AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

Reference:	CA18/2/3/9497

Aircraft Registration	**ZS-FHG**	**Date of Accident**	07 November 2015	**Time of Accident**	1048Z
Type of Aircraft	Piper PA-28-180 (Aeroplane)		**Type of Operation**	Part 141	
Pilot-in-command Licence Type	Private pilot licence	**Age**	22	**Licence Valid**	Yes
Pilot-in-command Flying Experience	Total Flying Hours	126.5		**Hours on Type**	102.7
Last point of departure	Port Elizabeth international airport (FAPE): Eastern Cape province				
Next point of intended landing	George aerodrome (FAGG): Western Cape province				

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

Westerly side of the airport on the perimeter fence at GPS co-ordinates, S33° 59″ 28 .64´ E025° 36″ 07.06´.

Meteorological Information	Temperature: 22° C, Dew-point: 15°C, Wind speed: 14 knots, QNH 1013hPa				
Number of people on board	1 + 0	**No. of people injured**	0	**No. of people killed**	1

Synopsis

On Saturday 07 November 2015, the pilot being the sole occupant on-board the aircraft was conducting a navigation flight exercise from Port Elizabeth (FAPE) international airport to George (FAGG) under visual flight rules (VFR) conditions when the accident happened. According to the refueller, before departure, 59 litres of fuel were uplifted followed by the pre-flight inspection. The refueller reported that ZS-FHG pilot had trouble starting the engine the first time. At the second attempt, it started but quitted within seconds. On the third attempt the aircraft managed to start. All appeared normal and the aircraft taxied to the runway 26 holding point where the pilot took power and took off. According to the air traffic controller (ATC) officer on duty at the time, the initial climb appeared normal, until the aircraft was half way down runway 26 at about 600 feet AGL when the pilot declared the engine emergency. The aircraft flew past the runway end and initiated a 180° turn to the right upon which after a series of turns the aircraft stalled and impacted the airport perimeter fence. The aircraft burst into flames and the pilot was fatally injured. The investigation concluded that the accident was a result of non-adherence to standard set emergency procedure as prescribed in the pilot operating handbook (POH). With the available runway length and clearway available the landing could have been successful.

Probable Cause

Unsuccessful forced landing due to engine failure.

The pilot's decision not to land on the remaining runway ahead and the loss of engine power.

Contributing factor/s:

Non adherence to emergency procedures as prescribed in the POH.

SRP Date	17 January 2017	Release Date	02 February 2017

AIRCRAFT ACCIDENT REPORT

Name of Owner : 43 Air School
Operator : (AIFA) Avic international flight training academy
Manufacturer : Piper Aircraft Cooperation
Model : PA-28-180
Nationality : South African
Registration Marks : ZS-FHG
Place : Westerly of FAPE airport perimeter fence
Date : 07 November 2015
Time : 1048Z

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 07 November 2015, the pilot as the sole occupant on-board the aircraft was conducting a navigation flight exercise (hour building flight towards commercial rating) from Port Elizabeth (FAPE) International airport located in the Nelson Mandela Bay Metropolitan Municipality to George (FAGG) in the Western Cape when the accident occurred. The aircraft involved was a Piper PA-28-180, call sign AVQ327 owned by 43 Air school based in Port Alfred but leased to Avic international flight training academy (AIFA). According to the available information gathered from AIFA, the cross country exercise started in the morning at FAGG and ended at FAPE where an uneventful landing was carried out on runway 26, with no technical snags reported. The aircraft was taxied to the general aviation area next to the Shelton aircraft maintenance organisation (AMO) for parking where upon the pilot joined his fellow aviators. The pilot spent time with his colleagues. After about 45 minutes the pilot walked to the aircraft and prepared it for a return flight to FAGG. The flight plan was filed with a FAPE briefing. Before the flight, 59 litres of Avgas LL 100 fuel was uplifted at Shelton aviation followed by a pre-flight inspection by the pilot.

1.1.2 The aircraft had a total of five hours´ endurance of fuel. The refueller at Shelton aviation reported that the ZS-FHG pilot had trouble in starting the engine the first time. On the second attempt it started, but quit within seconds. On the third attempt, the aircraft managed to start. All seemed normal and the aircraft taxied to runway 26 holding point. The refueller carried on with his daily duties. In less than five minutes he heard the emergency vehicles sirens sounding. Wondering what could have happened; he quickly went out and saw the airport fire fighting vehicles rushing to the western side of airport. He then saw a big fireball at the western side of the airport, was informed that the ZS-FHG aircraft had been involved. The air traffic controller (ATC) on duty at the time reported that he had taken over from the previous controller and that the accident happened twenty minutes after he took position. According to his memory, he had given taxi clearance to the holding point of runway 26 to three aircrafts, namely AVQ327 (ZS-FHG), AVQ395 (ZS-PBX) and AVQ397. AVQ327 and AVQ395 both reported ready and he “the controller” cleared AVQ327 for take-off.

1.1.3 According to the ATC transcript, 54 seconds after AVQ327 departure; AVQ395 was also cleared for take-off. Few seconds later at about 600 feet AGL, AVQ327 pilot reported an engine emergency at about 600 feet AGL saying “engine cutting out and asked to land back onto runway 26”. The ATC responded to AVQ327´s pilot after 20 seconds of reporting an engine emergency. According to the controller he wanted to make sure that AVQ395 was put on standby and does not enter the runway. According to the controller the response was made in plain English and the pilot was cleared to land back onto the runway. After realising that there was an emergency which required immediate attention, he instructed AVQ395 pilot to standby for take-off as he was only entering the runway for line up. The controller then observed AVQ327 proceeding, at the same height and then initiated a right turn alongside the instrument landing system approximately 300 meters from runway 08 threshold. During the turn, the aircraft lost height rapidly and could not reach the runway. The aircraft struck the wildlife exclusion airport perimeter fence before colliding with the ground. The controller activated the crash alarm at once and waited for the airport emergency services vehicles to respond. Attached below are the radar images screens depicting AVQ327.

Figure 1: Radar identified target depicting AVQ327 aircraft initiating a turn to the right and reporting an emergency passing 600 feet AGL. This indicates that the transponder was still operational.

Figure 2: Another radar target depicting AVQ327 at a different angle continuing in a turn to the right and having lost 200 feet in 9 seconds

Figure 3: AVQ327 was no longer radar identifiable hence the target is now a square

1.1.4 The controller reported that the aircraft hit the ground, and a big fireball formed. He then pressed the crash alarm for the second time and saw the fire section inspection vehicle, Mike Alpha and the fire engine on the A12 parking bay. He then gave MA the instruction to proceed to the threshold of runway 08 towards the location of the accident and informed him about the amount of fuel the aircraft had had in preparation for the flight to FAGG. The aircraft was destroyed by the post impact fuel-fed fire and the pilot was fatally injured. The local police station at Humewood was notified and officers were dispatched to the scene. The aircraft wreckage came to rest on its belly, nose low facing east. Police officers together with the forensic pathologist later extracted the pilot's body from the wreckage and took it to a nearby state mortuary. According to the eye-witnesses "FAPE wildlife exclusion fence project contactors" the accident happened as they were busy concreting the northern fence of FAPE, east of gate 6. According to the report, the aircraft sound appeared to be abnormal where after it initiated a turn to the right towards their location. For safety, they ran away from the fence upon which the aircraft impacted the fence before bursting into flames. The team was cleared from the accident site upon which a roll call was taken. All were accounted for without injuries.

1.1.5 The accident occurred during day-light conditions approximately at GPS co-ordinates S33° 59″ 28 .64´ E025° 36″ 07.06´. Attached below is the Google Earth map depicting the airport layout and location of the accident site.

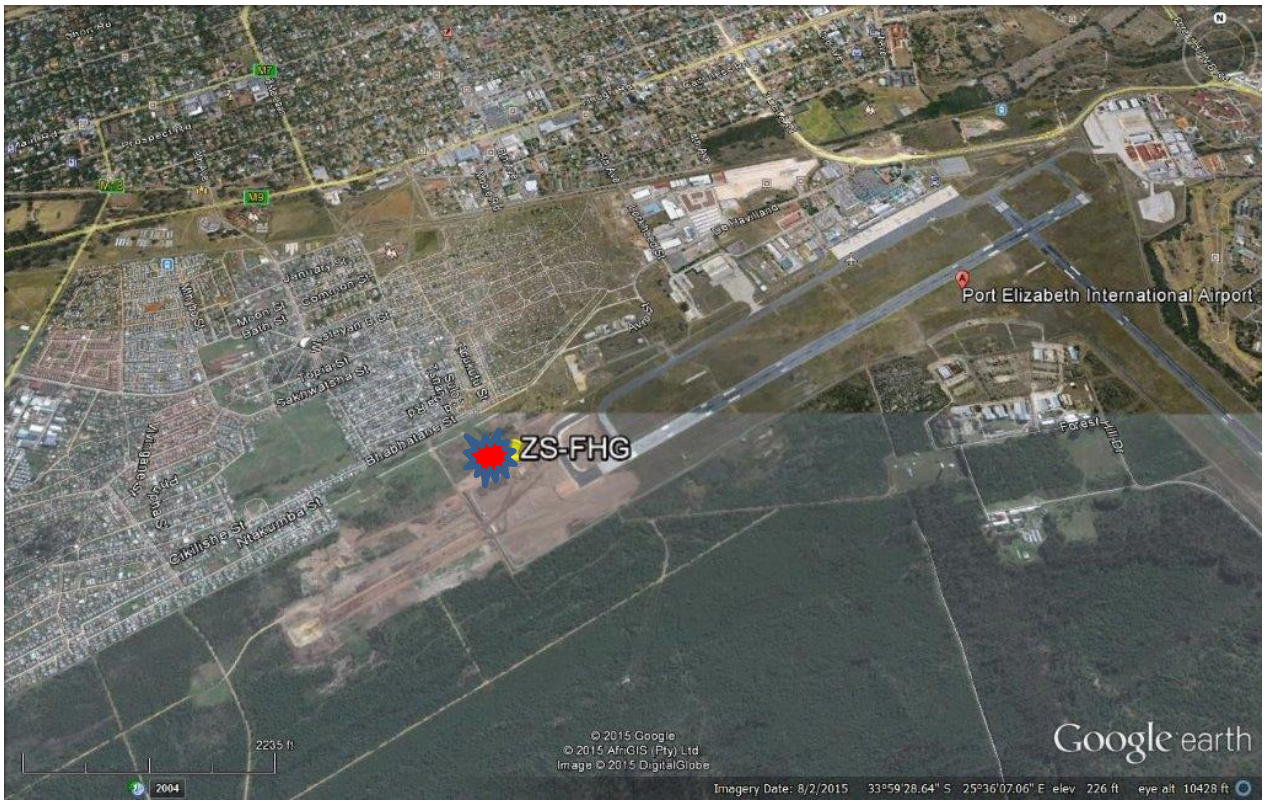


Figure 4: The Google Earth map depicting the airport layout and accident site

1.2 Injuries to Persons:

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

1.3 Damage to Aircraft:

1.3.1 The aircraft was destroyed by the post fuel-fed fire that erupted during the accident sequence.

Figure 5: The wreckage as found at the crash site

1.4 Other Damage:

1.4.1 The airport perimeter fence (four complete panels and three posts) which had just been erected was damaged during the accident sequence. Attached below is the photograph showing the damage to the airport perimeter fence.

Figure 6: View of a damaged wildlife exclusion FAPE airport perimeter fence

1.5 Personnel Information:

Nationality	Chinese	Gender	Male	Age	22
Licence Number	0272515255	Licence Type	Private pilot licence		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	31 January 2017				
Restrictions	Nil				
Previous Accidents	Nil				

Experience:

Total Hours	126.5
Total Past 90 Days	31.1
Total on Type Past 90 Days	31.1
Total on Type	102.7

*NOTE: The pilot was a 22 year old male, Chinese-national. He held a South African civil aviation authority issued Private Pilot License (PPL), issued 07 July 2015 with no ratings. According to the pilot's profile at SA CAA, the pilot had conducted his practical flight test through an approved reputable aviation training organization (ATO 0047). His profile showed no accident or incident history, enforcement actions, pilot certificate or rating failure, or retest history. His aeronautical logbook was made available during the investigation. All entries made showed that he had accumulated 126.5 hours total aeronautical experience, with 102.7 hours on a PA-28-180 aircraft. The pilot also completed a language proficiency test for his radiotelephony communication. He was a passionate aviator and very good in English. The pilot training file showed that he underwent all the applicable emergency procedures (stall/spin recovery techniques and forced landings exercises) required and was found to be good and able to cope under all conditions. All this was done following the ATO´s training and procedures manual as approved by the South African civil aviation authority (SACAA).

Aircraft Traffic Controller (ATC):

Nationality	South African	Gender	Male	Age	25
Licence Number	ATS 1051	Licence Type (All inclusive)	Aerodrome Control Approach Control Procedural Approach Control Radar		
Licence valid	Yes	Type Endorsed	Not Applicable		
Ratings	None				
Medical Expiry Date	31 August 2016				
Restrictions	Wear suitable corrective lenses				

*NOTE: Records of the air traffic controller (ATC) was on duty in the Port Elizabeth (FAPE) international airport tower at the time of the accident showed that he was experienced and familiar with local operations. The controller had also undertaken the required annual training in unusual circumstances and aircraft emergencies.

1.6 Aircraft Information:

1.16.1 The PA-28-180 Cherokee is a single-engine, low-wing monoplane of all-metal construction. It has four place seating and 200 lb baggage capacity, and a 180 horsepower engine. The Cherokee 180 is powered by a four cylinder, direct drive, horizontally opposed engine rated at 180 horsepower at 2700 rpm.

Figure 7: Piper PA-28-180 aircraft

Airframe:

Type	Piper PA-28-180	
Serial Number	28-4516	
Manufacturer	Piper Aircraft Cooperation	
Maximum take-off weight	2 400 lb	
Empty weight	1 230 lb	
Maximum speed	132 knots	
Date of Manufacture	1968	
Total Hours (At time of Accident)	5 256.04 (Tachometer Hours)	
Last 50 Hour Inspection (Hours & Date)	5 222.3	09 October 2015
Total Hours Flown	33.74	
Certificate of Airworthiness (Issue Date)	08 September 2015	
C of R (Issue Date) (Present owner)	11 January 2013	
Operating categories	Standard Part 141	

*****NOTE: The aircraft airframe hours at the time of the accident could not be determined with accuracy because the flight folio could not be found. It was believed to have been destroyed by post fire that erupted after the crash. The hours entered in the table above were found from the last maintenance documentation found at the AMO located at FAGG. The last maintenance work pack, dated 09 October 2015, job card No 2829 showed that the aircraft underwent a 50 hour inspection at 5 222.3 tachometer hours. The engine responded well to power changes. A magneto drop test was also carried out and both engine and magneto came out serviceable. During this inspection, seven quarts of oil was added to the engine and the oil filter was replaced. The maintenance task was performed by AMO No 1209. All relevant aircraft certification such as the certificate of registration, the authority to fly, the radio licence and the mass and balance certificates were found to be valid. The aircraft logbook entries were appropriately certified in accordance with the applicable regulations. The aircraft profile showed that the aircraft had been involved in an accident on 01 November 2010. Accident report No CA18/2/3/8856 showed that the aircraft had collided with the power lines during an approach for landing at Koedoesvlei airfield, Eastern Cape. The aircraft was damaged; but repaired and released to service.

Engine:

Type	Lycoming O-360-A4A
Serial Number	RL-39402-36E
Hours since New	4 527
Hours since Overhaul	683

*NOTE: According to the last engine logbook entries, the current Lycoming engine, serial number RL-39402-36E was fitted to ZS-FHG on 29 May 2014 after having undergone comprehensive overhaul maintenance in accordance with CRMA 2014-478. The maintenance was conducted by AMO 46. During the process new rubber engine mounts certificate No C-11223 from aerospace welding were fitted. Engine hoses carrying fluid were fabricated, pressurised, tested and fitted to ZS-FHG. New engine controls cables were fitted to the aircraft. All class two components such as the magnetos, carburettor, starter, and the alternator were then fitted to the engine.

Propeller:

Type	Sensenich
Serial Number	76EM855-0-60
Hours since New	2 682
Hours since Overhaul	983

1.7 Meteorological Information:

1.7.1 An official weather report was obtained from the South African Weather Services (SAWS). The weather data on the report was extracted from the SAWS Automatic Weather Station. The data below was for 07 November 2015 at FAPE.

Temperature :22°C

Dew-point :15°C

Wind speed :14 Knots

QNH :Q1013hPa

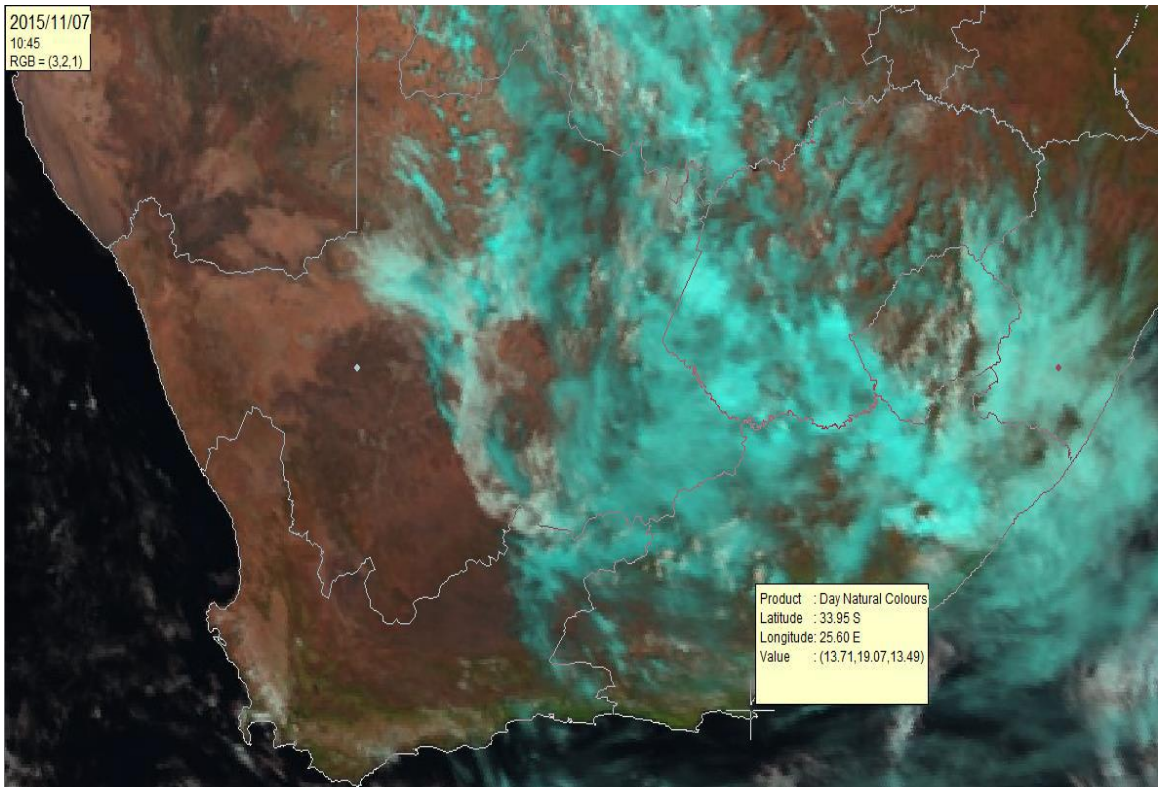


Figure 8: Satellite image taken on 07 November 2015

1.8 Aids to Navigation:

1.8.1 The aircraft was equipped with the following navigational aids.

- Magnetic compass.
- Transponder.
- ADF (Automatic Direction Finder).
- VOR (Variable Omni Range) finder.
- DME (Distance Measuring Equipment).

1.9 Communications:

1.9.1 The communications equipment installed in the aircraft was found to comply with the approved equipment list. There were no defects reported with the communication equipment prior to the accident. The pilot was able to communicate with the control tower officer on the airport frequency of 118,1MHz. Transcripts showed that the communication between the pilot and the controller was good.

1.10 Aerodrome Information:

1.10.1 The accident happened in day light conditions at GPS co-ordinates determined to be S33° 59″ 28 .64´ E025° 36″ 07.06´.

Aerodrome Location	Port Elizabeth	
Aerodrome Co-ordinates	S33°59´.24″ E025°36´.37″.	
Aerodrome Elevation	226 feet AMSL	
Aerodrome Status	Licensed	
Runway Designations	08/26	1 980 X 46
Runway Dimensions	17/35	1 677 X 46
Runway Used	Runway 26	
Runway Surface	Asphalt	
Approach Facilities	NDB,ILS,VOR,DME, Runway Lights and PAPÍs	

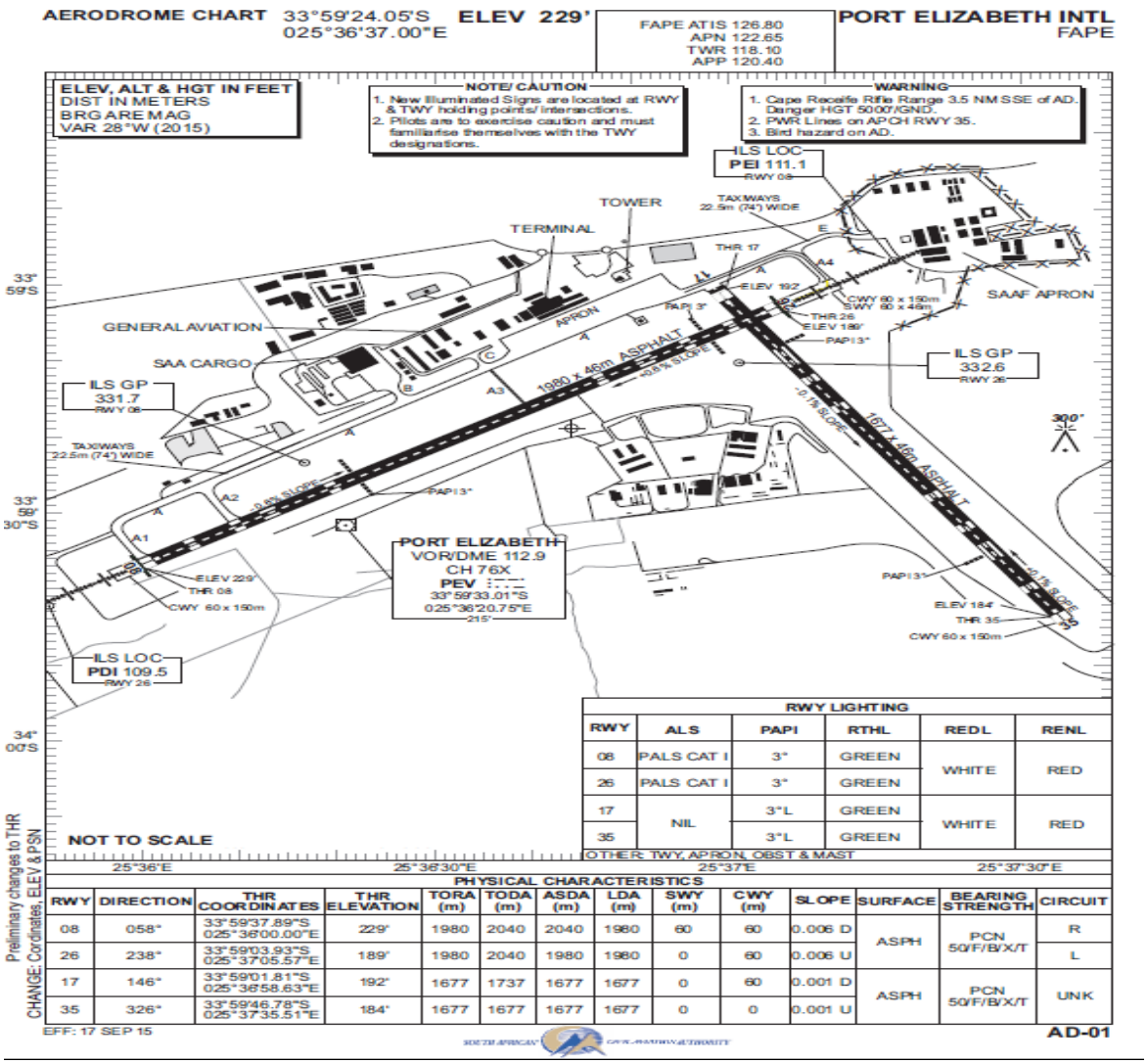


Figure 9: Airport layout as per aeronautical information publication (AIP)

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 regulations to be fitted.

1.12 Wreckage and Impact Information:

1.12.1 The wreckage came to rest nose low at an easterly heading. The cockpit/cabin area was destroyed and the position of the fuel selector switch could not be determined, yet the investigation was able to determine that the aircraft had enough fuel, correct grade for the planned flight. Sections of the aircraft such as the tail section and the left wing were outside of the airport perimeter fence with the other wing and the forward fuselage inside. The airport perimeter fence that was damaged during the accident sequence. Attached below are the photographs.

Figure 10: Accident site relative to runway in use at the time of the accident

Figure 11: The remains of ZS-FHG

1.12.2 The position of the primary flight controls was examined; no evidence of control restriction, jamming or pre-impact anomalies were found. The impact forces sustained by the aircraft structures have resulted in erroneous control position indications. In general, the position of the flight controls after impact could not be relied upon as evidence of the aircrafts pre-impact configuration.

1.12.3 The aircraft landing gears broke. The position of wing the flaps could not be determined. The entire cockpit and all cabin seats and structures, along with the seat belts and their attachments, were destroyed by the fire. The cockpit, including instrumentation and switches were destroyed. The damage to the switches was such that their position prior to the ground impact could not be ascertained. The tail section survived the fire with the rudder in a neutral position. The aircraft remained essentially intact, but was destroyed by the impact and post impact fuel-fed fire.

Figure 12: Aircraft tail section view and the damaged airport perimeter fence

1.12.4 The aircraft was structurally intact prior to the accident. The wreckage was thoroughly examined before recovery from the site. The wings leading/trailing edges, together with the wing attachments and associated structure, the cast-aluminium fuselage frames, and most of the flying control system cranks and levers were destroyed by the forces generated during the accident sequence. The engine controls (power lever/melted mixture control lever), and the cockpit instruments and radios were severely damaged. The propeller was still attached to the hub, but one blade was curved.

Figure 13: A photograph showing the engine controls

Figure 14: Condition of the propeller at the accident site

1.13 Medical and Pathological Information:

1.13.1 The post mortem report indicated the cause of death to be multiple injuries sustained during the accident sequence. The pathologist reported that there was no evidence of drugs or alcohol having being consumed, nor was there any evidence of natural sickness which could have contributed to the accident.

1.14 Fire:

1.14.1 The fuel-fed fire erupted after impact with the ground.

1.15 Survival Aspects:

1.15.1 The accident was considered non-survivable. The aircraft burst into flames after impact, suggesting that; though the pilot might still have been conscious after collision with the perimeter fence and the ground, he might have been incapable of vacating the burning wreckage. The emergency medical service was dispatched to the site of the accident, however the pilot was found to have succumbed to his injuries. The pilot's body was extracted from the wreckage and handed into the care of the Forensic Pathology services located at Port Elizabeth. Humewood police has opened an inquest investigation docket.

Figures 15: Emergency vehicles (fire truck and the ambulance) at accident site

1.16 Tests and Research:

1.16.1 The investigation of the regulatory oversight and the safety culture indicated no shortcomings. The company showed a pro-active approach to safety management. Following the accident, the Shelton aviation fuel bay was visited upon which an investigation was carried out. The investigation discovered that personnel dispensing fuel were well trained in fuel handling to assure that only clean and dry fuel was dispensed daily. Scrutiny of their documentation also showed that Shelton aviation had procedures in place to assure that clean and dry fuel was delivered to the storage system.

1.16.2 In addition, daily, weekly and monthly fuel inspections were conducted on a continuing basis to assure that the fuel in the fixed storage and dispensing system was free of water and sediments prior to refuelling the aircrafts. Records from AIFA showed that ZS-FHG´s flight to FAPE was uneventful with no fuel-related problems reported. Before the return flight to FAGG, ZS-FHG had uplifted additional 59 litres of fuel. The fuel register revealed that the same day, a Cessna C172 was refuelled before ZS-FHG and it left FAPE without reporting any fuel related matter. In addition, after ZS-FHG was refuelled, another PA-28-180 was topped up from the same dispensing unit and no fuel-related mishap was reported. In a nutshell no fuel related problem was reported.

1.16.3 Engine Investigation:

On 08 November 2015, a Lycoming O-360-A4A engine, serial number RL-39402-36E and a Sensenich propeller, serial EM855-0-60 propeller were recovered from the accident site to an approved engine overhaul facility in Port Alfred for examination and tear down inspection under the supervision of the investigators. Detailed analysis of the propeller blades exhibited signs of rotation at low power. The alternator was destroyed during the accident sequence but remained attached to the engine by the cables. Before the engine teardown, the magnetos were inspected and bench tested and no faults were found. All eight champion spark plugs were also bench tested and no faults were found. The engine could still turn and compression was established. The engine was subjected to severe heat damage. Before the strip down all crushed wires, pipes and baffles were removed. Due to the extent of the damage on all sides of the engine it was not possible to investigate the ignition systems. The following were noted.

- Oil pump was removed: Internally no abnormalities could be found. The oil pump gears were turning freely and no evidence of overheat or running dry could be found.
- Vacuum pump was still intact and turning free.
- Oil filter was normal. It was cut open, a magnet used and it was free from chips.
- Oil thermal or temperature oil control was normal. Oil pressure relief valve was fine.
- Exhaust pipes clean, free from oil.
- The damaged starter was removed. No internal abnormalities could be found.
- The rocker shafts and valve rockers were removed. No abnormalities could

be found.

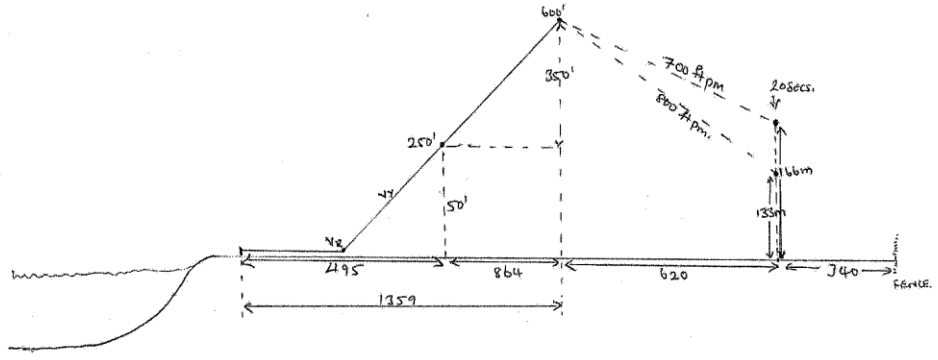
- Pushrod tubes and pushrods were removed. No abnormalities could be found.
- Cylinder base nuts were removed and torque on all the nuts were found to be normal.
- Cylinders were removed one at a time, checking the condition of pistons and position of the ring gaps. No abnormalities could be found.
- The piston pins were all checked for free rotational movement and were then removed with the pistons. No anomalies were found.
- The connecting rods were checked for normal movement on the big end bearings of the crankshaft and were found to be normal. Crankshaft rotation was checked and it was found to be able to rotate normally.
- The crankcase was then split and the crank with connecting rods was removed to expose the main crank bearings. No abnormalities could be found with the main bearings.
- The camshaft was removed and inspected. No abnormalities could be found with the camshaft and camshaft bearings.
- The camshaft gear drive train was removed and inspected. No abnormalities were found.
- The fuel pump was tested and found serviceable. There was evidence of Avgas fuel of the correct grade within the lines.
- The carburettor butterfly gave free play. Suction filter was clean.
- Fuel plunger was still in a good working condition and fuel strainer not blocked. Full power and idle cut off settings were accurate. The primer was normal with no restrictions.
- The engine investigation in general showed nothing abnormal or signs of defective workmanship.

1.16.4 ATC handling emergency:

FAPE ATC communication record was made available to the investigating team on a compact disc (CD) and examined later as part of the investigation. During the process it came to the attention of the investigators that the pilot broadcasted an emergency call (my engine is cutting off inside, requesting emergency landing on the runway) at 10:47:36, **600 feet AGL**.

The response from the control tower was made at 10:47:56 (AVQ327 you can land back on the runway), 20 seconds later. At this stage, the aircraft was on track still travelling at 85 miles per hour. The investigators with the aid of one of SACAA reputable flight schools flight instructors worked out the twenty seconds time lapse relative to the aircraft track leading up to the accident. The calculations were made considering the PA28-180 pilot operating handbook (POH) and the recent conditions for the day as per the official weather report. Temperature, 22°C: QNH, 1013 hectopascals (Hpa): Wind speed, 14 knots: Wind direction, 240 Density Altitude, zero (0) ft and the aircraft mass and balance which was within limits (standard aircraft weight with full tanks and 1 crew/pilot). From adding full power to rotate and to climb to 50 feet above the runway, 1 625 feet (495 meters) was used. Rate of climb for current conditions was 750 ft per minute. Vertical travel 350 ft @ 750 ft per minute {(0.46 minutes) (28 seconds)}. This was to climb from the end of the take-off distance at 50 ft above the runway to 400 ft above aerodrome level (ATC transcript indicated at 600 feet altitude, airfield elevation was 200 ft AMSL) best rate of climb (VY) 74 knots (recommended climb speed), headwind 14 knots. Therefore 60 knots ground speed = 6 080 feet per minute @ 28 seconds = 2 837 ft (864 meters). 864 meters travelled + take-off distance of 495 meters = 1 359 metres. Runway 26 length as publicised on the aeronautical information publication (AIP) was 1 980 metres - **1 359** metres = **620** metres short of the threshold. Therefore the investigation determined that the aircraft would have been 620 meters before the runway end when the aircraft report an engine failure at 600 ft altitude, assuming reported conditions were correct and flying accuracy was maintained. According to FAPE apron manager, the clear way/grass area available from the threshold to the airport perimeter fence was **340.4** metres. The 620 meters short of runway end + 340.4 clear way/grass area = 960.4 meters. The aircraft travelled additional **514** meters before a call "you can land back on the runway" (10:47:56) was made. Meaning that the aircraft was right at the runway end when a call was made heading towards the airport perimeter fence before commencing a 180° turn to the right. Nine seconds later (illustrated on figure 2) the aircraft lost height and dropped to 400 feet AGL. Seconds later, the aircraft disappeared from the radar, suggesting that during the series of turns, it entered into a stall condition, from which it impacted the airport perimeter fence before bursting into flames. The accident scene also revealed that the aircraft did not have forward speed at the time of the accident. Below is the Google earth map depicting FAPE aerodrome layout and the calculated aircraft performance/travel.

Figure 16: Google Earth map depicting the airport layout



V_y = 85 mph = 74 kts
∴ 74 − 14 (Head wind).
= 60 kts.
60 kts GS = 31 m/s.
∴ In 20secs the distance covered
= 31 m/s x 20s
= 620 m.

V_x = 74 mph = 64 kts.
∴ 64 kts GS − 14 kts (Head wind)
= 50 kts GS.
= 25.7 m/s.
∴ In 20secs the distance covered
= 25.7 m/s x 20s.
= 514 m.

Figure 17: Calculated distance verses performance of the aircraft at the time of the accident

(a) Front view of the wreckage (b) Rear view of the wreckage

Figures 17: Photographs showing how the aircraft impacted the fence. The fence was found to have been pushed outside but not inside towards the direction of the aircraft flight path, suggesting that the aircraft did not have forward speed at the time of the accident

1.17 Organizational and Management Information:

1.17.1 This was a private flight.

1.17.2 The investigation of the regulatory oversight and the safety culture indicated no shortcomings. The operator showed a pro-active approach to safety management

1.17.3 The last annual Inspection prior to the accident flight was certified on 09 October 2015 at 5222.3 Tachometer hours. The AMO No 1209 that performed the last mandatory inspection was accredited by the SA CAA.

1.18 Additional Information

1.18.1 None.

1.19 Useful or Effective Investigation Techniques:

1.19.1 None.

2 ANALYSIS:

2.1 Records showed that the pilot was the holder of a private pilot licence and had logged a total of 126.5 flight hours, of which 102.7 hours were on type. His medical certificate was valid and he was fit to commence with flying activities at the time of the mishap. This aircraft took off in good weather condition prevailing. The examination of the aircraft maintenance records and maintenance program indicated no issues with the aircraft maintenance that could have contributed to the accident. The investigation of the company regulatory oversight and the safety culture indicated no shortcomings. The company showed a pro-active approach to safety management. On-site investigation revealed that the aircraft was structurally intact prior to the accident. From the ab-initio stages, pilots are taught what to do in case of an emergency after takeoff. Firstly, it is expected of the pilot to lower the nose and adopt the best gliding speed to avoid an inadvertent stalling. Secondly, it is expected of the pilot to close the throttle to reduce the uncertainty from any partial power that maybe apparent.

2.3 Lastly, it is expected of the pilot to choose the landing site within 45˚ either side of the extended runway centerline. The ATC recording revealed that AVQ327 pilot had broadcasted an emergency call at 600 feet AGL, and 620 meters short of runway end. The aircraft continued along the runway center line before commencing a 180° turn. Seconds later the aircraft crashed onto the airport perimeter fence. The investigation was unable to determine the cause of the engine anomaly, but could also not ignore the prescribed engine power loss during takeoff emergency drill as specified in the aircraft POH. The IIC anticipated that at the point the engine anomaly was detected and reported, the pilot could have directly landed the aircraft as there was 620 meters runway length available, plus the grass area/clearway which was about 340.4 meters long. In addition, the situation at that point could also have allowed a best glide speed between 700 or 800 feet per minute. The attempt to return to the airport after an engine failure is often called ‘the impossible turn’ because it usually ends in the aircraft stalling during the turn and spinning, with often fatal results. Pilots are trained ***never to turn back to the runway*** after an engine failure unless they have adequate altitude. In closing, this investigation did not set aside or ignore the air traffic controller’s actions, however it focused more at the responsibilities of the pilot and his decision making outcomes related to his expertise. Whatever his reason, the decision to continue flying, when he still had ample space in which to land, was a fateful one.

3. CONCLUSION:

3.1 Findings:

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

3.1.2 The pilot's medical certificate was valid with no restrictions.

3.1.3 The pilot disregarded the POH standard operating procedure, "the pilot should land straight ahead in case of emergency after take-off".

3.1.4 The flight was operated as a general aviation flight under VMC.

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

3.1.6 The aircraft was maintained in accordance with the existing regulations.

3.1.7 The aircraft was destroyed by impact forces and post-impact fire.

3.1.8 Due to the destruction of the aircraft by impact fire, it could not be determined whether any pre-impact failure or system malfunction contributed to the accident.

3.1.9 The propeller blade damage was consistence with the engine not producing power.

3.1.10 The accident was considered not survivable.

3.2 Probable Cause/s:

3.2.1 Unsuccessful forced landing due to engine failure.

3.2.2 The pilot's decision not to land on the remaining runway ahead and the loss of engine power

3.3 Contributing factor/s:

3.3.1 Non-adherence to emergency procedures as prescribed in the POH.

4. SAFETY RECOMMENDATIONS:

4.1 None.

5. APPENDICES:

5.1 Emergency procedures as per the aircraft flight manual.

EMERGENCY PROCEDURES

INTRODUCTION

This section contains procedures that are recommended if an emergency condition should occur during ground operation, takeoff, or in flight. These procedures are suggested as the best course of action for coping with the particular condition described, but are not a substitute for sound judgment and common sense. Since emergencies rarely happen in modern aircraft, their occurrence is usually unexpected, and the best corrective action may not always be obvious. Pilots should familiarize themselves with the procedures given in this section and be prepared to take appropriate action should an emergency arise.

Most basic emergency procedures, such as power off landings, are a normal part of pilot training. Although these emergencies are discussed here, this information is not intended to replace such training, but only to provide a source of reference and review, and to provide information on procedures which are not the same for all aircraft. It is suggested that the pilot review standard emergency procedures periodically to remain proficient in them.

ENGINE POWER LOSS DURING TAKEOFF

The proper action to be taken if loss of power occurs during takeoff will depend on circumstances.

1. If sufficient runway remains for a normal landing, land straight ahead.
2. If insufficient runway remains, maintain a safe airspeed and make only a shallow turn if necessary to avoid obstructions. Use of flaps depends on circumstances. Normally, flaps should be fully extended for touchdown.
3. If you have gained sufficient altitude to attempt a restart, proceed as follows:
   a. MAINTAIN SAFE AIRSPEED
   b. FUEL SELECTOR - SWITCH TO ANOTHER TANK CONTAINING FUEL
   c. ELECTRIC FUEL PUMP - CHECK ON
   d. MIXTURE - CHECK RICH
   e. CARBURETOR HEAT - ON

NOTE

If engine failure was caused by fuel exhaustion, power will not be regained after tanks are switched until empty fuel lines are filled, which may require up to ten seconds.

If power is not regained, proceed with the POWER OFF LANDING procedure.

5.2 Transcript.

ATS AUDIO TRANSCRIPT FORMAT

Transcript of 118,1MHz voice recordings on *Port Elizabeth Tower, 07/11/2015* regarding Safety Event involving AVQ327

Time	RTF	Station	Text of transmission
10:45:41	RTF	AVQ372	AVQ327 Ready.
10:45:46	RTF	FAPE TOWER	AVQ327 Runway two six, surface wind two seven zero degrees one three gusting one seven knots, cleared take-off report *"-C" "-T" "-R"* outbound.
10:46:04	RTF	AVQ372	Cleared for take-off runway two six. Report *"-C" "-T" "-R"* outbound.
10:46:48	RTF	AVQ395	Port Elizabeth Tower AVQ395 ready for take-off.
10:46:58	RTF	FAPE TOWER	AVQ395 Runway two six, cleared take-off, surface wind two seven zero degrees one eight knots, Report *"-C" "-T" "-R"* outbound.
10:47:08	RTF	AVQ395	Runway two six, cleared take-off, copy the wind, Report *"-C" "-T" "-R"* outbound, AVQ395.
10:47:36	RTF	AVQ327	"-P" "-E" Tower AVQ327, my engine is cutting off inside, requesting emergency landing on the runway.
10:47:46	RTF	FAPE TOWER	AVQ395 orbit, uhm, standby for the take-off.
10:47:53	RTF	AVQ395	Standby for the take-off.
10:47:56	RTF	FAPE TOWER	AVQ327 you can land back on the runway.
10:48:00	RTF	AVQ327	Landing back on the runway AVQ327.

5.4 Below is the sequence of events covering the 20 seconds delay:

- 10:46:48 AVQ397 advises ATC that he is ready for take-off…(**In approximately ten seconds, two transmissions was made by the ATC with the view to make sure that the ahead [AVQ327] is clear of the runway or is above 500 feet AGL**)
- 10:46:58 ATC clears AVQ397 for take-off….
- 10:47:08 AVQ397 acknowledges instruction….
- 10:47:36 AVQ327 declares and emergency and indicates his engine is cutting out and request emergency landing on the runway….
- 10:47:46 ATC informs AVQ397, orbit, then hesitate and says standby for take-off….
- **When AVQ327 declares emergency, ATC was caught off guard. He could not ignore the aircraft that was about to depart. He had to first make sure that the aircraft stops or clears off the runway. It was for that reason that he first had to stop AVQ397 before he could give AVQ327 the clearance to land back on the runway**. It must be taken into account that the time it takes any person to process an emergency before undertaking a good and safe decision cannot be quantified but must be within reason….
- 10:47:53 AVQ395 says standby for take-off (At this time the ATC thought it was safe for AVQ327 to land back on the runway)

5.5 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:

<u>Weight</u>: 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.

…END…