SOUTH AFRICAN CIVIL AVIATION AUTHORITY

Section/division **Accident and Incident Investigation Division** Form Number: CA 12-12a

AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9196		
Aircraft registration	**ZU-FVY**	**Date of accident**	16 July 2013		**Time of accident**	0945Z	
Type of aircraft	Van's RV-7A (Aeroplane)		**Type of operation**		Private		
Pilot-in-command licence type		Private pilot	**Age**	64	**Licence valid**	Yes	
Pilot-in-command flying experience		Total Flying Hours	661,0		**Hours on type**	55,0	
Last point of departure	Baragwanath aerodrome (FASY), Gauteng province						
Next point of intended landing	Baragwanath aerodrome (FASY), Gauteng province						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
1,5 km from the threshold of runway 31 at FASY (GPS position: 26°21.297' South 027°47.905' East)							
Meteorological information	Surface wind: 230°/5 knots, Temperature: 20°C, Visi bility: + 10 km						
Number of people on board	1 + 0	**No. of people injured**	1	**No. of people killed**	0		

Synopsis

The pilot, being the sole occupant onboard the aircraft was engaged in a private flight from Tedderfield aerodrome to Baragwanath aerodrome where he executed one touch-and-go, making use of runway 31.

While positioning the aircraft for a second touch-and-go and turning right base leg for runway 31 at a height of approximately 500 feet above ground level (AGL) the engine stopped. The aircraft was unable to sustain flight and the pilot opted to execute a forced landing onto an open grass field below. Approximately 30 m after touch down the nose landing gear collapsed and the aircraft nosed over coming to rest in an inverted attitude.

The pilot, who was wearing his four point safety harness, sustained a laceration to his head and right lower leg. He managed to unbuckle himself and broke the canopy plexi-glass making use of a portable fire extinguisher, which allow him to crawl out from underneath the wreckage. There were no eye-witnesses to the accident and therefore nobody to assist the injured pilot. He managed to walk approximately 2 km to the Baragwanath aerodrome where he was assisted by people at the aerodrome who took him to the Randfontein Hospital where he was kept overnight under observation after the lacerations to his head and leg was surgically attended to.

Probable cause

Unsuccessful forced landing following an engine stoppage in flight.

Contributory factor

The engine stoppage was determined to have been caused by the simultaneous grounding of both the magnetos during flight.

IARC Date		Release Date	

AIRCRAFT ACCIDENT REPORT

Name of Owner	**:** Doorware CC
Name of Operator	**:** Private
Manufacturer	**:** Van's Aircraft
Model	**:** RV-7A
Nationality	**:** South African
Registration Marks	**:** ZU-FVY
Place	**:** Baragwanath aerodrome
Date	**:** 16 July 2013
Time	**:** 0945Z

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 produced without prejudice to the rights of the CAA, which are reserved.

1. FACTUAL INFORMATION

1.1 History of flight

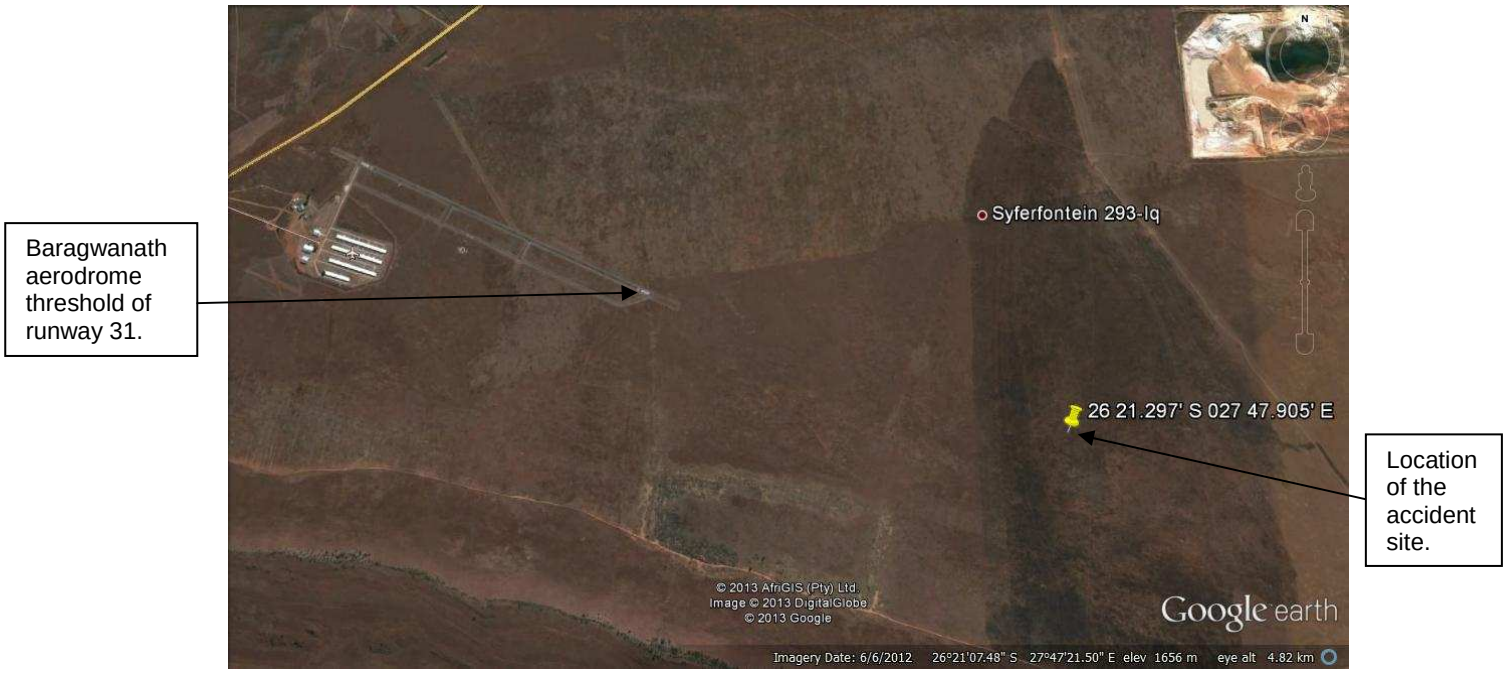
1.1.1 During an interview with the pilot he indicated that he conducted a flight with the aircraft on Saturday, 13 July 2013. During the flight he landed at Rand aerodrome (FAGM) where the aircraft was refuelled to capacity and 99 litres of Avgas was uplifted. He then flew from FAGM to Tedderfield aerodrome, his home base, which was a flight of approximately 10 minutes. On Tuesday morning 16 July 2013 he went to Tedderfield aerodrome with the intention to fly again. Following his arrival at the aerodrome he pulled the aircraft out of the hangar where he first washed it by rinsing it off with a hose and then he dried it by hand with a chamois. He further stated that he did strain the fuel tanks to check for sediment/contamination prior to

the flight but did not observe anything untoward. He then boarded the aircraft and flew from Tedderfield aerodrome to Baragwanath aerodrome. With Baragwanath aerodrome being an unmanned facility the pilot joined overhead, broadcast his intentions on the VHF frequency 122.70 MHz and proceeded to fly a touch-and-go onto runway 31 as there was no other traffic in the circuit.

1.1.2 This was followed by a right-hand circuit with the intention to execute a second touch-and-go. The pilot opted for a right-hand circuit as the area was clear of obstructions. While turning right base leg for runway 31 at a height of approximately 500 feet above ground level (AGL) the engine stopped but the propeller continued to windmill. The aircraft started to loose altitude at a rate of descent of between 500 to 600 feet per minute. The pilot indicated in an interview that he was caught by surprise when the engine stopped and opted to execute a forced landing onto an open grass field below. He immediately switched to the right-hand fuel tank, switched on the electrical fuel pump in an attempt to try a restart but was unable to do so due to a high rate of descent. He then lowered the flaps to the full down position and flew the aircraft. Approximately 30 m after touch down the nose landing gear collapsed and the aircraft nosed over coming to rest in an inverted attitude. The accident occurred 0.8 nautical miles (1.48 kilometres) from the threshold of runway 31.

1.1.3 The pilot who was wearing his four point safety harness sustained a laceration to his head and right lower leg. He managed to unbuckle himself while in an upside down position. With the aircraft being in an inverted attitude it was impossible for the pilot to open the canopy (the canopy needs to be unlatched before it slides open towards the back when aircraft is on its wheels). In order to evacuate the aircraft the pilot had to break the plexi-glass of the canopy. He managed to get hold of a portable fire extinguisher that was in the cabin and broke the plexi-glass on the right-hand side where after he crawled out from underneath the wreckage. There were no eye-witnesses to the accident and therefore nobody to assist the injured pilot. He managed to walk approximately 2 kilometres (km) to Baragwanath aerodrome (hangar area) where he was assisted by people working at the aerodrome. He was taken to the Randfontein Hospital where he was kept overnight under observation after the lacerations to his head and right lower leg were surgically attended to.

1.1.4 The accident occurred during daylight conditions at a geographical position determined to be 26°21.297’ South 027°47.905’ Ea st at an elevation of 5 444 feet above mean sea level (AMSL).



The Google Earth image indicates the position of the accident site in relation to the Baragwanath aerodrome.

1.2 Injuries to persons

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

1.3 Damage to aircraft

1.3.1 The aircraft was substantially damaged when it nosed over coming to rest in an inverted attitude during a forced landing in an open grass field.

Figure 1. A view of the aircraft as it came to rest in an inverted attitude.

1.4 Other damage

1.4.1 No other damage was caused.

1.5 Personnel information

Nationality	British	Gender	Male	Age	64
Licence number	0270172786	Licence type	Private pilot		
Licence valid	Yes	Type endorsed	Yes		
Ratings	None				
Medical expiry date	30 September 2013				
Restrictions	Must wear corrective lenses				
Previous accidents	None				

NOTE: The pilot commenced with his type conversion training onto the aircraft on 2 April 2013. His training was conducted under the auspices of an approved aviation training organisation (ATO) based at Cape Town International aerodrome. During this period he had flown 7.6 hours of dual flight training.

Flying experience:

Total hours	661,0
Total past 90-days	55,0
Total on type past 90-days	55,0
Total on type	55,0

1.6 Aircraft information

1.6.1 The Van's RV-7A series aircraft are an all-aluminum, low-wing monoplane of monocoque construction. The aircraft are deemed *Experimental – amateur built* by the Federal Aviation Administration (FAA) in the United States of America and are accepted under the corresponding category by several other aviation authorities around the world. In South Africa the aircraft was registered under the non-type certified aircraft (NTCA) category.

Figure 2. A view of the aircraft ZU-FVY.

Airframe:

Type	Van's RV-7A	
Serial number	74090	
Manufacturer	Van's Aircraft	
Year of manufacture	2012	
Total airframe hours (at time of accident)	65,8	
Last annual inspection (hours & date)	10,3	27 March 2013
Hours since last annual inspection	55,5	
Authority to Fly (issue date)	3 April 2013	
Authority to Fly (expiry date)	27 March 2014	
C of R (issue date) (present owner)	23 October 2012	
Operating categories	Private operation	

NOTE: On 12 June 2013 a 50-hour inspection was carried out on the aircraft by an approved aircraft maintenance facility. The inspection entailed the following:

(i) Replacing the engine oil as well as the oil filter.

(ii) Remove, inspect, clean and re-fit the spark plugs.

(iii) Perform a differential pressure test on the engine, with all four cylinders being found to be within the allowable limits.

Engine:

Type	Lycoming YIO-360-M1B
Serial number	EL-35888-51E
Hours since new	65,8
Hours since overhaul	T.B.O. not yet reached

Propeller:

Type	Hartzell HC-C2YR-1BFP/F7497-2
Serial number	NS1010B
Hours since new	65,8
Hours since overhaul	T.B.O. not yet reached

1.6.2 The aircraft was being operated within its allowable weight and balance limitations with the pilot being the sole occupant onboard the aircraft.

1.6.3 With the aircraft being registered in the non-type certified aircraft (NTCA) category the owner/pilot had the option to choose what instrumentation he wanted to install in the aircraft as well as the layout of the switches as well as the interior. The owner/pilot acquired an array of switches that he preferred an opted to have these switches installed instead of the standard toggle switches that comes standard with the kit. He also opted for two separate magneto switches instead of the standard key type switch. The photos below provides the reader with a better understanding of the cockpit switch layout that was opted for by the owner/pilot and then the 'standard layout' with the key switch installed on another RV-7A type aircraft.

A view of the switches that was fitted to ZU-FVY.

Figure 3. A view of the layout of the switches that was opted for by the owner/pilot of ZU-FVY.

Figure 4. A close-up view of the two magneto switches as well as the battery master switch on ZU-FVY.

Figure 5. A view of the layout of the switches that was opted for by another owner, similar type of aircraft.

1.7 Meteorological information

1.7.1 The weather information was obtained from the pilot's questionnaire as well as the observations made by the Investigator that dispatched to the scene.

Wind direction	230°	Wind speed	5 kt	Visibility	+ 10 km
Temperature	20℃	Cloud cover	Nil	Cloud base	Nil
Dew point	unknown				

1.8 Aids to navigation

1.8.1 The aircraft was equipped with standard navigational instrumentation as approved by the regulator. There were no recorded defects with the navigational equipment during the flight.

1.9 Communications

1.9.1 The aircraft was equipped with standard communication equipment as approved by the regulator. There were no recorded defects with the equipment prior to or during the flight.

1.9.2 Baragwanath aerodrome was an unmanned facility. While flying in the circuit the pilot broadcast his intentions on the designated VHF frequency 122,70 MHz.

1.10 Aerodrome information

1.10.1 Baragwanath aerodrome is an unlicensed facility. The pilot executed a forced landing within the boundaries of the aerodrome perimeter.

Aerodrome location	7 nm ESE of Weston-area	
Aerodrome co-ordinates	26°20’58” South 027°46’31” East	
Aerodrome elevation	5 393 feet above mean sea level	
Runway designations	13/31	
Runway dimensions	1000 x 10 m	
Runway used	31	
Runway surface	Asphalt	
Approach facilities	None	
Aerodrome status	Unlicensed	

1.11 Flight recorders

1.11.1 The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR), nor was it required to be fitted to this type of aircraft by regulation.

1.11.2 The aircraft was equipped with Dynon Skyview EFIS instrumentation, which had a non volatile memory installed. The instrumentation was not damaged in the accident and it was possible to successfully download the data into an Excel spreadsheet from the unit with the assistance of a competent person. Additional data on the download of the non volatile memory is contained in sub-heading 1.16 of this report.

1.12 Wreckage and impact information

1.12.1 The pilot executed a forced landing onto an open field below him on a heading of 260°M. He touched down with the flaps in the full down position. The grass was approximately 80 centimetres (cm) in height and very dry. The ground surface was also covered with ant hills, which placed a substantial amount of strain on the landing gear. The left main wheel spat was found to have separated from the wheel assembly during the landing roll. Ground markings indicate that approximately 10 m after touch down the nose wheel started to collapse. It left a clear track on the ground and approximately 20 m further on the aircraft nosed over. The outer sections of the wings, as well as the vertical stabiliser and rudder were damaged as the aircraft came to rest in an inverted attitude. The canopy, which was manufactured from plexi-glass remained fairly intact. With the aircraft coming to rest in an inverted attitude the canopy could not be opened and the pilot managed to break the plexi-glass on the right-hand side with the assistance of a portable fire extinguisher that was located in the cabin of the aircraft.

Figure 6. The ground mark in the centre of the photo was caused by the nose landing gear.

(a) (b)

Figure 7. A view of the damage caused to the left wing (a), also visible the deformation to the vertical stabilizer (b).

1.12.2 The fuselage displayed evidence of deformation especially in the area aft of the wings. The spinner was fractured and one of the propeller blades displayed a bending moment backwards. Both fuel caps were found to be secured, with the wing tanks still intact. Evidence of fuel spillage was evident from both the fuel vents, which was located just aft of the forward bulkhead. This observation was confirmed by the aerodrome manager that dispatched to the scene following the notification of the accident to him. He stated that he observed a substantial amount of fuel being drained from the aircraft fuel tanks via both the fuel tank vent lines (left and right).

1.12.3 Both the magneto switches were found to be in the off position during the on-site

investigation. During an interview with the pilot he indicated that he had switched off only the battery master and avionics switch before he vacated the aircraft. He also removed his head set and took it with him.

A view of the magneto switches in the OFF position as found during the on-site investigation.

Figure 8. A photo of the cockpit, which was taken during the on-site investigation, aircraft in an inverted attitude.

1.12.4 During the on-site investigation it was noted that fuel was leaking from both the fuel tank vents. During the recovery of the wreckage, after it was turned back onto its wheels 50 litres of fuel was drained from the left wing tank and 75 litres from the right wing tank.

1.13 Medical and pathological information

1.13.1 Not applicable.

1.14 Fire

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

1.15 Survival aspects

1.15.1 The accident was survivable. The pilot, who was seated on the left-hand side made use of the aircraft equipped four point safety harness. The impact sequence was found to be within the range of human tolerance. The pilot sustained a laceration to his head (left-hand side) as well as to his lower right leg, which were surgically attended to in hospital.

1.15.2 With the aircraft coming to rest in an inverted attitude the pilot was unable to open the canopy, which needs to be unlocked via a mechanical mechanism and then slides backwards. As there were no eye witness to the accident and therefore no one to assist the pilot he managed to break the plexi-glass canopy with a portable fire extinguisher that was positioned in the cabin.

1.15.3 The pilot stated during an interview with him that he also tried to make a phone call from his cell phone, but being of the touch screen type and with his hands being covered in blood the phone did not function accordingly.

1.16 Tests and research

1.16.1 The aircraft was equipped with Dynon Skyview EFIS instrumentation, which contained a non volatile memory. The non volatile memory captured a substantial amount of flight and engine parameters of the last 15 minutes of the flight. The instrumentation was not damaged in the accident and it was possible to download the data with the assistance of a competent person.

Of special interest to the post field investigation was the engine parameters. It was noted from the data that at 09:44:36Z the engine revolutions per minute (rpm) decayed from 2080 rpm to zero. This sudden engine stoppage was determined to have been caused by both the magnetos being grounded (switched off) during flight.

The sequence of events as described by the pilot after the engine stopped was captured on the data. The pilot indicated that he switched on the electric fuel pump in order to attempt an engine restart. It was noted that the fuel pressure delivered by the mechanical fuel pump was 24.1 psi when the engine failed, at 09:44:58Z the fuel pressure increased to 34.4 psi, which indicate the activation of the electric fuel pump 22 seconds after the engine stopped. It was further noted that during the 22 second time frame the aircraft had descended by 200 feet. At 09:45:29Z, which was 53 seconds after the engine stopped the aircraft touched down on the open

field.

With the aircraft being registered in the non-type certified aircraft (NTCA) category the aircraft was not fitted with the standard key type switch mechanism but instead the owner opted for an array of separate switches, which include a separate 'Battery Masters' switch as well as a separate switch for each magneto as can be seen in figure 3 and 4 of this report. It should be noted that the magneto switches was not of the guarded type *(a design where the pilot had to unlatch the guard before the switch can be either moved to the ON or OFF position).*

The two point headset socket was positioned above the two magneto switches and slightly to the left of it on the instrument panel. A test was conducted where the pilot brought his headset to the aircraft and he plugged it into the sockets and attached the wire clip to the glare-shield as illustrated in figures 9, 10 and 11, this was as the headset was installed in the aircraft on the day of the accident flight. It was noted that the headset control mechanism, which include two AA batteries, weighing 0.1350 kg (0.298 lbs) was hanging directly in front of the two magneto switches in very close tolerance to it.

Figure 9. The photo displays the headset as it was plugged in at the time of the accident flight.

Figure 10. The photo displays the headset control mechanism with the magneto switches in the ON position.

Figure 11. The photo displays the headset control mechanism with the magneto switches in the OFF position.

Figure 12. The photo displays the headset with its control mechanism that was used by the pilot.

Figure 13. The photo displays the headset control mechanism which was 12 cm in length.

1.16.2 Magnetos

Both the magnetos, serial number's 12071531 and 12070359 were found to be undamaged during the accident sequence, they were removed from the engine and were subjected to a bench tests functional check at an approved engine maintenance facility, no anomalies were found during the test procedure. Further to that the engine gear drive train with reference to the magneto drives were inspected

and was found to be consistent with normal operation. It was further determined that there was no short circuit in the system and each magneto switch allowed power through to the magnetos when switched to the ON position.

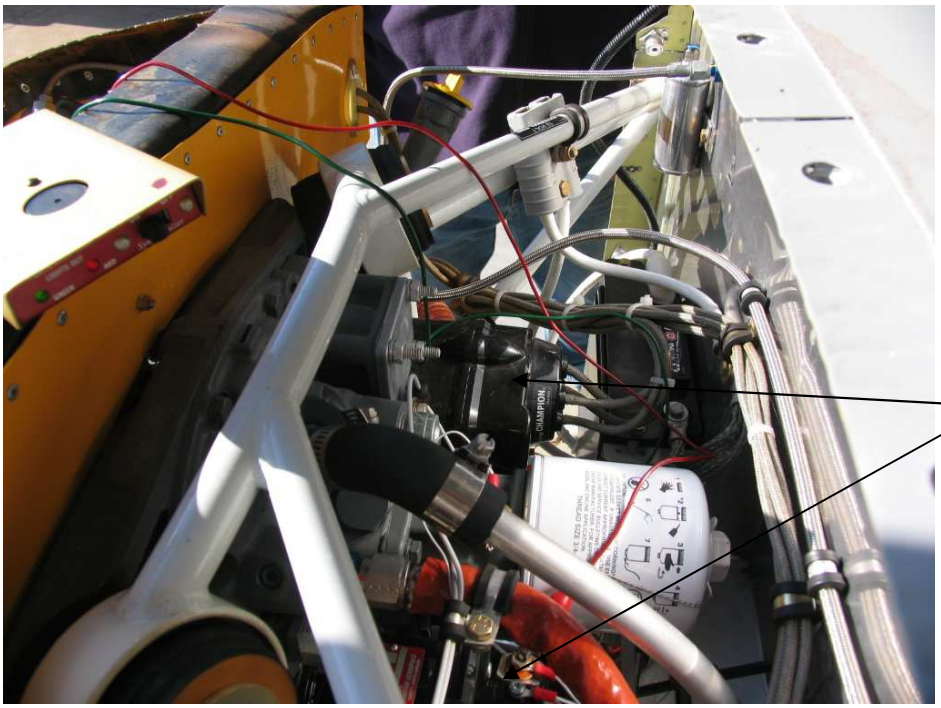


Figure 14. A view of the two magnetos, still attached to the engine.

Figure 15. A view of the two magnetos after they were removed from the engine prior to bench testing.

1.17 Organizational and management information

1.17.1 This was a private flight, with the owner also being the pilot.

1.17.2 The last annual inspection that was carried out on the aircraft was certified on 27 March 2013 at 10,3 airframe hours.

1.18 Additional information

1.18.1 Engine power loss in flight

Source: Pilot's Operating Handbook, Section 3, page 15 of 46

"Complete power loss is usually due to fuel interruption, if this is so power will be restored when the fuel flow is itself restored. The first action is to trim for the best glide – 90 mph / 78 knots IAS – and establish it there is time to attempt restart or immediately prepare for an emergency "Power Off" landing.

Restart procedure is to switch to the other tank (provided it is fuelled), turn on the fuel pump and move mixture to rich, the reduce power to minimise engine RPM if it should start. Check engine gauges for an indication of cause and if no fuel pressure is indicated confirm fuel tank selection, quantity and pump on. When power is restored, turn fuel pump off and reset the mixture. Monitor fuel pressure indication.

If engine still fails to restart and time permits switch the L then the R ignition OFF then ON, then ensure that both are ON. Try moving the throttle and/or mixture to different settings.

This may restore power if mixture is too rich or too lean or if there is a partial fuel blockage. Try the other tank. Water in fuel may take time to be drawn through the system. Allowing the engine to windmill may restore power. If the failure is due to water, then fuel pressure will be normal; with throttle wide and mixture rich the water will be consumed faster than with the throttle closed. If the failure is due to fuel exhaustion of one tank, then the empty fuel lines may take up to ten seconds to refill.

<u>REMEMBER, ALWAYS FLY THE AIRCRAFT FIRST (AVIATE, NAVIGATE, COMMUNICATE).</u>

1.18.2 Power off landing

Source: Pilot's Operating Handbook, Section 3, page 15 of 46

*"The initial action is **FLY THE AIRCRAFT**. ALWAYS TRIM FOR BEST GLIDE – 90 mph / 78 knots. Always fly the aircraft, do not stall. Pick a field & plan the approach BEFORE attempting to rectify the problem. If power restoration measures are ineffective you will ALREADY have an airport/field available and PLANNED, stick to normal procedures, and broadcast your problem/intent if possible.*

*Having identified a suitable field, plan an into wind landing. Try to be 1000 ft at the end of the downwind leg, abeam the planned threshold, to make a normal landing. Aim initially for the centre of the field. Drag with a wind milling propeller will be MUCH higher than you are used to. Only lower final stages of flap when you judge you can land in the centre of the field (as planned) then lower flap to bring your touchdown point closer to the threshold of the field. Plan for slowest short field landing **BUT DO NOT STALL**.*

When committed to landing close throttle, turn off masters and ignition switches. Turn fuel selector to off and move mixture to idle cut off. Seat belts should be tight and touchdown should be at the slowest speed possible".

1.18.3 Aerodrome traffic pattern

Source: Federal Aviation Administration (FAA), Airplane Flying Handbook (FAA-H-8083-3A), Chapter 7.

"The traffic pattern assures that air traffic flows in an out of an aerodrome in an orderly manner. An aerodrome traffic pattern is established appropriate to the local conditions, including the direction and placement of the pattern, the altitude to be flown, and the procedures for entering and leaving the pattern. Unless the aerodrome display approved visual markings indicating that turns should be made to the right, the pilot should make all turns in the pattern to the left.

When operating at an aerodrome with an operating control tower, the pilot receives, by radio, a clearance to approach or depart, as well as pertinent information about the traffic pattern. If there is not a control tower, it is the pilot's responsibility to determine the direction of the traffic pattern, to comply with the appropriate traffic rules, and to display common courtesy toward other pilots operating in the area.

Compliance with the basic rectangular traffic pattern reduces the possibility of conflicts at aerodromes without an operating control tower. It is imperative that the

pilot form the habit of exercising constant vigilance in the vicinity of aerodromes even though the air traffic appears to be light.

The standard rectangular right-hand traffic pattern is illustrated in figure 16 below. The traffic pattern altitude is usually 1 000 feet above the elevation of the aerodrome surface on the downwind leg. The use of a common altitude at a given aerodrome is the key factor in minimizing the risk of collisions at aerodromes without operating control towers.

Once the aircraft is ready to commence the base leg turn, which starts at approximately 45° to the threshold the aircraft com pletes a medium level turn 90° to the final approach track. Once the aircraft is established on base leg additional flap is extended and the altitude adjusted to maintain the nominated approach speed.

Premature decent on downwind prior to turning base is discouraged because in the event of the aircraft experiencing an engine failure the aircraft would be too low to glide onto the active runway".

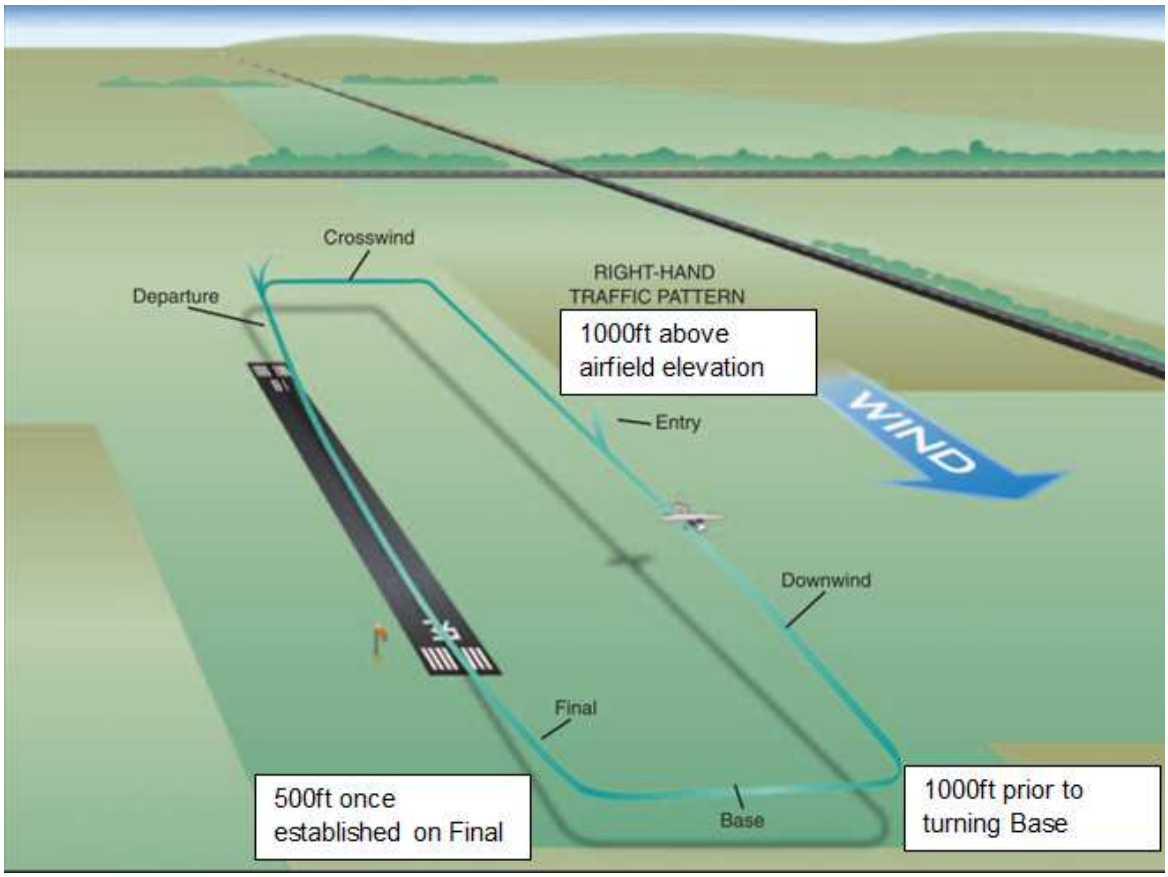


Figure 16. This image illustrates the standard rectangular right-hand traffic pattern.

1.19 Useful or effective investigation techniques

1.19.1 None.

2. ANALYSIS

2.1 Pilot (Man)

The pilot, who was also the owner of the aircraft held a valid private pilot licence and had flown 55,0 hours on the aircraft (ZU-FVY) over the past 90-days, including the accident flight. The aircraft type was endorsed in his logbook after he had completed his type conversion training via an approved aviation training organisation. The pilot was familiar with the aircraft and had flown it to several of our neighbouring countries during the 55,0 hour period.

The pilot deviated from flying the aircraft at the recommended circuit altitude of 6 400 feet, which was 1 000 feet AGL on downwind and was therefore unable to glide onto the active runway following the engine stoppage as he turned right onto base leg at a height of approximately 500 feet AGL (the height data was obtained from the download of the Dynon Skyview non volatile memory).

2.2 Aircraft (Machine)

The aircraft, which was registered under the non-type certified aircraft (NTCA) category had flown 65,8 hours since it was released to service as a new aircraft with its maiden flight being conducted on 12 March 2013. It was in possession of a valid Authority to Fly at the time of the accident.

The aircraft owner, who was also the pilot at the time of the accident flight, had opted to install Dynon Skyview EFIS instrumentation and further to that he opted for an array of ‘non standard’ switches (meaning switches that did not form part of the aircraft kit as made available by the manufacturer). The switches he opted for excluded the installation of the key type ignition switch, which comes standard with the aircraft kit. The switch layout he opted for instead allowed for a separate ‘Battery Masters’ switch as well as a two separate magneto switches (left and right) as can be seen in figure 4, page 9 of this report.

From an esthetical point of view the switches as opted for by the owner looked very neat, but from a safety perspective the switches could easily (without effort) be switched from the ON position to the OFF without any warning system being in placed (i.e., either a warning light or an audio warning or both). Further to that, essential switches, which include the two magneto switches was not of the guarded type, which made it even more prone to an accidental disturbance (being switch off in-flight) without any warning to the pilot.

The airframe headset sockets (two points) for the pilot's headset was found to be located slightly above the two magneto switches on the left-hand side of the instrument panel. Depending on the way the pilot route his headset wiring once plugged in it did allow for the headset control mechanism to be positioned in close (very) proximity to the two magneto switches, hanging directly in front of them. The routing of the headset wiring as displayed in figure 9, 10 and 11 of this report was as the pilot recalls it to be on the day of the accident with the control mechanism hanging in front of the two magneto switches. With the information that was obtained from the download of the data from the non volatile memory of the Dynon instrumentation it was possible to determine that the two magnetos were grounded (switched off) simultaneously, which caused the engine to stop and the propeller to windmill.

The pilot then followed the emergency procedure as laid down in the POH by switching tanks and selecting the electrical fuel pump to the on position. However he also stuck to the basics and flew the aircraft as he did not have much height to work with he concentrated on getting the flaps down and land the aircraft to the best of his ability before he was able to attempt an engine restart. He did indicate that he never considered that any of the switches could have been switched off (i.e., the magnetos) and therefore never considered it as an option. The pilot did indicate that he was caught by surprised when the engine stopped in-flight and it took him a second or two or three to focus on the emergency and fly the aircraft.

2.3 Mission

The flight was nothing out of the norm for the pilot. He had flown many circuits in the aircraft prior to this flight and was therefore well familiar with the flying characteristics of the aircraft. The aircraft, ZU-FVY was the only aircraft in the circuit at Baragwanath aerodrome at the time of the occurrence. This was an unlicensed aerodrome and therefore no aerodrome rescue and fire-fighting (ARFF) personnel where available to respond, nor was there any eye-witnesses to the

accident.

2.4 Environment

The flight was conducted within the perimeter of an aerodrome. Fine weather conditions prevailed at the time with the wind being from a south-westerly direction at 5 knots, which could have resulted in some moderate turbulence being around midday. The pilot managed to land the aircraft on the open field he had identified but due to the rough ground surface the nose wheel collapsed and the aircraft nosed over.

2.5 Conclusion

The possibility of this type of scenario happening (the unguarded magneto switched being switched off in-flight simultaneously) should be regarded as an extremely isolated case, however, due to the installation and layout of the switches, the post field investigation determined that it was indeed possible for the pilot headset control mechanism to have made contact with both magneto switches simultaneously during flight. As to how this occurred the possibility of turbulence was considered (being a midday flight), or the pilot adjusting his air vent (located in the left-hand corner next to the magneto switches) and in doing so allowed his hand to make contact with the headset control mechanism, which intern moved forward and isolated the two magneto switches, switching them off, resulting in an engine stoppage. The fact that these switches were unguarded allowed them to be exposed whereby the accidental deactivation of the switches could not be eliminated in-flight. Without any warning system being installed, the pilot was unable to conduct proper fault finding timeously and diverted his attention to his primary task by flying the aircraft and executing a forced landing.

3. CONCLUSION

3.1 Findings

3.1.1 The pilot was the holder of a valid private pilot licence and had the aircraft type endorsed in his logbook.

3.1.2 The pilot held a valid aviation medical certificate that was issued by a CAA approved medical examiner.

3.1.3 This was a private flight, with the pilot also being the owner of the aircraft, which was registered on the South African Register under the non-type certified aircraft (NTCA) category.

3.1.4 The aircraft was in possession of a valid Authority to Fly.

3.1.5 The aircraft was in possession of a valid Certificate of Registration.

3.1.6 The aircraft was properly maintained and had accumulated a total of 65,8 hours since new.

3.1.7 On the morning prior to the flight to Baragwanath aerodrome the pilot, who was also the owner of the aircraft washed the aircraft by rinsing it off with a hose and then drying it with a chamois. Fuel was strained from both tanks prior to the flight and no sediment/contamination was found.

3.1.8 The aircraft was flown within its allowable weight limitations as prescribed by the aircraft manufacturer, with the pilot being the sole occupant onboard.

3.1.9 There was ample fuel onboard the aircraft at the time of the accident with 125 litres of Avgas being drained from both fuel tanks during the recovery of the wreckage.

3.1.10 The Dynon Skyview EFIS instrumentation contained a non volatile memory that captured the last 15 minutes of the accident flight. The unit was downloaded and the data captured indicate that at 09:44:36Z both the magnetos were grounded during flight resulting in engine stoppage.

3.1.11 The aircraft was not equipped with a key type switch mechanism, but instead the owner opted for an array of separate switches, which include a switch for each magneto, these switches were not of the guarded type.

3.1.12 The pilot headset sockets were positioned in close proximity to the two magneto switches on the instrument panel.

3.1.13 The pilot connected his headset in such a way that his headset control mechanism was hanging in front of the two magneto switches in very close proximity.

3.1.14 The engine stopped while the pilot was turning right base leg for runway 31 at Baragwanath aerodrome at a height of approximately 500 feet AGL.

3.1.15 The time that lapsed from the engine stopped until the pilot executed the forced landing (touched down) was 53 seconds.

3.1.16 The pilot sustained a laceration to his head and right lower leg. He had to break the plexi-glass of the canopy with the assistance of a portable fire extinguisher, which was positioned in the cabin in order to free him from the wreckage as it was not possible to open the canopy being in an inverted attitude.

3.1.17 Fine weather conditions prevailed at the time of the accident flight.

3.2 Probable cause/s:

3.2.1 Unsuccessful forced landing following an engine stoppage in flight.

3.3 Contributory factor/s:

3.3.1 The engine stoppage was determined to have been caused by the simultaneous grounding of both the magnetos during flight. (The probability that the pilot's headset control mechanism have made contact with both the magneto switches while in-flight, switching them off could not be ruled out).

3.3.2 The fact that the two magneto switches were not guarded and being positioned in close proximity to the headset sockets should be regarded as a significant risk factor.

3.3.3 There was no warning indication to the pilot (i.e., warning light or an audio warning, or both) that the magnetos were switched off in-flight.

4. SAFETY RECOMMENDATIONS

4.1 It is recommended in the interest of aviation safety that the switches that were installed in the accident aircraft should not be allowed on aircraft if the magneto switches are:

(i) Not of the guarded type;
(ii) And if the layout of the switches on the instrument panel is of such an arrangement that the magneto switches can be switched off accidentally at

any stage during flight.

4.2 It is recommended that the key switch mechanism, which is an approved and tested mechanism worldwide, not be substituted by the installation of separate magneto switches, which could jeopardise flight safety.

4.3 It is recommended that the headset sockets be installed on the aircraft in such a location that once a headset is plugged in, its control mechanism does not interfere with any of the controls/critical parts of the aircraft at any stage during the flight.

5. APPENDICES

5.1 None.