AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

			Reference:	CA18/2/3/9407	
Aircraft Registration	**ZU-YUM**	**Date of Accident**	14 February 2015	**Time of Accident**	1345Z
Type of Aircraft	Lancair 360		**Type of Operation**	Private(Part 91)	

Pilot-in-command Licence Type	Private Pilot	**Age**	38	**Licence Valid**	Yes
Pilot-in-command Flying Experience	Total Flying Hours	809.9		Hours on Type	366.8

Last point of departure	Parys Aerodrome (FAPY), Parys, Free State Province
Next point of intended landing	Kitty Hawk Aerodrome (FAKT), Pretoria, Gauteng Province

Location of the accident site with reference to easily defined geographical points (GPS readings if possible)

On the farm Boomplaas next to Parys Aerodrome, Free State Province (GPS S26°52.820 E027°31.337 at 4728ft elevation)

Meteorological Information	Temperature: 31 ºC; Wind 270º/08 kt gusting 20-25 nots; Visibility: 10 000 m; Cloud Cover: None				
Number of people on board	1+1	**No. of people injured**	0	**No. of people killed**	2

Synopsis

The pilot accompanied by his six-year old son took off on a private flight from Parys Aerodrome in Free State Province with the intention to fly back to Kitty Hawk Aerodrome in Gauteng from where they arrived earlier.

The witness said, the aircraft made a right hand turn over Parys town where after it flew at low altitude and high speed from west to east over the airfield. The intention of the pilot was then to perform a left turn, do a low-level flypast over Runway 24. The aircraft was seen in a steep left turn pitching up where after it nosedived and impacted the ground.

Weather was described as “bad” at the time, very turbulent and the aircraft was flying with a tailwind component gusting between 20 to 25 knots. Witness marks indicated that the aircraft impacted the ground in a fairly level attitude with the wreckage path in an approximately 219 metres trajectory.

Probable Cause

The pilot lost control of the aircraft during a tight left downwind turn at low altitude from which he was unable to recover.

<u>Contributory Factor/s:</u>

1. A tailwind component gusting 20-25 knots during the left turning manoeuvre most likely also induced an aerodynamic stall and subsequent loss of lift.

SRP Date	17 January 2017	Release Date	02 February 2017

AIRCRAFT ACCIDENT REPORT

Name of Owner	**:**	The Petr Trust
Name of Operator	**:**	The Petr Trust
Manufacturer	**:**	Douglas J Binks
Model	**:**	Lancair 360
Nationality	**:**	South African
Registration Marks	**:**	ZU-YUM
Place	**:**	Parys, Free State Province
Date	**:**	14 February 2015
Time	**:**	1345Z

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 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 On 14 February 2015, the pilot accompanied by his six-year old son took off from Kitty Hawk Aerodrome in Gauteng on a private flight to Parys Aerodrome in Free State Province. They arrived at Parys Aerodrome earlier the morning at approximately 1030Z from Kitty Hawk Aerodrome, parked the aircraft and had lunch at the aerodrome's clubhouse restaurant.

1.1.2 At approximately 1330Z, the pilot accompanied by his son left the restaurant and went to the aircraft with the intention of flying back to Kitty Hawk Aerodrome. ZU-YUM took off on Runway 24 and the pilot communicated on the VHF frequency 123.5 Hz to the aerodrome's safety officer on the ground for a radio check and stated his intention to perform a low level fly-past over Runway 24. The safety officer, who was also a glider pilot, was standing at his glider on Runway 25; a grass runway used by glider pilots.

1.1.3 The aircraft was seen flying over the town of Parys, where it made a right hand turn where after the safety officer witnessed the aircraft, with its landing gear retracted flying at low altitude and high speed from west to east over the airfield, which witnesses at the airfield assumed to be about 170 knots. A witness described the weather at the time as "bad" and very turbulent with the aircraft flying with a tail wind component gusting between 20 to 25 knots. As the aircraft flew over the witness location, it was seen climbing. The intention of the pilot was then to perform a left turn, do a low level fly-past over Runway 24 and route back to Kitty Hawk Aerodrome. The aircraft was then seen by a witness in a steep left turn pitching up, where after it nosedived and impacted the ground.

1.1.4 Another witness, a driver of a motor vehicle travelling about 8 km outside the town of Parys along the R59 road towards Parys stated that his attention was drawn to the low flying aircraft and making what he described as a "back flip" at approximately 14 feet AGL with wings level and diving before it impacted the ground. The witness stopped his car at the side of the road and jumped over the farm fence to assist the occupants on board. He also alerted the emergency service who declared the occupants deceased at the scene of the accident. The accident occurred during daylight conditions at a GPS position S26°52.820 E027°31.337 at an elevation of 4728ft.

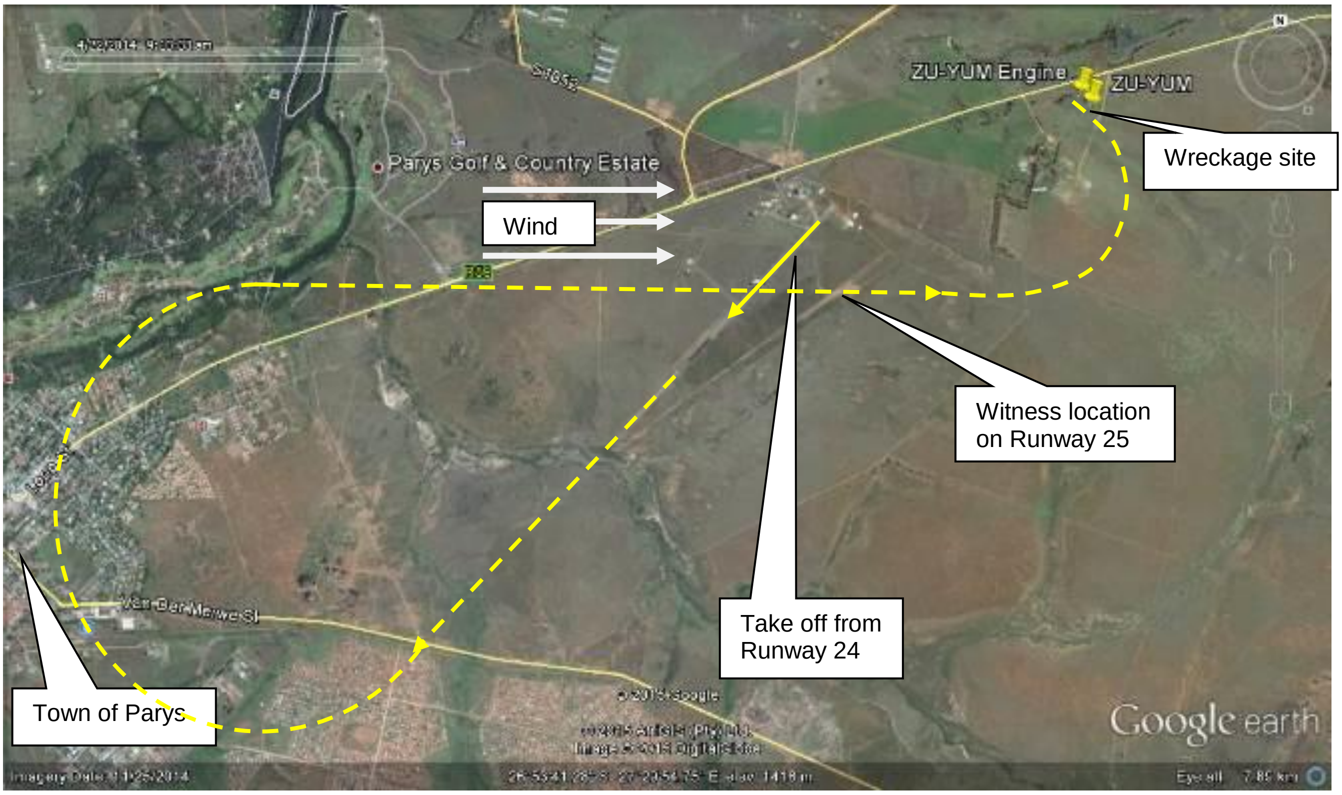

Figure 1: Google Earth view and flight path

1.2 Injuries to Persons

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

1.3 Damage to Aircraft

1.3.1 The aircraft was destroyed.

Figure 2: View of aircraft wreckage

1.4 Other Damage

1.4.1 During the accident sequence, the aircraft damaged two wire fences on the farm Boomplaas.

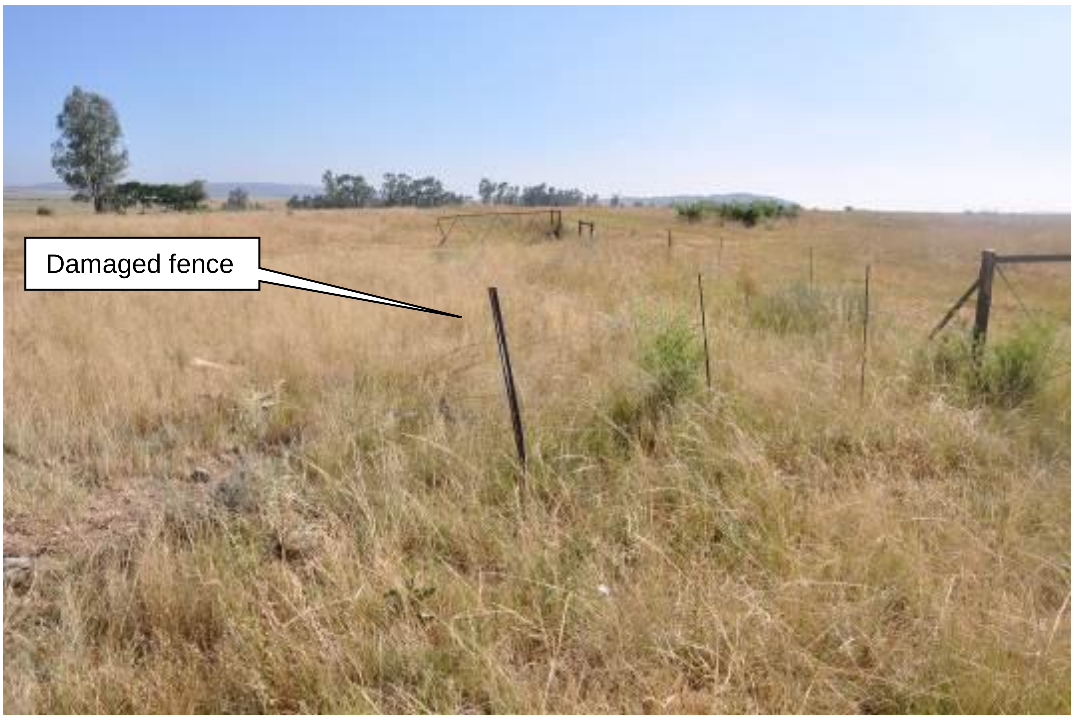

Figure 3: View of first impact with the damaged wire fence

1.5 Personnel Information

Nationality	South African	Gender	Male	Age	38
Licence Number	0270466923	Licence Type	Private Pilot		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Night Rating, Test Pilot Rating – class 2				
Medical Expiry Date	30 April 2015				
Restrictions	Nil				
Previous Accidents	Nil				

Flying Experience:

Total Hours	809.9
Total Past 90 Days	12.4
Total on Type Past 90 Days	12.4
Total on Type	326.8

Note: 1. The pilot's logbook was last updated on 8 February 2015.
2. The pilot's last annual flight renewal test was done on 12 April 2014.

1.6 Aircraft Information

1.6.1 Lancair 360

General Description

The Lancair 360 is a two-seater aircraft marketed in kit form constructed primarily of composite materials. It is a low-wing monoplane of conventional configuration with retractable tricycle undercarriage.

The wing structure is constructed of composite materials, while each wing contains a 16 gallon fuel tank. The aircraft also has an 11 gallon header fuel tank.

Engine and Propeller

The Lancair 360 is powered by a Lycoming 0-360-A1F6, four cylinder 180 hp engine with a fixed pitch two-bladed propeller.

Figure 4: Photo of the aircraft prior to the accident

1.6.2 Airframe:

ZU-YUM was built in 1994 and registered in the United States of America. On 05 October 2006, the aircraft was deregistered in United States of America, where after it was brought to South Africa and registered on 12 October 2015.

Type	Lancair 360	
Serial Number	391	
Manufacturer	Douglas J Binks	
Date of Manufacture	1994	
Total Airframe Hours (At time of Accident)	717.6	
Last MPI (Hours &Date)	714.7	01 October 2014
Hours since Last MPI	2.9	
Authority to Fly (Issue Date)	02 October 2014	
C of R (Issue Date) (Present owner)	05 September 2008	
Previous Accidents	Nil	

Note: 1. The last flight recorded in the Flight Folio was on 17 January 2015 on 716.9 hours.
2. The last flight in ZU-YUM in the pilot's logbook was on 17 January 2015.
3. The flight hours were calculated as the tachometer was destroyed during the impact sequence

1.6.3 Engine:

Type	Lycoming 0-360-A1F6
Serial Number	L-15370-36A
Hours since New	2954.2
Hours since Overhaul	717.6

1.6.4 Propeller:

Type	Hartzell HC-F2YR-1F
Serial Number	CM1114A
Hours since New	717.6
Hours since Overhaul	254.4

1.6.5 Fuel

The right and left wing tanks ruptured on impact with the ground. According to documented evidence, 137.20 litres of Avgas 100LL was uplifted on 10 January 2015. The aircraft was then flown for 1.5 hours before the accident occurred. It was calculated that ZU-YUM thus had approximately 101 litres (27 gallons) of fuel in its tanks for the flight.

Note: The aircraft has a fuel capacity of 11 gallons in the header tank and 16 gallons per wing with fuel consumption at 75% power of 10 gallons per hour.

1.6.6 <u>Weight and Balance</u>

Basic Empty Mass	1252 lbs
Pilot	212 lbs
Passenger	35 lbs
Fuel	162 lbs
Cargo	15 lbs
Total Weight	1676 lbs
Maximum Take-off & Landing Weight	1685 lbs
Below Maximum Take-off Weight	**9 lbs**

a) The total weight of the aircraft was within limits for the flight and was determined to be 9 lbs below the maximum take-off weight limit and maximum landing weight limit of the aircraft. See the column below.

1.7 Meteorological Information

1.7.1 The following information was obtained from the official report by the South African Weather Services (SAWS):

1) <u>Surface observations</u>
Parys is not a SYNOP station, so Potchefstroom (FAPS) and Vereeniging (FAVV) were used for surface data.

<u>METARs</u>
<u>Station: FAPS</u>
FAPS 141400Z AUTO 30008KT //// // ////// 31/M03 Q1013=
FAPS 141300Z AUTO 30008G18KT //// // ////// 31/00 Q1013=

<u>Station: FAVV</u>
FAVV 141300Z AUTO //////KT //// // ////// 28/10 Q1014=

2) <u>Satellite Image</u>

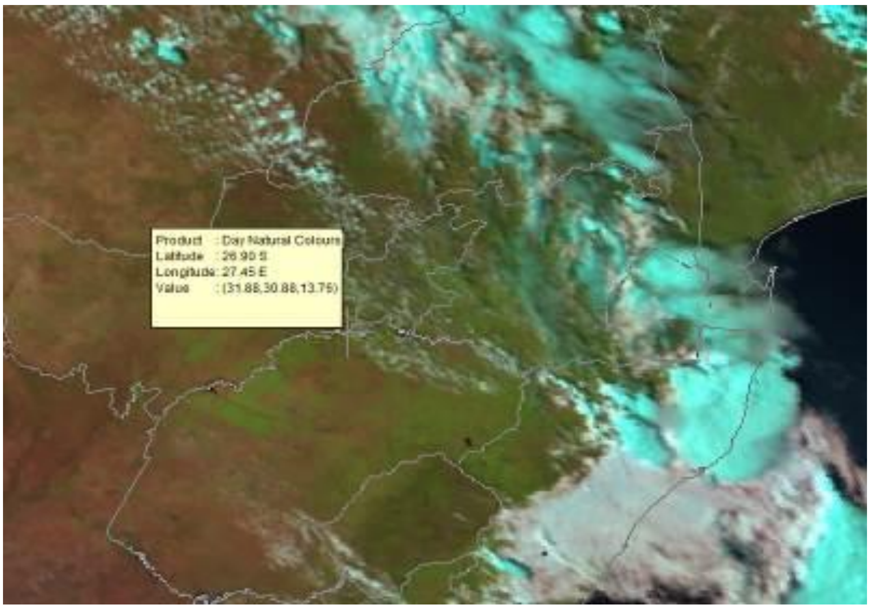

Figure 4: Satellite image of the weather in the area

In the above satellite image (EUMETSAT MSG), one can see that Parys is situated exactly on an air mass boundary. Cumulus and Towering Cumulus developed just east of Parys and this in itself can cause moderate to severe low level turbulence. No thunderstorms were in the vicinity of Parys during the accident (most of the development occurred well east of Parys). It's also evident from the observations that there wasn't a lot of moisture available in the low levels of the atmosphere around Parys.

3) <u>Wind</u>

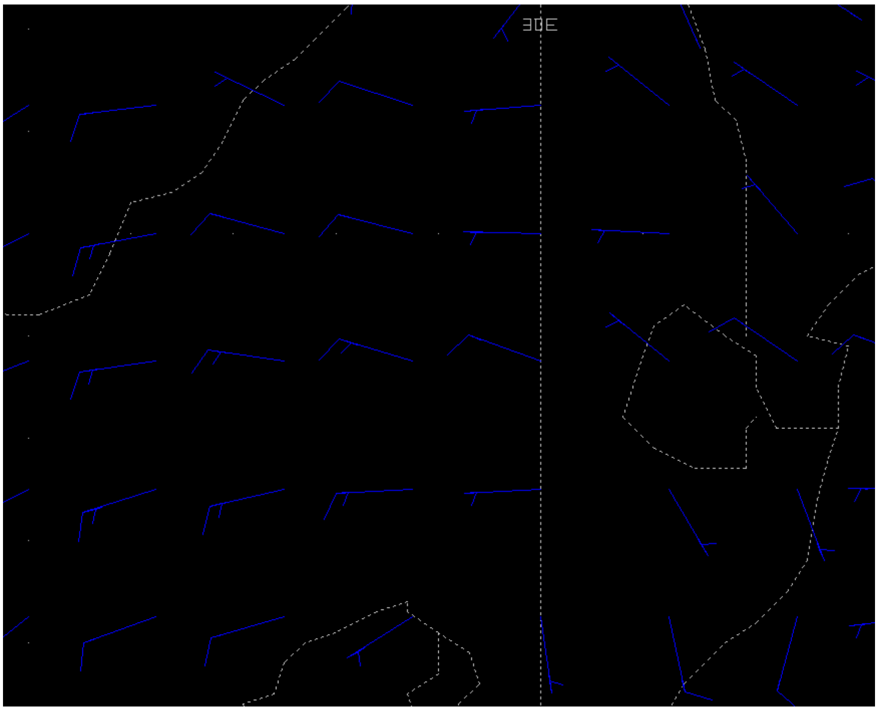

Figure 5: Numerical Model Prediction

Shown above is the wind for the 850hPa pressure level (~ 5000ft AMSL) for 1500 UTC on that day. Relatively strong winds were forecast by the models and this was confirmed when looking at the observations (some gusts were reported). This specific model run was suggesting a 15 knot average wind speed over the Parys area (gusts well over 15 knots would have been possible).

1.7.2 The following information was obtained from a witness, a glider pilot who was flying in the area before the accident occurred. He obtained the weather from the weather sites on the internet before his flight. He also stated that he decided to discontinue his flight due to turbulent weather in the area.

Wind direction	270	Wind speed	Gusting 20-25 knots	Visibility	10 000 m
Temperature	31°C	Cloud cover	Clear skies	Cloud base	None
Dew point	Unknown				

1.8 Aids to Navigation

1.8.1 The aircraft was equipped with approved navigational aids. No defects to the navigational equipment were reported or recorded prior to the accident flight.

1.8.2 The aircraft was equipped with a Flightdek D180 avionic unit, which combines all Electronic Flight Information Systems (EFIS), engine monitoring and autopilot functions into a single unit. The aircraft was also fitted with a Garmin 430 GPS and had a portable Garmin 496 GPS on board.

1.9 Communications

1.9.1 The aircraft was equipped with the approved communications equipment. No defects to the communication equipment were reported or recorded prior to the accident flight.

1.9.2 The pilot communicated on the VHF frequency 123.5 Hz to the aerodrome's safety officer on the ground for a radio check and stated his intention to perform a low level fly-past over Runway 24. The safety officer, a glider pilot was standing at his glider on Runway 25, a grass runway used by glider pilots.

1.10 Aerodrome Information

1.10.1 The aircraft accident occurred approximately 1520 m outside the boundaries of FAPY on the private farm Boomplaas. The GPS coordinates of the accident site position are S 26°52,820 E 027°31,337.

1.10.2 The airspace is classified as class G with unmanned procedures in force. The normal circuit pattern of Runway 24 is a left-hand pattern. Eyewitness information shows that the pilot did not follow a standard departure procedure and turned out right after take-off. The accident occurred, whilst the aircraft was turning left onto the base leg for a fly-past over Runway 24 at FAPY.

Note: Class G: Operations may be conducted under IFR or VFR. ATC has no authority, but VFR minimums are to be known by pilots. Traffic Information may be given as far as is practical in respect of other flights.

Aerodrome Location	Parys Aerodrome (FAPY)	
Aerodrome Co-ordinates	S 26°5313,94 E 027°3019,11	
Aerodrome Elevation	4 740 ft	
Runway Designations	06/24	11/29
Runway Dimensions	1 343 x 20 m	743 x 91 m
Runway Used	Runway 24	
Runway Surface	Asphalt	
Aerodrome Status	Licensed	
Approach Facilities	Nil	

1.11 Flight Recorders

1.11.1 The aircraft was not fitted with a cockpit voice recorder (CVR) or a flight data recorder (FDR), nor was this required by regulations.

1.12 Wreckage and Impact Information

1.12.1 The aircraft took off on Runway 24 at Parys Aerodrome in a south westerly direction over the town of Parys, where it made a right hand turn followed by a fly-past over the airfield. The aircraft was seen flying at approximately 500 AGL at about 170 knots over the airfield, climbing and entering in a steep left turn, where after it nosedived and impacted the ground.

1.12.2 The wreckage path indicated that the aircraft impacted the ground, where after it impacted a wire fence. Witness marks on the propeller indicated the impact of the propeller with a metal rod from the fence. The propeller carved into the hard ground 11 m from the first point of impact, which indicated that the engine was operating at a high power setting. Witness marks then indicate the wing impacting the ground. The propeller was found 37 m from the first point of impact. The tail of the aircraft was found 111 m from the first point of impact, followed by the fuselage and the main landing gear 165 m from the first point of impact. The fibreglass wings disintegrated on impact with the ground and the engine was found 219 meters from the initial point of impact with no evidence that it had rolled along the ground. It appears to have bounced and travelled through the air for most of that distance, which indicates the high speed of the aircraft during the accident sequence.

1.12.3 The following damage was found:

- The damage sustained to the propeller indicated that the engine was at a high power setting at the time of the impact sequence.
- Both wings of the aircraft disintegrated and were destroyed during the impact sequence. Pieces of the wing were found scattered around.
- Both wing tanks disintegrated during the crash.
- The cockpit area and forward part of the cabin were completely destroyed.
- The nose landing gear and both main landing gear broke from the fuselage and was found at separate locations.
- The tail broke from the fuselage.

Figure 6: The tail of the aircraft

Figure 7: The fuselage

Figure 8: The engine was found 219m from the initial point of impact

Figure 9: The propeller
Inset: The evidence marks from impacting the fence's metal rod

1.13 Medical and Pathological Information

1.13.1 According to the post-mortem report, the cause of death of the pilot was determined to be caused by severe injuries to his head. The pilot suffered bilateral open forearm fractures consistent with injuries caused by the steering column. Also bilateral ankle fracture-dislocation injuries consistent with injuries caused by the rudder pedals.

The report also stated that the pilot had a severe underlying cardiac condition (coronary artery disease with Gr IV occlusion of the left main coronary artery) and with a contribution from this, e.g. myocardial infarction (heart attack) cannot be excluded.

The results of the toxicology tests for the pilot were not available at the time this report was compiled. Should any of the toxicology results indicate that medical aspects may have affected the performance of the pilot, this will be considered as new evidence and the investigation will be re-opened.

1.13.2 Further investigation by the Aviation Medical Department of the SACAA into the pilot's medical history revealed that no abnormalities were detected or reported.

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 not considered survivable due to the magnitude of the deceleration forces experienced when the aircraft impacted the ground surface.

1.15.2 Although the occupants on board the aircraft were secured by the aircraft's seatbelts, the seats broke out of their attachments during the impact sequence.

1.16 Tests and Research

1.16.1 Engine Investigation

The engine was recovered to an approved aircraft maintenance organisation (AMO) and stripped for further investigation purposes. The engine sustained impact damage attributable to the severe impact forces. There was no evidence of any failure or malfunction with the engine prior to the accident.

1.16.2 Flightdek D180 avionic unit

The aircraft was equipped with a Flightdek D180 avionic unit, which combines all Electronic Flight Information Systems (EFIS), Engine Monitoring and autopilot functions into a single unit. The aircraft was also fitted with a Garmin 430 GPS and had a portable Garmin 496 GPS on board, which interfaced with the Flightdek D180 avionic unit.

All three were recovered and sent for downloading. The Garmin 430 GPS had no record logging, thus no memory, and the data on the portable Garmin 496 was irretrievable due to accident damage.

The contents of the on-board flash storage on the Flightdek D180 avionic unit could be accessed; however, there were no data logged. The manufacturer stated that this sometimes happens with the first generation equipment as data logging was an optional feature that customers had to enable.

Figure 10: The Flightdek D180 avionic unit from ZU-YUM

Figure 11: A new Flightdek D180 avionic unit

1.16.3 <u>Elevator Servo</u>

<u>Description</u>

The autopilot via the Flightdek D180 avionic unit controls the pitch axis of aircraft with the elevator servo. The autopilot can be disengaged via the Flightdek D180 avionic unit. The servo also includes a precision-machined brass “shear screw” that pins the servo arm to the servo arm attachment, providing a manual override by the pilot through the control column in the event that the autopilot does not disengage. The shear screw will break at the application of 100 inch-pounds of torque, at which point the servo arm will travel freely providing manual control of the elevator via the control column for the pilot.

<u>The elevator servo of ZU-YUM</u>

The elevator servo was recovered with the brass shear screw still intact. The servo arm, which attaches via a push-pull rod to the elevator was, however, found bent caused by impact damage. The elevator servo was found jammed and when it was opened, it moved freely. The investigation determined that the elevator servo jammed due to impact damage during the accident sequence. The intact brass shear screw indicates that no manual override was necessary to disengage the elevator servo. The ZU-YUM accident occurred during the take-off/climb phase of flight and during this flight phase, the autopilot will also not be engaged.

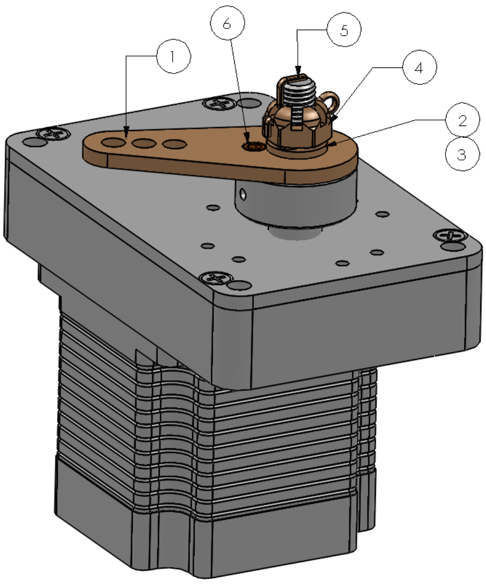

Figure 12: The elevator servo

1. Servo Arm; 2. Flat washer; 3. Wave washer; 4. Castle nut; 5. Cotter pin; 6. Shear screw

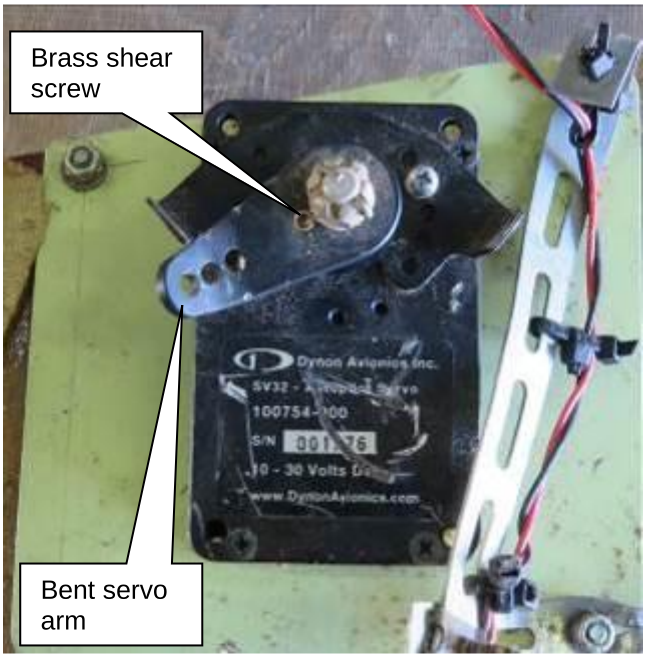

Figure 12: The elevator servo of ZU-YUM

1.17 Organisational and Management Information

1.17.1 The last annual inspection before the accident was certified on 01 October 2014 at 714.7 airframe hours by an Aero Club approved person (AP) who was in possession of a valid AP certificate.

1.17.2 This was a privately owned aircraft and was privately operated.

1.18 Additional Information

1.18.1 <u>Base Leg Turn with a Tailwind</u>

The greatest hazard on such a base leg turn occurs when the wind becomes a tailwind. This increases the aircraft ground speed by the wind velocity. If the pilot has not correctly anticipated the increased ground speed with an early turn to final turn, several problems arise. As the pilot becomes aware of overshooting the final turn to runway, he senses (peripheral vision) that he is moving much faster than usual. The approach and glide angle is much flatter than usual. To lower the speed he raises the nose, to correct the overshoot he wants to increase the rate of turn − most often this is accomplished by additional rudder. Here we have the classic stall-spin entry in the downwind (tailwind) turn. Basic procedure, if the wind is blowing you towards the runway on downwind, would be to double your distance from the runway on your downwind. The 'home-field' pilot who flies by reference to ground objects for pattern orientation is especially exposed to the hazards of this situation.

<u>Reference:</u>
http://www.whittsflying.com/web/page3.46Flying_Winds_in_the_Pattern.htm

1.18.2 Lancair 360 Speeds

The following speeds are given as per the POH

V_{ne} (Never Exceed Speed) ***Caution: Smooth air only***	Red Line	235 KCAS
	Yellow Arc	183 - 235 KCAS
V_a (Manoeuvring Speed)		143 KCAS
V_{no} (Normal Operating Range)	Green Arc	70 - 183 KCAS

1.18.3 Stalls in a turn

An airplane will stall during a coordinated steep turn exactly as it does from straight flight, except that the pitching and rolling actions tend to be more sudden. If the airplane is slipping toward the inside of the turn at the time the stall occurs, it tends to roll rapidly toward the outside of the turn as the nose pitches down because the outside wing stalls before the inside wing. If the airplane is skidding toward the outside of the turn, it will have a tendency to roll to the inside of the turn because the inside wing stalls first. If the coordination of the turn at the time of the stall is accurate, the airplane's nose will pitch away from the pilot just as it does in a straight flight stall, since both wings stall simultaneously.

Reference:
Extract from FAA-H-8083-3A, Airplane Flying Handbook, Chapter 4-10

1.18.4 Stalling Speed

The stalling speed increases in a turn. The wings are at a higher angle of attack in a turn than when the aeroplane is flying straight at the same speed. They carry an extra load (i.e. they generate increased lift) and so experience a higher load factor. The stalling angle will therefore be reached at a higher speed in a turn than when straight and level. Stalls at a higher speed than normal are called accelerated stalls.

Reference:
Extract from the Air Pilot's Manual Volume 1

Analysis

The aircraft's calculated MTOW on the day was 1685lbs. Eyewitnesses reported the aircraft appeared to be in a 45 degree angle of bank. According to the stall speeds in the POH at a MTOW of 1658 with the aircraft in a 45 degree angle of bank, an approximate stall speed of 80kts may be expected.

1.18.5 The following information was issued by the U.S. Department of Transportation: Federal Aviation Administration (FAA) to Operators dated 9 March 2010 regarding safety concerns of amateur-built experimental Lancair and other amateur built airplanes possessing high wing loading and stall speeds in excess of 61 knots.

InFO 10001
DATE: 3/9/10

Subject:
Safety concerns of amateur-built experimental Lancair and other amateur built airplanes possessing high wing loading and stall speeds in excess of 61 knots

Purpose:

To alert owners/operators and pilots about a Federal Aviation Administration (FAA) operational safety concern regarding amateur-built airplanes operating under an experimental airworthiness certificate and possessing high wing loading with stall speeds in excess of 61 knots.

Background:

FAA analysis of fatal accidents for airplanes operating under an experimental airworthiness certificate, such as the Lancair, has revealed a large and disproportionate number of fatal accidents for their fleet size. Though the FAA has seen a recent downward trend, these aircraft types have experienced fatal accident rates substantially higher than for-personal-use general aviation and the overall fatal accident rate for all amateur-built experimental aircraft. The FAA believes that this is mainly due to the pilot's lack of awareness of the slow-flight and stall characteristics of these types of high performance aircraft. Also, the nature of amateur-built aircraft means that each amateur-built aircraft may have unique flight handling characteristics.

Discussion:

Over the past few years, a number of fatal accidents occurred in these types of aircraft. A majority of the fatal accidents occurred due to inadvertent stall/spins, while at slower airspeeds in home airport traffic patterns. Amateur-built experimental aircraft are not required to be type certificated in accordance with Title 14 of the Code of Federal Regulations (14 CFR) part 23 – Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes. Stability, handling and stall characteristics for the amateur-built experimental airplanes are different from general aviation airplanes that are type certificated under part 23. In addition to not meeting the part 23 certifications standards, aircraft such as the Lancair are high-performance, hand-made (nonproduction) aircraft. Each individual amateur-built experimental aircraft possessing high wing loading and stall speeds in excess of 61 knots can have unique handling, stability, and stall characteristics. These design characteristics, while allowing for higher operational speeds, can expose pilots to additional risk during slow-speed operations, while close to the ground and with little time to recover from an unintentional stall. Understanding these differences is critical for safe operation of such aircraft.

Recommended Action:

The FAA recommends that pilots operating the amateur-built experimental aircraft, such as the Lancair amateur-built experimental airplanes do the following:

1. *Review and thoroughly understand all available information regarding the slow-flight and stall characteristics of their own Lancair prior to attempting to duplicate these manoeuvres. In addition, obtain specialised training from a Lancair recommended flight instructor who has had adequate training in the Lancair model or other similar high-performance airplanes to experience slow-flight handling characteristics, stall recognition, and stall recovery techniques.*

2. *Install an angle-of-attack (AOA) indicator and/or a stall warning indicator to provide warning of an impending stall. Owners that already have an AOA and/or a stall warning indicator installed should have the calibration validated to assure proper operation. Amateur-built experimental aircraft can possess flight characteristics, including stall speeds, which can vary from airplane to airplane. (Note: indicated airspeeds can be as much as 10-20% off if the pilot tube is not in the proper location, or if not properly calibrated and verified).*

3. *Amateur-built experimental aircraft possessing high wing loading and stall speeds in excess of 61 knots, such as the Lancair, should have their aircraft*

evaluated by a mechanic with sufficient builders and maintenance experience to verify proper rigging, wing alignment, and weight and balance. Lancair airplane builders should use the services of experienced and qualified construction evaluators who are familiar with the Lancair and/or other similar aircraft construction, rigging, flight and handling characteristics.

4. *Owners of amateur-built experimental aircraft possessing high wing loading and stall speeds might wish to have their aircraft evaluated by a qualified test pilot to determine the aircraft's handling characteristics prior to adding any suggested aerodynamic improvement and where appropriate, have items such as leading edge wing cuffs and/or strakes installed and then tested, by a qualified test pilot to verify improvements to the aircraft's handling characteristics and or reduction in stall speed before permanent attachment.*

1.19 Useful or Effective Investigation Techniques

1.19.1 Not required.

2. ANALYSIS

2.1 The pilot accompanied by his six-year old son took off on a private flight from Parys Aerodrome in Free State Province with the intention to perform a low level fly-past over the runway and then route back to Kitty Hawk Aerodrome in Gauteng from where they arrived earlier. After take-off from Runway 24, the aircraft made a right hand turn over Parys town, where after it flew at approximately 500 AGL at high speed from west to east over the airfield. Witnesses who also were pilots estimated the aircraft's speed at approximately 170 knots. The intention of the pilot was then to perform a left turn, then do a low level fly-past over Runway 24.

2.2 Another witness described the weather at the time as "bad" and very turbulent, whilst the aircraft flew with a tailwind component gusting between 20 to 25 knots. As the aircraft flew over the witness location, it was seen climbing. The aircraft was then seen in a steep left turn pitching up, where after it nosedived and impacted the ground.

2.3 Evidence from the post-mortem examination suggests that the pilot possibly could also have suffered a myocardial infarction (heart attack) during the flight. This is substantiated by a severe underlying cardiac condition, where the autopsy found coronary artery disease with Grade IV occlusion of the left main coronary artery. A heart attack would have degraded the pilot's performance or even incapacitated him during the flight, which might have affected his ability to control the aircraft. The steep left turn-pitching up–manoeuvre, where after the aircraft nosedived, could have been a direct consequence of pilot incapacitation when he possibly suffered a heart attack. Witness marks indicated that the aircraft impacted the ground in a fairly level wheels-up attitude, which indicates that the pilot attempted to recover, but due to insufficient height the aircraft impacted the ground. The open forearm fractures caused by the aircraft steering column and ankle fracture-dislocation injuries caused by the rudder pedals indicate that the pilot was holding the controls and is also consistent with the witness marks, which indicate that the pilot attempted to recover.

2.3 The surrounding terrain is open and relatively flat and does not appear to have had any influence on the flight path or to have had any leeward wind effect. No evidence of any defect or malfunction in the aircraft was found that could have contributed to the accident. No abnormalities with the aircraft were reported by the pilot or witnesses. Propeller blade damage was consistent with the engine producing power at impact.

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 on his licence. He accumulated a total of 809.9 flying hours, which included 326.8 on type.

3.1.2 The pilot was the holder of a valid aviation medical certificate issued by an approved medical examiner.

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

3.1.4 There was sufficient fuel on board the aircraft at the time of the accident.

3.1.5 The weight and balance of the aircraft were below the maximum allowable limits for the aircraft.

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

3.1.7 There was no evidence of any defect or malfunction in the aircraft that could have contributed to the accident.

3.1.8 Propeller blade damage was consistent with the engine producing power at impact.

3.1.9 The aircraft was seen by a witness banking sharply to the left, pitching up and then nosediving into the ground.

3.1.10 The weather at the time was described as “bad” and very turbulent with the wind gusting between 20 to 25 knots.

3.1.11 There was evidence that the pilot had a severe underlying cardiac condition, which could have caused a myocardial infarction (heart attack) during the flight. A heart attack could have degraded the pilot’s performance or even incapacitated the pilot during the flight, which could have affected his ability to control the aircraft.

3.2 Probable Cause/s

3.2.1 The pilot lost control of the aircraft during a tight left downwind turn at low altitude, from which he was unable to recover.

3.3 Contributory Factor/s:

3.3.1 A tailwind component gusting 20-25 knots during the left turning manoeuvre most likely also induced an aerodynamic stall and subsequent loss of lift.

4. SAFETY RECOMMENDATIONS

4.1 None

5. APPENDICES

5.1 None.

…END…