AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9710		
Aircraft Registration	**ZU-DLY**	**Date of Accident**	11 May 2018		**Time of Accident**	1450Z	
Type of Aircraft	Windlass Aquilla		**Type of Operation**		Private (Part 94)		
Pilot-in-command Licence Type		National Pilot Licence	**Age**	36	**Licence Valid**	Yes	
Pilot-in-command Flying Experience		**Total Flying Hours**	80		**Hours on Type**	80	
Last point of departure	Brits Airfield (FABS), North West Province						
Next point of intended landing	Brits Airfield (FABS), North West Province						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Private farm in Brits (GPS position: 25°30'48.89" S 027°46'33.67" E, elevation 3780ft							
Meteorological Information	Wind: 290° 2kts; temperature: 24ºC; dew point: 4°C, QNH: 1019						
Number of people on board	1 + 1	**No. of people injured**	2	**No. of people killed**	0		
Synopsis							

The aircraft took off runway 02 with two occupants on board for a scenic flight around the Brits Area. The pilot stated that he entered into a circuit and on finals elected to do a fly past. As he flew past the airfields club house he applied full throttle to increase power to climb. Shortly after climbing, the engine had a power loss and the pilot immediately searched for a place to execute a forced landing. During the descent, the left wheel collided with the railway overhead power line and the aircraft subsequently impacted the ground a few meters from the railway line.

The aircraft sustained damage to the left main gear, propeller blade, instrument panel and the engine mount support tube. The pilot sustained serious injuries and the passenger sustained minor injuries.

The investigation revealed that during the forced landing, the aircraft's left main gear wheel impacted with a power line and the aircraft subsequently impacted the ground following an inflight engine power loss due to a cold seizure of the no.1 piston.

Probable Cause

The aircraft had a cold seizure of no:1 piston during a fly past and the engine failed, the pilot decided to do a forced landing however the aircraft rear wheel collided with power lines and the aircraft subsequently impacted the ground.

SRP Date	22 January 2019	Release Date	28 January 2019

Name of Owner	**:** Senekal F C
Name of Operator	**:** Senekal F C
Manufacturer	**:** Solo Wings CC
Model	**:** Windlass Aquilla
Nationality	**:** South African
Registration Marks	**:** ZU-DLY
Place	**:** North of Brits Airfield (FABS)
Date	**:** 11 May 2018
Time	**:** 1450Z

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 (2011) 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 blame or 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 The aircraft took off Brits Airfield (FABS) runway 02 with the pilot and a passenger on board for a scenic flight around the Brits Area. The aircraft climbed the to a circuit height and entered the right hand circuit. The pilot then descended the aircraft on final approach but elected to do a fly past. At the bottom of his descend, he applied full power to climb. Shortly after commencing the climb, the engine had power loss and the pilot immediately searched for a place to execute a forced landing. During the descent, the left rear wheel got caught by the railway overhead power line and the aircraft subsequently impacted the ground a few meters from the railway line.

1.1.2 The aircraft was substantially damaged. Both occupants sustained injuries.

1.1.3 The accident occurred during daylight conditions on a private farm north of Brits Airfield at a position with GPS coordinates determined to be: 25°30'48.89" South, 027°46'33.67" East and an elevation of 3 780 ft.

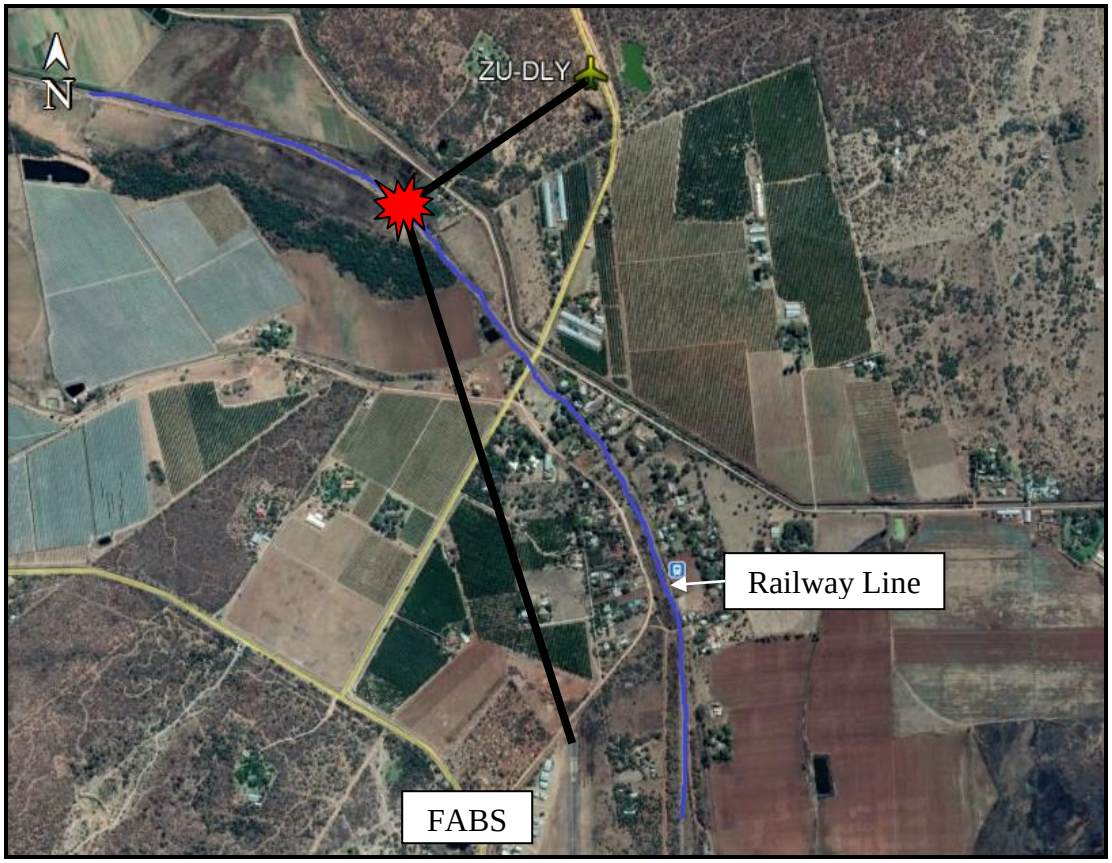

Figure 1: Aircraft flight path

Figure 2: Aircraft as it came to rest

1.2 Injuries to Persons

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

1.3 Damage to Aircraft

1.3.1 The aircraft sustained damage to the left main gear, 1 propeller blade, instrument panel and the engine mount support tube.

1.4 Other Damage

1.4.1 Railway overhead power line broke.

1.5 Personnel Information

Nationality	South African	Gender	Male	Age	36
Licence Number	0279035521	Licence Type	National Pilot Licence		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	30 June 2021				
Restrictions	Corrective lenses				
Previous Accidents	None				

Flying Experience:

Total Hours	80
Total Past 90 Days	40
Total on Type Past 90 Days	40
Total on Type	80

1.6 Aircraft Information

Airframe:

Type	Windlass Aquilla	
Serial Number	WA 1067	
Manufacturer	Solo Wings CC	
Date of Manufacture	2004	
Total Airframe Hours (At time of Accident)	814.25	
Last MPI (Date & Hours)	20 November 2017	794.0
Hours since Last MPI	20.25	
ATF (Issue Date)	26 March 2018	
C of R (Issue Date) (Present owner)	8 November 2016	
Operating Categories	Private (Part 94)	

Engine:

Type	Rotax 582
Serial Number	5743085
Hours since New	814.25
Hours since Overhaul	TBO not yet reached

Propeller:

Type	Aero
Hours since New	174.55
Hours since Overhaul	TBO not yet reached

1.7 Meteorological Information

Wind direction	290°	Wind speed	2 kts	Visibility	9999
Temperature	24°C	Cloud cover	CAVOK	Cloud base	CAVOK
Dew point	4°C				

1.7.1 An official weather report was requested from the South African Weather Services (SAWS) for the day and time of the accident. The meteorological aeronautical reports (METAR's) were made available for Rustenburg Airport (FARG). There were no surface observation stations available in the area of the accident.

1.8 Aids to Navigation

1.8.1 The aircraft was equipped with standard navigational equipment as approved by the regulator for the aircraft type. There were no recorded defects with the navigational equipment prior to the flight.

1.9 Communications

1.9.1 The aircraft was equipped with a hand-held radio and there were no reported defects to communications equipment prior to the flight.

1.10 Aerodrome Information

1.10.1 The accident did not occur at an aerodrome but it 1nm north of Brits aerodrome (FABS).

Aerodrome Location	Brits, North West Province (FABS)
Aerodrome Co-ordinates	25°31'56.4" S 027°46'29.45" E
Aerodrome Elevation	3 740.0 feet
Runway Designations	02/20
Runway Dimensions	900m x 20m
Runway Used	02
Runway Surface	Asphalt
Approach Facilities	none

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 by regulation to be fitted to this aircraft type.

1.12 Wreckage and Impact Information

1.12.1 The aircraft collided with railway overhead lines as it descended during a forced landing. The aircraft subsequently impacted the ground with the propeller facing towards the ground. One of the propeller blades had snapped off from the mid-section and the left wheel was broken off and lying a few meters from the main wreckage. The cockpit was also damaged and the wing was observed to be intact.

Figure 3: Damage to the cockpit

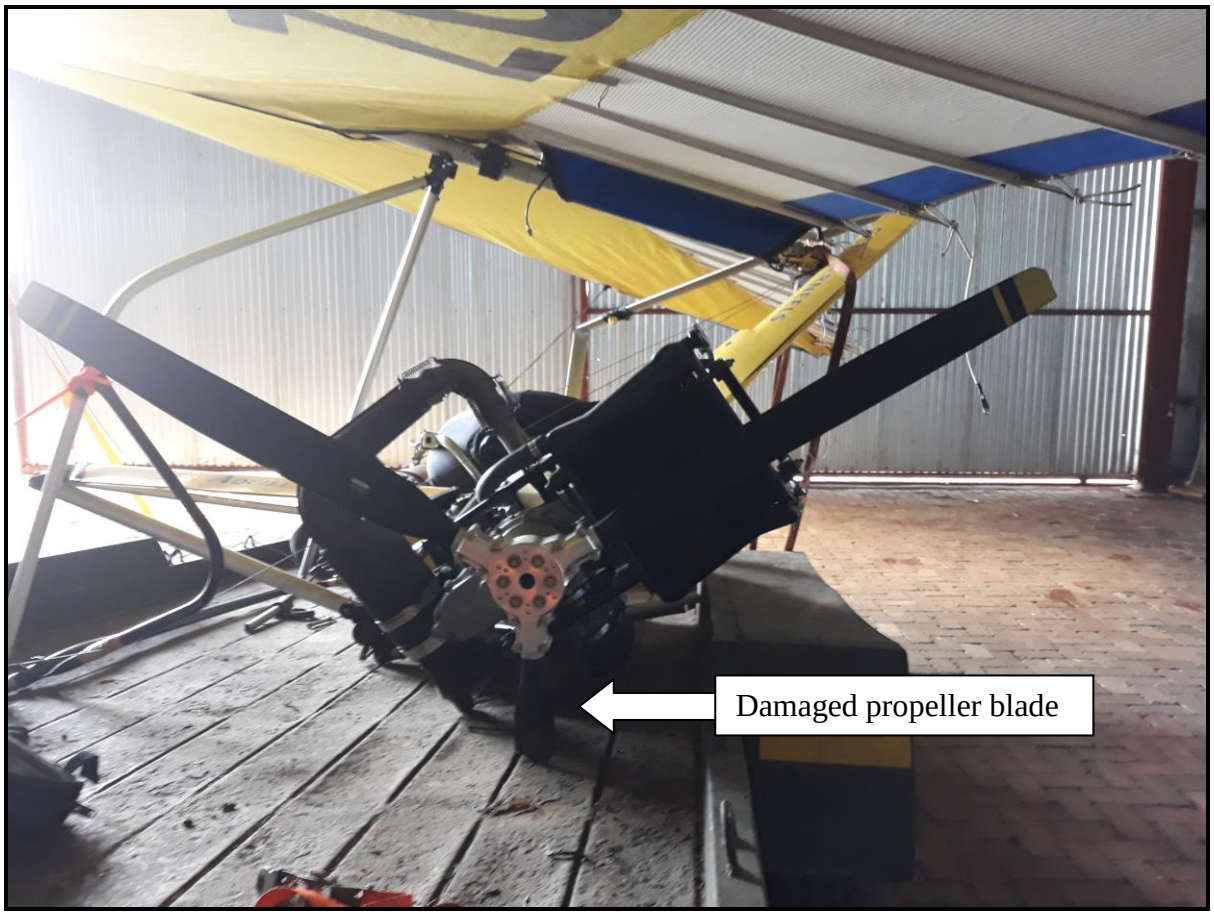

Figure 4: Damage to one of the propellers

1.13 Medical and Pathological Information

1.13.1 The following injuries were sustained by the pilot: fractured femur, broken back and he was partially induced for 12 days in hospital following the accident. The passenger sustained minor injuries.

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 aircrafts upright attitude and low speed on impact. Both occupants were found with their safety harnesses still secured but their injuries were due to the fact that the aircraft has no side panels.

1.16 Tests and Research

1.16.1 The aircraft with the engine fitted was recovered to an AMO and the engine was subjected to an engine run in the presence of investigators. The following was found: Only one blade of the propeller was broken which shows that the propeller was stationary on impact and that therefore the engine was not running on impact. The spark plugs were removed and a compression gauge was inserted in each spark plug receptacle. The engine was then cranked by pulling on the handle four times to build compression of the cylinders. Compression on cylinder no.1 was indicating 100kPa and compression on cylinder no.2 was indicating 625kPa. The cylinders were inspected and it was determined that the piston in cylinder no.1 had seized.

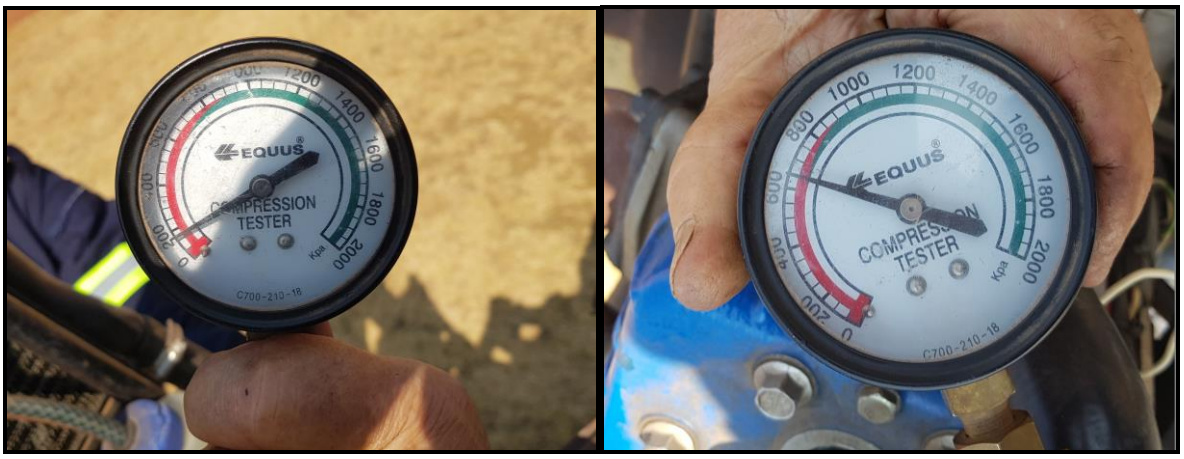

Figure 5: Cylinder no.1 left and Cylinder no.2 right

1.17 Organizational and Management Information

1.17.1 The aircraft was maintained by an Approved Person (AP), who was appropriately authorised and rated to carry out maintenance on the aircraft type. No maintenance related anomalies were identified regarding the performance of the aircraft.

1.17.2 The last Mandatory Periodic Inspection (MPI) was certified on 20 November 2017 by an AP at 794.0 airframe hours after which the aircraft flew a further 20.25 hours up until the accident.

1.18 Additional Information

1.18.1 Abstract from similar accident due to a cold seizure: http://www.ultralightnews.com

The Rotax 582 is a liquid cooled engine and ships without a thermostat. Rotax does make a thermostat for this engine but it is not installed on a new engine. A cold seizure is a result of the piston expanding too fast with respect to its cylinder. The engine is constructed on many different types of materials all housed together and designed to work as one system. All internal engine components, when heated (running engine) will expand to some extent. This expansion is normal and unavoidable. Different components will expand at different rates and will expand to different extents. When you fire an engine after it has been able to cool down to a state where all internal components are at their "NEUTRAL" state meaning they are in no state of any expansion due to heat, these components will begin their expansion all over again. In other words: While descending with the engine at idle it appears that the engines rear cylinder cooled faster than the piston and causes it to seize. If the engine had a thermostat installed, it would have kept the water hot around the cylinder during the descent and then the cylinder would not have cooled off too fast, therefore the piston would not have seized. They also said not to leave the engine at idle for a long period, periodically rev the engine during long idle times while flying, as in long descents.

1.18 Useful or Effective Investigation Techniques

1.18.1 None.

2. ANALYSIS

2.1 Man

The pilot was in possession of a valid national pilot's licence and a valid medical certificate with lens restrictions. He had a valid rating on the weight shift controlled microlight on his licence.

2.2 Aircraft

The last MPI was carried out and certified by the Approved Person on 20 November 2017 at 794.0 airframe hours.

No mechanical defects or malfunctions were reported prior to the flight that could have contributed to the accident.

It is most probable that when applying full throttle it increased the engine temperature but there was a thermo-imbalance between the pistons and the cylinders due to their different materials composition, therefore the piston expanded faster than the cylinder due to a phenomenon known as cold seizer. This normally occurs when hot expanding piston due to thermal expansion is inside a cylinder which is cooled by cooling liquid resulting in the piston seizing in the cylinder sleeve leading to the failure of the engine. The compression test indicated 100kpa for cylinder no: 1 as compared to cylinder no: 2 which indicated 625kpa.

2.3 Mission

The pilot and a passenger took off from FABS for a scenic private flight around the Brits area. The pilot entered into a circuit at FABS which required him to climb to the circuit height and then descend until landing. On downwind the pilot began his descent and released the throttle to put the engine on idle which caused the engine temperature to cool down momentarily. He then did a fly past instead of fully landing which meant he had to apply full throttle to climb. Applying full throttle increased the engine temperature again but there was a thermo-imbalance between the pistons and the cylinders due to their different materials, therefore the piston expanded faster than the cylinder. The piston which is contained within the cylinder, eventually expanded to the point that its sides could not move through the cylinder and it completely seized. The engine cut out and the pilot immediately looked for a place to execute a forced landing. During the descent, the left rear wheel collided with the railway overhead line and the aircraft impacted the ground a few meters from the railway line.

2.4 Environment

The accident occurred during daylight condition at GPS coordinates determined to be 25°30'48.89" South 027°46'33.67" East at an elevation of 3 780 feet above mean sea level (AMSL). According to the South African Weather Service (SAWS), fine weather conditions prevailed on the day of the accident.

The accident occurred on a private farm with bushy terrain and a railway line running to the west of its boundary.

3. CONCLUSION

3.1 Findings

3.1.1 The pilot held a valid National Pilot licence and had the aircraft type endorsed on his licence. The pilot had a valid aviation medical certificate with corrective lens restrictions.

3.1.2 The flight was operated as a private scenic flight under visual meteorological conditions (VMC).

3.1.3 Fine weather conditions prevailed on the day of the accident.

3.1.4 The aircraft had a valid Authority to fly at the time of the accident.

3.1.5 The AP who performed the last MPI on the aircraft was in possession of a valid licence.

3.1.6 The last MPI was carried out on 20 November 2017 by an AP at 794.0 airframe hours after which the aircraft flew a further 20.25 hours until the accident. The aircraft had a total of 814.25 airframe hours at the time of the accident

3.1.7 The propeller blade damage was consistent with an engine producing no power on impact.

3.1.8 Both occupants were injured in the accident.

3.1.9 The aircraft had a cold seizure of no:1 piston during a fly past and the engine lost power, the pilot decided to do forced landing however the aircraft rear wheel collided with power lines and aircraft subsequently impacted the ground.

3.2 Probable Cause/s

3.2.1 The aircraft had a cold seizure of no:1 piston during a fly past and the engine lost power, the pilot decided to do forced landing however the aircraft rear wheel collided with power lines and the aircraft subsequently impacted the ground.

4. SAFETY RECOMMENDATIONS

4.1 None.

5. APPENDICES

5.1 None.