SOUTH AFRICAN CIVIL AVIATION AUTHORITY

Section/division **Occurrence Investigation** Form Number: CA 12-12a

AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9109		
Aircraft Registration	ZS-JHN	**Date of Accident**	25 November 2012		**Time of Accident**	0927Z	
Type of Aircraft	Piper PA31			**Type of Operation**	Private		
Pilot-in-command Licence Type	Commercial Pilot	**Age**	30		**Licence Valid**	Yes	
Pilot-in-command Flying Experience	Total Flying Hours	1699.5			Hours on Type	1.6	
Last point of departure	Grand Central Aerodrome (FAGC) - Gauteng						
Next point of intended landing	Tzaneen Aerodrome (FATZ) - Limpopo						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Corner Donavan and Austin Rd approximately 0.5nm north of Grand Central Aerodrome. S25°58' 41" E 028°08' 61"							
Meteorological Information	Wind: VAR/05 Temperature/Dewpoint : 19/08℃ Cloud: SCT025 Visibility: >10km						
Number of people on board	1+0	**No. of people injured**	0		**No. of people killed**	**0**	
Synopsis							

The pilot who was the sole occupant on board the aircraft departed on an IFR flight from FAGC to FATZ. After take-off he was cleared by Johannesburg Approach Control (Approach) to climb to F110 whilst climbing through F090, the left engine suddenly failed. He elected to turn back to FAGC for landing. However, during the return back to FAGC, he was unable to maintain altitude. He declared an emergency with Approach.

The pilot realised he was losing height rapidly and decided to do a forced landing in an open field 1nm North of FAGC. As the pilot was about to land the aircraft, a fire erupted in the right engine and continued until touch down. He executed a wheels-up landing and evacuated the aircraft without injuries once the aircraft came to a stop. The fire which started in flight engulfed the right wing and the fuselage.

On inspection the left wings outboard tank was full and the main tank was empty. Both fuel selectors were also found on main tanks (left and right) position.

Probable Cause

Unsuccessful forced landing due to fuel starvation and the cause of the fire was undetermined. The left engine failed because of fuel exhaustion and the cause of fire could not be determined.

IARC Date		Release Date	

AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : Devenco Trading 16 Pty Ltd
Manufacturer : Piper Aircraft Corporation
Model : PA31-350
Nationality : South African
Registration Marks : ZS-JHN
Place : Glen Austin
Date : 25 November 2012
Time : 09:27z

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 accidents 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 the morning of 25 November 2012 at 0902Z the pilot, sole occupant on board the aircraft, took off from FAGC to FATZ. He filed an IFR flight plan to cruise at F110 in controlled airspace. The take-off roll and initial climb from RWY 17 was uneventful and passing FL075 FAGC Tower Controller transferred the aircraft to Johannesburg Approach Control (Approach) on 124.5 MHz

1.1.2 On contact with Approach the pilot was cleared to climb to FL110. On the climb approaching FL090 the aircraft lost power on the left engine, oil pressure dropped and the cylinder head temperature increased. He then advised Approach of the problem and requested to level out at FL090 to attempt to identify the problem.

1.1.3 He requested radar vectors from Approach to route direct to FAGC and proceeded to shut down the left engine. The pilot continued routing FAGC using the right engine but was unable to maintain height. He noticed the oil

pressure and manifold pressure on the right engine dropping. The pilot also reported seeing fire through the cooling vents of the right engine cowling.

1.1.4 The pilot requested distance to FAGC from Approach and was told it is 2.5nm (nautical miles) and the aircraft continued loosing height. An update from Approach seconds later indicated that the aircraft was 1nm from FAGC. The pilot decided to do a wheels up forced landing on an open field when he realised that the aircraft was too low. He landed wheels up in a wings level attitude

1.1.5 The aircraft impacted and skidded across an uneven field and came to a stop 5m from Donovan Street. The pilot disembarked the aircraft and attempted to put out the fire which had started inflight on the right engine but without success. Eventually the right wing and the fuselage were engulfed by fire. Minutes later the FAGC fire department using two vehicles extinguished the fire. The pilot escaped with no injuries and the aircraft was destroyed by the ensuing fire.

1.2 Injuries to Persons

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

1.3 Damage to Aircraft

1.3.1 The fuselage and the right wing were completely destroyed in the fire. The right propeller broke off the engine while the aircraft was skidding across the field. The left wing and propeller suffered minor damages. There was no visible puncture on the left main and outboard fuel tanks

Picture 1 - Minutes after the crash

1.4 Other Damage

1.4.1 The vegetation or grass around the location where the aircraft came to a stop was completely burnt.

1.5 Personnel Information

Nationality	South African	Gender	Male	Age	30
Licence Number	0270511454	Licence Type	Commercial Pilot		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Instrument and night rating				
Medical Expiry Date	31 May 2013				
Restrictions	NIL				
Previous Accidents	None				

Flying Experience:

Total Hours	1699.5
Total Past 90 Days	72.5
Total on Type Past 90 Days	1.6
Total on Type	1.6

Note: The pilot embarked on this flight, FAGC to FATZ, 1.6hrs after the conversion to the aircraft. He completed the familiarisation exercise on the 23 November 2012.

1.6 Aircraft Information

Airframe:

Type	Piper PA31	
Serial Number	31-7405496	
Manufacturer	Piper Aircraft Corporation	
Date of Manufacture	1974	
Total Airframe Hours (At time of Accident)	8029.6	
Last MPI (Date & Hours)	01 Nov 2012	8029.6
Hours since Last MPI	18.3	
C of A (Issue Date)	08/07/2009	
C of R (Issue Date) (Present owner)	03/01/2011	
Operating Categories	Private	

Engine: Left

Type	Lycoming
Serial Number	L-3416-61-A
Hours since New	6149.2
Hours since Overhaul	1455.2

Propeller: Left

Type	Hartzell
Serial Number	DJ11632A
Hours since New	8029.6 (Airframe Hours)
Hours since Overhaul	80.5

Engine: Right

Type	Lycoming
Serial Number	L-3416-61 A
Hours since New	6149.2
Hours since Overhaul	1455.2

Propeller: Right

Type	Hartzell
Serial Number	DJ11629A
Hours since New	8029.6 (Airframe hours)
Hours since Overhaul	80.5

Note: The pilot refuelled the aircraft with 91.9 litres of AVGA 100 on 23 November 2012 two days before the accident. On the day of the accident 25 November 2012 it could not be determined how much fuel was remaining in the tanks after the previous flight which lasted 1.6hrs

1.7 Meteorological Information

Wind direction	VAR	Wind speed	05kts	Visibility	>10km
Temperature	19	Cloud cover	SCT	Cloud base	025
Dew point	08				

1.8 Aids to Navigation

1.8.1 The aircraft was fitted with standard navigational equipment to conduct IFR (Instrument Flight Rules).

1.8.2 The navigational equipment was serviceable at the time of the accident.

1.9 Communications

1.9.1 The aircraft was equipped with standard communication systems and none was reported unserviceable prior to or during the accident. The pilot maintained two way radio communications with a Johannesburg Approach controller who assisted in vectoring the aircraft and alerting FAGC of the emergency situation.

1.9.2 Recorded transcript between the Johannesburg Approach controller and the pilot of ZS-JHN, on ATC frequency 124.5 MHz (Megahertz) is marked "Annexure A" and is attached to the appendix.

1.10 Aerodrome Information

1.10.1 The accident occurred outside the boundaries of an aerodrome.

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 it required by regulations to be fitted to this type of aircraft.

1.12 Wreckage and Impact Information

1.12.1 The aircraft impacted the ground in a westerly direction wings level attitude. The terrain was an uneven rocky ground covered by short grass. During the forced landing the aircraft bounced and skidded across the field for approximately 165m before it came to a stop 5m from Donovan Road.

1.12.2 The aircraft's right propeller broke off and the right engine top cowling came off during the forced landing sequence. They were found approximately 70m and 95m respectively from the main wreckage. Pieces of debris were scattered in a radius of about 150m from the aircraft.

1.12.3 The fire which started in flight and continued until the aircraft came to a stop, completely destroyed the aircraft seconds after the pilot safely disembarked the aircraft.

Picture 2 - final stop and fire intensifying as taken from ZS-RMJ R22 flying in the vicinity

1.13 Medical and Pathological Information

1.13.1 The pilot's medical certificate was valid and he was not injured in the accident.

1.14 Fire

1.14.1 The pilot first noticed the fire in flight through the cooling vents of the right engine cowling. The origin of the fire in the engine is still not determined.

1.14.2 After the aircraft came to stop the pilot was unable to put out the fire because of its intensity and the size of the fire extinguisher, 1kg. Within minutes the fire spread through the whole right wing and the fuselage.

1.14.3 The FAGC fire department took some time to find the entry to the enclosure which was not far from the airport, two vehicles arrived 5 to 10 minutes after the accident occurred and completely extinguished the fire in 3 to 4 minutes.

Picture 3 – Aircraft was almost completely destroyed by fire

1.15 Survival Aspects

1.15.1 The accident was survivable as the aircraft's speed was low and controllable.

1.15.2 The pilot was properly restrained with safety harnesses installed in the aircraft.

1.15.3 The aircraft was fitted with a fire extinguisher which the pilot used after the accident but was not sufficient to extinguish the fire.

1.16 Tests and Research

1.16.1 Inspection of the wreckage, the left wing outboard tank was found full (40gal AVGAS 100) and the left main tank was empty. The fuel drained from the left main tank drain plug was not more than 150ml. No fuel could be measured from the right tanks as they were completely burnt.

1.16.2 All pipes, wires, baffle material and components of the right engine were completely burnt.

1.16.3 The left propeller was feathered and suffered substantial damage from impact. Below the left engine there was a puddle of oil which was dripping from the excess fuel drainage pipe. The oil dipstick showed 6 litres remained in the engine instead of 09 to 12 litres as indicated in the Aircraft Operational Manual

1.17 Organizational and Management Information

1.17.1 The pilot who is rated on the PA-34-200 was successful on the 23 November 2012 to have the PA-31-350 endorsed on his licence.

1.17.2 The maintenance records indicated that the aircraft was equipped and maintained in accordance with existing regulations and approved procedures.

1.17.3 The last MPI was certified on the 01 November 2012 by AMO no210 at 8029.6 airframe hours and the aircraft had flown a further 18.3 hours.

1.18 Additional Information

1.18.1 On 23 November 2012, the accident pilot accompanied by an instructor departed from FAGC to Pretoria GFA on a familiarisation training flight that lasted 1.6hrs.

1.18.2 During the familiarisation flight they performed exercises which included recovering from stalls in the clean and landing configuration. Asymmetric control as well as correct engine power settings for those configurations.

1.18.3 On their way back from GFA they joined the left hand circuit at FAGC RWY35.. They completed 3 asymmetric circuits.

1.18.4 The flight duration on 25 November 2012 from take-off to crashing lasted no longer than 25min.

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2 ANALYSIS

2.1 The weather was fine and not a contributing factor to the accident.

2.2 The pilot had a valid licence with an expiry date of 31 May 2013.

2.3 The aircraft had approximately 40gal of fuel on the left outboard tank and the fuel selectors (left and right) were both on the main tank position.

2.4 On the 23 November 2012 the pilot and his instructor spent 1.6hrs flying a familiarisation exercise at the Pretoria GFA. The consumption rate was much higher since most of their flight the power setting was close to red range or 45 inches manifold pressure for single engine operation. Normal range for power is the green range or 18inches manifold pressure..

2.5 The circuit exercise at FAGC lasted 30mins which also explained why the left engine failed first. According to the pilot and radar tracks, the flight took

approximately ±30mins before the left engine failed. It is the left engine that was used to do asymmetric circuits on the 23 November 2012.

2.6 From run-up checks, taxiing and staying airborne for 20 min before the first engine failure plus the flight before of 1.6hrs is enough to drain the main tanks dry at 34.3gal/h or higher.

2.7 After the accident both fuel selectors were found on the main tank position. Both right tanks were completely destroyed thus no measurements could be determined. Visual inspection revealed no fuel in the left main tank and when drained from the drain plug only 150ml came out. The outboard tank was full, 40gal.

2.8 The origin of the fire on the right engine is still undetermined but contributed to the fire that engulfed the aircraft.

3 CONCLUSIONS

3.1 Findings

3.1.1 On 23 November 2012 the pilot passed his familiarisation test to fly the PA-31-350.

3.1.2 The maintenance records indicated that the aircraft was equipped and maintained in accordance with existing regulations and approved procedures.

3.1.3 The last MPI was certified on the 01 November 2012 by AMO no210 at 8029.6 airframe hours and the aircraft had flown a further 18.3 hours.

3.1.4 On the 23 November 2012 the pilot and his instructor refuelled the aircraft with 91gal of fuel and proceeded to fly for 1.6hrs on a familiarisation exercise and completed 3 asymmetric circuits at FAGC on their way back from the Pretoria GFA.

3.1.5 The fuel uplifted on the 25 November 2012 could not be determined since there are no records of refueling. After the accident the fuel remaining wasin the left outboard tank was approximately 42gal of fuel.

3.1.6 An inflight fire which started on the right hand engine continued to burn until the aircraft came to a stop and eventually destroyed the right wing and the fuselage.

3.1.7 The aircraft was equipped with a 1kg fire extinguisher which the pilot used to extinguish the fire after evacuating the aircraft but with no success.

3.2 Probable cause

3.1.1 During the familiarisation exercise fuel tanks were never switched from main to outboard tanks after 30min or an hour of flying.

3.2.2 The origin of the fire could not be established. Some of the materials were burnt beyond recognition.

4 SAFETY RECOMMENDATIONS

4.1 None

5. APPENDICES

Annexure A

Time	From	To	Message
09:07:45	ZS-JHN	ATC	Radar good day JULIET HOTEL NOVEMBER
09:07:50	ATC	ZS-JHN	JULIET HOTEL NOVEMBER good day under radar control passing 8000 feet climb to FL110
09:07:55	ZS-JHN	ATC	Under radar control passing 8000ft climbing FL110 JULIET HOTEL NOVEMBER
09:09:07	ATC	ZS-JHN	JULIET HOTEL NOVEMBER enter the TMA (Terminal Movement Area) heading 070
09:09:14	ZS-JHN	ATC	Enter the TMA heading 070 JULIET HOTEL NOVEMBER
09:15:12	ATC	ZS-JHN	JULIET HOTEL NOVEMBER expedite your climb to FL110
09:15:19	ZS-JHN	ATC	Copy that madam JULIET HOTEL NOVEMBER
09:15:25	ZS-JHN	ATC	Radar approach JULIET HOTEL NOVEMBER
09:15:26	ATC	ZS-JHN	JULIET HOTEL NOVEMBER go ahead
09:15:27	ZS-JHN	ATC	Mam is it possible to maintain FL090?
09:15:30	ATC	ZS-JHN	Affirm; is that your final level request?
09:15:31	ZS-JHN	ATC	Affirm JULIET HOTEL NOVEMBER
09:15:33	ATC	ZS-JHN	Copy that I'll change it…
09:15:35	ZS-JHN	ATC	Thank you very much
09:15:42	ATC	ZS-JHN	JULIET HOTEL NOVEMBER turn right now heading

			110.
09:15:45	ZS-JHN	ATC	turn right heading 110 JULIET HOTEL NOVEMBER
09:16:14	ZS-JHN	ATC	Radar JULIET HOTEL NOVEMBER…
09:16:15	ATC	ZS-JHN	JULIET HOTEL NOVEMBER go ahead…
09:16:19	ZS-JHN	ATC	Mam we are going to route direct Grand Central we've got engine problem
09:16:24	ATC	ZS-JHN	JULIET HOTEL NOVEMBER copied turn right direct Grand Central track required 230
09:16:28	ZS-JHN	ATC	Turn right direct Grand Central 240 JULIET HOTEL NOVEMBER
09:17:24	ATC	ZS-JHN	JULIET HOTEL NOVEMBER maintain 8000ft or would you like to descend?
09:17:28	ZS-JHN	ATC	Mam we gonna try to maintain 8000ft…
09:18:10	ZS-JHN	ATC	Radar from JULIET HOTEL NOVEMBER Mam we gonna further descend down to 7500ft and vectors for Grand Central
09:18:16	ATC	ZS-JHN	JULIET HOTEL NOVEMBER at your discretion you can descend and maintain a listening watch on 124.1
09:18:24	ZS-JHN	ATC	Copy that mam I'll maintain a listening watch on 124.1 and vectors for Grand Central
09:18:29	ATC	ZS-JHN	You can route direct Grand Central heading 235
09:18:31	ZS-JHN	ATC	Route direct Grand Central 235 JULIET HOTEL NOVEMBER
09:20:00	ATC	ZS-JHN	JULIET HOTEL NOVEMBER broadcast your intentions 124.1 thereafter central 122.8
09:20:04	ZS-JHN	ATC	Sorry mam 124.1 thereafter 122.8 JULIET HOTEL NOVEMBER
09:22:26	ZS-JHN	ATC	Johannesburg radar JULIET HOTEL NOVEMBER
09:22:27	ATC	ZS-JHN	JULIET HOTEL NOVEMBER go ahead
09:22:28	ZS-JHN	ATC	Mam this is an emergency, we've got engine fire in the right engine and we lost the left engine. Vectors asap to Grand Central
09:22:38	ATC	ZS-JHN	JULIET HOTEL NOVEMBER you can go straight to Grand Central position left downwind runway 17

09:22:42	ZS-JHN	ATC	Left downwind for runway 17 and you'll notify them of the emergency
09:22:50	ATC	ZS-JHN	JULIET HOTEL NOVEMBER affirm they know exactly where you are. Position for left base runway 17
09:23:01	ZS-JHN	ATC	Thanks direct runway 17
09:24:18	ATC	ZS-JHN	JULIET HOTEL NOVEMBER if you can read this transmission there is fire and emergencies on standby
09:24:22	ZS-JHN	ATC	Copy that Mam. Can you give us the distance we are unable to maintain…
09:24:30	ATC	ZS-JHN	At this stage you 2.8nm to final touch down. If you look at your 12 o'clock you should be able to see the runway.
09:24:35	ZS-JHN	ATC	Affirm Mam we've got the runway visual what's the final number
09:24:40	ATC	ZS-JHN	2.5nm to the runway threshold…
09:24:45	ZS-JHN	ATC	Copy that JULIET HOTEL NOVEMBER
09:25:30	ZS-JHN	ATC	Radar can you confirm that distance for JULIET HOTEL NOVEMBER again
09:25:32	ATC	ZS-JHN	JULIET HOTEL NOVEMBER at this stage it's just over 1nm
09:25:40	ZS-JHN	ATC	JULIET HOTEL NOVEMBER we are not gonna make it, we probably gonna go into a field 1nm short of Grand Central
09:25:43	ATC	ZS-JHN	Copied JULIET HOTEL NOVEMBER we will advise them…

Compiled by:

..... Date: ……..

For: Director of Civil Aviation

Investigator-in-charge: …… Date…….....
Robert Mvemve

Co-Investigator: ……..…… Date: …….....