selector for the operating engine is on X FEED, the selector for the inoperative engine must be in the OFF position. Do not operate with both selectors on X FEED. Fuel and vapour are always returned to the tank on the same side as the operating engine.*