AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

Reference:	CA18/2/3/9606

Aircraft Registration	**ZS-JTC**	**Date of Accident**	18 March 2017	**Time of Accident**	1245Z
Type of Aircraft	Cessna 172N (Aeroplane)	**Type of Operation**	Part 141		
Pilot-in-command Licence Type	Student Pilot	**Age**	20	**Licence Valid**	Yes
Pilot-in-command Flying Experience	Total Flying Hours	49.4		**Hours on Type**	26.4
Last point of departure	Vereeniging aerodrome (FAVV): Gauteng province				
Next point of intended landing	Potchefstroom aerodrome (FAPS): North West province				

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

177m right of runway 21 threshold at GPS co-ordinates determined to be S26º 40. 14.8″ E27º 04. 29.4″ at an elevation of approximately 4 520 ft AMSL.

Meteorological Information	Temperature, 27°C: Dew point, 7°C: Wind speed, 12 knots: Wind direction, 200° magnetic: Visibility, 10 km: CAVOK.				
Number of people on board	1 + 0	**No. of people injured**	1	**No. of people killed**	0

Synopsis

On Saturday 18 March 2017, the student pilot was conducting a solo navigation flight from Vereeniging (FAVV) aerodrome when the accident occurred. Before departure, he ordered full fuel; “about 54 US gallons”, and completed the pre-flight inspection. According to the student, his planned routes were Potchefstroom (FAPS), Parys (FAPY) and then back to FAVV. Visual meteorological conditions (VMC) prevailed at the time leading up to the accident and the flight plan was filed with Johannesburg information. The student boarded the aircraft and completed the pre-start checks before starting the engine. Take-off from FAVV was uneventful, followed by a good touch and go landing on runway 21 at FAPS. Within a few minutes the student returned for an additional touch and go. After touchdown the aircraft bounced severely, and the student took power with the intent to effect an instant go-around maneuverer with the flaps retracted to zero degrees. The aircraft stalled and impacted the ground heavily approximately 177m, to the right of the runway 21 threshold. The aircraft was substantially damaged. The pilot sustained serious injuries to his head. A post-accident examination of the aircraft did not reveal any pre-impact anomalies that would have precluded normal operation.

Probable Cause

The aircraft bounced on landing following an attempt for a go around and the student took power with the intent to take off with the flaps retracted to zero degrees. The aircraft stalled and impacted the ground heavily approximately 177m, to the right of the runway 21 threshold.

SRP Date	13 June 2017	Release Date	27 June 2017

AIRCRAFT ACCIDENT REPORT

Name of Owner	**:** Atis Aviation (PTY) Ltd
Operator	**:** Unitas Flying School
Manufacturer	**:** Cessna Aircraft Company
Model	**:** Cessna 172N
Nationality	**:** South African
Registration Marks	**:** ZS-JTC
Place	**:** In the field within the borders of FAPS
Date	**:** 18 March 2017
Time	**:** 1245Z

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 Saturday 18 March 2017, the student pilot being the sole occupant on-board the aircraft, a Cessna 172N, ZS-JTC was conducting a solo navigation flight from Vereeniging (FAVV) aerodrome when the accident occurred. Before departure, the student ordered full fuel; “about 54 US gallons”, completed the pre-flight inspection of the aircraft and met with the instructor for the pre-flight briefing. According to the student pilot, his planned routes were FAVV, Potchefstroom (FAPS), Parys (FAPY) and then back to FAVV. Visual meteorological conditions (VMC) prevailed at the time leading up to the accident and the flight plan was filed with Johannesburg information. The student pilot boarded the aircraft and completed the pre-start checks before starting the engine. The engine indications were normal and he taxied the aircraft for runway 15 departure. At the holding point he completed the before take-off checks and took off for FAPS. The flight was uneventful at the assigned flight level (FL) 065 up until FAPS. At FAPS, the student reported that he flew the aircraft onto downwind leg at the normal circuit altitude for approach to land on runway 21. He reported that the approach speed was stable, with normal flap setting at 20° and approach speed of 65 knots.

1.1.2 He further stated that the aircraft floated during flare followed by a good touch and go landing. Full engine power was applied and the engine responded normally when throttle was advanced to the full forward position. The flap lever was then advanced from 20° to 0°. About fourteen minutes later, the student returned for an additional touch and go landing. He joined left downwind at 70 knots indicated air speed (IAS) with 20° flaps settings left base leg and final approach for runway 21 left. According to the student, during the second touch and go landing, the aircraft bounced severely from which he took power with the intent to effect an instant go around. He added full power and the rest he doesn't remember. According to the 1st witness, who reported to have seen the aircraft through the aerodrome club house window, the aircraft made a strange maneuverer just before the impact on the grass area on the eastern side of the runway. The aircraft was low, about 80 feet above ground level (AGL), just before the crash. He stated that the aircraft drifted off to the right of runway 21 with the right wing low, before it impacted the grass area nose down with the left wing low raising a cloud of dust. The emergency services were called and Potchefstroom Medi-clinic dispatched paramedics to the scene. The student sustained severe head injuries. Paramedics together with the aviators from FAPS rescued the injured student before first aid was administered. The student was later rushed to the Medi-clinic for further medical care.

1.1.3 The 2nd witness (pilot from another aircraft who was also inbound) reported that he was notified by Johannesburg information that a C172 aircraft was en-route to FAPS for a touch and go landing. After changing to 123.00 MHz frequency he overheard that the aircraft he was informed about was also inbound. He instantly radioed the student about his position, as he was worried that the two aircraft might collide in mid-air when they joined overhead. No response was forthcoming. According to him, the student sounded uncertain and unclear as he could not indicate to him his exact location; how far he was inbound. The pilot took a decision to orbit for about ten minutes until the student pilot had made a call. The student called overhead and the witness flew inbound and for the first time spotted a C172 aircraft about five nautical miles (NM), "9.26 kilometres" descending. The student called on the radio that he was at left downwind, but was actually on the right downwind. This witness was behind the C172 as number two for the finals, runway 21. After the witness's final stop at the hangar zone, he observed the C172 aircraft making a right turn and the witness assumed, it was for another touch and go landing. The witness left and later heard that a C172 aircraft had crashed alongside runway 21. The aircraft was substantially damaged during the accident sequence.

1.1.4 The flight was conducted under the provisions of Part 141 of the Civil Aviation Regulations of 2011, as amended and the operator held a valid air service licence

as well as an air operating certificate ATO approval at the time of the accident. The flight was planned to take approximately 2.4 hours flying time. That included the touch and go landings at the specified aerodromes.

1.1.5 The accident happened in day light conditions at GPS co-ordinates determined to be S26º 40. 14.8″ E27º 04. 29.4″ at an elevation of approximately 4 520 ft AMSL. Below is the Google Earth map showing the flight plan.

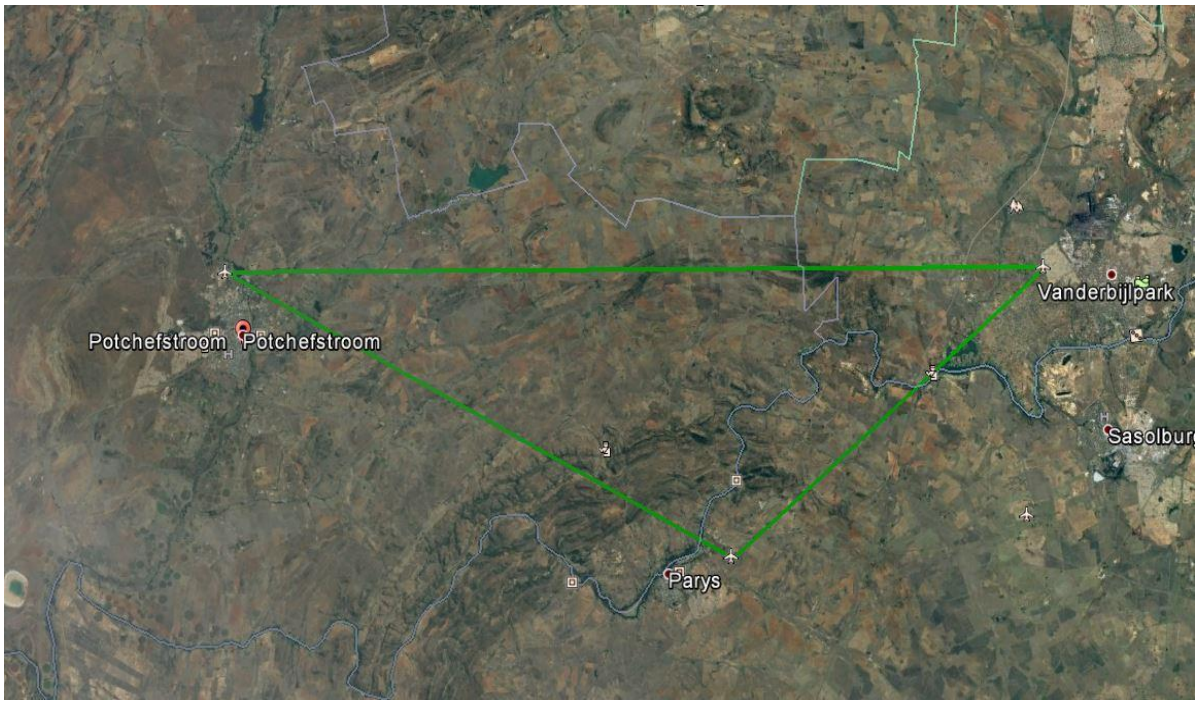

Figure 1: Google Earth map showing aerodrome and the flight path as per the flight plan

1.2 Injuries to Persons:

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

1.3 Damage to Aircraft:

1.3.1 The aircraft was substantially damaged.

Figure 2: The wreckage as found at the accident site

1.4 Other Damage:

1.4.1 None.

1.5 Personnel Information:

Nationality	Egyptian	Gender	Male	Age	20
Licence Number	0272571860	Licence Type	Student Pilot		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Nil				
Medical Expiry Date	30 June 2018				
Restrictions	None				
Previous Accidents	Nil				

Experience:

Total Hours	49.4
Total Past 90 Days	27.1
Total on Type Past 90 Days	27.1
Total on Type	27.1

*NOTE: The student pilot was a 20 year old Egyptian national. He held a valid South African civil aviation authority (SACAA) issued student pilot license (SPL), issued on 24 July 2016. According to the student pilot's profile at the SACAA, he had conducted his practical flight test through an approved aviation training organization (ATO) (no 0041) at Vereeniging aerodrome. His aeronautical logbook was made available during the investigation. All entries made showed that he had accumulated about 49.4 hours total aeronautical experience, with 26.4 hours on a C172N aircraft. The student also completed a language proficiency test for his radiotelephony communication. The student pilot's training file showed that he had undergone all the applicable emergency procedures such as stall/spin recovery techniques, go around and forced landings. All this was done following the ATO´s training and procedures manual as approved by SACAA. However, the analysis of the student's training highlighted certain areas in which the student was found not yet competent. The student was found not yet competent on certain aspects of the navigational training exercise by instructor A, which included the following: Failure to manage organisation of cockpit workload, magnetic heading and time en route, maintenance of attitude heading, revisions of estimated time of arrival (ETA) and heading, entering the traffic pattern, uncertainty of position procedure and air traffic control (ATC) liaison in controlled/regulated airspace. On the last navigation training the student was found to be competent in all aspects of navigational exercise and he was sent on a solo navigational flight the next day by instructor A. The student pilot's flight instructor A had attained a Grade III instructor's rating on 08 October 2015 and upgraded to a class II rating on 28 April 2017. The instructor A and the student had flown together prior to the occurrence, for a total of 19.7 hours. The flying instructor A reported that the student had demonstrated above average flying ability for his level of experience. During the dual instructional flight prior to the student's first solo flight, the student had demonstrated to the instructor A the ability to consistently make safe take-offs and landings.

1.6 Aircraft Information:

1.6.1 The Cessna 172N is a high-wing monoplane of all metal semi-monocoque construction. The aircraft is equipped with fixed tubular spring steel main landing gear struts and a steerable nose landing gear. It was powered by Lycoming carburetted engine; model No IO-320-E2D. It comprises a direct drive air-cooled horizontally opposed four-cylinder carburettor piston engine with 150 horse power at 2700 RPM. The aircraft flight control system consists of conventional aileron, rudder and elevator control surfaces. The control surfaces are manually operated through mechanical linkage using a control wheel for ailerons and elevator, rudder/brake pedals for the rudder. The aircraft is fitted with a two-bladed fixed pitch Sensenich 74DM7S14-0-58 propeller. The aircraft is certified for single pilot operation. The engine power is controlled by a throttle located on the switch and control panel above the center pedestal. The throttle opens in the full forward position and closes in the full aft position. A friction lock is located at the base of the throttle and is operated by rotating the lock clockwise to increase friction or counterclockwise to decrease it. The mixture control, mounted adjacent to the throttle control, is a red knob with raised points around the circumference and is equipped with a lock button in the end of the knob. The rich position is full-forward, and full-aft is the idle cut-off position. The aircraft has an airspeed indicator calibrated in knots and a true airspeed indicator which allows true airspeed to be read off the face of the dial. In addition, the indicator incorporates a window which displays pressure altitude overlaid with the temperature scale. The vertical speed indicator shows the aircraft rate of climb or descent in feet per minute (fpm). The aircraft has single slot type wing flaps which are extended or retracted by positioning the flap switch lever to the desired flap position. The switch lever is moved up/down in a slotted panel at the 10°, 20° and 30° positions. The aircraft was fitted with a pneumatic type stall warning system which has an inlet in the leading edge of the left wing and a warning horn in the upper left corner of the windshield. It activates when the low pressure creates a differential pressure in the stall warning system resulting in an audible warning.

Figure 3: The aircraft, ZS-JTC aircraft photograph

Airframe:

Type	Cessna 172N	
Serial Number	172-69462	
Service Ceiling	13 500 ft (4 100m)	
Manufacturer	Cessna Aircraft Company	
Maximum take-off weight	2 300 lb	
Empty weight	1 492.4 lb	
Date of Manufacture	1977	
Total Airframe Hours (At time of Accident)	3 479.3	
Last Annual (Hours & Date)	3 459.4	15 March 2017
Total Hours Flown	20	
Certificate of Airworthiness (Issue Date)	11 December 2013	
Certificate of Airworthiness (Expiry Date)	10 December 2017	
C of R (Issue Date) (Present owner)	12 October 2016	
Operating categories	Standard Part 141	
Recommended fuel used	Avgas LL 100	

Previous Accidents/Incidents	On 19 July 2013 ZS-JTC was recovered from FAVV airfield after the engine suddenly developed a severe vibration and subsequent loss of power whereby an emergency landing was carried out on a ploughed field after an emergency was declared. The aircraft sustained damage on the propeller and the spinner. Two days after the accident was repaired and the aircraft was returned back to service. The repair was done by AMO 85 with CRMA No 1412 after which all tests required were carried out before the aircraft was released to service.

*NOTE: The aircraft records showed that it was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The aircraft maintenance organisation (AMO) which completed the last mandatory periodic inspection (MPI) on the aircraft prior to the accident flight was in possession of a valid AMO certificate (no 1342). All relevant aircraft documentation such as the certificate of registration; the certificate of airworthiness and the mass and balance certificates were accounted for and were all found to be detailed and accurate. The aircraft engine, propeller and airframe logbook were examined. All maintenance entries made were appropriately certified in terms of applicable SACAA regulations. Scrutiny of the snag register revealed that no snags were reported on the aircraft prior to the accident flight.

Engine:

Type	Lycoming IO-320-E2D
Serial Number	L-20907-27A
Hours since New	Not known
Hours since Overhaul	982.5

Propeller:

Type	Sensenich 74DM7S14-0-58

Serial Number	A63240
Hours since New	Not known
Hours since Overhaul	982.5

*NOTE: It was determined by calculation that at the time of the accident, the aircraft was approximately 362.6 pounds below the maximum allowable all up-weight of 2 300 pounds. The aircraft's center of gravity was within the prescribed limits.

1.7 Meteorological Information:

1.7.1 Weather information as per the student pilot questionnaire.

Wind direction	200° Magnetic	Wind speed	12 knots	Visibility	10 Km
Temperature	27°C	Cloud cover	None	Cloud base	None
Dew point	7°C				

1.8 **Aids to Navigation:**

1.8.1 The aircraft was equipped with standard navigational equipment that meets the requirements of the regulator. According to the available information, the student pilot had an iPad on-board the aircraft. The iPad was found on the student's feet inside the aircraft. A white universal serial bus (USB) charger cable was also found lying near the rudder pedals. The device was removed from the aircraft and handed over to one of his associates after he was rushed to hospital for medical care. Efforts were made to find the iPad, but without success. According to the flight school, students are not allowed to use iPads during any portion of their initial training. However what they do outside of flying was entirely up to them. The school had recommended that students should learn to fly using steam gauge type instruments. After they have qualified they can do what they feel works for them. In addition a 1:50 000 000 aeronautical map (attached on appendices) was found with en-route checkpoints marked.

1.9 Communications:

1.9.1 The aircraft was equipped with standard communication equipment that meets the requirement of the regulator. No distress or mayday call was picked up by any station or tower or by any other aircraft in the area at any stage during the flight.

1.10 Aerodrome Information:

1.10.1 The accident happened in day-light conditions at GPS co-ordinates determined to be S26º 40.14.8″ E27º 04. 29.4″ at an elevation of approximately 4 520 ft AMSL. The aerodrome is uncontrolled and the runway surface is made of asphalt. The aerodrome is owned by the Tlokwe local municipality situated in the North West province. The aerodrome has one runway with orientation 03/21, about 1 489 metres in length and 30 metres width. Both runway directions are in use depending upon the wind direction. The aerodrome manager has set up a local ATC which is manned by the pilots of the flying club. There are no navigational aids available on the aerodrome. The emergency services such as the fire fighting vehicles and the medical emergency services are provided by the local municipality. There are two windsocks installed near the runway; one at the end of runway 21 and other near the middle of the runway. During the runway inspection, nothing abnormal was detected around the runway 21 threshold areas.

Aerodrome Location	Potchefstroom	
Aerodrome Co-ordinates	S26°40´.05″ E027°05´.05″.	
Aerodrome Elevation	4 520 feet AMSL	
Aerodrome Status	Licensed	
Runway Designations	03/21	1 489 x 30
Runway Dimensions	15/33	1000 x 30
Runway Used	Runway 21	
Runway Surface	Asphalt	
Approach Facilities	Runway Lighting	

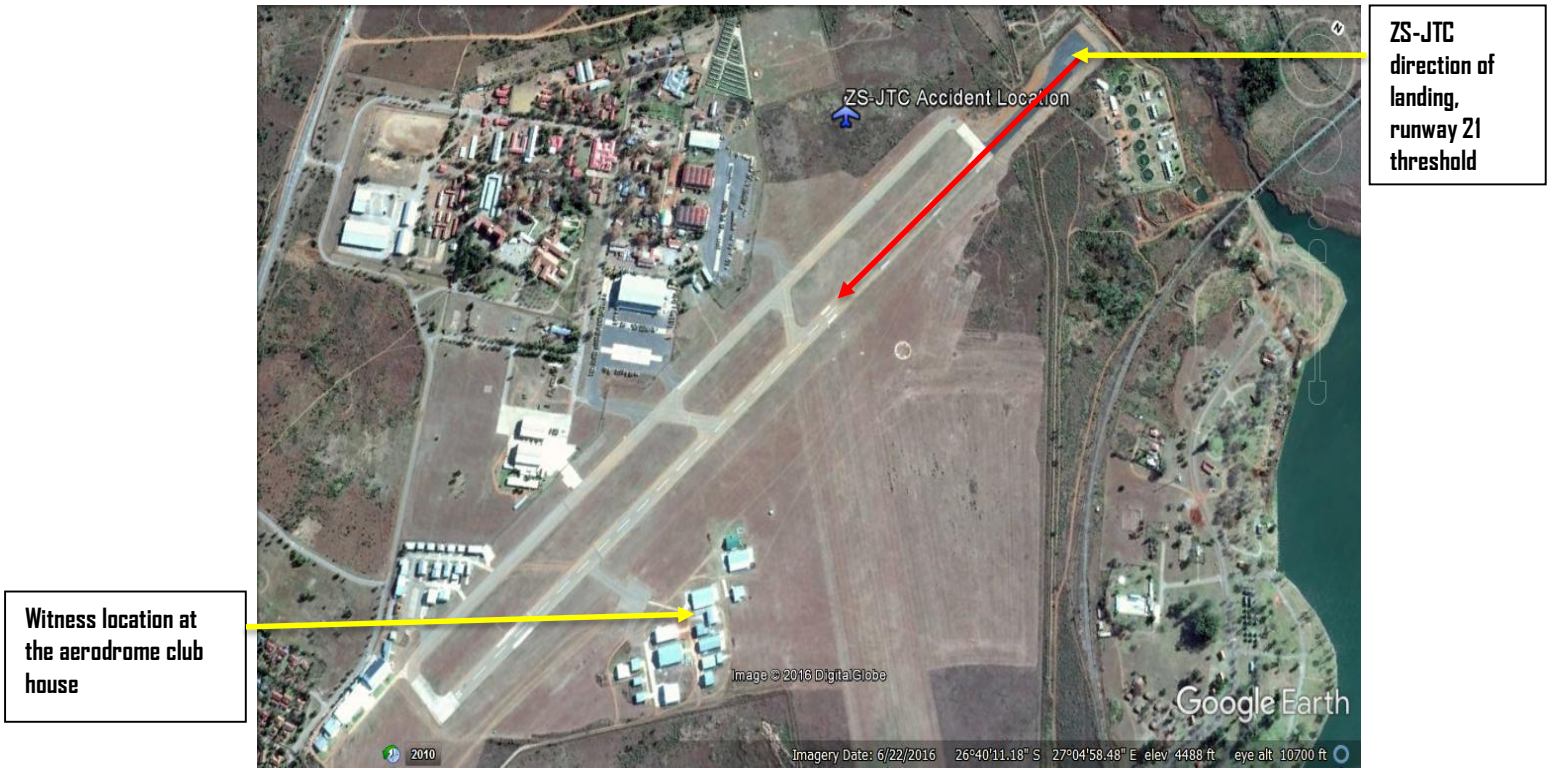

Figure 4: FAPS Google Earth map showing the accident side, about 177 metres parallel to runway 21

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 the regulation to be fitted to this aircraft type.

1.12 Wreckage and Impact Information:

1.12.1 The wreckage was located on the eastern side of the runway boundary fence of FAPS aerodrome, approximately 177 meters parallel to the threshold of runway 21. During the impact sequence, the aircraft structure and airframe received progressively more damage as it impacted the ground surface. However, the aircraft structure remained intact except for the failed nose gear strut. The nose wheel was properly secured into the wheel axle/fork with the tyre properly inflated with nitrogen dry air as recommended by the manufacturer. The aircraft spring loaded main gear was examined and found to be intact, with both main wheel tires properly inflated with nitrogen dry air following the manufacture's specifications. The aircraft structure was thoroughly examined and nothing was missing. Visual inspection showed no evidence of a possible engine oil leak on the aircraft structure and the underbelly. All antennas and the navigation lights were accounted for and were properly secured to their respective mounting areas.

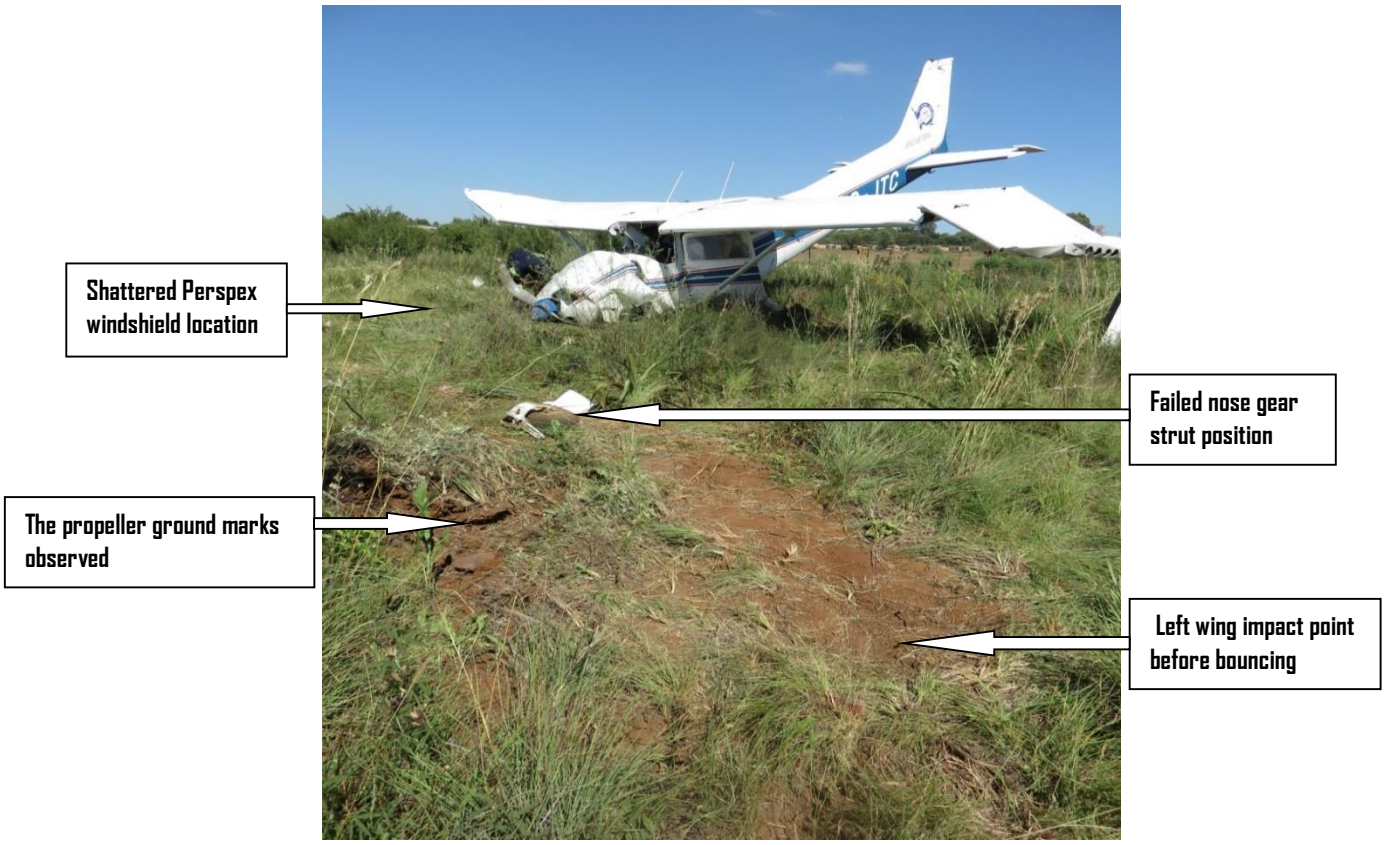

Figure 5: The first point of impact and the final position of the wreckage

1.12.2 The outboard wing stations suffered severe damage on the upper and bottom surfaces. Both wings tips were severely damaged during the accident sequence. Portions of the wing debris were observed at the accident site; on the other hand no evidence of fuel spillage was discovered. The aft fuselage did not have any deformation. The front Perspex glass windshield had shattered during the accident sequence. The left hand door was slightly distorted. The engine couplings remained undamaged. The engine/propeller remained intact and secured to the aircraft structure. The spinner was attached to the propeller hub, but it was crushed. The engine mount trusses were deformed to the left, with the engine alignment about fifteen degrees off the centreline. There were several propeller strike marks on the ground along the wreckage trail; the marks were consistent with the propeller being powered at impact. The nose section was damaged, which compromised the instruments panel and cabin integrity. The floor structure, including the front seats tracks, had buckled, and the rudder pedals and surrounding floor/firewall structure were damaged by crushing. The pilot seat derailed due to impact forces. The cockpit controls were positioned as follows: engine mixture control full rich; throttle control displaced at a near idle position; carburetor heat full cold; engine primer in and locked; magnetos both on and fuel selector on the right tank “according to the rescuers reports”. Photographs attached below.

Figure 6: Right-hand side picture of the aircraft showing damage as found

Figure 7: Rear view of the aircraft with the wing flaps in a retracted position “as found”

Figures 8: Sheared nose wheel strut and the shattered windshield

Figure 9: The propeller as found at the accident site

Figures 10: The scoring marks on the propeller blade tips

1.12.3 The flight control cable system continuity was confirmed, with some pre-impact anomalies consistent with overload. The elevator trim tab actuator was in a 5 degree down position, and the wing flaps were fully retracted. The propeller blades showed evidence of rotation with leading edge nicks. The engine's crankshaft flange was intact from the crankshaft, and the crankshaft could be rotated. The fuel strainer bowl was inspected and was clear of debris. The oil level dip stick/gauge showed enough oil was present inside the engine. The oil was clean and showed no evidence of metal chips or failure of the engine accessories. No evidence of pre-impact abnormalities was noted on the engine case and components.

1.13 Medical and Pathological Information:

1.13.1 None.

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 to be survivable. There was no severe damage to the cockpit support structure as illustrated in figure 5 and the pilot was properly restrained by a safety harness.

1.16 Tests and Research:

1.16.1 Examination of the aircraft revealed no structural or airframe failure. All engine controls showed evidence of normal operation prior to the accident. The propeller was spinning prior to the accident. The primary and secondary flight controls were operational and the aircraft had enough fuel, correct grade free of water and sediments. Good weather conditions prevailed at the time leading up to the accident. The aircraft mass and balance were also within the allowable limits and had no bearing on the accident. The accident happened about 177 meters parallel to the threshold of runway 21. The runway in use was free from traffic and obstacles at the time the landing was commenced.

1.16.2 The aircraft could still fly in this condition if the engine alone could pull all the weight, but is only common on fighter aircrafts. As the angle of attack increases, wing lift goes up, then suddenly drops sharply as the smooth air flow detaches from the back of the wing. This resulted in the aircraft entering into a stall from which recovery was impossible. A stall warning horn activated during the trouble as it was found in a serviceable condition during the wreckage analysis. The approach phase of flight is dynamic and requires delicate awareness because it typically involves changes in the aircraft altitude, heading, speed, and configuration. The student stated that he was in excellent health, that he was not taking any prescription medications at the time of the accident, and that he had not taken any medications that might have affected his performance in the 72 hours before the accident. He was properly licensed and medically fit to conduct the flight. Below is a normal landing checklist and proper go around procedure as per the aircraft flight manual.

1.16.3 Normal landing checklist:

i. Airspeed 60 – 70 (with flaps up)
ii. Flaps – as desired
iii. Airspeed 55 – 65 (flaps down)
iv. Touchdown – lower nose gently with main wheels first
v. Brakes – minimum required

1.16.4 Go around procedure:

i. Full power (carb heat off/cold if applicable)
ii. Flaps 1 notch out (this typically is 20 degrees)
iii. Through Vy (best rate of climb speed) and obstacles cleared flaps to 10 degrees
iv. Positive rate of climb (depicted on both the vertical speed indicator (VSI) and altimeter) flaps out

1.17 Organizational and Management Information:

1.17.1 The purpose of the flight was a solo navigational training flight conducted under part 135 restricted to part 141.

1.17.2 The flight school indicated that a designated flight instructor had checked the pilot's flight planning prior to departure and found the planning satisfactory.

1.17.3 The Aircraft Maintenance Organisation (AMO) that performed the last maintenance on the aircraft prior to the accident flight was in possession of a valid AMO approval certificate no, 1342 that has been issued by South African Civil Aviation Authority.

1.18 Additional Information:

1.18.1 The stall warning system on the C172N aircraft is a pneumatic type consisting of a calibrated air inlet on the leading edge of the left wing, and is attached to an air-operated horn near the upper left corner of the windshield, inside the wing root. Electrical power is not required, because it operates on low pressure produced as the wing approaches a stall. A partial vacuum occurs when the vent air is pulled through the horn, where a small metallic reed, similar to the reed in musical instruments, produces an audible sound in the cockpit. The stall warning system is calibrated to sound 5 to 10 knots above the actual stall speed. A pilot can be unaware of the increasing angle of attack, and then be surprised when the stall warning horn comes on. Once activated, the system does not differentiate between

approaching a stall or being stalled, and a pilot will not be able to determine how close to the actual stall the aircraft is. In contrast, an angle of attack detector, or lift detector, provides the pilot with a continuous representation of the aircraft's state of lift, which may assist a pilot to safely control the aircraft during critical maneuvers.

1.18.2 During the investigation, it came to the attention of the investigators that an iPad device found in the aircraft could have been in use during the flight and had distracted the pilot during the critical phase of flight.

1.19 Useful or Effective Investigation Techniques:

1.19.1 None.

2 ANALYSIS:

2.1 According to the available information, the student pilot was licenced, equipped and medically fit for the flight. The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures. No defects were recorded of any of the aircraft system prior to the accident flight. Available information showed that fine weather conditions prevailed in the area at the time leading up to the flight and subsequent accident. The prevailing weather conditions were therefore not considered to have had any bearing on the accident. The wreckage investigation revealed that the engine was running before the impact, the primary and secondary flight control surfaces were operational and the aircraft had enough fuel, free of water and sediments. On the day of the accident the student was conducting a navigational solo flight under Visual Flight Rules (VFR).

2.2 The flight plan was filed with Johannesburg information, the way points were FAVV-FAPS-FAPY-FAVV. The student took off from FAVV en-route to the first way point, which was FAPS. The pilot who was flying the micro light reported that when ZS-JTC arrived at FAPS the student failed to report joining in/overhead and to established communication with other traffic that was flying in the area. This witness circled the area for about ten minutes in order to avoid joining in at the same time as ZS-JTC and to establish visual contact. The student then reported joining left downwind for runway 21, unaware that he was actually joining right downwind. The student reported a good landing, but then called left hand out without reporting why. After the witness final stop at the hangar zone, he observed the ZS-JTC aircraft making a right turn and the witness assumed it was for another touch and go landing. The student reported that after touch down on runway 21 threshold, the

aircraft bounced severely after which he took power with the intent to effect an instant go around. It is important to mention the role of human factors in this accident.

2.3 The investigation considered the circumstances in which the aircraft came to be in a position from which it was not possible to complete its intended maneuver, and the reasons for the severity of the outcome. Safe landing of the aircraft consists in the pilot permitting the aircraft to contact the ground within a predetermined touchdown zone at the lowest possible vertical speed and the lowest horizontal speed consistent with adequate control. This technique of maintaining the desired approach profile is taught at the flight school. One technique of achieving the visual maintenance of the desired approach slope at a constant angle is by using the perspective phenomenon. A runway appears to change its shape as the pilot's observation point changes. For example, seen from final approach a runway will appear wider at the approach end than at the opposite end. When a constant approach angle is maintained, the apparent configuration of a runway will also remain constant. If the approach angle is made steeper, the runway will appear to grow longer and narrower. If the approach angle is made shallower, the runway appears to grow shorter and wider. There are two basic methods that flying instructors use to teach student pilots how to correct deviations from the desired approach profile to a runway. Both of these methods achieve the same objective by applying the principle that aircraft attitude plus engine power equals performance.

2.4 Another technique teaches the student to pitch the aircraft up and down as necessary to stay on the desired approach path, aiming the aircraft at the desired flare point on the runway. With each significant attitude change, engine power must be adjusted to maintain the desired approach speed. Another method teaches the student to stay on the desired approach path by increasing or decreasing power as necessary to change the aircraft's rate of descent.

2.5 The instructor who trained the student was the same the instructor who signed the student to go on navigational solo flight.

2.6 The eyewitness saw the aircraft through the club house window. The investigators visited the club house and located the exact spot where the eyewitness had been seated. From the investigators viewpoint, it was difficult to clearly see the activities happening at the threshold side. This information has led the investigators to

conclude that the eyewitness only saw the last portion of the flight just before the crash and that the accident had begun with high-speed approach followed by a heavy landing, upon which the student switched into a panic mode. The investigation could also not rule out the fact that the student might have unaware approached with the flaps retracted to the point where he committed to land. The retracted flaps caused such a loss of lift that no amount of power could have helped. When the aircraft is at a regular angle of attack with the nose more or less forward, the wing works as designed and produces lift. If the aircraft turns the nose straight up while continuing to go forward, it is usual that the wings will stop producing lift, as they are just vertical walls against the wind at this point

3. CONCLUSION:

3.1 Findings:

3.1.1 The student pilot held a valid licence and had the aircraft type endorsed in his logbook.

3.1.2 His aviation medical certificate was valid with no restrictions.

3.1.3 The flight was operated as a general aviation navigational flight under VMC.

3.1.4 The aircraft was in possession of a valid certificate of airworthiness at the time of the accident.

3.1.5 The AMO that performed the MPI on the aircraft prior to the accident flight was in possession of a valid AMO No 1342.

3.1.6 The weather was calm with wind light and variable.

3.1.7 The engine was operational and the propeller was turning during at the time of impact.

3.1.8 There was sufficient fuel present during the investigation.

3.1.9 The flight control surfaces showed no signs of malfunctions.

3.1.10 The aircraft had been maintained in accordance with the approved maintenance schedule by an approved AMO.

3.1.11 The accident was considered survivable.

3.2 Probable Cause/s:

3.2.1 The aircraft bounced on landing following an attempt for a go around and the student took power with the intent to take off with the flaps retracted to zero degrees. The aircraft stalled and impacted the ground heavily approximately 177m, to the right of the runway 21 threshold.

4. SAFETY RECOMMENDATIONS:

4.1 None

5. APPENDICES:

5.1 Stalls:

Reference: Aeroplane Flight Training Manual 4th edition, Transport Canada, Pg. 75:

A stall is a loss of lift and increase in drag that occurs when an aircraft is flown at an angle of attack greater than the angle for maximum lift. Stall training will allow you to recognize the symptoms of an approaching stall early enough to take action to prevent a stall from happening. You will also learn how to recover positively and smoothly with a minimum loss of altitude should a stall occur.

Why does a wing stall?

The lift generated by a wing is dependent upon a smooth accelerated airflow over a wing. At moderate angles of attack the airflow near the trailing edge of the wing becomes turbulent. As the angle of attack increases, the turbulent air progresses forward towards the leading edge of the wing until the stalling angle is reached. At the point the downwash and the pressure differential are greatly reduced, and a loss of lift results. Due to the loss of lift and increase in drag, the remaining lift is insufficient to support the aeroplane, and the wing stalls. It is basic in recognizing stalls to remember that, unlike angle of incidence, angle of attack is a relative factor. Therefore you cannot rely upon aircraft attitude entirely to indicate the possibility of a stall. Angle of attack may be simply defined as the angle between the mean chord of an aerofoil and its direction of motion relative to the airflow (relative airflow). In this manual, the term “relative airflow,” is used to describe the direction of the airflow with respect to an aerofoil in flight. An aircraft may be stalled in practically any attitude and at practically any airspeed.

Stalling speeds:

Regardless of airspeed, an aircraft always stalls when the wings reach the same angle of attack. Remember, angle of attack and aircraft attitude are not consistently related. Although stalling speeds may be given for a specific type of aircraft, stalling speed for each aircraft may vary with the following factors:

Weight: Since weight opposes lift, a lightly loaded, properly balanced aircraft will have a lower stalling speed than a similar aircraft operating at its maximum permissible weight.

Balance: The position of the Centre of Gravity (CG) will also affect the stalling speed of an aircraft. A forward CG location will cause the stalling angle of attack to be reached at a higher airspeed while a rearward CG will cause the stalling angle of attack to be reached at a lower airspeed. An improperly loaded aircraft may display undesirable stalling characteristics. This is particularly true of an aircraft loaded beyond the aft CG limits.

Power: Because of the additional upward thrust and other lift contributing factors of a power-on stall, the stalling speed will be lower than the power off.

Flaps: When flaps are extended the camber of the wing ifs effectively increased. This deflects more of the airflow downward for a given airspeed, thereby increasing lift. This factor allows the aircraft to be flown at a lower speed before the stall occurs.

Pitch: When an aircraft is pitched upward abruptly, the load factor is increased correspondingly and a higher stalling speed is introduced for the duration of change in pitch attitude.

Angle of Bank: The greater the bank angle, in co-ordinated flight, the higher the stalling speed.

Aircraft Condition: A clean, well-maintained, properly rigged aircraft will invariably have better stalling characteristics and lower stalling speeds than a similar aircraft in poor general condition.

Retractable Landing Gear: Extended the landing gear increases drag. The effect on stalling speed varies from aircraft to aircraft, but generally in the classic wings level nose-up attitude a slightly lower stalling speed will be noted, especially in the power-on configuration. With altitude, the density of the air in which an aircraft is

flying decreases. Although the true airspeed at which the aeroplane stalls is higher at altitude, the airspeed indicator, which itself functions by the effect of the air density, will record the same speed when the aircraft stalls at altitude as it did at or near ground level. Therefore, indicated stalling speeds will remain the same ay all altitudes.

Stalls during turns:

When an aircraft is stalled during a level or descending turn, the inside wing normally stalls first, and the aircraft will roll to the inside of the turn. In a level turn, the inside wing is travelling more slowly than the outside wing and obtains less lift, causing it to sink and increase its angle of attack. Under the proper conditions, this will produce a stall. During a descending turn, the path described by the aircraft is a downward spiral; therefore, in the inside wing is meeting the relative airflow at a steeper angle of attack and is the one to stall first and drop lower. However, during a climbing turn, the path described by the aircraft is an upward spiral; therefore, the outside wing is meeting the relative airflow at a steeper angle of attack than the lower wing. As a result, the higher wing will normally stall first and drop abruptly when the stalled condition occurs.

5.2 Aeronautical map found in the aircraft.