AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	**CA/18/2/3/8534**		
Aircraft Registration	**ZS-MHA**	**Date of Accident**	24 August 2008		**Time of Accident**	1145Z	
Type of Aircraft	Piper PA28R 200		**Type of Operation**		Private		
Pilot-in-command Licence Type	Private		**Age**	25	**Licence Valid**	Yes	
Pilot-in-command Flying Experience	Total Flying Hours		113.4		Hours on Type	19.5	
Last point of departure	Rand Aerodrome (FAGM)						
Next point of intended landing	Rand Aerodrome (FAGM)						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Next to Germiston Golf Course in a stream (GPS co-ordinates: S 26º 13.896' E 028º 08.666')							
Meteorological Information	CAVOK, wind 340º 10 kts, density altitude 7404, QNH 1022 , temperature 23ºC						
Number of people on board	1 + 2	**No. of people injured**	0	**No. of people killed**	3		

Synopsis

The aircraft took off from runway 35 on a visual flight rules (VFR) private flight from Rand Aerodrome.

According to witnesses, the aircraft was slow and low during the climb phase of the flight. While overhead the golf course, the aircraft lost altitude. The left-hand wing collided with trees and separated from the aircraft. The aircraft crashed and came to a halt in a shallow stream**.**

The pilot and front-seat passenger were seriously injured and taken to hospital. The rear passenger was fatally injured at the accident site. Both pilot and front passengers, who were Nigerian nationals, succumbed to their injuries later that same week.

The aircraft performance parameters had been exceeded due to the pilot executing his take-off roll approximately 1000ft less than the recommended distance as published in the pilot operating handbook. The aircraft entered into a stall from which the pilot could not recover, and was later found to have been involved in an accident.

Probable Cause

The aircraft was rotated too early during the take-off roll causing it to gain insufficient speed, which resulted in the aircraft entering into a stall.

Contributory remark:

The pilot rotated at an insufficient take-off distance as a result of high density altitude.

IARC Date		Release Date	

AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : TAS Flite School cc
Manufacturer : Piper Aircraft Corporation
Model : PA28R-200
Nationality : South African
Registration Marks : ZS-MHA
Place : Johannesburg area of the Gauteng Province
Date : 24 August 2008
Time : 1145Z

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 two hours.

Purpose of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (1997), this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to establish legal liability****.*

Disclaimer:

This report is 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 took off from runway 35 on a visual flight rules (VFR) private flight from Rand Aerodrome. According to witnesses, the aircraft was slow and low during the climb phase of the flight. While overhead the golf course, the aircraft lost altitude.

1.1.2 The left-hand wing collided with trees and separated from the aircraft. The aircraft crashed and came to a halt into a shallow stream. A post-impact fire ensued that was limited to the engine, fire wall, and the front of the cabin.

1.1.3 The pilot and front-seat passenger were injured and taken to hospital. The rear passenger was fatally injured at the accident site.

1.1.4 The pilot-in-command and the front-seat passenger, who was also a pilot, were Nigerian nationals. The pilot-in-command and the front-seat passenger were transferred to hospital by the emergency services, and were transferred to another hospital later that week. Both pilot and passenger succumbed to their injuries later that same week.

1.2 Injuries to Persons

Injuries	Pilot	Crew	Pass.	Other
Fatal	1	-	2	-
Serious	-	-	-	-
Minor	-	-	-	-
None	-	-	-	-

1.2.1 The rear-seat passenger, who was a South African national, was removed from beneath the aircraft. The pilot-in-command and front-seat passenger were transferred to a hospital, and then to another hospital later that week. Both pilot and front-seat passenger succumbed to their injuries later that same week.

1.3 Damage to Aircraft

1.3.1 The engine, firewall and the cabin had fire damage, and the wings separated from the fuselage. The aircraft was destroyed in the accident.

Figure 1: The aircraft wreckage in a stream at the golf course

1.4 Other Damage

1.4.1 Two trees bordering the golf course where damaged by the left-hand wing of the aircraft

1.5 Personnel Information

Nationality	Nigerian	Gender	Male	Age	25
Licence Number	**********	Licence Type	Private		
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Night Rating				
Medical Expiry Date	30/11/2009				
Restrictions	None				
Previous Accidents	None				

Flying Experience:

Total Hours	113.4
Total Past 90 Days	20.9
Total on Type Past 90 Days	19.5
Total on Type	19.5

1.6 Aircraft Information

1.6.1 The airplane was a Piper PA28R-200, which is a single-engine, four-occupant, low-wing, fixed tricycle landing gear airplane.

1.6.2 The aircraft experienced starting problems prior to departure. Maintenance personnel were called in and the problem was rectified. The defect was not recorded in the flight folio or logbooks of the aircraft.

Airframe:

Type	Piper PA28R-200	
Serial Number	28R-7435200	
Manufacturer	Piper Aircraft Corporation	
Date of Manufacture	1974	
Total Airframe Hours (At Time of Accident)	6 786.82	
Last MPI (Date & Hours)	30/07/2008	6 744.69
Hours Since Last MPI	42.13	
C of A (Issue Date)	1991/08/22	
C of R (Issue Date) (Present owner)	2004/09/07	
Operating Categories	Standard	

Engine:

Type	Lycoming
Serial Number	L-26706-51A
Hours Since New	1 396.19
Hours Since Overhaul	TBO not reached

Propeller:

Type	Hartzell
Serial Number	2398
Hours Since New	Unknown
Hours Since Overhaul	1 047.0

Aircraft Performance:

1.6.3 Aircraft performance with respect to aircraft weight and take-off performance was calculated utilizing the Piper Cherokee pilot operating handbook (POH) and the weight and balance documents. The aircraft weight at the time of the accident was estimated to be 2 290 lbs estimating the pilot and front-seat passengers' combined weight at 440 lbs, estimated rear passenger weight and baggage at 150 lbs, and a full load of fuel (50 gallons). The aircraft's weight and balance was determined to be within allowable limits as per the POH.

1.6.4 The density altitude was calculated utilizing the airport elevation of 5 483 ft, an outside air temperature (OAT) of 23ºC, a QNH of 1023, and a dew point temperature of 1ºC. The result was a density altitude of 7 404 ft. Take-off distance to clear a 50 ft obstacle at the density altitude, was calculated to be 4200ft utilizing the take-off distance vs. density altitude charts provided in the POH, which assume a max gross weight of 2 600 lbs and 25º flaps. The best rate of climb was found to be 520 ft per minute, utilizing the climb performance vs. density altitude chart in the POH, which assumes a max gross weight of 2 600 lbs, zero flaps and gear retracted.

1.6.5 The Piper Cherokee POH states: "The best rate of climb airspeed at gross weight is 95 mph. At lighter than gross weight, these speeds is reduced." The published stall table lists the stall speed at zero degrees angle of bank and flaps down as 64 mph. The published maximum rate of climb at sea level is 910 ft per minute.

1.7 Meteorological Information

1.7.1 The following meteorological information was obtained from the South African Weather Service (report reference: JS16/7/1/24082008).

Wind direction	300º	Wind speed	10 kts	Visibility	CAVOK
Temperature	23ºC	Cloud cover	None	Cloud base	None
QNH	1023	Dew point	1ºC		

1.8 Aids to Navigation

1.8.1 The aircraft was equipped with the standard navigation equipment which was serviceable at the time of the accident.

1.9 Communications.

1.9.1 The pilot was communicating his intentions on the tower frequency 118.7 MHz.

1.10 1.10 Aerodrome Information

Aerodrome Location	Rand Aerodrome (FAGM)	
Aerodrome Co-ordinates	S 26º 14.31' E 028º 09.05'	
Aerodrome Elevation	5 483 ft	
Runway Designations	11/29	17/35
Runway Dimensions	1 660 m	1 463 m
Runway Used	Runway 35	
Runway Surface	Asphalt	
Approach Facilities	Visual Approach Slope Indicator System (VASIS)	

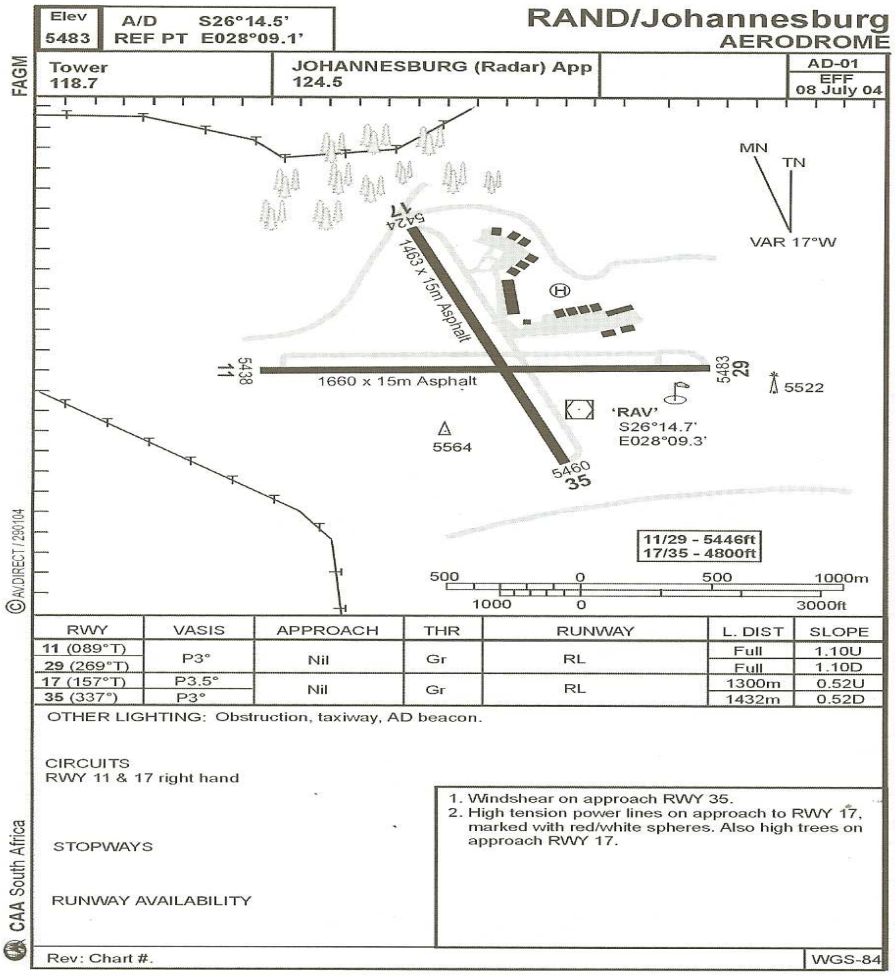

Figure 2: The runway designations at FAGM

1.10.1 The Rand Aerodrome (FAGM) is located in the vicinity of a golf course. The Airport/Facility Directory establishes the airport elevation at 5 483 ft above mean sea level (AMSL), and the runway is oriented in a north-south direction (runways 35 and 17). Runway 35 slopes downward with an altitude difference of 36 ft between ends. The bottom end of runway 35 borders a golf course that has large trees as well as large electricity pylons surrounding the golf course.

1.10.2 The advisory note 2 on the aerodrome information warns of high-tension power lines as well as high trees on approach to runway 17.

1.11 Flight Recorders

1.11.1 The aircraft was not fitted with a flight data recorder (FDR) or cockpit voice recorder (CVR), and neither were required by the applicable regulations.

1.12 Wreckage and Impact Information

1.12.1 The accident occurred at a location outside the aerodrome at GPS co-ordinates S 26 13.896' E 028 08.666'. The aircraft was taking off in a northerly direction when the aircraft experienced a loss of altitude. The aircraft was seen by witnesses to descend and then disappear behind trees. The aircraft was later found to have been involved in an accident.

1.12.2 During an on-site investigation, the following was observed:

1.12.2.1 The aircraft wreckage was located partially submerged in a stream of water at the Germiston golf course, adjacent to Rand Aerodrome, at an elevation of 5 426 ft AMSL. The immediate vicinity was level terrain, populated with tall trees. The initial point of contact with the trees was identified by the top missing from a tree 200 ft immediately south east of the wreckage. Freshly severed tree trunk and branches were at the base of the tree.

1.12.2.2 A 4 ft section of the left wingtip with impact damage was found at the base of the tree.

1.12.2.3 The main wreckage was oriented on a bearing of 320º magnetic lying in a shallow stream. The engine was attached to the firewall and the propeller was present on the engine. Black soot and charring was evident on the fuselage around the engine compartment and inside the cockpit on the pilot's seat.

1.12.2.4 Both wings had been cleanly separated at the wing root. The wing spar fracture locations were characterized by bright surfaces, granular in texture, and 45º fracture surfaces. The right wing was orientated parallel with the left side of the fuselage, with the wingtip towards the front of the airplane. The wing had a leading edge indentation at the wing tip. Both the right and left fuel tanks had been breached (25 gallon capacity fuel tanks). The right fuel tank was approximately 1/4 full of fuel. The tail was separated from the empennage, and hung by the rudder and stabilizer control cables. The left stabilizer, vertical stabilizer and rudder were present.

1.12.2.5 The wing root exhibited signatures consistent with overload.

1.12.2.6 It was determined that the fuel selector was set to the left tank position.

1.12.2.7 The ELT was found in the armed position. No report of ELT beacon activation had been received by airport personnel.

1.13 Medical and Pathological Information

1.13 1 The rear passenger was fatally injured. The pilot-in-command and the front-seat passenger, who was also a pilot, were Nigerian nationals. The pilot-in-command and the front-seat passenger were transferred to hospital by the emergency services. The pilots were then transferred to another hospital later that week. Both pilots succumbed to their injuries later that same week.

1.13.2 There was no evidence that physiological factors or incapacitation affected the performance of the pilot.

1.13.3 A post mortem examination of the pilot showed that the cause of death was cited as multiple injuries.

1.14 Fire

1.14.1 There was a post-accident fire in the engine compartment, which was beginning to spread to the cockpit. The airport aviation fire and rescue were notified of the accident by the tower at 1545Z. Two fire fighting vehicles and an ambulance were dispatched to the accident site.

1.14.2 The fire and rescue services were on the scene within minutes of the impact due to the quick response of the air traffic controller in notifying them that an aircraft had gone down at the golf course.

1.14.3 Access to the accident site was hampered due to uneven terrain and the location of the aircraft, which was partially submerged in a narrow stream.

1.14.4 The fire was extinguished using 450 lt of water and foam solution as well as a 9 kg dry chemical powder (DCP) fire extinguisher and a 9 kg carbon dioxide fire extinguisher. Bolt cutters and crow bars were also used to free the occupants from the aircraft.

1.15 Survival Aspects

1.15.1 Emergency services were quick to respond and were on the scene within minutes of the impact due to the vigilance of the air traffic controller, who alerted them as soon as he realised that the aircraft was in trouble.

1.15.2 The fire and rescue services arrived at the scene and found the aircraft ablaze.

1.15.4 Access to the accident site was hampered due to uneven terrain and the location of the aircraft, which was partially submerged in a narrow shallow stream.

1.15.5The fire was quickly extinguished by the emergency services, where after they proceeded to cut the airframe to gain access to the occupants of the aircraft.

1.15.6 The pilot and front-seat passenger were removed from the aircraft and taken to hospital.

1.15.7 The emergency services were unable to locate the second passenger and requested the ATC to confirm the number of occupants onboard the aircraft.

1.15.8 The ATC confirmed three onboard.

1.15.9 The rear seat passenger was found trapped between the fuselage of the aircraft and the bottom of the stream of water.

1.15.10 The tail of the aircraft was moved to enable emergency services to free the

trapped passenger. The passenger succumbed to her injuries at the scene of the accident.

1.15.11 The ELT was found in the armed position. No report of ELT beacon activation had been received by airport personnel.

1.15.12 The accident was not survivable due to the magnitude of the deceleration forces and the severity of the injuries sustained by the occupants.

1.16 Tests and Research

1.16.1 Effects of density altitude according to document FAA-P-8740-2 AFS-800-0478:

Performance figures in the aircraft owner's handbook for length of take-off run, horsepower, rate of climb, etc., are generally based on standard atmosphere conditions, namely 59ºF (15ºC), and pressure 29.92 inches of mercury at sea level.

However, inexperienced pilots, as well as experienced pilots, may run into trouble when they encounter an altogether different set of conditions. This is particularly true in hot weather and at higher elevations. Aircraft operations at altitudes above sea level and at higher than standard temperatures are commonplace in mountainous areas. Such operations quite often result in a drastic reduction of aircraft performance capabilities because of the different air density.

Density altitude is a measure of air density. It is not to be confused with pressure altitude, true altitude or absolute altitude. It is not to be used as a height reference, but rather as a determining criterion in the performance capability of an aircraft.

Air density decreases with altitude. As air density decreases, density altitude increases. The further effects of high temperature and high humidity are cumulative, resulting in an increasing high density altitude condition. High density altitude reduces all aircraft performance parameters. To the pilot, this means that the normal horsepower output is reduced, propeller efficiency is reduced and a higher true airspeed is required to sustain the aircraft throughout its operating parameters. This requires an increase in runway length for take-off and landing, and decreased rate of climb. An average small airplane, for example requiring 1000ft for take-off at sea level under standard atmospheric conditions, will require a take-off run of approximately 2000ft at an operational altitude of 5000ft.

1.16.2 The distance from the threshold of runway 35 to the point of the runway adjacent to the fire station is approximately 3 123 ft. The length of runway available for take-off (TORA) is 4 898 ft.

1.16.3 Stall Hazards

Not all stall accidents are the same. They don't have the same causes and they don't all have the same consequences. For instance some stall some stall accidents occur when the wing exceeds its critical angle of attack and the coefficient of lift (CL) falls while the coefficient of drag (CD) increases. The lift decreases to the point where the airplane can't maintain level flight and drag increases to the point where the aircraft can't accelerate. The aircraft maintains a roughly wings level attitude while it "mushes" into the ground. This type of accident is often survivable.

(Aircraft Accident Investigation. Richard H. Wood. Robert W. Sweginnis. Second edition. Chapter 27 page 203)

1.17 Organisational and Management Information

1.17.1 The aircraft training organisation had a valid ATO certificate at the time of the accident.

1.17.2 The aircraft maintenance organisation had a valid AMO certificate at the time of the accident.

1.18 Additional Information

1.18.1 The air traffic controller on duty reported the aircraft an hour late for its planned departure time. The delay was due to the aircraft having difficulty starting.

1.18.2 The air traffic controller on duty reported that he saw a third person board the aircraft although the flight plan filed was for two people onboard the aircraft. The air traffic controller proceeded to give clearance for take-off without questioning the pilot about the additional person taken onboard the aircraft.

1.18.3 The air traffic controller on duty reported that he saw the aircraft executing its take-off run slower than normal for that particular aircraft. He further reported that the aircraft finally lifted off the runway adjacent to the fire station located at the airport. The air traffic controllers witnessed the aircraft take off, but climb very slowly and disappear behind trees located at the golf course adjacent to runway 35. He immediately alerted the emergency services that an aircraft had gone down at the golf course.

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2. ANALYSIS

2.1 The weather on the day was fine and was not a contributory factor to the accident.

2.2 The density altitude on the day of the accident was calculated as being 7404 ft. This meant an increase in runway length required for takeoff.

2.3 Take-off distance to clear a 50 ft obstacle at that density altitude was calculated to be 4 200 ft as per the aircraft POH.

2.4 The distance from the threshold of runway 35 to the point of the runway adjacent to the fire station is approximately 3 123 ft.

2.5 The aircraft lifted off adjacent to the fire station, which is approximately 1000 ft less than specified in the POH for take-off distance at a density altitude of 7 404 ft.

2.6 The temperature recorded for the day was 23ºC, which may have not seemed that high to the pilot, as temperatures at Rand Aerodrome can get much higher than that

in the summer months.

2.7 The high-density altitude contributed to degrading all the aircraft performance parameters. To the pilot, this meant that the normal horsepower output was reduced, propeller efficiency was reduced and a higher true airspeed was required to sustain the aircraft throughout its operating parameters. It also meant an increase in runway length requirements for take-off and landing, and a decreased rate of climb.

2.8 The aircraft experienced a decreased rate of climb as it approached the tree line at the end of the runway. In an attempt to clear the tall trees at the end of the runway, the pilot would have had to pull back on the aircraft's controls, which would have caused a further decay in the rate of climb as this would increase the angle of attack thus decaying the air speed.

2.9 The aircraft entered into a stall from which the pilot could not recover.

2.10 The aircraft cleared the tree line bordering the golf course and then disappeared behind the trees and entered into the golf course. The aircraft left wing struck a tree near the edge of the golf course. The aircraft impacted the ground and then came to a stop in a stream running through the golf course.

2.11 Emergency services were quick to respond due to the vigilance of the air traffic controller, who alerted them as soon as he realised that the aircraft was in trouble.

2.12 The search and rescue efforts were hampered by uneven terrain and the location of the aircraft, which was partially submerged in a narrow shallow stream. Their efforts were further hampered by the aircraft, which was lying on top of the second passenger and which had to be moved in order to rescue the trapped passenger.

2.13 The pilot and the front-seat passenger were taken to hospital. The rear-seat passenger was trapped between the aircraft and the bottom of the shallow, muddy stream. The aircraft had to be moved in order to free the trapped passenger. The passenger succumbed to her injuries at the accident site.

3. CONCLUSION

3.1 Findings

3.1.1 The pilot was a holder of a valid licence with the aircraft type endorsed in his logbook. The pilot had 19.8 hours experience on the aircraft type.

3.1.2 The pilot was in possession of a valid aviation medical certificate that was issued by an approved SACAA medical examiner, without restrictions.

3.1.3 The engine was dismantled and analysed by an approved aircraft maintenance organisation to determine if it had contributed to the cause of the accident. The engine was found not to have contributed to the cause of the accident.

3.1.4 The high-density altitude on the day required that the pilot use 4 200 ft of runway for take-off instead of the 3 123 ft he used on the day of the accident.

3.1.5 The aircraft was unable to climb after take-off and entered into a stall from which the pilot could not recover.

3.1.6 The aircraft was later found to have crashed in a stream at a golf course.

3.2 Probable Cause/s

3.2.1 The aircraft stalled after take-off.

3.3 Contributory remark

3.3.1 Insufficient take-off distance as a result of high-density altitude.

4. SAFETY RECOMMENDATIONS

4.1.1 Density altitude advisories at airports with elevations of 2 000 ft and higher – control towers should broadcast the advisory "Check Density Altitude" when the temperature reaches a predetermined level. These advisories will be broadcast on appropriate tower frequencies or, where available, the ATIS. The ATIS will broadcast these advisories as a part of a Local Airport Advisory.

4.1.2 These advisories should be provided by air traffic facilities as a reminder to pilots that high temperatures and high field elevations will cause significant changes in aircraft characteristics. The pilot retains the responsibility to compute density altitude, when appropriate, as a part of preflight duties.

Figure 3: A density altitude indicator at an airport

4.1.3 An article should be published in the *Safety Link* magazine, alerting pilots to the fact

that even though the surrounding terrain may look wide open and relatively flat, on a typical summer day, some light airplanes could be at or close to their service ceiling before they even leave the ground. This would alert the pilots to pay particular attention to the density altitude and the appropriate performance charts in the airplane flight manual (AFM) or the pilot operating handbook (POH). Pilots should remember that no summer day is standard (FAA-P-8740-2 AFS-800-0478).

5. APPENDICES

5.1 Post Mortem reports of the occupants of the aircraft.

Submitted through the office of the SM for the Panel, November 2009.