

## AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference: CA18/2/3/8755	
<b>Aircraft Registration</b>	<b>ZS-PYL</b>	<b>Date of Accident</b>	12 February 2010		<b>Time of Accident</b> 1400Z
<b>Type of Aircraft</b>	Reims-F172M		<b>Type of Operation</b> Private		
<b>Pilot-in-command Licence Type</b>		Private	<b>Age</b>	29	<b>Licence Valid</b> Yes
<b>Pilot-in-command Flying Experience</b>		Total Flying Hours	79,1		Hours on Type 76,7
<b>Last point of departure</b>		Rand Aerodrome (FAGM)			
<b>Next point of intended landing</b>		Rand Aerodrome (FAGM)			
<b>Location of the accident site with reference to easily defined geographical points (GPS readings if possible)</b>					
Open field at Tulisa Park near Alberton. GPS Position (S 26°14'52.3" E 28°06'43.2")					
<b>Meteorological Information</b>		Surface wind: 240°/8 kt, temperature: 29 °C, Visibility: CAVOK			
<b>Number of people on board</b>	1+2	<b>No. of people injured</b>	0	<b>No. of people killed</b>	0
<b>Synopsis</b>					
<p>On 12 February 2010, at approximately 1400Z, a Cessna F172M, registration ZS-PYL, was on a local pleasure flight to the general flying area with the pilot in command and two passengers on board, having taken off from Runway 29 at Rand Aerodrome (FAGM).</p> <p>The pilot stated that during climb-out at approximately 500 feet above ground level (AGL), the aircraft experienced a loss of engine power and the engine stopped. The pilot mentioned that while trying to identify a suitable place to execute a forced landing, he attempted an engine restart, which was unsuccessful. The pilot immediately notified Rand ATC of his intentions to execute a forced landing.</p> <p>The pilot then executed a forced landing on an open field at Tulisa Park near Alberton. During the forced landing sequence, the aircraft hit a heap of rocks before it came to a standstill. The aircraft sustained substantial damage during the landing sequence.</p> <p>FADEC data analysis revealed that the engine power loss and subsequent stoppage had been caused by a sudden decrease in fuel pressure. Engine strip-down analysis further revealed that the slide bearing inside the fuel high-pressure pump (HPP) was extremely worn, as were the bearing seats of the eccentric shaft inside the pump housing. Chips of the damaged slide bearing and the bearing seat were scattered throughout the entire fuel system.</p>					
<b>Probable Cause</b>					
Unsuccessful forced landing as a result of engine power loss and subsequent stoppage.					
<b>IARC Date</b>				<b>Release Date</b>	



## AIRCRAFT ACCIDENT REPORT

**Name of Owner/Operator** : Aero Diesel Technology CC  
**Manufacturer** : Reims Aviation SA  
**Model** : F172M  
**Nationality** : South African  
**Registration Marks** : ZS-PYL  
**Place** : Tulisa Park (Alberton)  
**Date** : 12 February 2010  
**Time** : 1400Z

*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.*

## 1. FACTUAL INFORMATION

### 1.1 History of Flight

- 1.1.1 On 12 February 2010, at approximately 1400Z, a Reims F172M, registration ZS-PYL, was on a local pleasure flight to the general flying area with the pilot in command and two passengers on board, having taken off from Runway 29 at Rand Aerodrome (FAGM).
- 1.1.2 The pilot stated that during climbing at approximately 500 feet above ground level (AGL), the aircraft experienced a loss of engine power which was followed by an engine stoppage. The pilot mentioned that while trying to identify a suitable place to execute a forced landing, he attempted an engine restart, which was unsuccessful. The pilot immediately notified Rand ATC of his intentions to execute a forced landing.
- 1.1.3 The pilot then executed a forced landing on an open field at Tulisa Park near Alberton. During the forced landing sequence, the aircraft hit a heap of rocks before it came to a standstill. The aircraft sustained substantial damage during the landing sequence.
- 1.1.4 The accident happened in daylight, at approximately 1400Z, 3 km south of Rand Aerodrome, at an elevation of 5522 feet above mean sea level and GPS position determined to be (S 26°14'52.3" E 28°06'43.2").

## 1.2 Injuries to Persons

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

## 1.3 Damage to Aircraft

- 1.3.1 The aircraft sustained substantial damages to the nose and right landing gears, the right wing, the propeller as well bottom side of the engine cowling.



**FIGURE 1** Damage to the aircraft

## 1.4 Other Damage

- 1.4.1 There was no other damage.

## 1.5 Personnel Information

### Pilot-in-command

Nationality	Congolese	Gender	Male	Age	29
Licence Number	*****	Licence Type		Private	
Licence valid	Yes	Type Endorsed		Yes	
Ratings	Night rating, flight test				
Medical Expiry Date	31 May 2010				
Restrictions	None				
Previous Accidents	None				

Flying Experience:

Total Hours	79,7
Total Past 90 Days	12
Total on Type Past 90 Days	12
Total on Type	76,7

Aircraft Maintenance Engineer (AME) responsible for caring out the maintenance on the aircraft.

Nationality	South African	Gender	Male	Age	36
Licence Number	*****	Licence Type	Aircraft Maintenance Engineer		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Held all required ratings				
Licence Expiry Date	05 February 2011				

## 1.6 Aircraft Information

### Airframe

Type	Reims F172M	
Serial Number	1039	
Manufacturer	Reims Aviation SA	
Date of Manufacture	1973	
Total Airframe Hours (At time of Accident)	12435,9	
Last MPI (Date & Hours)	11 February 2010	12424,7
Hours since Last MPI	11,2	
C of A (Issue Date)	05 November 2007	
C of R (Issue Date) (Present owner)	19 October 2007	
Operating Categories	Standard	

### Engine

Type	Thielert TAE 25-02-99
Serial Number	02-02-02309
Hours since New	805,4
Hours since Overhaul	TBO not yet reached

### Propeller

Type	MTV-6-A1187-129
Serial Number	080269
Hours since New	200
Hours since Overhaul	TBO not yet reached

## 1.7 Meteorological Information

- 1.7.1 Weather information obtained from the official weather report from the South African Weather Services.

Wind direction	240°	Wind speed	08 kt	Visibility	CAVOK
Temperature	29 °C	Cloud cover	Few	Cloud base	4 500 ft
Dew point	10 °C				

## 1.8 Aids to Navigation

- 1.8.1 The aircraft was equipped with standard navigation equipment. All the navigation equipment was serviceable prior to the accident.

## 1.9 Communications

- 1.9.1 The pilot broadcast her intentions on the VHF frequency 118,7 MHz, which was the frequency in use at the Rand Aerodrome.

## 1.10 Aerodrome Information

- 1.10.1 The aircraft crash landed on an open grass field at Tulisa Park near Alberton, at a GPS position determined to be (S 26°14'52.3" E 28°06'43.2") and an elevation of approximately 5522 ft above mean sea level (AMSL).

Aerodrome Location	Rand Aerodrome (FAGM)	
Aerodrome Co-ordinates	S 26°14.31' E 028°09.05'	
Aerodrome Elevation	5 483 ft	
Runway Designations	11/29	35/17
Runway Dimensions	1 660 m x 15 m	1 463 m x 15 m
Runway Used	29	
Runway Surface	Asphalt	
Approach Facilities	NDB/VOR/DME/PAPIs/landing lights	

## 1.11 Flight Recorders

- 1.11.1 The aircraft was not fitted with a cockpit voice recorder (CVR) or a flight data recorder (FDR). Neither was required by regulations to be fitted to this type of aircraft.



## **1.12 Wreckage and Impact Information**

1.12.1 The accident site was rocky terrain at Tulisa Park near Alberton. Evidence of airframe damage indicated that the aircraft had struck the ground on a south-easterly heading, while in a slight nose-down and right-wing-low attitude.

1.12.1 The integrity of the flight control system was established and all parts of the aircraft were accounted for on the accident site.



**FIGURE 2      Wreckage site**

## **1.13 Medical and Pathological Information**

1.13.1 None of the occupants on board were injured.

## **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 to be survivable as all occupants were securely strapped in their seats and the cabin was not damaged.

## **1.16 Tests and Research**

### **1.16.1 On-site wreckage examination**

- (i) On-site inspection of the wreckage revealed that all of the structural damage was consistent with the impact; nothing was found to suggest that there had been any pre-impact failure of the primary structure. Approximately 50 litres of fuel was drained from the fuel tanks.

### **1.16.2 Aircraft systems and engine examination**

- (i) The wreckage and engine were recovered and taken to an approved aircraft maintenance facility for further investigation. The engine was inspected for any obvious outside damage, but nothing abnormal was found. All fuel lines and fittings were inspected for cracking, leaks and loose attachments, and none were found.
- (ii) The aircraft had been fitted with a full authority digital engine control (FADEC) computer, which controls all aspects of aircraft engine performance and keeps all the engine performance data. A FADEC computer download was carried out and the data was sent to the engine manufacturer (Thielert) for further analysis. The results revealed that there had been a sudden decrease in fuel pressure to 0 bars a few moments after takeoff.
- (iii) A decision was taken to send the engine to the manufacturer in order to determine the cause of the decrease in fuel pressure. The engine manufacturer carried out the engine strip down, and the subsequent results revealed that the slide bearing inside the fuel high-pressure pump (HPP) was extremely worn, as were the bearing seats of the eccentric shaft inside the pump housing. The chips of the damaged slide bearing and the bearing seat were scattered throughout the entire fuel system.
- (iv) In order to be able to simulate the failure, the HPP was reassembled using the defective parts and was subjected to a functional test on the HPP test bench. The HPP worked properly during the test.
- (v) Fuel samples were sent to a laboratory to determine whether the correct fuel type was used in the engine, and also to determine if there were any metallic particles in the entire fuel system. The test results showed an increased amount of metallic material in the fuel, and these particles correspond to the metal mainly used in slide bearings as the one found damaged in the HPP. The analysis also found that the correct fuel type was used.
- (vi) According to the engine operation and maintenance manual, the HPP is supposed to be replaced after 600 hours and sent to Thielert (engine manufacturer) for overhaul. The bearing that failed is one of the components that would be replaced during the HPP overhaul. According to the engine log book the engine had done 805,4 hours at the time of the accident and still had the original HPP installed, meaning it was not replaced at 600 hours as required by the engine operation and maintenance manual.

## **1.17 Organisational and Management Information**

### **1.17.1 This was a private flight.**

### **1.17.2 According to CAA records, the engineer that certified the last MPI was properly rated to work on this aircraft.**

## **1.18 Additional Information**

### **1.18.1 Civil Aviation Regulations (CAR's) of 1997 states:**

#### **(Part 43.02.8 Mandatory Inspections)**

1. Mandatory tests and inspections shall be carried in accordance with the approved maintenance schedule for a particular aircraft at the prescribed times or intervals.

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

### **1.19.1 None.**

## **2. ANALYSIS**

- 2.1 The pilot accompanied by two passengers was on a local pleasure flight to the general flying area. They took off from Runway 29 at Rand Aerodrome. During climb-out at approximately 500 feet the pilot experienced a sudden loss of engine power and a subsequent engine stoppage. The pilot spotted an open field at Tulisa Park near Alberton and decided to execute a forced landing, during which the aircraft sustained substantial damage.
- 2.2 The FADEC data analysis revealed that the engine power loss and subsequent stoppage were caused by a sudden decrease in fuel pressure. Engine strip-down analysis further revealed that the slide bearing inside the fuel high pressure pump (HPP) was extremely worn, as were the bearing seats of the eccentric shaft inside the pump housing. Chips of the damaged slide bearing and the bearing seat were scattered throughout the entire fuel system.
- 2.3 In order to be able to simulate the failure, the HPP was reassembled using the defective parts and was subjected to a functional test on the HPP test bench. The HPP worked properly during the test. It was concluded that since the HPP worked on the test bench, there was a likelihood that the HPP did not fail in flight, but the chips of the slide bearing which contaminated the fuel system could have closed off the fuel supply or return bore, thus resulting in an engine failure/ loss of fuel pressure as was confirmed by the FADEC data.

## **3. CONCLUSION**

### **3.1 Findings**

- 3.1.1 The pilot was a holder of a valid private pilot licence (aeroplane).
- 3.1.2 The aircraft had a valid certificate of airworthiness.
- 3.1.3 Weather conditions were reported to be fine, with the prevailing wind being 240° at 8 knots. It was not a factor in this accident.
- 3.1.4 The accident happened in daylight conditions.



- 3.1.5 Post-accident FADEC analysis and an engine strip examination revealed that there was a decrease in fuel pressure after take-off which was caused by the failure of one of the bearings inside the HPP.
- 3.1.6 The engine stopped shortly after take-off as a result of low fuel pressure.
- 3.1.7 According to the Thielert engine operation and maintenance manual, the HPP is supposed to be replaced after 600 hours; however, the engine had 805.4 hours at the time of the accident and still had the original HPP fitted.
- 3.1.8 Maintenance schedules were not complied with; therefore the AMO contravened Part 43.02.8 of the Civil Aviation Regulations (CAR's) of 1997.

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

- 3.2.1 Unsuccessful forced landing as a result of engine power loss and subsequent stoppage.

## **4. SAFETY RECOMMENDATIONS**

4.1 The use of the Thielert TAE 25-02-99 diesel engine in this airframe does present a significant change to maintenance requirements as to be followed by Aircraft Maintenance Organizations (AMOs) who are more familiar with the airframe being fitted with Lycoming or Continental avgas engines.

4.2 It is recommended that the Director of Civil Aviation instructs the Airworthiness Department of the SACAA to:

Issue a Maintenance Advisory Notice (MAN) to Aircraft Maintenance Organizations, stressing the importance to at all times ensure strict adherence to the maintenance requirements of the newer diesel powered generation of engines in lieu of the traditionally Avgas powered engines due to different accessories installed.

## **5. APPENDICES**

- 5.1 None.

Report reviewed and amended by the Advisory Safety Panel 21 September 2010.

-END-