SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9252		
Aircraft Registration	ZU-DZC	**Date of Accident**	04 December 2013		**Time of Accident**	1136Z	
Type of Aircraft	Evektor-Aerotechnik A.S (SPORTSTAR) (Aeroplane)		**Type of Operation**		Training flight		
Pilot-in-command Licence Type	PPL (Aeroplane)		**Age**	54	**Licence Valid**	No	
Pilot-in-command Flying Experience	Total Flying Hours		Approximately 1261.5		Hours on Type	Unknown	
Last point of departure	Pietermaritzburg Airport (FAPM)- Kwa-Zulu Natal Province						
Next point of intended landing	Pietermaritzburg Airport (FAPM)- Kwa-Zulu Natal Province						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
At Richmond on a sugar cane farm with GPS reading (S 29º 56' 37", E 030º 18' 27")							
Meteorological Information	Wind direction 120°C, Wind speed 10KT, Temperature at 26°C, Dew point 12°C, QNH 1016, Visibility <10km						
Number of people on board	2+0	**No. of people injured**	0	**No. of people killed**	2		

Synopsis

The aircraft departed FAPM at approximately 1117Z with a crew of two on board engaged in a proficiency check flight. The aircraft was reported missing later on the same day, as it did not arrive at the expected time at FAPM. The aircraft was last observed on the King Shaka International Airport radar at approximately 1136Z the same day at a point approximately 18 Nm south west of FAPM around Pietermaritzburg general flying area (PGFA).

The search and rescue team was dispatched to the accident site, where the search was initiated in the area around the last point where the aircraft disappeared from the radar. The search was unsuccessful due to failing light sunset. Members of the Pietermaritzburg flying club, who were helping with the search, discovered the aircraft the next morning.

The aircraft crashed on a sugar cane farm 18.2 nautical miles (Nm) South West of FAPM. The aircraft sustained substantial damage with both crewmembers having sustained fatal injuries.

The investigation found that the cause of the accident was a lack loss of engine power during flight. The aircraft entered a stall and spin condition and the pilot was unable to recover from the flight manoeuvre.

Probable Cause

The pilot failed to maintain flying speed and stalled the aircraft

Contributing factor

Loss of engine power

IARC Date		Release Date	

AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : Grosvenor
Manufacturer : Evektor Aerotechnik
Model : SportStar
Nationality : South African
Registration Marks : ZU-DZC
Place : Richmond on a sugar cane farm at GPS reading (S 29º 56' 37", E 030º 18' 27" with elevation of 2700ft AGL
Date : 04 December 2013
Time : 1136Z

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 The aircraft, with a crew of two on board, departed from Pietermaritzburg airport at approximately 1117Z to Pietermaritzburg general flying area (PGFA) with the intention of completing proficiency checks training exercises for the owner. The aircraft was expected to land back at FAPM on the same day, after completing the exercise flight.

1.1.2 According to Pietermaritzburg air traffic control (ATC), the aircraft changed from their radio frequency at approximately 1122Z to an unmanned frequency of 124.8 MHz in the general flying area. This was when they last had contact with the aircraft.

1.1.3 According to King Shaka International Airport radar recordings, the aircraft disappeared permanently at approximately 1136Z in the area around Richmond. The FAPM-ATC requested the Pietermaritzburg search and rescue team to dispatch to the area around where the aircraft last made contact with the radar. The search was unsuccessful because of failing light.

1.1.4 The aircraft was discovered the next morning, on 5 December 2013, around the last point of radar contact. A member of the Pietermaritzburg flying club spotted the missing aircraft. The air crew informed the ground crew (Richmond police, and the search and rescue team), who were busy with the ground search at the accident site. On discovery of the aircraft, both occupants were dead.

1.1.5 The aircraft crashed on a sugar cane farm 18.2Nm South West of Pietermaritzburg airport in the Richmond area. The exact location of the crash was at GPS reading: (S 29º 56' 37", E 030º 18' 27"), with the field elevation of 2700 ft.

1.2 Injuries to Persons

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

1.3 Damage to Aircraft

1.3.1 The aircraft was substantially damage.

Figure 1: Shows the aircraft damage

1.4 Other Damage

1.4.1 Damage was limited to the portion of the vegetation in which the aircraft crashed. During recovery of the aircraft, it was observed that the right wing tank had ruptured. Fuel had escaped and contaminated the immediate surroundings.

1.5 Personnel Information

Pilot

Nationality	South African	Gender	Male	Age	43
Licence Number	0270247992	Licence Type	PPL (Aeroplane)		
Licence valid	No	Type Endorsed	Yes		
Ratings	flight test, test pilot class 2, night, single engine piston, tug Pilot, safety pilot.				
Medical Expiry Date	30 November 2013 (was expired)				
Restrictions	None				
Previous Accidents	None				

Flying Experience:

Total Hours	1261.1
Total Past 90 Days	13.5
Total on Type Past 90 Days	5.8
Total on Type	307.5

1.5.2 The pilot's logbook was not up to date. The last entry was on 18 September 2013 at 1257, 2 hours. From the flight folio, we accumulated 3.9 hours, which was the last recorded before the accident flight. There was recorded evidence showing that the pilot flew other aircraft models more often than the accident aircraft model. The pilot flew the aircraft type during the previous three months, approximately once in each month.

Note: The hours presented are in accordance with the available information.

Instructor (PIC)

Nationality	South African	Gender	Male	Age	54
Licence Number	0270004369	Licence Type	Commercial		
Licence valid	Yes	Type Endorsed	No		
Ratings	Instrument, Instructor Grade 2, Flight Test, Night, Single engine Piston, Multi engine Piston, Tug Pilot				
Medical Expiry Date	28 February 2014				
Restrictions	Corrective Lenses				
Previous Accidents	None				

Flying Experience:

Total Hours	6231.5
Total Past 90 Days	33.65
Total on Type Past 90 Days	0
Total on Type	0

1.5.1 The total flying hours of the instructor were determined according to the available information. The last entry update was in 22 November 2013. The indicated total flying hours at that time was 6231.5

1.6 Aircraft Information

Airframe

Type	SportStar	
Serial Number	20050502	
Manufacturer	Evektor Aerotechnik	
Date of Manufacture	2005	
Total Airframe Hours (At time of Accident)	300.7	
Last Annual Inspection(Date & Hours)	02 September 2013	295
Hours since Last Annual Inspection	5.7	
C of A.T.F (Issue Date)	06 September 2013	
C of R (Issue Date) (Present owner)	24 October 2005	
Operating Categories	Standard Part 24	

Engine:

Type	Rotax 912 ULS
Serial Number	5645336
Hours since New	300.7
Hours since Overhaul	TBO not yet reached

Propeller:

Type	Woodcomp SR3000
Serial Number	RT255
Hours since New	300.7
Hours since Overhaul	TBO not yet reached

1.6.1 The SportStar and EuroStar are a family of a two-seater, light sport aircraft (LSA), manufactured by Evektor-Aerotechnik of the Czech Republic and powered by a Rotax 912ULS, 100 horsepower (75 kW) engine. The SportStar was the first approved special light-sport aircraft (S-LSA) and was named "S-LSA Aircraft of the

Year" by Aero News Network. The SportStar is an all-metal design made from anodized, corrosion-proofed aluminium.

The airframe uses a pop-riveted and bonded construction, which the company claims will improve fatigue characteristics and result in a longer service life. The company also claims this construction technique results in better crashworthiness, the elimination of rivet zippering in an accident and lower in-flight noise levels due to the elimination of oil-canning and flexing. The SportStar was designed for towing sailplanes up to 1544 lbs (700 kg) gross mass and for towing banners up to 1479 sq ft (140 m^2).

Weight and Balance

1.6.2 The aircraft maximum take-off mass is 1213 lbs with a maximum allowable baggage mass of 55 lbs and an empty mass of 695 lbs ± 2%. The total allowable fuel of 31.7 US gallons can be carried equally among the wing tanks. According to records 40 litres (10.58 lbs) fuel was uplifted prior to flight. During the accident, fuel was spilt due to damage to the tank on the right wing. The left wing tank had sufficient fuel of the correct grade.

Item	**Arm to the Datum (leading edge)**		**Weight W**	**Moments M**
	(in)	(mm)	(lbs) or (kg)	(lbs.in) or (kg.mm)
Empty airplane			695	
Crew	19.69	500	154.32+188.495	6750.03
Fuel (6 lbs/USGAL) (0.72 kg/ltr)	36.22	920	63.386	2295.849
Baggage	50.00	1270	0	0
			Total weight	Total moments
			1101.2	

1.6.3 The aircraft weight and balance at the time of take-off was within the maximum recommended take-off weight limits.

1.7 Meteorological Information

1.7.1 Weather information obtained from the official South African weather service.

Wind direction	120º	Wind speed	10 KT	Visibility	10 km
Temperature	26ºC	Cloud cover	SCT040	Cloud base	040
Dew point	12ºC				

1.8 Aids to Navigation

1.8.1 The aircraft was equipped with the standard factory-fitted navigational equipment

approved by the Regulator. There were no recorded defects to navigational equipment prior to flight.

1.9 Communications

1.9.1 The aircraft was equipped with a VHF (Very High Frequency) radio approved by the Regulator. There were no recorded defects on the communication equipment prior to flight. The pilot communicated with Pietermaritzburg Air Traffic Control during (ATC) take-off at approximately 1117Z. The ATC last contacted the aircraft at approximately 1122Z when the aircraft radio frequency switched to the unmanned frequency of 124.8 MHz around Pietermaritzburg general flying area.

1.10 Aerodrome Information

1.10.1 The accident occurred on a sugar cane farm 18.2Nm South West of Pietermaritzburg airport in the Richmond area. The exact location at which the aircraft crashed was at GPS reading: (S 29º 56' 37", E 030º 18' 27") with field elevation of 2700 ft.

1.11 Flight Recorders

1.11.1 The aircraft 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

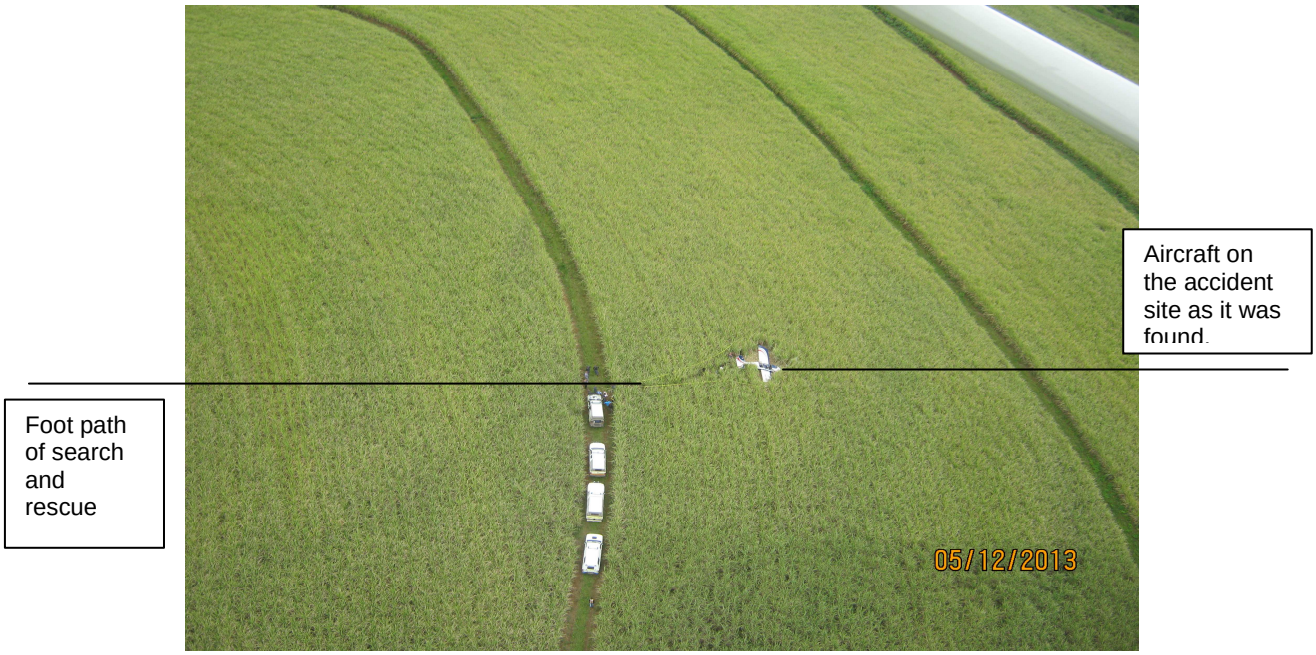

Figure 2: Shows the surrounding of the accident site

1.12.1 The onsite observations showed that the aircraft impact with the ground was on its belly. The terrain surrounding the accident site is mountainous and hilly.

1.12.2 The aircraft wreckage pattern was consistent with an aircraft involved in a flat spin prior to impact. The aircraft remained intact facing in a north-westerly direction with only minimum distance of left rotational movement.

Figure 5: View of the spin effect on the cockpit sidewalls

The engine ignition switch was at “ON” position with both magnetos activated. The impact damage affected the bottom surface of the fuselage, which was pushed inward to the opposite impact direction.

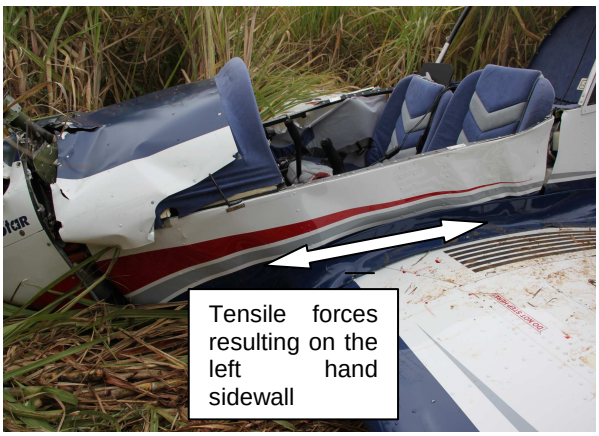

Figure 3: Left hand side view of the damage

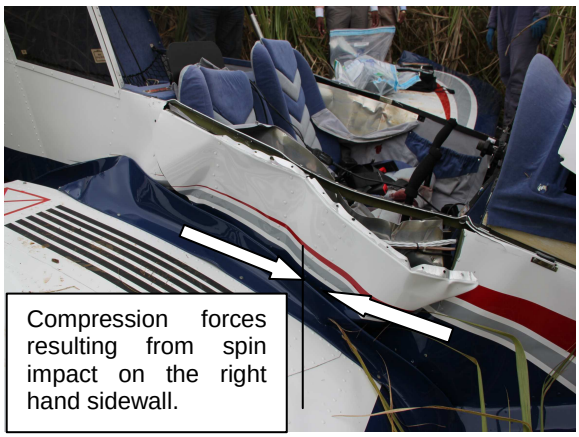

Figure 4: Right hand side view damage

1.12.3 Further observations on the propeller damage indicated that the aircraft impact was with the engine on complete stop. Two of the three propeller blades snapped from the hub and one remained on the up-right position. During impact all three-fixed undercarriage collapsed towards the fuselage bottom and were pushed to the right

side.

Figure 6: Shows propeller damage

Figure 7: view of the remaining propeller

Figure 8: Shows the front view of the aircraft

The right-hand main landing gear broke off from the root attachment on the main spar of the fuselage structure and damaged the right- hand wing bottom. The damage ruptured the right wing tank causing a fuel spill on the ground. Further damage to the fuselage bottom caused by impact forces pushed the fuselage bottom upward.

1.13 Medical and Pathology Information

1.13.1 According to the pathology report, the fatal injuries to the crew members were caused by the severe impact forces of the aircraft with the ground.

1.13.2 Toxicology report was not available at the time of completion of this report.

1.14 Fire

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

1.15 Survival Aspects

1.15.1 The accident was not considered survivable, due to the severe impact forces experienced by the aircraft.

1.15.2 The aircraft was equipped with shoulder harnesses, which both occupants used during flight. Both occupants were found strapped into their seats. The harnesses did not fail during the accident sequence.

1.16 Tests and Research

1.16.1 After recovery of the aircraft, the engine was inspected for propeller strike damage. Both tests for propeller strike and fuel system restriction were satisfactory, with no anomalies. Fuel was found in the carburettor fuel bowl. The engine run tests could not be conducted due to the damage sustained during impact.

1.16.2 All control surfaces were accounted for and all damage to the aircraft was attributable to the severe impact forces.

1.17 Organizational and Management Information

1.17.1 The aircraft was operated privately, operating as Non-Type Certificated Aircraft (Standard Part 24)

1.17.2 The aircraft was maintained and equipped in accordance with existing regulations by a qualified and approved person (AP)

1.18 Additional Information

1.18.1 On the day of the accident, the two pilots were reported to have been out for proficiency check as they flew to the (FAPM) airport general flying area. During investigation, a form CA61-03.4 of Civil Aviation Authority for proficiency check procedure was found on the workshop table. The aircraft owner, prior to flight, had already pre-completed the form.

1.18.2 Section 5 exercises on the form require the pilot to conduct low- level flying with precautionary landing and emergency procedures. Section 6 of the exercise

requires the pilot to simulate engine failure during take-off and simulation of engine failure from a minimum of 2000 feet (ft) above ground level AGL. Simulation of the engine failure requires the engine to be at low power settings (idle speed).

1.18.3 According to the radar recording, the aircraft was flying at 4500 ft AMSL around the accident area. Before the aircraft disappeared permanently from the radar, it disappeared twice for periods of approximately 10 seconds each en-route. Each time the aircraft disappeared, it first indicated a loss in height. The area around the Pietermaritzburg general flying area has field elevation varying from 1000 to 3500ft AMSL.

According to King Shaka International Airport radar recording, the aircraft appeared at 1122Z while still routing to the Pietermaritzburg general flying area (PGFA). The aircraft disappeared from the radar twice with time intervals of 10 seconds at 1122Z, while still heading towards PGFA. The aircraft appeared closer to PGFA flying at 4000ft above ground level and disappeared at 4500 ft between 1122Z and 1124Z. The aircraft flew within the flying area and manoeuvred around. It then disappeared and reappeared at 1136Z at 4000 ft and ascended to 5000 ft. Moments after that the aircraft vanished from the radar.

1.18.4 According to the pilot flying records, he flew a different aircraft model, which was of a more advanced design than the accident aircraft. The new design had different flight controls eg: electronic adjustable flying controls, electronic instrument panel and different flap trim mechanism.

Information extracted from official Evektor website (www.evektor.com)

Harmony: Model LSA has enlarged aileron-sand rudder to improve crosswind capabilities. It is important to understand that the aircraft in each case are identical - only the paperwork is different. The Harmony LSA is the latest aircraft in the Evektor stable. Based on the tried and trusted SportStar MAX, it has the same crisp handling and looks of the SportStar, while outright speed and performance are enhanced by the swept wing and tail. In addition, the Harmony has a host of other changes under the skin to make it even more enjoyable and easy to maintain. Chief among these are:

- more legroom for taller pilots
- different design of brake and rudder pedals
- changed steering and rudder geometry
- bigger ailerons for excellent crosswind capability
- bigger rudder for increased side-slip control
- further increased spacing between rudder pedals

- new sleeker, aerodynamic wheel spats

- new fairings optimized for speed
- revised nose gear leg
- optional electric cabin ventilation
- optional steps at rear of wing

Stall in a SportStar/ Harmony

A stall occurs when the wing is flying too slowly to continue to lift the aircraft. Different aircraft stall in different ways, depending on a variety of factors including the wing aerofoil design, aircraft weight, out-of-balance flight, wind conditions etc.
The SportStar wing has very benign stall characteristics, with little or no tendency to drop a wing, with or without flap.

- When the stall happens, you'll experience a brief front-to-back 'break' of the control stick
- Controls held back, without flap and engine at idle, the aircraft will mush down. Application of power is enough to resume flying
- With flap and engine at idle there is a little more of a ‘break' and again, application of engine power will have the aircraft flying again
- Power-on stalls happens at such a steep nose-up attitude that it is unlikely you will ever experience such a stall involuntarily! However, gently lowering the nose and reduction/application of power will get the aircraft flying again

Spinning

Under current LSA regulations, the SportStar and Harmony are not authorized for intentional spins. They are anyway very reluctant to spin in either direction. You should not attempt to spin the aircraft - not only is it not authorized but it is illegal!

The SportStar and Harmony are particularly easy aircraft to fly - but to fly them well, takes experience, ideally prefaced with effective training. With the owner's safety in mind, every new Evektor is delivered with an included 3-hour familiarization training programme with an experienced instructor.

Although not compulsory, we strongly recommend that unless you have already flown a SportStar or Harmony for many hours (and even then it is still worth

considering) you take up this cost-included programme. The owner familiarization programme covers:

- a full briefing on the aircraft
- pre-flight checks and preparation
- a general handling and familiarization flight
- airfield circuits with touch-and-go's
- short field take-off and landing (STOL)
- baulked landing/go-round
- low speed flight with stall recognition and recovery
- high speed flight including spiral dive and recovery
- crosswind take-off and landing
- practiced engine failure

In 3 hours, you can begin to cover these items and the programme will give you a good foundation on which to build experience.

1.18.5 Spin

Information extracted from Aircraft Flying Handbook, Chapter 4, pages 4-12 to 4-16

A spin may be defined as an aggravated stall that results in what is termed “autorotation” wherein the airplane follows a downward corkscrew path. As it rotates around a vertical axis, the rising wing is less stalled than the descending wing creating a rolling, yawing, and pitching motion. The airplane is basically being forced downward by gravity, rolling, yawing, and pitching in a spiral path.

In a spin both wings are in a stalled condition, but one wing will be in a deeper stall condition than the other. This causes the aircraft to auto rotate (yaw) towards the deeper-stalled wing due to its higher drag. Spin is also characterized by high angle of attack, low airspeed, and high rate of descent.

Spins differ from spiral dives, which are characterized by low angle of attack and high airspeed. A spiral dive is not a type of spin because neither wing is stalled. In a spiral dive, the airplane will respond conventionally to the pilot's inputs to the flight controls. A spin, on the other hand, is a low speed maneuver that requires stall

recovery techniques. In the early years of flight, a spin was frequently referred to as a "tailspin". Refer to appendices (A) for spin wreckage pattern.

1.19 Useful or Effective Investigation Technique

1.19.1 None

2. ANALYSIS

2.1 The instructor was not qualified for the flight. He was a qualified instructor but he did not have the aircraft type endorsed on his license.

2.2 The pilot had the aircraft endorsed but his license was not valid at the time of the accident.

2.3 The weight and balance was within limits and was not considered a contributing factor to the accident

2.4 Following the evidence of how the aircraft hit the ground, it might have encountered stall/spin conditions that resulted in an unsuccessful recovery during training exercise (engine failure simulation).

2.5 It is the investigator's opinion that the pilot was either unable to recover from section 6 exercise simulation of engine failure from the minimum height of 2000 feet. The aircraft entered a flat spin in which the pilot was unable to recover the engine power. The aircraft crashed while the engine was at stop or low RPM power settings (wind milling). The Evektor aircraft manufacturer discourages pilots from engaging in intentional or any other spin on this aircraft type. However we could not determine what caused the engine low speed condition.

2.6 The reported meteorological information indicated low-level turbulence with airspeed of 10 knots in the area around the accident site. The weather was not considered the contributing factor to the accident.

2.7 The aircraft model (Harmony) which the pilot flew often, was more electronic than the accident aircraft. It also possesses different design aerodynamic manoeuvres. Electronically adjusted controls are complex compared to manual controls; one needs familiarisation every time one converts from electronic to manual control aircraft. The Evektor aircraft manufacturer strongly recommends that unless you have already flown a SportStar or Harmony for many hours (and even then, it is still worth considering) the pilot take up this cost-included program.

The owner familiarization program covers flying controls and maneuvering behaviors of the aircraft. With the owner's safety in mind, every new Evektor is delivered with an included 3-hour familiarization training program with an

experienced instructor. Refer to 1.18.4 Spinning. Time spent flying any aircraft type makes pilots more familiar with the aircraft model compared to other models. However the pilot completed a 3 hour flight on the 23 November 2013 as a sole occupant.

3. CONCLUSION

3.1 Findings

3.1.1 The instructor was not qualified on the aircraft type.

3.1.2 The pilot had the aircraft endorsed on his license.

3.1.3 The pilot‘s medical certificate was not valid at the time of the accident.

3.1.4 The aircraft was certified, equipped and maintained in accordance with existing regulations and approved procedures.

3.1.5 All control surfaces and aircraft damage were accounted for and all damage was attributable to the severe impact forces.

3.1.6 The remaining fuel in the aircraft’s tanks was sufficient, uncontaminated and of the recommended grade.

3.1.7 The weight and balance of the aircraft was within accepted limits.

3.1.8 The aircraft was involved in a flat spin prior to impact with the ground.

3.1.9 The engine was either running at low speed or in a complete stop at the time of impact.

3.2 Probable Cause/s

3.2.1 The pilot failed to maintain flying speed and stalled the aircraft

3.3 Contributing factors

3.3.1 Loss of engine power conditions

3.3.2 We could not establish what caused the engine low speed conditions.

4. SAFETY RECOMMENDATIONS

4.1 None

5. APPENDICES

5.1 Appendices A Stall/spin wreckage pattern

Compiled by: Maropene Aubrey Nkoana

…….. Date:……..
For: Director of Civil Aviation

Investigator-in-charge: Maropene Nkoana Date: ……..

Co-Investigator: Jan Du Plessis Date: …….

Appendix A Stall/ Spin wreckage pattern

The damage that the aircraft sustained exhibited the wreckage pattern of a spinning aircraft as illustrated in Aircraft Accident Investigation Book Second Edition by Richard H. Wood and Robert W. Sweginnis

The wreckage pattern of stall/ spin exhibited the following:

- The engine was pushed to the right (as viewed from the rear)
- Compression damage to the trailing edge root of the left wing
- Tension to the trailing edge root of the right wing
- Compression to the leading edge root of the right wing
- Compression damage to the leading edge of the right wing

The picture below shows the stall/ (spiral or flat) spin wreckage pattern. The characteristics may not always be found

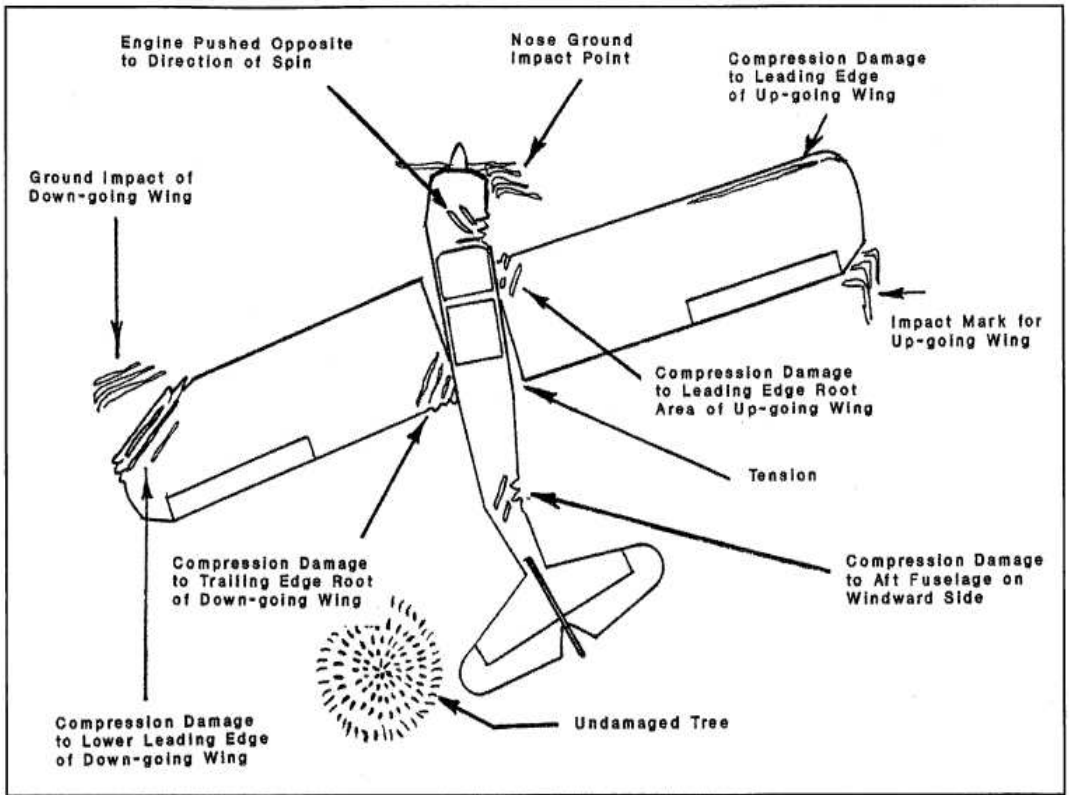

Figure 9: Stall/ spin wreckage pattern

***Note**: Not all spin impact characters shown on this figure where experienced by the aircraft as it was involved in a flat spin.*