SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9416		
Aircraft Registration	ZU-EHM	**Date of Accident**	27 February 2015		**Time of Accident**	15:30Z	
Type of Aircraft	Windlass Aquilla microlight		**Type of Operation**		Private (pleasure)		
Pilot-in-command Licence Type	NPL		**Age**	57	**Licence Valid**	Yes	
Pilot-in-command Flying Experience	Total Flying Hours		764,28		Hours on Type	341,20	
Last point of departure	Dairy farm private airstrip, Irene, Centurion, Gauteng						
Next point of intended landing	Dairy farm private airstrip, Irene, Centurion, Gauteng						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
On a private farm airstrip with GPS co-ordinates: S25 º 52' 43.17", E028º 12' 35,74"							
Meteorological Information	Wind direction: 270º; Air temperature: 25 ºC; Wind speed: 7 kts; Visibility: Good						
Number of people on board	1+1	**No. of people injured**	1+0	**No. of people killed**	0		

Synopsis

The pilot, being the owner of the microlight, took off from the private airstrip on his farm for a pleasure flight, accompanied by a passenger. The pilot stated that during take-off, while lifting off, he noticed that the airfoil tube member was disconnected from its joining position. The pilot then opted to turn around and land on the airstrip runway again.

The pilot stated that during the turnaround, the keel bar control was in vain. Although he managed to align the microlight with the intended landing runway, it was impossible to flare prior to landing. The microlight landed nose first on the thick grass before the prepared runway and rolled over. The microlight sustained substantial damage to the nose landing gear, pylon and the lower boom member.

The pilot sustained serious injuries during the accident sequence, whereas his passenger was not injured.

The post-investigation revealed that the accident was caused by the loss of aircraft control by the pilot following the disconnected airfoil tube during flight.

Probable Cause

Unsuccessful forced landing

Contributory Factors

1. Dislodged component
2. Inadequate pre-flight inspection

IARC Date		Release Date	

AIRCRAFT ACCIDENT REPORT

Name of Owner	**:** VAN DER BYL A R
Name of Operator	**:** VAN DER BYL A R
Manufacturer	**:** Solo Wings CC
Model	**:** Aquilla II
Nationality	**:** South African
Registration Marks	**:** ZU-EHM
Place	**:** Dairy farm private airstrip, Irene, Centurion, Gauteng
Date	**:** 27 February 2015
Time	**:** 15:30Z

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 take-off just after lift-off, the pilot noticed that the airfoil tube member was disconnected from its bottom attachment link and was stuck behind the instrument panel. The pilot turned the microlight around in an attempt to land on the prepared runway again. The pilot further explained that the keel bar for weight shift control was in vain during flight. Although he managed to align the microlight to the intended landing runway, the approach was unstable and the microlight landed on

some tall, thick grass before the prepared landing strip runway. On contact with the grass, the microlight rolled over and came to rest inverted, facing in a northwesterly direction. The microlight sustained substantial damage to the nose gear, airfoil tube, keel tube (bar) and the pylonôs extended member.

1.1.2 Rescue work was initiated by personnel who were at the scene, while an ambulance was contacted. The microlight cables were cut by rescue personnel to remove the pilot and his passenger. The pilot was seriously injured during the accident sequence, whereas the passenger did not sustain any injuries. The accident occurred in daylight conditions on a farm with GPS co-ordinates S25 º 52' 43.17", E028º 12' 35.74"and a field elevation of 4 702 ft.

1.2 Injuries to Persons

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

1.3 Damage to Aircraft

Figure 1: Damage to the aircraft

1.3.1 The aircraft sustained substantial damage.

1.3.2 Figure 1 shows the damage sustained by the microlight during the accident sequence.

1.4 Other Damage

1.4.1 None

1.5 Personnel Information

Nationality	South African	Gender	Male	Age	57
Licence Number	0270236474	Licence Type	PPL microlight		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Weight-shift controlled microlight				
Medical Expiry Date	30 June 2015				
Restrictions	Corrective lenses				
Previous Accidents	None				

Flying Experience:

Total Hours	764,28
Total Past 90 Days	7,12
Total on Type Past 90 Days	7,12
Total on Type	341,2

1.6 Aircraft Information

Airframe:

1.6.1 The Aquilla II microlight is controlled by weight shift on all three axes. The power is controlled by a foot throttle on the right pedal and the choke and cruise throttle levers are under the seat on the left. The two-position ON/OFF switches are in the

instrument pod. The front wheel brake can only be operated from the front with the left foot. The designated flight envelope of the Aquilla excludes all aerobatics, defined as pitch greater than 30 degrees and rolls greater than 60 degrees. Pilots are urgently warned to ensure that they fly the Aquilla within the specified flight envelope.

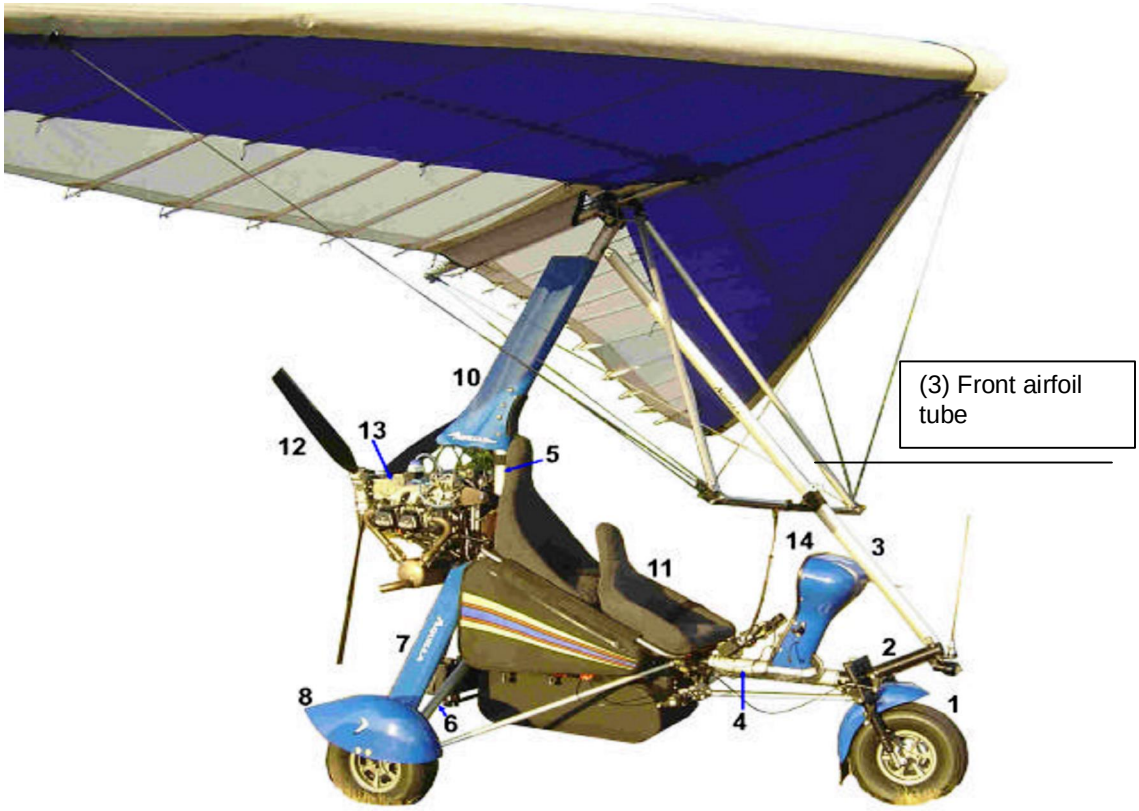


Figure 2: Airfoil tube member (3)

Type	Aquilla II	
Serial Number	WA1144	
Manufacturer	Solo Wings CC	
Date of Manufacture	2006	
Total Airframe Hours (At time of Accident)	426,24	
Last MPI (Date & Hours)	22 May 2014	416,3
Hours since Last MPI	9,94	
C of A.T.F (Issue Date)	6 June 2014	
C of A.T.F (Expiry Date)	21 May 2015	
C of R (Issue Date) (Present owner)	4 August 2006	
Operating Categories	Part 24 NTCA	

Engine:

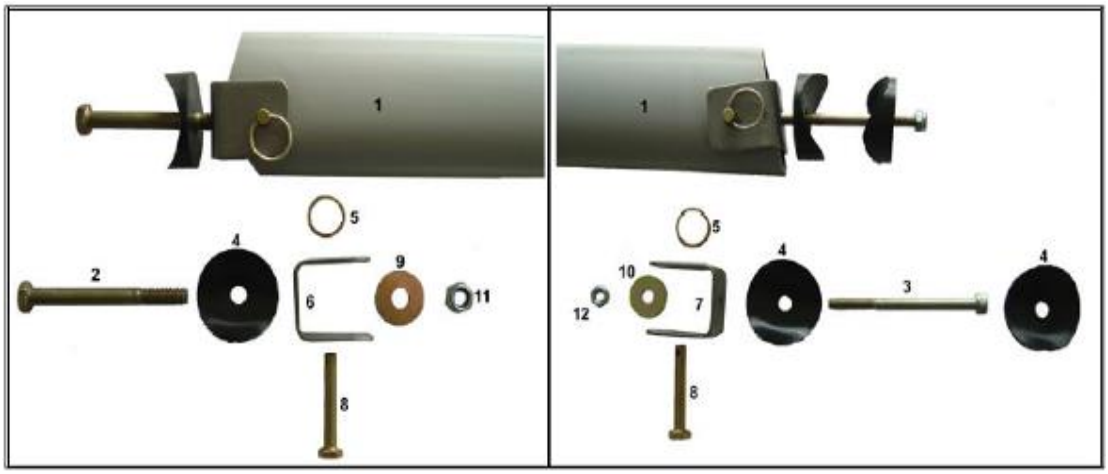
Type	Rotax 912 ULS
Serial Number	5646752
Hours since New	426,26
Hours since Overhaul	TBO not yet reached

Propeller:

Type	Neuform
Serial Number	Unknown
Hours since New	426,26
Hours since Overhaul	TBO not yet reached

1.6.2 The front airfoil tube

This is the front tube with an airfoil shape that forms part of the microlight main structural members (Figure 3). It connects on both the top and the bottom on the U-shaped brackets with safety pins (8) and a safety ring (5). The bottom U-shaped bracket is bolted in place on the front elbow (2). The two saddles are used on the bottom airfoil tube connecting point. The one saddle is used between the U-shaped bracket (7) and the elbow and the other on the end connection before inserting the washers (10) and the nut (12).



Top connection point **Bottom Connection point**

Figure 3: Airfoil connecting points ï illustrated parts

1.6.3 Aircraft documentation such as maintenance records, certificates and service bulletin letters were studied and reviewed. The information records how the aircraft was equipped and maintained. All service bulletins published by the engine and aircraft manufacturer were adhered to by the aircraft maintenance organisation. Furthermore, the last annual inspection, conducted on 18 June 2014, was considered for maintenance analysis. All work done was in accordance with prescribed procedures.

1.6.4 The approved personnel member who carried out the annual inspection informed the investigating team that he always used a new nylon nut of the correct specification during his maintenance servicing.

1.7 Meteorological Information

Meteorological information as obtained from the official weather service website

Wind direction	20º	Wind speed	7 kt	Visibility	GOOD
Temperature	25 ºC	Cloud cover	None	Cloud base	None
Dew point	12 ºC				

1.8 Aids to Navigation

1.8.1 The microlight was equipped with the standard factory-fitted navigational equipment approved by the Regulator. There were no recorded defects to navigational equipment prior to the flight.

1.9 Communications.

1.9.1 The microlight was equipped with one VHF (very high frequency) radio approved by the Regulator. There were no recorded defects regarding the communication equipment prior to the flight.

1.10 Aerodrome Information

Aerodrome Location	Private airstrip, Dairy farm Irene , Centurion, Gauteng
Aerodrome Co-ordinates	S25 º 52' 43.17", E028º 12' 35.74"
Aerodrome Elevation	4 700 ft
Runway Designations	07/25
Runway Dimensions	280 m × 6 m
Runway Used	07
Runway Surface	Grass
Approach Facilities	None

1.11 Flight Recorders

1.11.1 The microlight was not equipped with a flight data recorder or a cockpit voice recorder. Neither recorder was required by the relevant aviation regulations.

1.12 Wreckage and Impact Information

Figure 4: Landing strip

1.12.1 The area at which the aircraft took off in under the air space controlled by the AFB WTKLF. The aircraft accident occurred on the thick grass before the prepared landing strip. The pilot was unable to control the aircraft during landing due to the disconnected tube control noticed during take-off.

Figure 5: Airfoil with bottom U-bracket

1.12.2 According to the accident site observation, the microlight landed on the nose landing gear first, followed by the airfoil tube digging into the ground, and then rolled over. The airfoil tube was damaged during impact and got bent. The bottom connection of the airfoil tubeôs U-bracket became disconnected due to a lost nut (Figure 5).

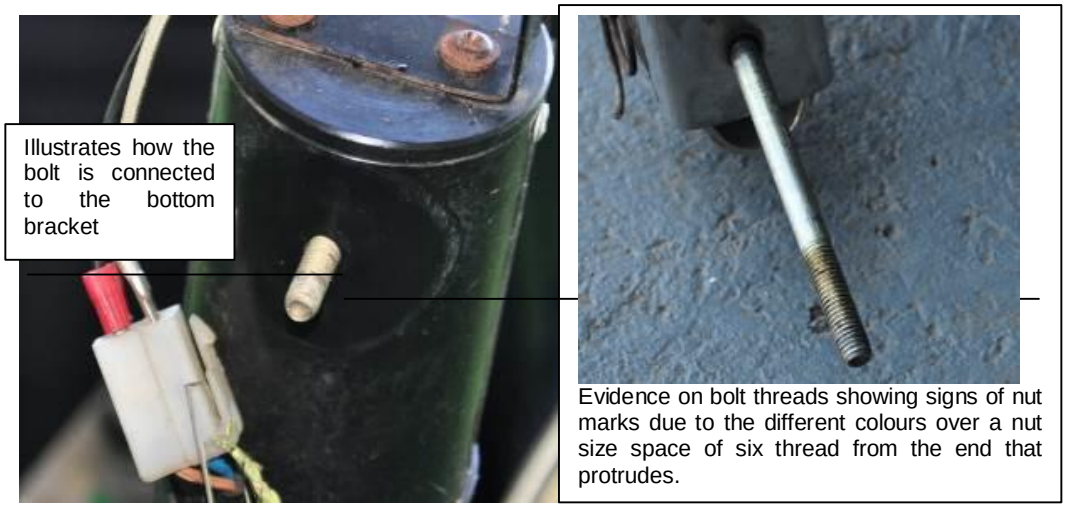


Figure 6: Evidence marks on bottom saddle

1.12.3 The nut and saddles were not found in the accident area. However, there were evidence marks on the front elbow, showing that the saddles had been attached prior to the accident (Figure 6). There was further evidence showing that there had been a nut prior to the accident. The microlight remained with the wheels-up position on the grass. During the rescue, some of the cables were cut for access. The aircraft sustained substantial damage to the airfoil tube, keel bar, nose gear and the cables.

1.13 Medical and Pathological Information

1.13.1 The pilot sustained serious leg injuries.

1.14 Fire

1.14.1 There was no pre- or post-impact fire during the accident sequence.

1.15 Survival Aspects

1.15.1 The accident was considered survivable due to the low kinetic energy during impact. The pilot was seriously injured and hospitalised. The pilot and the passenger were secured with the aircraft-equipped shoulder harnesses, which did not fail during the accident sequence.

1.16 Tests and Research

1.16.1 No test was carried on any of the microlight components.

1.16.2 During investigation, the pilot mentioned to the investigating team that he never checked the bottom U-bracket bolt and nut in his pre-flight inspection. The following is the pre-flight inspection as described in the manufacturerôs flight manual.

Pre-flight inspection

The pre-flight or visual exterior inspection is done before each and every flight. Spectators as well as other pilots like to look, feel, touch your aircraft, usually when you are not around! During the pre-flight inspection you need to make sure that nothing is missing or out of place and that no-one has tampered with the aircraft. To conduct the inspection in a manner that ensures that nothing is left out, get into a habit of following a fixed routine. First break down the components or sections of the pre-flight into small logical units and do a hands-on ñtouch and feelò check. Checking out your aircraft is as important as checking out the weather. PLEASE donôt ever become complacent about pre-flights.

NOSE WHEEL

1. Check the tyre for wear and cuts, also for proper inflation.
2. Check foot throttle and foot brake assemblies for freedom of movement and cable wear.
3. Check axle nut for security.
4. Check if mudguard is secure.
5. Check proper installation of pin and safety ring at the base of the airfoil upright.
6. Check shock absorbers.
7. Check brake

PYLON

1. Check the general condition of the pylon, look for cracks and elongation of hole.
2. Check the front support attachment pin and ring.
3. Check for free movement of hang point assembly and elongation of hang-bolt hole.
4. Check hinge point area for security, wear and tear ï brackets, bolts, locking bolt etc.
5. Check that the safety cable between the pylon and the keel goes around the wing keel twice and is in front of the wing hang-block. It must pass underneath the crossbar tensioning cables.

1.16.3 Security of the bolts and nuts

The nyloc nut type (Figure 7)

Information extracted from various references as follows: www.wisegeek.com: FAA AC43. 13-1B; Air Force T.O 1-1A-8

A nyloc nut is a fastener that incorporates a nylon component to effectively lock the nut into position on the bolt. The nylon component of the nyloc nut has a smaller inside diameter than the actual nut, thereby locking the nut in place by squeezing the nylon firmly around the bolt when tightened. Unlike a standard locking washer, the nyloc nut prevents the nut from loosening under vibration as the nylon is tightly wedged into the bolt threads and provides resistance to turning once tightened.

Figure 7: Nylon nut types

One common problem with standard nut-and-bolt fasteners is that they can become loose or even work themselves free over time and with vibration. Chemical thread-locking compounds work well at reducing the occurrence of loosening nuts, but can be very time-consuming and, in difficult-to-reach areas, nearly impossible to apply. The nyloc nut allows a bolt to be tightened without fear of its loosening under nearly any condition, and typically there is no more difficulty in installing the nylon locking nut than a conventional non-locking nut. One drawback to using a nyloc nut is that the nut cannot be threaded tight by using fingers alone. The nylon insert requires that a wrench be used on the nut once the threads come into contact with the nylon inside.

Even though the nylon locking nut can be reused in many applications, it is recommended that a fresh locking nut be used on any critical fastener connection. The slightest risk of failure warrants a ban on the reuse of the fastener in all critical applications, such as cylinder head bolts, connecting rod bolts and main bearing cap bolts. Modern nylon formulas permit the nyloc nut to be used in many internal engine applications without concern.

Authorities disagree on whether nyloc nuts should be reused. For example, Carroll Smithõs nuts and fasteners, nuts, bolts and plumbing handbook notes that the nylon insert is not damaged by installation and can therefore be reused many times. The Federal Aviation Administration advisory circular allows nuts to be reused if the prevailing torque is within specification. However, the Air Force technical order requires replacement of self-locking nuts in critical areas. Various specifications for aerospace grade self-locking nuts require that the running torque be maintained without preloading the fastener.

1.17 Organizational and Management Information

1.17.1 This was a private flight.

1.17.2 The approved person who maintained the microlight is licensed and approved by RAASA.

1.17.3 The microlight had flown 9,94 hours since the last MPI, which was conducted on 22 May 2014 at 416,3 airframe hours.

1.18 Additional Information

1.18.1 The pilot explained to the investigating team that the pre-flight inspection procedures on the microlight do not include the inspection on the bottom U-bracket bolt and nut security. The microlight can be flown either fitted with the fairing or without it. The pre-flight inspection while the fairing is fitted will not allow the

inspection of the bottom U-bracket connecting bolt nut security.

2.18.2 According to a maintenance personnel member who had experience on microlights, it is always advisable to use a new self-lock nut every time during service maintenance. He further stated that it was not easy for the nut to get lost if it was installed as a new component during maintenance, with the correct torque and specifications. In many instances where the nylon nut is lost, it occurs after the initial installation when the nut was removed and reused more than once.

2.18.3 The pilot accompanied by a passenger took off from a private airstrip on a farm for a pleasure flight. The pilot stated that het usually liaised with the Air Force Base Waterkloof (AFB WTKLF) airspace controllers before take-off and advised them of his intention to fly around in the area, obtaining permission first. On the day of the accident, no communication was established between the pilot and the AFB WTKLF air traffic controllers (ATC). The pilot stated that he had attempted to contact the WTKLF ATC via the landline telephone as usual, but was unsuccessful and decided that he would go ahead with his take-off and would then establish communication while airborne.

1.19 Useful or Effective Investigation Techniques

1.19.1 None

2. ANALYSIS

2.1 With regard to the accident flight, a few abnormal activities occurred prior to the flight. The pilotõs pre-flight inspection was not properly done. The pilot mentioned that he did not inspect the bottom U-bracket attachment bolt and nut as it was not a standard pre-flight checklist item. The pilot acted negligently during flight preparation. The inspection checklist point No. 4 under the pylon inspection heading states that the security of hinge points, brackets, bolts, locking bolts etc. must be checked The microlight was flown without a fairing, which makes it easy to inspect the bolt and nut security of the bottom U-shaped bracket.

2.2 According to the nyloc nut specification, the nut cannot easily get lost if fitted according to specifications. This suggests that the nut might have been tampered with either during or after maintenance. We could not recover the nut during investigation to determine whether it was a reuse or was the correct specification. However, the microlight flew for 9,94 hours after the maintenance over a period of nine months.

2.3 The microlight can be flown with or without the fairing, which requires removal of the airfoil tube for fitting. This can be achieved by removing the safety pin on the bottom U-shaped bracket attachment. It is possible that someone might remove the bottom U-shape in an attempt to fit the fairing if not knowledgeable. That would result in the nylon nutôs being reused or mis-fitting of the nut. However, the microlight had been flown without the fairing at the time of the accident.

2.4 If the nut had been fitted as a reuse item during maintenance or between operational activities, the pilot might have anticipated its getting lost over time during operation, due to vibration. The airfoil tube is considered flight-critical because it is considered a balance structural member. However, the pilot stated that he did not bother inspecting the nut for security as it was not part of the standard pre-flight inspection checklist.

2.5 The pilot did not get permission as he always did from the airspace controller prior to flight. Although the pilot alleges that he tried to contact the airspace controller but was unsuccessful, he proceeded with the flight hoping to establish communication while airborne, which he never had a chance to do following the accident. If there had been traffic in the surrounding airspace and the flight was successful, It could have posed a risk to other aircraft

3. CONCLUSION

3.1 Findings

3.1.1 The pilot was a qualified and licensed for the flight in accordance with existing regulatory procedures.

3.1.2 The pilot did not conduct a proper pre-flight inspection.

3.1.3 The pilot also did not follow the standard operation procedure prior to flight when he failed to contact ATC WTKLF for permission before proceeding with the flight.

3.1.4 The microlight was maintained by an approved person who was qualified and licensed in accordance with regulatory procedures.

3.1.5 The microlight was in possession of valid certificates of registration and a certificate of an authority to fly.

3.2 Probable Cause/s

3.2.1 Unsuccessful forced landing

3.3 Contributory Factor

3.3.1 Dislodged component

3.3.2 Inadequate pre-flight inspection

4. SAFETY RECOMMENDATIONS

4.1 None

5. APPENDICES